PROJECT MANUAL

CSO 15 and CSO 81 Sewer Separation

PROJECT I.D. P079
ARPA PROJECT NUMBER 1079

ENGINEERING DIVISION, PUBLIC WORKS DEPARTMENT

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/ KANSAS CITY, KANSAS

CONTRACT DOCUMENTS

FOR

CSO 15 AND CSO 81 SEWER SEPARATION

PROJECT ID P079



ENGINEERING DIVISION
of

PUBLIC WORKS DEPARTMENT

Prepared by: _____ 6/10/2024
Project Manager Date

Approved: _____ 6/10/24
County Engineer Date

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LEGAL NOTICE OF INVITATION FOR BIDS
UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS
OFFICE OF THE COUNTY ENGINEER

Bids are being solicited for a capital construction project known as:

Project Name **CSO 15 and CSO 81 Sewer Separation**
Project ID No. **P079**
Bid Date **July 17, 2024**
Contract Completion Date **April 30, 2025**
Estimated Value **$3,500,000 to $4,200,000**

Bids will be received until 8:45 a.m. on the above date, at the Office of the Unified Government Clerk, 3rd Floor, Municipal Office Building, 701 North Seventh Street, Kansas City, Kansas, 66101. At 9:00 a.m., in the 5th Floor Administrative Conference Room #515, the bids will be publicly opened and read aloud.

Project goals for MBE/WBE participation are NOT part of this solicitation.
Prevailing Wage Rate is NOT part of this solicitation.

Printed copies of the Bidding Documents consisting of the drawings and specifications, together with information to bidders, bid proposal form and forms of contracts, performance bond and payment bond may be obtained from Drexel Technologies at http://www.drexeltech.com/.

Additionally, Bidding Documents may be picked up at Drexel Technologies on a CD or downloaded electronically. See the Drexel Technologies website for pricing. All purchases are non-refundable. Drexel Technologies can be contacted by phone at (913) 371-4430 or electronically at http://www.drexeltech.com/. Bidding Documents will be shipped only if the requesting party assumes responsibility for all related shipping charges. Corporate, certified, or cashier's checks shall be made payable to Drexel Technologies.

The Bidding Documents may be examined online at http://www.drexeltech.com, in person during regular business hours at Drexel Technologies 10840 West 86th Street, Lenexa, KS, 66214-1632, or at the office of the Director of Water Pollution Control, 50 Market Street, Kansas City, KS, 66118.

A **Mandatory** Pre-Bid Conference will be held at:

Kaw Point Treatment Complex
50 Market Street, Kansas City, Kansas
Room: 207 Conference Room
Date: June 27, 2024
Time: 9:30 AM

Bid security is required. The Unified Government reserves the right to reject any or all bids. Instructions and Information to Bidders contains additional requirements.

The Unified Government of Wyandotte County/Kansas City, Kansas

Troy Shaw Digitally signed by Troy Shaw Date: 2024.06.06 08:50:49-05'00'

County Engineer

Unified Government Clerk

INSTRUCTIONS AND INFORMATION TO BIDDERS

1. Sealed bids will be received until the date and time stated in the Legal Notice of Invitation for Bids at which time in the Council Chambers the bids will be publicly opened and read aloud.

2. Bids shall be submitted in sealed envelopes, addressed to the Unified Government Clerk, Municipal Office Building, One McDowell Plaza, Kansas City, Kansas. The outside of each sealed envelope containing a Bid Form shall plainly be marked "Bid" and shall state the name of the project and the name and address of the bidder. If forwarded by mail, the sealed envelope containing the Bid Form must be mailed inside another envelope to the addressee.

3. Within ten days from the date of receipt of the notice of award, the successful bidder shall come into compliance with chapter 11 of the Procurement Code and Regulations regarding Affirmative Action and Equal Employment Opportunity as required by Sections 18-137 and 18-138 of the Code of Ordinances of the Unified Government of Wyandotte County/Kansas City, Kansas. For information regarding compliance requirements, contact the Contract Compliance Division located on the 3rd Floor of the Municipal Office Building, 701 N. 7th Street, Kansas City, Kansas 66101, Room 318 or call (913) 573-5443.

4. Along with the bid, all bidders must submit, on the form provided, a completed Affidavit of Intended Utilization, listing the names of Subcontractors and Suppliers proposed for use and designating which Work each is to perform. Affidavit of Intended Utilization is required whether or not project goals are established. The Unified Government encourages solicitations from local-, minority-, and women-owned businesses, on all projects whether or not project goals are established. Prime bidders may access a listing of L/M/WBE firms by visiting www.wycokck.org and clicking the link titled “Supplier Database.”

5. When a project goal for participation by MBEs or WBEs is established in the agreement, additional submittals are required. These additional requirements are located in the section of this project manual titled “Additional Requirements when MBE/WBE Goals are Established”.

6. All bids shall be submitted on the printed Bid Form, or photocopy thereof, included in the Bidding Documents. All blank spaces must be filled in, in ink or typewritten, and the Bid Form must be fully completed and executed when submitted. Only one executed copy of the Bid Form is required. All other forms required to be submitted shall be completed by the bidder and submitted with the Bid Form. The Bid Form and all required forms shall be fastened together in one package. A second complete copy of the Bid Form and all other required forms, fastened as a second package, shall be submitted in the same envelope.

7. All Bids in excess of $50,000.00 must be accompanied bid security in the form of a bank-certified check, cash, or a Bid Bond underwritten by a surety company licensed to issue Bid Bonds in the State of Kansas. The bid security shall be in an amount not less than five percent (5%) of the total bid. The Bid Bond shall be in substantially the Bid Bond form provided in these Bidding Documents. The check or Bid Bond shall be made payable to the Unified Government of Wyandotte County/Kansas City, Kansas. As soon as the bids have been

compared, the Unified Government will return the checks or cash of all except the three lowest responsible bidders. Upon execution of the contract by the Unified Government, the checks or cash shall be returned to all bidders.

8. Bids may be modified or withdrawn by written notice received in the office of the Unified Government Clerk, Municipal Office Building, One McDowell Plaza, Kansas City, Kansas, prior to the time and date for bid opening. No bidder may withdraw or modify a bid with in sixty (60) days after the actual date of bid opening.

9. The Unified Government may issue amendments to Bidding Documents prior to the time for receipt of bids. The bidder shall acknowledge receipt of all amendments by executing and submitting them with the bid. Amendments shall be sent to all prospective bidders known to have received an Invitation for Bids. All postponements of the opening date of bids shall be effectuated by amendment.

10. Any information obtained from an officer, agent or employee of the Unified Government or any other person shall not modify or change the Invitation for Bids and shall not affect the risk or obligation assumed by the bidder or relieve him from fulfilling any of the conditions of the Invitations for Bids. Should a prospective bidder be in doubt as to the meaning of any provisions of the Invitation for Bids, he may submit to the Unified Government a written request for an interpretation. Any written request for interpretation shall be submitted to the Unified Government no later than seven (7) days from the date set for bid opening. Any interpretation of the Invitation for Bids shall be made by amendment.

11. Bidders shall visit the site of work and existing facilities and shall fully inform themselves of existing conditions and limitations. Any geotechnical reports made available to Bidders are for information only and are not a warranty of subsurface conditions, nor part of the Contract Documents. Bidders are encouraged to study all available reports of subsurface exploration and other technical data to draw their own conclusions regarding site conditions and may conduct their own independent investigation of the site. Responsibility for differing site conditions shall be determined in accordance with the Clause in the Invitation for Bids entitled "Differing Site Conditions" (Section 16 - General Conditions.) Bidder shall study all reports of subsurface exploration and other technical data which may be identified in the bidding documents. Bidder shall be familiar with all federal, state, and local laws and regulations that may affect cost, progress, or performance of the work. Bidder shall prepare bid from complete bidding documents.

12. A conditional or qualified bid will be rejected. Unified Government reserves the right to waive minor irregularities in a bid and to correct obvious mathematical errors on a bid form. The Unified Government reserves the right to reject any or all bids, prior to opening, a solicitation may be canceled in whole or in part when the Purchasing Director or head of the user department determines in writing that such action is in the Unified Government's best interest for reasons including but not limited to: the supplies, services or construction are no longer required, the UG can not longer reasonably expect to fund the procurement, proposed amendments to the solicitation would be of such magnitude that a new solicitation is desirable. When a solicitation is canceled prior to opening, notice of cancellations shall be

sent to all businesses solicited. Bids may also be rejected after opening but prior to award in whole or in part, reasons for rejections include but are not limited to: the supplies, services or construction being procured are no longer require, ambiguous or otherwise inadequate specifications were part of the solicitation, the solicitation did not provide for consideration of all factors of significance to the UG, prices exceeds available funds, all otherwise acceptable bids or proposals are at clearly unreasonable prices, or there is reason to believe that the bids or proposals may not have been independently arrived at in open competition. Individual bids may be rejected by the Unified Government in whole or in part. The reasons for the rejection of bids include but are not limited to: the business that submitted the bid is nonresponsible, the bid is not responsive, that is, it does not conform in all material respects to the invitation for bids, or the supply services or construction item offered in the bid is unacceptable by reason of its failure to meet the requirements of the specifications or permissible alternates or other acceptability criteria set forth in the invitation for bids. All Bidders must agree that such rejection shall create no liability on the part of the Unified Government of Wyandotte County/Kansas City, Kansas because of such rejections; and the filing of any bid in response to this Invitation shall constitute an agreement of the Bidder to these conditions.

13. Bid consists of unit price tabulation for one or more geographical sites and a single grand total. Comparison of bids will be based on the grand total. A single bidder will be selected. Unit prices shall prevail.

14. The contract for the work shall be awarded to the lowest responsive and responsible bidder whose bid does not exceed available funds as certified by the appropriate Fiscal Officer. Bidder's not complying with all of the requirements contained in the Legal Notice of Invitation for Bids and the Instructions and Information to Bidders may be judged nonresponsive. Bidder's responsibility or nonresponsibility shall be determined the following factors: 1) the availability of the appropriate financial, material, equipment, facility, and personnel resources and expertise, or the ability to obtain them, necessary to indicate its capability to meet all contractual requirements; a satisfactory record of performance; a satisfactory record or integrity; qualified legally to contract with the Unified Government; and supplied all necessary information in connection with the inquiry concerning responsibility. Bidders shall supply information as requested by the Procurement Officer concerning the responsibility of such bidder. The Unified Government may waive informalities in its determination of responsiveness and responsibility.

15. Written notice of award shall be sent to the successful bidder. The successful bidder shall within ten (10) days from the date of receipt of the notice of award perform the following:

    (a) If the contract is in excess of $50,000, submit a performance bond in the amount of 100%of the contract price.

    (b) If the contract is in excess of $50,000, submit a payment bond to the State of Kansas in the amount of 100% of the price specified in the contract for the protection of all persons supplying labor, materials, equipment and supplies to the contractor or its subcontractor. Said bond shall comply with the requirements of K.S.A. 60-1111, as amended, and shall be filed with the Clerk of the District Court of Wyandotte County, Kansas.

(c) If the contractor is not a corporation or a resident of the State of Kansas, submit executed copy of the Appointment of Process Agent Form which has been filed in the office of the Clerk of the Wyandotte County District Court.

(d) If the contractor is a foreign corporation, has applied to and been authorized by the Kansas Secretary of State to do business in Kansas in accordance with K.S.A. 17-7301 et seq., has a resident agent in the State of Kansas, and executes the foreign Corporation Resident Agent Designation form.

(e) Submit a certificate of insurance evidencing insurance as required by the Clause in the Invitation for Bids entitled "Insurance" (Section 27 - General Conditions).

(f) Execute the agreement.

(g) Submit the supplied Maintenance Bond.

(h) Submit Tax Clearance Certifications from the four “Local Governments” per paragraph number 21 of these Instructions and Information to Bidders.

The Unified Government may at its option declare the bidder in default if the bidder fails to perform all of the above-enumerated conditions, in which case the bid security shall become the property of the Unified Government.

16. All bonds required by the Bidding Documents shall contain all terms and conditions contained in the provided bond forms and shall be executed by a surety company authorized to do business in the State of Kansas and countersigned by an agent licensed by the Unified Government of Wyandotte County/Kansas City, Kansas. The attorney in fact who signs bonds must file with each bond a certified and effective dated copy of their power of attorney.

17. The Unified Government, within thirty (30) days of Bidders' compliance with all the conditions contained in paragraph number 15 of this Information to Bidders, shall sign and return to the contractor a photocopy of the executed agreement. Should the Unified Government not execute the Agreement within thirty (30) days period, the Bidder may by written notice withdraw his signed agreement. Such notice of withdrawal shall be effective upon receipt of notice by the Unified Government.

18. The Notice to Proceed will be issued within thirty (30) days of the execution of the Agreement by the Unified Government. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the Unified Government and the Contractor. If the Notice to Proceed has not been issued within the thirty (30) day period or within the period mutually agreed upon, the Contractor may, by Written Notice, terminate the Agreement without further liability on the part of either party.

19. Prior to contract award, the successful bidder(s) must ensure that all occupational taxes are

paid. For information, contact the Unified Government of Wyandotte County/Kansas City, Kansas License Division at (913) 573-8690.

20. *It is the respondent's responsibility to ensure bids are received by the closing date and time.* Delays in mail delivery or any other means of transmittal, including couriers or agents of the issuing entity shall not excuse late bid submissions. Respondents shall be responsible for actual delivery of the response to the appropriate office identified in the document.

21. The Unified Government of Wyandotte County/Kansas City, KS; Johnson County, KS; City of Kansas City, MO; and Jackson County, MO; (collectively the "Local Governments"), have agreed to cooperate with each other to ensure that tax funded contracts are performed by Contractors in compliance with the Tax Laws of the Local Governments. Contractor agrees that the Contractor shall be in compliance with the respective Tax Laws of the Local Governments throughout the term of this contract and any contract renewals and that proof of Contractor's compliance with the Tax Laws of the Local Governments shall be a condition of award. All Contractors entering into a contract and all subsequent renewals with the Unified Government of Wyandotte County in the amount of $20,000.00 or more must obtain a Tax Clearance Certification. The Tax Clearance Certification must be signed by an authorized official from all four (4) of the "Local Governments" and submitted to the Unified Government Procurement and Contract Compliance Department. The Tax Clearance Certification shall be valid for a period of one year from the date of issuance and shall not be dated more than sixty (60) days prior to any notice of intent to contract by the County. For information instructions and forms regarding compliance requirements, contact the Contract Compliance Division located on the 3rd Floor of the Municipal Office Building, 701 N. 7th Street, Kansas City, Kansas 66101, Room 318 or call (913) 573-5443.

22. Successful bidder(s) shall furnish the supplied Maintenance Bond in an amount equal to 25% of the total Contract Price holding good for a period of three (3) years after the final acceptance of the Work. The maintenance bond shall protect the Unified Government against all damages, losses and expenses which may occur to the Unified Government, by reasons of defective materials used, or by reason of defective workmanship done, for, and the construction of, said work; and shall refill all excavation in such manner that it shall be, and shall remain, for the said period of three (3) years, flush with the surfaces of streets and adjacent property, and shall repair for said period of three (3) years, all pavements, walks, curbs, gutters, and sodding over and adjacent to said Work if such items are damaged as the result of settlement of backfill of excavated areas. If any items covered by the maintenance bond are not repaired or replaced by the Contractor within a reasonable time, as determined by the Unified Government or if a hazard occurs as the result of disrepairs, the Unified Government shall have the right to correct, or have corrected such disrepair, at the expense of the Contractor or Bonding Company. Such bond shall be executed by a surety company authorized to do business in the State of Kansas and requires the appointment of a Kansas Resident Agent. Such bond shall be furnished by the Contractor immediately following the completion of the project and acceptance thereof by the Unified Government.

23. Relations Between Contractor and Labor. The Contractor shall make a good faith effort to

employ local labor within the Kansas City, Kansas Area insofar as it is available, for all work, except key positions. For purposes of this subparagraph, "local labor" is defined as resident of the Kansas City, Kansas Area for three (3) months next preceding the letting of this contract. "Key Position" is defined as superintendent, foreman, or timekeeper. If local labor is not available in sufficient quantities within the Kansas City, Kansas Area to prosecute and complete the work sufficiently, the Contractor may recruit labor from outside the area, only after he or she has satisfied the Engineer that a good faith attempt has been made to recruit local labor and only with the permission of the Engineer. It shall be understood that in the event of a reduction in labor force, preference will automatically be given to local residents of the Kansas City, Kansas Area.

24. Copeland Anti-Kickback Act. The Contractor and all subcontractors shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR, Part 3). This Act provides that each contractor or subgrantee shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled.

25. Debarment and Suspension. Contractor certifies that it will not knowingly enter into a contract with anyone who is ineligible under the 2 CFR part 180 and part 1532 (per Executive Order 12549, 51 FR 6370, February 21, 1986) or who is prohibited under Section 306 of the Clean Air Act or Section 508 of the Clean Water Act to participate in the Project. Suspension and debarment information can be accessed at http://www.sam.gov. Contractor represents and warrants that it has or will include a term or conditions requiring compliance with this provision in all of its subcontracts under this Agreement.

26. Federal Lobbying Restrictions (31 U.S.C 1352). Recipients of federal financial assistance may not pay any person for influencing or attempting to influence any officer or employee of a federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress with respect to the award, continuation, renewal, amendment, or modification of a federal grant, loan, or contract. These requirements are implemented for USEPA in 40 CFR Part 34, which also describes types of activities, such as legislative liaison activities and professional and technical services, which are not subject to this prohibition. Upon award of this contract, Contractor shall complete and submit to the Unified Government the certification and disclosure forms in Appendix A and Appendix B to 40 CFR Part 34. Contractor shall also require all subcontractors and suppliers of any tier awarded a subcontract over $100,000 to similarly complete and submit the certification and disclosure forms pursuant to the process set forth in 40 CFR 34.110.

27. Civil Rights Obligations. Contractor shall comply with the following federal non-discrimination requirements:

    a. Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, and national origin, including limited English proficiency (LEP). (42 U.S.C 2000D, et. seq)

b. Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination against persons with disabilities. (29 U.S.C. 794, supplemented by EO 11914, 41 FR 17871, April 29, 1976 and EO 11250, 30 FR 13003, October 13, 1965)

c. The Age Discrimination Act of 1975, which prohibits age discrimination. (42 U.S.C 6101 et. seq)

d. Section 13 of the Federal Water Pollution Control Act Amendments of 1972, which prohibits discrimination on the basis of sex.

e. 40 CFR Part 7, as it relates to the foregoing.

28. Equal Employment Opportunity (EEO). The Contractor shall comply with Executive Order 11246, entitled 'Equal Employment Opportunity,' as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60). (EO 11246, 30 FR 12319, September 28, 1965).

Contractor's compliance with Executive Order 11246 shall be based on implementation of the Equal Opportunity Clause, and specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4.

During the performance of this contract, the contractor agrees as follows:

1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

2) The Contractor will, in all solicitations or advancements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

3) The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part

of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

4) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5) The Contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

6) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8) The Contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States. [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966–1970 Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230, EO 13665 of April 8, 2014, 79 FR 20749, EO 13672 of July 21, 2014, 79 FR 42971]

29. Segregated Facilities. (41 CFR 60-1.8) The Contractor must ensure that facilities provided

for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensuring that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. This obligation extends to all contracts containing the equal opportunity clause regardless of the amount of the contract. The term "facilities," as used in this section, means waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, wash rooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees; provided, that separate or single-user restrooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

30. This contract is made using federal assistance provided to the Unified Government of Wyandotte County, Kansas City, Kansas (Unified Government) by the US Department of Treasury under the American Rescue Plan Act ("ARPA Funds"), Sections 602(b) and 603(b) of the Social Security Act, Pub. L. No. 117-2 (March 11, 2021). In using such funds, the Unified Government must comply with the terms of ARPA, regulations issued by the U.S. Department of the Treasury ("Treasury") governing the expenditure of monies distributed from the ARPA Funds (including, without limitation, the Interim Final Rule (86 Fed. Reg. 26,786 (May 17, 2021) and Final Rule (87 Fed. Reg. 4,338 (Jan. 27, 2022)), the Award Terms and Conditions applicable to the ARPA Funds, and such other guidance as Treasury has issued or may issue governing the expenditure of monies distributed from the ARPA Funds (collectively, the "Regulatory Requirements"). Additionally, pursuant to the Regulatory Requirements, the Unified Government must comply with the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200 other than such provisions as Treasury has determined or may determine are inapplicable to the ARPA Funds and pursuant to 2 C.F.R. §200.327 the Unified Government must include within any contract applicable provisions described in Appendix II to 2 C.F.R. Part 200.

31. Value Engineering-Construction (Oct 2020)

(a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) of this clause.

(b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

Collateral savings, as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

Contractor's development and implementation costs, as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the

contractual changes required by Government acceptance of a VECP.

Government costs, as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

Instant contract savings, as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) of this clause).

Value engineering change proposal (VECP) means a proposal that-

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change-

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in paragraphs (c)(1) through (7) of this clause. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) of this clause.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) Government action.

(1) The Contracting Officer will notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer will notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it will not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer will notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The decision to accept or reject all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

ct all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

(f) Sharing-

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by-

(i) 45 percent for fixed-price contracts; or

(ii) 75 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to-

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) Collateral savings. If a VECP is accepted, the Contracting Officer will increase the instant contract amount by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings will not exceed the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or $100,000, whichever is greater. The Contracting Officer is the sole determiner of the amount of collateral savings.

the amount of collateral savings.

ateral savings.

(h) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of $75,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) of this clause, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

These data, furnished under the Value Engineering-Construction clause of contract, shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations.

to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations.

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights

in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in part 27 of the Federal Acquisition Regulation.)

BID

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS

B I D

To: The Unified Government of Wyandotte County/Kansas City, Kansas

Proposal of _____
(hereinafter called "Bidder") organized and existing under the laws of the State of

_____, doing business as _____

_____.

1. In compliance with the Invitation for Bids, the undersigned Bidder hereby proposes to furnish all material, tools, labor and equipment and to perform all Work necessary to construct and complete the Project known as:

   Project Name: CSO 15 and CSO 81 Sewer Separation
   Project ID: P079/ARPA 1079

   in strict accordance with the Contract Documents, within the time set forth herein, and at the prices stated herein.

2. By submission of this Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies, as to his own organization, that:

   A. The price submitted is independently arrived at without collusion.

   B. The bidder has not knowingly influenced and promises that it will not knowingly influence a Unified Government employee or former Unified Government employee to breach any of the ethical standards set forth in Article 12 (Ethics in Public Contracting) of the Procurement Code.

   C. The Bidder has not violated, is not violating, and promises that it will not violate the prohibition against gratuities and kickbacks set forth in Sec. 29-635 of the Unified Government Code (Gratuities and Kickbacks).

   D. The Bidder represents that he has not retained and will not retain a person to solicit or secure a Unified Government contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except for retention of bona fide employees or bona fide established commercial selling agencies for the purpose of securing business.

3. Bidder hereby agrees the Work will be Substantially Completed on or before **December 31, 2024**, and completed and ready for final payment in accordance with the General Conditions

on or before **April 30, 2025**.

4. Bidder acknowledges receipt of the following Amendment(s):

_____

_____

_____

5. Bidder agrees to furnish all materials, labor, tools, equipment and perform all the Work described in the Contract Documents for the following prices:

BASE BID

Item No.	Description[(1)]	Estimated Quantity[(2)]	Unit	Unit Price	Total
A. MOBILIZATION					
A-1	Mobilization	1	LS	$	$
SUBTOTAL A:				**$**	
B. INTERNAL CCTV SEWER PIPE INSPECTION					
B-1	Pre-Construction CCTV	1552	LF	$	$
B-2	Post-Construction CCTV, Sanitary, 8-inch through 15-inch	44	LF	$	$
B-3	Post-Construction CCTV, Storm, 15-inch and greater	3,420	LF	$	$
SUBTOTAL B:				**$**	
C. PAVEMENT AND MISCELLANEOUS REMOVAL AND RESTORATION					
C-1	Remove Curb & Gutter	750	LF.	$	$
C-2	Remove Sidewalk	660	SF	$	$
C-3	Remove Sanitary Manhole	1	EA	$	$
C-4	Remove Inlet	8	EA	$	$

C-5	Remove Pavement	4620	SY.	$ _____	$ _____
C-6	Remove Existing Pipe, 18-inch diameter and smaller	60	LF	$ _____	$ _____
C-7	Abandon Pipe In-Place, Fill with Flowable Fill	50	CY	$ _____	$ _____
C-8	Abandon Manhole or Inlet, Fill with Flowable Fill	15	CY	$ _____	$ _____
C-9	Brace Street Lighting or Power Poles	4	EA	$ _____	$ _____
C-10	Remove and Reinstall Sign	5	EA	$ _____	$ _____
C-11	Remove and Reinstall Fire Hydrant	2	EA	$ _____	$ _____
C-12	Remove and Replace Concrete Channel Lining, 5” Thick	490	SF	$ _____	$ _____
C-13	Construct Concrete Curb & Gutter	750	LF	$ _____	$ _____
C-14	Construct Concrete Sidewalk, 4-inch Thick	500	SF	$ _____	$ _____
C-15	Construct ADA Ramps	160	SF	$ _____	$ _____
C-16	Construct Concrete Driveway	400	SF	$ _____	$ _____
C-17	Construct Concrete Trench Patch – 6-inches thick	3,040	LF	$ _____	$ _____
C-18	Roadway Mill and Asphalt Overlay	4,620	SY	$ _____	$ _____
C-19	Clearing and Grubbing	1	LS	$ _____	$ _____
C-20	Sodding	10,422	SY	$ _____	$ _____

C-21	Relocate Water Service Line	5	EA	$ _____	$ _____
C-22	Remove and Reinstall Fence	100	LF	$ _____	$ _____

SUBTOTAL C: **$**_____

D. STORM SEWER PIPE AND MANHOLE CONSTRUCTION

D-1	15-Inch Diameter Storm Sewer	234	LF	$ _____	$ _____
D-2	18-Inch Diameter Storm Sewer	710	LF	$ _____	$ _____
D-3	24-Inch Diameter Storm Sewer	1,376	LF	$ _____	$ _____
D-4	30-Inch Diameter Storm Sewer	150	LF	$ _____	$ _____
D-5	36-Inch Diameter Storm Sewer	950	LF	$ _____	$ _____
D-6	Storm Sewer Manhole, 48-inch Diameter, 8-Feet Deep	5	EA	$ _____	$ _____
D-7	Storm Sewer Manhole, 60-inch Diameter, 8-Feet Deep	9	EA	$ _____	$ _____
D-8	Storm Sewer Manhole, 72-inch Diameter, 8-Feet Deep	3	EA	$ _____	$ _____
D-9	Storm Sewer Manhole, 84-inch Diameter, 8-Feet Deep	1	EA	$ _____	$ _____
D-10	Additional Depth Beyond 8-Feet, 48-Inch Diameter Storm Sewer Manhole	10	VF	$ _____	$ _____

D-11	Additional Depth Beyond 8-Feet, 60-Inch Diameter Storm Sewer Manhole	17	VF	$ _____	$ _____
D-12	Additional Depth Beyond 8-Feet, 72-Inch Diameter Storm Sewer Manhole	5	VF	$ _____	$ _____
D-13	Additional Depth Beyond 8-Feet, 84-Inch Diameter Storm Sewer Manhole	7	VF	$ _____	$ _____
D-14	Storm Sewer Inlet, 5'X3', Setback or In-Line	17	EA	$ _____	$ _____
D-15	36-Inch Diameter Storm Sewer Pipe Bend	1	EA	$ _____	$ _____
D-16	Stormwater Pre-Treatment Device	1	LS	$ _____	$ _____
D-17	36-Inch Storm Sewer Pipe Outfall at Creek	1	LS	$ _____	$ _____

SUBTOTAL D: **$**_____

E. SANITARY SEWER PIPE AND MANHOLE CONSTRUCTION

E-1	12-Inch Diameter Sanitary Sewer	44	LF	$ _____	$ _____
E-2	Sanitary Sewer Manhole, 48-Inch Diameter, 8-Feet Deep	2	EA	$ _____	$ _____
E-3	Additional Depth Beyond 8-Feet, 48-Inch Diameter Sanitary Sewer Manhole	9	VF	$ _____	$ _____
E-4	6-Inch Diameter Sanitary Sewer Lateral	75	LF	$ _____	$ _____
E-5	Sanitary Sewer Lateral Wye Connection	5	EA	$ _____	$ _____

SUBTOTAL E: **$**_____

F. MISCELLANEOUS

F-1	Project Signs	2	EA	$ _____	$ _____
F-2	Traffic Control	1	LS	$ _____	$ _____
F-3	Bypass Pumping	1	LS	$ _____	$ _____
F-4	Erosion and Sediment Control	1	LS	$ _____	$ _____
F-5	Construction Staking	1	LS	$ _____	$ _____

SUBTOTAL F: **$** _____

AL. CONSTRUCTION ALLOWANCES

AL-1	Brownfield Allowance	1	LS	$50,000.00	$50,000.00
AL-2	Force Account Allowance	1	LS	$300,000.00	$300,000.00

SUBTOTAL AL: **$350,000.00**

TOTAL BID AMOUNT FOR CSO 15 AND 81 SEWER SEPARATION (SUBTOTAL A + B + C + D + E+F+ AL):

_____ dollars and

(written in words)

_____ cents.

(written in words)

$ _____.

(figures)

(1)See Specification Section 1100 – Progress and Payment for a more detailed description.
(2)Quantities are not guaranteed. Final Payment will be based on actual quantities.
(3)Include allowances in Total Bid Amount.

Respectfully submitted,

By _____ _____
Signature Date SEAL

_____
Title

Attest _____
(Corporations only)

_____
Business Address

_____
License Number (if applicable)

Bidder's form of business is:

_____ An INDIVIDUAL,
residing in the State of _____

_____ A PARTNERSHIP,
organized in the State of _____

_____ A CORPORATION,
incorporated in the State of _____

B I D B O N D

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS:

THAT WE, _____,
(Name of Contractor)

as Principal, and _____,
(Name of Surety Company)

a corporation duly organized under the laws of the State of _____, and authorized to do business in Kansas as Surety, are held and firmly bound unto the Unified Government of Wyandotte County/Kansas City, Kansas for the sum of _____

Dollars ($_____), for the payment of which sum well and truly to be made, the said Principal and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for:

Project Name: CSO 15 and CSO 81 Sewer Separation
Project ID: P079/ARPA 1079

NOW, THEREFORE, if the Unified Government shall accept the bid of the Principal, and the Principal shall enter into a Contract with the Unified Government in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the Unified Government the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Unified Government may in good faith contract with another party to perform work covered by said bid and such larger amount for which the Unified Government may in good faith contract with another party to perform work covered by said bid or an appropriate liquidated amount as specified in the Invitation for Bids then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _ day of _____, 20___.

CONTRACTOR:

_____
(Name of Contractor)

(Seal)

By _____

_____
(Name)

_____
(Title)

_____
(Witness)

Approved:

_____
(Chief Counsel)

SURETY:

_____
(Name of Surety)

(Seal)

By _____

_____
(Name)

Attorney in Fact

_____
(Witness)

AGREEMENT

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS
AGREEMENT

THIS AGREEMENT, made this _____ day of _____ , 20___ , by and between the Unified Government of Wyandotte County/Kansas City, Kansas, hereinafter called "Unified Government," and

_____
(Contractor)

as (an individual), or (a partnership), or (a corporation), hereinafter called "Contractor."

WITNESSETH: That and for in consideration of the payments and agreements hereinafter mentioned:

1. The Contractor will commence and complete the construction of the Project known as:

   Project Name: CSO 15 and CSO 81 Sewer Separation
   Project I.D.: P079/ARPA 1079

2. The Contractor will furnish all of the Material, supplies, tools, Equipment, labor and other services necessary for the construction and completion of the Project described above.

3. The following project goals have been established for this project: **0%** Where goals are established, Contractor shall achieve the project goal or shall provide satisfactory documentation of good faith effort to achieve the project goal.

4. The Work shall be Substantially Completed on or before **December 31, 2024.** The Contractor shall complete all the Work required by the Contract Documents on or before **April 30, 2025**, unless the period for completion is extended otherwise by the Contract Documents. The Contractor further agrees to pay, as Liquidated Damages, the sum of **$1,500.00**, for each **Calendar** day thereafter Substantial Completion has not been achieved as provided in Section 24 of the General Conditions. The Contractor further agrees to pay, as Liquidated Damages, the sum of **$2,250.00**, for each **Calendar** day thereafter Final Completion has not been achieved as provided in Section 24 of the General Conditions

5. The Contractor agrees to perform and complete all the Work described in the Contract documents for the unit prices listed in the Bid Form, for an estimated total amount of
   _____ (WORDS)
   _____ (NUMBERS)
   Actual payment shall be the sum of the products of the installed and accepted quantity of each bid item, measured by the Engineer as described in Contract Documents, times its unit price. The Contractor acknowledges that the unit prices listed in the Bid Form contemplate the construction of all facilities complete, in conformance with the Contract Documents, and that the cost of work required by the Contract Documents for which a specific unit price is not listed is included in the unit price for the closest applicable item.

6. It is understood that the "Engineer" representing the Unified Government shall be **Kristina Blevins.**

7. The term "Contract Documents" means and includes the following:
   (a) Legal Notice of Invitation for Bids
   (b) Instructions and Information to Bidders
   (c) Executed Bid Form
   (d) Bid Bond
   (e) Amendments
   (f) Agreement
   (g) Labor and Material Payment Bond
   (h) Performance Bond
   (i) Maintenance Bond
   (j) Notice of Award
   (k) Notice to Proceed
   (l) Change Orders
   (m) Additional Written Instructions and Detailed Drawings Approved by the Engineer
   (n) Detailed Drawings
   (o) Standard Details
   (p) General Conditions
   (q) Supplemental General Conditions
   (r) Forms & State and Federal Forms
   (s) Technical Provisions
   (t) Special Conditions
   (u) Technical Specifications

8. The Unified Government will pay the Contractor in the manner and at such times as set forth in Section 25 of the General Conditions such amounts as required by the Contract Documents.

9. This Agreement shall be binding upon all parties hereto and their representative heirs, executor, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, an original on the date first above written.

OWNER:
Unified Government of Wyandotte County/Kansas City, Kansas

By _____
County Administrator

ATTEST:

_____
Unified Government Clerk

CONTRACTOR:

_____
(Contractor)

By _____

Name _____

Address _____

_____

ATTEST:

_____
Title

LABOR AND MATERIAL
PAYMENT BOND

Note to Clerk of the District Court, Wyandotte County, Kansas:
Please enter date filed and furnish case number.

Case No. _____

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS:

THAT WE,

_____
(Name of Contractor)

as Principal, and

_____
(Name of Surety Company)

a corporation duly organized under the laws of the State of _____, and authorized to do business in Kansas, as Surety, are held and firmly bound unto the State of Kansas, as Obligee hereinafter called State, for the use and benefit of claimants as hereinafter defined, in the amount of _____

_____
Dollars ($ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, 20___, entered into a contract with Unified Government of Wyandotte County/Kansas City, Kansas, for

Project Name: CSO 15 and CSO 81 Sewer Separation
Project I.D.: P079/ARPA 1079

in accordance with drawings and specifications prepared by **Burns & McDonnell Engineering Company, Inc.,** which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, if the said Principal or the sub-contractor or sub-contractors of said Principal shall pay all indebtedness incurred for supplies, materials, or labor furnished, or equipment used or consumed in connection with or in or about the construction or making of the above described improvements, this obligation shall be void; otherwise, it shall remain in full force and effect.

Signed and sealed this _____ day of _____, 20___.

CONTRACTOR:

_____
(Name of Contractor)

(Seal)

By _____

_____
(Name)

_____
(Title)

_____
(Witness)

SURETY:

_____
(Name of Surety)

(Seal)

By _____

_____
(Name)

Attorney in Fact

_____
(Witness)

Approved:

_____
(Assistant U.G. Attorney)

PERFORMANCE BOND

Filing of this bond with the Clerk of the District Court is not a contract requirement

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS:

THAT WE,

_____,
(Name of Contractor)

as Principal referred to herein as Contractor, and

_____
(Name of Surety Company)

a corporation duly organized under the laws of the State of _____, and authorized to do business in Kansas, as Surety, are held and firmly bound unto the Unified Government of Wyandotte County/Kansas City, Kansas, as Obligee, in the amount of _____

_____
Dollars ($ _____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____, 20___, entered into a contract with the Unified Government of Wyandotte County/Kansas City, Kansas for

Project Name: CSO 15 and CSO 81 Sewer Separation
Project I.D.: P079/ARPA 1079

in accordance with drawings and specifications prepared by **Burns & McDonnell Engineering Company, Inc.**, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract then this obligation shall be null and void; otherwise it shall remain in full force and effect. The Surety hereby waives notice of any alteration or extension of time made by the Unified Government and its obligation is not affected by any such alteration or extension provided the same is within the scope of the Contract. Whenever Contractor shall be, and is declared by Unified Government to be in default under the Contract, the Unified Government having performed Unified Government's obligations thereunder, the Surety may promptly remedy the default or shall promptly:

(1) Complete the Contract in accordance with its terms and conditions; or

(2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the Unified Government and the Surety jointly of the lowest responsive, responsible bidder, arrange for a contract between such bidder and the Unified Government, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completions arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean total amount payable by Unified Government to Contractor under the Contract and any amendments thereto, less the amount properly paid by Unified Government to Contractor. No right of action shall accrue on this bond to or for the use of any person or corporation other than the Unified Government or successors of the Unified Government.

Signed and sealed this _____ day of _____, 20___

CONTRACTOR:	**SURETY:**
_____	_____
(Name of Contractor)	**(Name of Surety)**
(Seal)	**(Seal)**
By _____	**By** _____
_____	_____
(Name)	**(Name)**
_____	**Attorney in Fact**
(Title)	
_____	_____
(Witness)	**(Witness)**

Approved:

_____

(Assistant U.G. Attorney)

MAINTENANCE BOND

Filing of this bond with the Clerk of the District Court is not a contract requirement

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS:

THAT WE,

_____,
(Name of Contractor)

as Principal referred to herein as Contractor, and

_____
(Name of Surety Company)

a corporation duly organized under the laws of the State of _____, and authorized to do business in Kansas, as Surety, are held and firmly bound unto the Unified Government of Wyandotte County/Kansas City, Kansas, as Obligee, in the amount of _____

_____
Dollars ($ _____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____, 20___, entered into a contract with the Unified Government of Wyandotte County/Kansas City, Kansas for

Project Name: CSO 15 and CSO 81 Sewer Separation
Project I.D.: P079/ARPA 1079

in accordance with drawings and specifications prepared by **Burns & McDonnell Engineering Company, Inc.**, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

Whereas, the Principal agrees to guarantee the work hereinabove described, including all materials and workmanship, for the period of three (3) year(s) beginning on the date the Obligee so accepts said work, said date being the formal acceptance date.

NOW, THEREFORE, if the Principal shall and will, in all particulars, well, duly, and faithfully observe, perform and abide by each and every covenant, condition and part of said written agreement and other Contract Documents and shall protect the Obligee against all damages, losses and expenses which may occur to Obligee, by reason of defective materials used, or by reason of defective workmanship done, for, and the construction of said work; and shall, if necessary, refill all excavation in such manner that it shall be, and shall remain, for the period

of three (3) years, flush with adjacent surfaces; and shall repair, if necessary, for said period of three (3) years, all surfaces adjacent to said work if such surfaces are damaged as the result of settlement of backfill of excavated areas; and shall guarantee the above work for a period three (3) years from date formal acceptance, then this obligation shall become null and void; otherwise, it shall remain in full force and effect.

Signed and sealed this _____ day of _____, 20___

CONTRACTOR:

_____
(Name of Contractor)

(Seal)

By _____

_____
(Name)

_____
(Title)

_____
(Witness)

Approved:

_____
(Assistant U.G. Attorney)

SURETY:

_____
(Name of Surety)

(Seal)

By _____

_____
(Name)

Attorney in Fact

_____
(Witness)

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS
APPOINTMENT OF PROCESS AGENT FORM

_____, as CONTRACTOR, having entered into written agreement, dated _____, 20___, for construction of certain public work described as **Project Name: CSO 15 and CSO 81 Sewer Separation**

Project ID: P079/ARPA 1079

does hereby appoint _____,

whose address is _____,

Kansas, as process agent, in compliance with the requisites of Section 16-113, General Statutes of Kansas as amended, 1980.

Duly executed this _____ day of _____, 20___.

Contractor _____

By _____

Title _____

Processing instructions:

1. *A Contractor who is doing business as an individual, a partnership, or an unincorporated association and who is not a resident of the State of Kansas shall execute this document.*

2. *Contractor shall file one copy of this document with the Clerk of the District Court of Wyandotte County, and one copy with the City's contracting agency.*

3. *Pursuant to paragraph 15 of the Instructions to Bidders a contract will not be executed until this form is completed and filed.*

FOREIGN CORPORATION RESIDENT AGENT DESIGNATION

Contractor is a corporation, and is not incorporated in the State of Kansas. Contractor must be authorized to do business in the State of Kansas in accordance with K.S.A. 17-7301. Contractor designates below a resident agent in the State of Kansas as required by K.S.A. 17-6202 and 17-7301, and as specified elsewhere herein.

Resident Agent

Name and Address _____

_____

_____

_____

_____

Processing instructions:

1. *A Contractor who is a corporation and is not incorporated in the State of Kansas shall execute this document.*

2. *Contractor shall file one copy of this document with the City's contracting agency.*

3. *Pursuant to paragraph 15 of the Instructions to Bidders a contract will not be executed until this form is completed and filed.*

CONDITIONS OF THE CONTRACT

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS - GENERAL CONDITIONS
TABLE OF CONTENTS

Section	Title
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3.	Schedules, Reports and Records for Public Projects
4.	Drawings and Specifications
5.	Shop Drawings
6.	Materials, Services and Facilities
7.	Inspection and Testing
8.	Substitutions
9.	Patents
10.	Construction Staking
11.	Protection of Work, Property and Persons
12.	Supervision by Contractor
13.	Changes
14.	Price Adjustment
15.	Variations in Estimated Quantities
16.	Differing Site Conditions, Price Adjustments
17.	Time for Completion
18.	Termination for Default for Non-performance or Delay - Damages for Delay - Time Extensions
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23.	Termination for Convenience
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25.	Payments for Work Performed in Accordance with the Contract Documents
26.	Acceptance of Final Payment as Release
27.	Insurance
28.	Contract Security
29.	Assignments
30.	Indemnification
31.	Separate Contracts and Right to Enter to Perform Work
32.	Subcontracting
33.	Engineer/Architect's Authority
34.	Project Representative
35.	Land and Rights-of-Way
36.	Permits and Licenses
37.	Guaranty
38.	Disputes
39.	Taxes
40.	Process Agent
41.	Saturday, Sunday, Holiday and Night Work
42.	Public Convenience and Safety
43.	Pre-Construction Conference
44.	Interruption of Service
45.	Utilities
46.	Additional Copies of Plans and Specifications
47.	Work on Railroad and Highway Rights-of-Way
48.	Records
49.	Historical or Archaeological Deposits
50.	Forty (40) Hour Week Provision
51.	Interest Payable on Claims
52.	Multiple Awards
53.	Inaccurate Pricing Data
54.	Prevailing Wage Rate
55.	Removal of Employees
56.	Nondiscrimination in Employment
57.	Revisions to Standard General Conditions

UNIFIED GOVERNMENT OF WYANDOTTE

COUNTY/KANSAS CITY, KANSAS

GENERAL CONDITIONS

1. DEFINITIONS: Wherever used in the Invitation for Bids, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural and/or of either sex thereof:

1.1 AMENDMENT - Written or graphic instruments issued prior to the opening of Bids which modify or interpret the Invitation for Bids by additions, deletions, clarifications or corrections.

1.2 AGREEMENT - The Unified Government's Agreement Form voluntarily signed and witnessed by the Unified Government and Contractor and made a part of the Contract Documents.

1.3 BID - The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.4 BIDDER - Any person, firm or corporation submitting a Bid for the Work.

1.5 BONDS - Bid, performance and payment bonds and other instruments of security, furnished by the contractor and his surety in accordance with the Invitation for Bids.

1.6 CHANGE ORDER - a written order signed by the Procurement Officer, directing the contractor to make changes which the Changes clause of the contract authorizes the Procurement Officer to order without the consent of the contractor.

1.7 UNIFIED GOVERNMENT - The Unified Government of Wyandotte County/Kansas City, Kansas, a Municipal Corporation.

1.8 CONSULTANT - A person, firm or corporation contracted with by the Unified Government to perform specific technical or professional tasks as set forth in the signed written agreement between the Unified Government and Consultant.

1.9 CONTRACT DOCUMENTS - The contract including Legal Notice of Invitation for Bids, Instructions and Information to Bidders, executed Bid Form, Bid Bond, Amendments, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, additional written instruction and detailed drawings approved by the Engineer/Architect, Drawings, general Conditions, Supplemental General Conditions, Special Conditions, Technical Provisions.

1.10 CONTRACT PRICE - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

1.11 CONTRACT TIME - The number of days stated in the Contract Documents for the completion of the Work. Time shall be measured in calendar days or working days as specified in the Agreement.

1.12 CONTRACTOR - The person, firm or corporation with whom the Unified Government has executed the Agreement.

1.13 DAYS - Except for calculation of Contract Time when working days are specified, all periods of time prescribed in the Contract Documents shall be measured in calendar days. In computing time the day of the event from which the designated period of time begins to run shall not be included, but the last day of the period shall be included unless it is Saturday, Sunday, or a Unified Government holiday, in which event the period shall run to the end of the next business day.

1.14 DRAWINGS - The part of the Contract Documents which show the characteristics and scope of the Work to be performed and which have been prepared and/or approved by the Engineer/Architect.

1.15 ENGINEER/ARCHITECT - The Procurement Officer or his designee, or the Consultant hired by the Unified Government to perform professional services as designated in the Agreement.

1.16 EQUIPMENT - All machinery and equipment, together with the necessary supplies for operation, upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.

1.17 INVITATION FOR BIDS - All documents, whether attached or incorporated by reference, utilized for soliciting bids, including but not limited to the Legal Notice of Invitation for Bids, Instructions and Information to Bidders, General Conditions, Supplemental General Conditions, Technical Provisions, Special Conditions, Agreement Form, Bid Form, Bond Forms, EEO Requirements, Drawings and Amendments.

1.18 MANUFACTURER - The person, firm or corporation responsible for the commercial manufacturing, assembling or processing of materials and/or equipment to be incorporated in the Project.

1.19 MATERIAL - Any substance specified for use in the construction of the project and its appurtenances.

1.20 MONUMENT - A boundary marker.

1.21 NOTICE OF AWARD - The written notice of the acceptance of the Bid by the Unified Government to the successful Bidder.

1.22 NOTICE TO PROCEED - A written notice issued by the Unified Government to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Contract Time.

1.23 PROCUREMENT CODE - The Procurement Code of the Unified Government of Wyandotte County/Kansas City, Kansas, effective June 27, 1983

by ordinance Number 64497, and amendments thereto. This document may be viewed during normal business hours in the office of the Unified Government Clerk.

1.24 PROCUREMENT OFFICER - Any person duly authorized to administer contracts and make written determinations with respect thereto. The term also includes an authorized representative acting within the limits of authority.

1.25 PROCUREMENT REGULATION - The Procurement Regulations of the Unified Government of Wyandotte County/Kansas City, Kansas, effective June 27, 1983, and amendments thereto. This document may be viewed during normal business hours in the office of the Unified Government Clerk.

1.26 PROJECT - The undertaking to be performed as provided in the Contract Documents with payment to the Contractor from the Unified Government.

1.27 PROJECT REPRESENTATIVE - The Engineer/Architect's agent assigned to the project site who shall act under the supervision and direction of the Engineer/Architect. He shall confer with the Engineer/Architect regarding his actions, and shall generally communicate with the Unified Government only through the Engineer/Architect.

1.28 SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, Manufacturer, Supplier or Distributor, which illustrate how specific portions of the Work will be fabricated, installed, formed or constructed.

1.29 SPECIFICATIONS - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship, including Technical Provisions and Special Conditions.

1.30 SPECIAL CONDITIONS - A part of the Contract Documents being a modification, amplification and/or additional information of the General, or Supplemental General Conditions or Technical Provisions.

1.31 SPECIFIED COMPLETION DATE - The date on which the contract work is specified to be completed.

1.32 SUBCONTRACTOR - An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

1.33 SUBSTANTIAL COMPLETION - That date as certified by the Engineer/Architect when the construction of the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

1.34 SUPPLEMENTAL GENERAL CONDITIONS - A part of the Contract Documents consisting of modifications and additions to the General Conditions or Instructions to Bidders that are applicable to a specific projects of procurement agency.

1.35 SUPPLIER - Any person, firm, corporation or organization who supplies Materials or Equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

1.36 SURETY - The corporation, partnership or individual, other than the Contractor, executing a bond furnished by the Contractor.

1.37 TECHNICAL PROVISIONS - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship required for the Project.

1.38 WORK - All labor, equipment and tools necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the Project.

1.39 WORKING DAY When working days are specified, a working day shall be any day from the starting date through the completion of the project except as follows:

a. Saturdays, Sundays, Unified Government holidays, and the dates from December 24 through January 2, inclusive, unless the Contractor requests and receives permission to work on these dates.

b. Days on which adverse weather, or conditions immediately resulting from adverse weather, prevent work on the controlling item for at least 50% of the total daily time.

c. Days on which the current controlling item is delayed or suspended due to acts of the Engineer/Architect for at least 50% of the total daily time.

d. Days on which correction of differing site conditions prevent work on the current controlling item for at least 50% of the total daily time. Differing site conditions shall be those listed in General Condition 16.1.

Only whole days will be counted. On non-working days Contractor may, at his option and with no count against the contract time, pursue any work not affected by weather or other conditions affecting the controlling item.

The current controlling item is that feature or features of the work which if delayed or prolonged, at the time in question, will delay the completion of the project. The controlling item may be an activity or it may be a curing period or other mandatory waiting period. Working and non-working days shall be determined and recorded at regular intervals by the Engineer/Architect. Contractor shall review calculation of time and resolve any differences with the Engineer/Architect prior to each partial pay submittal.

1.40 WRITTEN NOTICE - Any notice to any party to the Agreement in writing the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the Work, or so mailed or delivered to the party listed with the Clerk of the District Court of Wyandotte County as the Contractor's Process Agent.

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS.

2.1 The Contractor may be furnished additional written instructions and detail drawings, by the Engineer/Architect, as necessary to carry out the Work required by the Contract Documents.

2.2 The Contractor shall carry out the Work in accordance with the additional written instructions and detail drawings.

3. SCHEDULES, REPORTS AND RECORDSFOR PUBLIC PROJECTS.

3.1 The Contractor shall submit to the Engineer/Architect such schedule of quantities and costs, progress schedules, payrolls, reports, estimates record and other data where applicable as are required by the Contract Documents for the Work to be performed.

3.2 Prior to the commencement of Work, the Contractor shall submit construction progress schedules showing the order in which he proposes to carry on the Work, including dates at which he will start the various parts of the Work, estimated date of completion of each part and, as applicable, the dates at which special detail drawings will be required, and respective dates of submission of Shop Drawings, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

3.3 The Contractor shall also submit a schedule of payments that he anticipates he will earn during the course of the Work.

4. DRAWINGS AND SPECIFICATIONS.

4.1 The intent of the Drawings and Specifications is that the Contractor shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental work necessary to complete the Project in an acceptable manner, ready for use, occupancy or operation by the Unified Government.

4.2 In case of conflict between the Drawings and Specifications, the drawings shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings. Special Conditions shall govern over Technical Provisions and the General Conditions.

4.3 Any discrepancies, inconsistencies, or ambiguities found between the Drawings or Specifications shall be immediately reported to the Engineer/Architect, in writing, who shall promptly correct them in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities, but before correction by the Engineer/Architect, shall be done at the Contractor's risk.

5. SHOP DRAWINGS.

5.1 Where required by the special conditions or technical provisions, the Contractor shall provide to the Engineer/Architect not less than 4 copies of all Shop Drawings which bear the certification that the Contractor has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents. The Contractor shall also note on the Shop Drawings all deviations from the Contract Documents. The Engineer/Architect's approval of any Shop Drawing shall not release the Contractor from responsibility for deviations from the Contract Documents. The Engineer/Architect may elect not to review shop drawings not required by the contract documents. The approval of any Shop Drawing which substantially deviates from the requirement of the Contract Documents shall be evidenced by a Change order. If the Contractor requires more than 1 copy returned of "approved" or "approved if corrected as noted" drawings, additional copies shall be included in original submittal with all additional copies returned to the Contractor.

5.2 The review action by the Engineer/Architect will be as shown:

Action By Engineer	Retained By Engineer	Required Resubmittal
Approved	3	no
Approved if Corrected as Noted	3	no
Correct and Resubmit	1	yes
Not Approved	1	yes

5.3 Portions of the Work requiring a Shop Drawing or sample submission shall not begin until the Shop Drawing or sample has been approved by the Engineer/Architect. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer/Architect.

6. MATERIALS, SERVICES AND FACILITIES.

.6.1 It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all Materials, labor, tools, Equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and

deliver the Work within the specified time.

6.2 Contractor shall furnish only new Material of the type, size, and strength class with all accessories as specified, indicated and/or necessary for a completed project.

6.3 Manufacturer of Material to be incorporated within the project shall be experienced in the design, manufacture, testing, and commercial supplying of the specified materials.

6.4 Materials and Equipment shall be so transported, stored and installed as to insure the preservation of their quality and fitness for the Work. Said transporting, handling and storage shall conform to the Manufacturer's recommendations unless otherwise required in the Contract Documents. Stored Materials and Equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection.

6.5 Damaged Materials will be subject to rejection and cannot be incorporated within the project without written approval from the Engineer/Architect.

6.6 Manufactured articles, Materials and Equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the Manufacturer unless otherwise specifically stated in the Contract Documents.

6.7 Contractor shall submit to the Engineer/Architect six (6) copies each of Manufacturer's design, Material specifications, quality control methods, recommended installation instructions, warranties, delivery dates, manufacturing location and if specifically requested samples of Materials to be incorporated within the Project for approval. Purchase of Materials not approved by the Engineer/Architect will be done only at the Contractor's risk.

6.8 Materials, supplies and Equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer/Architect.

6.9 Materials, supplies or Equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

6.10 Contractor shall require, secure and submit to the Engineer/Architect six (6) copies of all material certifications and test transcripts for all Materials incorporated within the Project. Material testing shall be performed by the Manufacturer's quality control personnel and/or approved independent testing laboratory, all in conformance with applicable and acceptable standards. Provisions shall be made that the Engineer/Architect and/or approved independent test laboratory personnel may witness such tests. Failure of the Engineer/Architect to reject Materials will not be grounds for acceptance if defects are later found; however, all Materials rejected by the Engineer/Architect as unsuitable, nonconforming and/or failing to meet minimum required test results shall not be used and shall be removed from the Project site by the Contractor.

7. INSPECTION AND TESTING.

7.1 All Materials and Equipment used in the construction of the Work shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.

7.2 Tests and certifications are required to demonstrate that all products installed in the work comply with the specifications. Responsibility for testing shall be as indicated below:

a. City is responsible for acceptance tests on installed products and on products delivered for installation; such as field or laboratory tests for slump, air and strength of concrete, temperature of asphalt mixes, reference and relative density of asphalt mixtures, reference and relative density of embankment and fill material, infiltration/ exfiltration test and televising of sewer mains, thickness and surface straight edging, and the like; except for those tests listed in "c." below. Engineer/Architect shall determine the time, location, and frequency of field testing and sampling. Upon request the Unified Government will provide Contractor with one copy of test results.

If Contractor has reasonable objection to the testing laboratory employed by the Unified Government, Contractor shall submit a written protest using the procedure for claims based on procurement officer's actions or omissions.

b. Contractor shall reimburse the Unified Government for tests performed by the Unified Government when the results of those tests do not meet specified limits.

c. Contractor and his suppliers are responsible for process control tests normally conducted at the source of supply, such as certifications of manufactured products, concrete and asphalt mix designs, mixing plant quality monitoring tests, gradation tests of pipe bedding and imported fill material, fertilizer and seed certifications, and the like. Submittal of tests and certifications shall follow the procedures for shop drawings.

Contractor shall be responsible for the following field tests: tightness testing of manholes and sewer lines; mandrel testing of non-rigid sewer mains; start-up, demonstration and adjustment of HVAC, mechanical, electrical, or communication systems; and profilograph testing of concrete and asphalt pavements where required by the technical

specifications, special conditions, or drawings. When profilograph testing is ordered by the Engineer because of poor subjective ride quality, compensation for the testing shall be based on General Condition 7.7.

d. Contractor shall employ an independent commercial laboratory, acceptable to the Engineer, to conduct source of supply tests. The laboratory shall have the staff, equipment, qualifications, and experience to perform the tests in accordance with the specified standards.

e. Contractor shall cooperate with Unified Government's field testing and sampling; interrupting, exposing and repairing the work when necessary and providing labor, sample material, and facilities to accommodate the testing and sampling.

7.3 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be specifically inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer/Architect timely notice of readiness. The Contractor will then furnish the Engineer/Architect the required certificates of inspection, testing or approval.

7.4 Inspections, test or approvals by the Engineer/Architect or others shall not relieve the Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

7.5 The Engineer/Architect and/or his representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal, State or local agency shall be permitted to inspect all Work, Materials, payrolls, records of personnel, invoices of Material, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof.

. 7.6 If any Work is covered contrary to the instructions of the Engineer/Architect or his project representative, or if Work is covered prior to inspection required by the Contract Documents, said Work must, if requested by the Engineer/Architect, be uncovered for inspection and replaced at the Contractor's expense

. 7.7 If after the Work is covered in accordance with the Engineer/Architect's instructions and the requirements of the Contract Documents the Engineer/Architect subsequently issues instructions to uncover the Work for inspection, the contractor shall uncover the Work in question. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, inspection and reconstruction. If, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, inspection, and reconstruction and an appropriate Change Order shall be issued

8. SUBSTITUTIONS.

8.1 Whenever Material or Equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and not to limit competition, and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer/Architect, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer/Architect may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time.

9. PATENTS.

9.1 The Contractor shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the Unified Government, Engineer/Architect, or Consultants harmless from loss on account thereof, except that the Unified Government shall be responsible for any such loss when a particular process, design, or the product of a particular Manufacturer or Manufacturers is specified. However, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer/Architect.

10. CONSTRUCTION STAKING.

10.1 The Contractor shall perform all construction staking; completed staking shall be reviewed by the Engineer/Architect before work commences

10.2 The Owner will furnish necessary boundary surveys and establish all baselines for locating the principal component parts of the Work, together with a suitable number of bench marks adjacent to the Work as shown in the Contract Documents.

10.3 The Contractor shall retain or provide a Land Surveyor, licensed to practice in the State of Kansas, to develop and make any detailed surveys necessary for the construction of the Work.

10.4 The Contractor shall carefully preserve bench

marks, reference points and stakes and, in case of willful or careless destruction by his operations, or those of his Subcontractors or Material suppliers, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

11. PROTECTION OF WORK, PROPERTY AND PERSONS.

11.1 The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons who may be affected thereby, all the Work and all Materials or Equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

11.2 The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities forty-eight (48) hours in advance when prosecution of the Work may affect them. The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Unified Government or the Engineer/Architect or consultant or anyone employed by any of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

11.3 In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer/Architect or Unified Government, shall act to prevent threatened damage, injury or loss. He will give the Engineer/Architect prompt Written Notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved.

12. SUPERVISION BY CONTRACTOR.

12.1 The Contractor will supervise inspect and direct the Work. He will be solely responsible for the mean methods, techniques, procedures and safety of construction. Except where limited by the Engineer/Architect's authority to adjust schedule to meet objectives listed in Condition 33.2, the Contractor shall be responsible for sequence of the work. The Contractor will employ and maintain on the Work a qualified superintendent who has full knowledge of and prior experience with the Materials and methods necessary to conform with the terms of and intent of these Contract Documents and who shall have been designated to the Engineer/Architect in writing by the Contractor as the Contractor's representative at the site. The superintendent shall have full authority to act on behalf of the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent shall be present on the site at all times.

12.2 The Contractor shall not change the superintendent without prior approval of the Engineer/Architect, except if the superintendent leaves the Contractor's employment.

13. CHANGES.

13.1 CHANGE ORDER - The Procurement Officer, at any time, and without notice to the sureties, in a signed writing designated or indicated to be a Change Order, may order:

a. changes in the work within the scope of the Contract Documents; and

b. changes in the time for performance of the Work that do not alter the scope of the Contract Documents.

13.2 ADJUSTMENTS OF PRICE OR TIME FOR PERFORMANCE - If any such Change Order increases or decreases the Contractor's cost of, or the time required for, performance of any part of the Work under these Contract Documents, whether or not changed by the order, an adjustment shall be made and the Contract Documents modified in writing accordingly. Any adjustment in Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment Clause of these Contract Documents. (Section 14 of the General Conditions).

Failure of the parties to agree to an adjustment shall not excuse a Contractor from proceeding with the Work as changed, provided that the Unified Government promptly and duly make such provisional adjustments in payments or time for performance as may be reasonable. By proceeding with the Work, the Contractor shall not be deemed to have prejudiced any claim for additional compensation, or an extension of time for completion.

13.3 WRITTEN CERTIFICATION - The Contractor shall not perform any Change Order in excess of $500 unless it bears, or the Contractor has separately received, a written certification, signed by the Fiscal Officer, that funds are available therefore; and, if acting in good faith, the Contractor may rely upon the validity of such certification.

13.4 TIME PERIOD FOR CLAIM - Within 30 days after receipt of a written Change Order under

Paragraph (1) of this clause, unless such period is extended by the Procurement Officer in writing, the Contractor shall file notice of intent to assert a claim for an adjustment. Later notification shall not bar the Contractor's claim unless the Unified Government is prejudiced by the delay in notification.

13.5 CLAIM BARRED AFTER FINAL PAYMENT - No claim by the Contractor for an adjustment hereunder shall be allowed if notice is not given prior to final payment under these Contractor Documents.

13.6 CLAIMS NOT BARRED - In the absence of such a Change Order, nothing in the Contract Documents shall restrict the Contractor's right to pursue a claim arising under the Contract Documents if pursued in accordance with the Clause entitled "Claims Based on a Procurement Officer's Actions or Omissions" (Section 22 of the General Conditions) or for breach of contract.

14. PRICE ADJUSTMENT.

14.1 PRICE ADJUSTMENT METHODS - Any adjustment in Contract Price pursuant to clauses in these Contract Documents shall be made in one or more of the following ways:

a. by agreement on a fixed price adjustment before commencement of the pertinent performance or as soon thereafter as practicable;

b. by unit prices specified in the Contract Documents or subsequently agreed upon;

c. by the costs attributable to the event or situation covered by the clause, plus appropriate profit or fee, all as specified in the Contract Documents or subsequently agreed upon;

d. in such other manner as the parties may mutually agree; or

e. in the absence of agreement between the parties, by a unilateral determination by the Procurement Officer of cost attributable to the event or situation covered by the clause, plus appropriate profit or fee, all as computed by the Procurement Officer in accordance with generally accepted accounting principles and applicable sections of the regulations promulgated under Article 7 (Cost Principles) and subject to the provisions of Article 9 (Legal and Contractual Remedies) of the Procurement Code.

14.2 SUBMISSION OF COST OR PRICING DATA - The Contractor shall submit cost or pricing data for any price adjustments subject to the provisions of Section 29-200(Cost or Pricing Data) of the Procurement Code.

15. VARIATIONS IN ESTIMATED QUANTITIES.

15.1 VARIATIONS REQUIRING ADJUSTMENTS - Where the quantity of a pay item in these Contract Documents is an estimated quantity and where the actual quantity of such pay item varies more than 15% above or below the estimated quantity stated in these Contract Documents, an adjustment in the Contract Price shall be made upon demand of either party. The adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115% or below 85% of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Procurement Officer shall, upon receipt of a timely written request for an extension of time, prior to the date of final settlement, ascertain the facts and make such adjustment for extending the completion date as in the judgment of the Procurement Officer the findings justify.

15.2 ADJUSTMENTS OF PRICE - Any adjustment in Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment Clause of this contract. (Section 14 of the General Conditions).

16. DIFFERING SITE CONDITIONS, PRICE ADJUSTMENTS.

16.1 NOTICE - The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer/Architect of:

a. subsurface or latent physical conditions at the site differing materially from those indicated in these Contract Documents; or

b. unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in these Contract Documents.

16.2 ADJUSTMENTS OF PRICE OR TIME FOR PERFORMANCE - After receipt of such notice, the Engineer/Architect shall promptly investigate the site, and if it is found that such conditions do materially so differ and cause an increase in the Contractor's cost of, or the time required for, performance of any part of the Work under these Contract Documents, whether or not changed as a result of such conditions, an adjustment shall be made and the Contract Documents modified in writing accordingly. Any adjustment in Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment Clause of this contract. (Section 14 of the General Conditions.)

16.3 TIMELINESS OF CLAIM - No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in this clause; provided, however, that the time prescribed therefore may be extended by the Procurement Officer in writing.

16.4 NO CLAIM AFTER FINAL PAYMENT - No claim by the Contractor for an adjustment thereunder shall be allowed if asserted after final payment under these Contract Documents.

16.5 KNOWLEDGE - Nothing contained in this clause shall be grounds for an adjustment in compensation if the Contractor had actual knowledge of the existence of such conditions prior to the submission of bids.

17. TIME FOR COMPLETION.

17.1 The date beginning and the time for completion of the Work are essential conditions of the Contract Documents and the Contract Time shall commence on a date specified in the Notice to Proceed.

17.2 The Contractor will proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Unified Government that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work.

18. TERMINATION FOR DEFAULT FOR NON-PERFORMANCE OR DELAY - DAMAGES FOR DELAY - TIME EXTENSIONS.

18.1 DEFAULT - If the Contractor refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will assure its completion within the time specified in these Contract Documents, or any extension thereof, fails to complete said Work within such time, or commits any other substantial breach of these Contract Documents, and further fails within 14 days after receipt of written notice from the Procurement Officer to commence and continue correction of such refusal or failure with diligence and promptness, the Procurement Officer may, by written notice to the Contractor, declare the Contractor in breach and terminate the Contractor's right to proceed with the Work or such part of the Work as to which there has been delay. In such event the Unified Government may take over the Work and prosecute the same to completion, by contract or otherwise, and may take possession of, and utilize in completing the Work, such Materials, appliances, and plant as may be on the site of the Work and necessary therefore. Whether or not the Contractor's right to proceed with the work is terminated, the Contractor and the Contractor's sureties shall be liable for any damage to the Unified Government resulting from the Contractor's refusal or failure to complete the work within the specified time.

18.2 LIQUIDATED DAMAGES UPON TERMINATION - If fixed and agreed liquidated damages are provided in these Contract Documents, and if the Unified Government so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages for such reasonable time as may be required for final completion of the Work.

18.3 LIQUIDATED DAMAGES IN ABSENCE OF TERMINATION - If fixed and agreed liquidated damages are provided in the Contract Documents, and if the Unified Government does not terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the Work is completed or accepted.

18.4 TIME EXTENSION - The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

a. the delay in the completion of the Work arises from causes such as: acts of God; acts of the public enemy; acts of the Unified Government or any other governmental entity in either a sovereign or contractual capacity; acts of another Contractor in the performance of a contract with the Unified Government; fires; floods; epidemics; quarantine restrictions; strikes or other labor disputes; freight embargoes; unusually severe weather; delays of Subcontractors due to causes similar to those set forth above; or shortage of Materials; provided, however, that no extension of time will be granted for a delay caused by a shortage of Materials, unless the Contractor furnishes to the Engineer/Architect proof that the Contractor has diligently made every effort to obtain such Materials from all known sources within reasonable reach of the Work, and further proof that the inability to obtain such Materials when originally planned did in fact cause a delay in final completion of the entire Work which could not be compensated for by revising the sequence of the Contractor's operations; and

b. the Contractor, within ten days from the beginning of any such delay (unless the Procurement Officer grants a further period of time before the date of final payment under the Contract Documents), notifies the Engineer/Architect in writing of the causes of delay. The Procurement Officer shall ascertain the facts and the extent of the delay and extend the time for completing the Work when, in the judgment of the Procurement Officer, the findings of fact justify such an extension.

18.5 ERRONEOUS TERMINATION FOR DEFAULT - If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall be the same as if the notice of termination had been issue pursuant to the Termination for Convenience clause. (Section 23 of the General Conditions.)

18.6 Where the Contractor's services have been so terminated by the Unified Government, said termination shall not affect any right of the Unified Government against the Contractor then existing or which may thereafter accrue. Any retention or

payment of monies by the Unified Government will not release the Contractor from compliance with the Contract Documents.

18.7 ADDITIONAL RIGHTS AND REMEDIES - The rights and remedies of the Unified Government provided in this clause are in addition to any other rights and remedies provided by law or under these Contract Documents.

19. SPECIFIC ACTS CONSTITUTING SUBSTANTIAL BREACH.

19.1 The following acts committed by the Contractor will constitute a substantial breach of the Contract Documents and may result in termination of the Work.

a. If the Contractor is adjudged bankrupt or insolvent.

b. If the Contractor makes a general assignment for the benefit of his creditors.

c. If a trustee or receiver is appointed for the Contractor or any of his property.

d. If the Contractor files a petition to take advantage of any debtor's act or to reorganize under the bankruptcy or applicable laws.

e. If Contractor repeatedly fails to supply sufficient skilled workmen or suitable Material or Equipment.

f. If the Contractor repeatedly fails to make prompt payments to Subcontractors or for labor, Material or Equipment.

g. If the Contractor disregards ordinances, rules, regulations or orders of any public body having jurisdiction of the Work.

h. If the Contractor disregards the authority of the Purchasing Officer or consultant.

19.2 Acts other than those specified in 19.1 may constitute substantial breach.

19.3 The procedure for termination for substantial breach of the Contract Documents shall be in accordance with the clause entitled "Termination for Default for Non-performance or Delay - Damages for Delay - Time Extensions" (Section 18 of General Conditions).

20. CORRECTION OF WORK.

20.1 The Contractor shall promptly remove from the premises all Work rejected by the Engineer/Architect for failure to comply with the Contract Documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the Work in accordance with the Contract Documents and without expense to the Unified Government and shall bear the expense of making good all Work of other Contractors or Subcontractors destroyed or damaged by such removal or replacement.

20.2 All removal and replacement Work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected Work within ten (10) days after receipt of Written Notice, the Unified Government may remove such Work and store the Materials, at the expense of the Contractor.

21. SUSPENSION OF WORK.

21.1 SUSPENSION FOR CONVENIENCE - The Procurement Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as may be determined to be appropriate for the convenience of the Unified Government.

21.2 ADJUSTMENT OF COST - If the performance of all or any part of the Work is, for an unreasonable period of time, suspended, delayed or interrupted by an act of the Procurement Officer in the administration of these Contract Documents, or by the failure of the Procurement Officer to act within the time specified in these Contract Documents (or if no time is specified, within reasonable time), an adjustment shall be made for any increase in the cost of performance of these Contract Documents necessarily caused by such unreasonable suspension, delay, or interruption and the Contract Documents modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay or interruption to the extent:

a. that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor; or

b. for which an adjustment is provided for or excluded under any other provision of these Contract Documents.

21.3 TIME RESTRICTION ON CLAIM - No claim under this clause shall be allowed:

a. for any costs incurred more than 20 days before the Contractor shall have notified the Procurement Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and

b. unless the claim is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the Contract Documents.

21.4 ADJUSTMENTS OF PRICE - Any adjustment in Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment Clause of These Contract Documents. (Section 14 of the General Conditions.)

22. CLAIMS BASED ON A PROCUREMENT OFFICER'S ACTIONS OR OMISSIONS.

22.1 NOTICE OF CLAIM - If any action or omission on the part of the Procurement Officer

requiring a performance change within the scope of the Contract Documents constitutes the basis for a claim by the Contractor for additional compensation, damages, or an extension of time for completion, the Contractor shall continue with performance of the Work in compliance with the directions or orders of such officials, but by so doing, the Contractor shall not be deemed to have prejudiced any claim for additional compensation, damages, or an extension of time for completion, provided:

a. The Contractor shall have given Written Notice to the Procurement Officer:

i. prior to the commencement of the Work involved, if at that time the Contractor knows of the occurrence of such action or omission;

ii. within 30 days after the Contractor knows of the occurrence of such action or omission, if the Contractor did not have such knowledge prior to the commencement of the Work; or

iii. within such further time as may be allowed by the Procurement Officer in writing.

b. The notice required by Subparagraph (22.1.a.) of this paragraph described as clearly as practicable at the time the reasons why the Contractor believes that additional compensation, damages, or an extension of time may be remedies to which the Contractor is entitled; and

c. The Contractor maintains, and upon request makes available to the Procurement Officer within a reasonable time, detailed records to the extent practicable, of the claimed additional costs or basis for an extension of time in connection with such changes.

22.2 LIMITATION OF CLAUSE - Nothing herein contained, however, shall excuse the Contractor from compliance with any rules of law precluding any Unified Government officers and any Contractors from acting in collusion or bad faith in issuing or performing Change Orders which are clearly not within the scope of the Contract Documents.

22.3 ADJUSTMENTS OF PRICE - Any adjustment in the Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment clause of these Contract documents. (Section 14 of the General Conditions.)

23. TERMINATION FOR CONVENIENCE.

23.1 TERMINATION - The Unified Government may, when the interests of the Unified Government so require, terminate the Unified Government's obligations under these Contract Documents, in whole or in part, for the convenience of the Unified Government. The Procurement Officer shall give written notice of the termination to the Contractor specifying the part of the contract terminated and when termination becomes effective.

23.2 CONTRACTOR'S OBLIGATIONS - The Contractor shall incur no further obligations in connection with the terminated work and on the date set in the notice of termination the Contractor will stop Work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated obligations. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated obligations. The Procurement Officer may direct the Contractor to assign the Contractor's right, title, and interest under terminated orders or subcontracts to the Unified Government. The Contractor must still complete the obligation not terminated by the notice of termination and may incur obligations as necessary to do so.

23.3 RIGHT TO CONSTRUCTION AND SUPPLIES - The Procurement Officer may require the Contractor to transfer title and deliver to the Unified Government in the manner and to the extent directed by the Procurement Officer:

a. any completed construction; and

b. such partially completed construction, supplies, materials, parts, tools, dies, jigs, fixtures, plans, drawings, information, and contract rights (hereinafter called 'Construction Material') as the Contractor has specifically produced or specially acquired for the performance of the terminated obligation(s).

The Contractor shall protect and preserve property in the possession of the Contractor in which the Unified Government has an interest. If the Procurement Officer does not exercise this right, the Contractor shall use best efforts to sell such construction, supplies, and Construction Materials in accordance with the standards of K.S.A. 84-2-706. This in no way implies that the Unified Government has breached the Contract Documents by exercise of the Termination for Convenience Clause.

23.4 COMPENSATION

a. The Contractor shall submit a termination claim specifying the amounts due because of the termination for convenience, together with cost or pricing data, submitted to the extent required by Section 29-200 (Cost or Pricing Data) of the Procurement Code, bearing on such claim. If the Contractor fails to file a termination claim within one year from the effective date of termination, the Procurement Officer may pay the Contractor, if at all, an amount set in accordance with Subparagraph (c) of this Paragraph.

b. The Procurement Officer and the Contractor may agree to a settlement provided

the Contractor has filed a termination claim supported by cost or pricing data submitted as required by Section 3-303 (Cost or Pricing Data) of the Procurement Code and that the settlement does not exceed the total Contract Price plus settlement costs reduced by payments previously made by the Unified Government, the proceeds of any sales of construction, supplies, and Construction Materials under Paragraph 23.3 of these General Conditions, and the Contract Price of the Work not terminated.

c. Absent complete agreement under Subparagraph (b) of this Paragraph, the Procurement Officer shall pay the Contractor the following amounts, provided payments under Subparagraph (b) shall not duplicate payments under this Paragraph:

i. with respect to all contract Work performed prior to the effective date of the notice of termination, the total (without duplication of any items) of:

A. the cost of such Work plus a fair and reasonable profit on such portion of the Work (such profit shall not include anticipatory profit or consequential damages) less amounts paid or to be paid for completed portions of such Work; provided, however, that if it appears that the Contractor would have sustained a loss if the entire Work would have been completed, no profit shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss;

B. costs of settling and paying claims arising out of the termination of subcontracts or orders pursuant to Paragraph 23.2 of these General Conditions. These costs must not include costs paid in accordance with Subparagraph (c.i.A) of this Paragraph;

C. the reasonable settlement costs of the Contractor including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated obligation(s) and for the termination and settlement of subcontracts there-under, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to the terminated obligations.

ii. The total sum to be paid the Contractor under this Paragraph shall not exceed the total Contract Price plus the reasonable settlement costs of the Contractor reduced by the amount of any sales of construction, supplies, and Construction Materials under Paragraph 23.3 of these General Conditions, and the Contract Price of Work not terminated.

d. Cost claimed, agreed to, or established under Subparagraphs (b) and (c) of this Paragraph shall be in accordance with Chapter 7 (Cost Principles) of the Procurement Regulations.

24. LIQUIDATED DAMAGES.

24.1 When the Contractor fails to complete the Work or any portion of the Work within the time or times fixed in the Contract Documents, the Contractor shall pay to the Unified Government the amount listed in the Agreement as Liquidated Damages for each calendar day of delay pursuant to the "Termination for Default for Non-performance or Delay - Damages for Delay - Time Extensions" clause. (Section 18 of the General Conditions.)

25. PAYMENTS FOR WORK PERFORMED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

25.1 At least twenty (20) days before each progress payment falls due, the Contractor may submit, but not more than once a month, to the Engineer/Architect a partial payment estimate on a form suitable to the Engineer/Architect, filled out and signed by the Contractor covering the work performed during the period covered by the partial payment estimate and supported by such data as the Engineer/Architect may reasonably require. The Engineer/Architect will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Procurement Officer, or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Unified Government will, within thirty (30) days of presentation to the Procurement Officer of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Unified Government will retain five (5) percent of the amount of each payment until final completion and acceptance of all work covered by the Contract Documents. The Procurement Officer at any time, however, after fifty (50) percent of the work has been completed, if he finds that satisfactory progress is being made, may reduce retainage on the current and remaining

estimates. When the work is substantially complete (operational or beneficial occupancy), the retained amount may be further reduced to only that amount necessary to assure completion.

25.2 Prior to Substantial Completion, the Unified Government, with the approval of the Engineer/Architect, may use any completed or substantially completed portions of the work. Such use shall not constitute an acceptance of such portions of the work.

25.3 Upon completion and acceptance of the work, the Engineer/Architect shall issue a certificate attached to the final payment request that the Work has been accepted by him under the conditions of the Contract Documents. The entire balance found to be due the Contractor, including the retained percentages, but except such sums as may be lawfully retained by the Unified Government, shall be paid to the Contractor within thirty (30) days of completion and acceptance of the work.

25.4 The Contractor will indemnify and save the Unified Government and the Engineer/Architect, and their agents and employees harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the work. Prior to final payment and prior to any progress payment when so requested by the Unified Government, the Contractor shall furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so, the Unified Government may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Unified Government to either the Contractor, his surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Unified Government shall be considered as a payment made under the Contract Documents by the Unified Government to the Contractor and the Unified Government shall not be liable to the Contractor for any such payments made in good faith.

26. ACCEPTANCE OF FINAL PAYMENT AS RELEASE.

26.1 The acceptance by the Contractor of final payment shall be made and shall operate as a release to the Unified Government of all claims and all liability to the Contractor, other than claims in stated amounts as may be specifically excepted by the Contractor, for all things done or furnished in connection with this Work and for every act and neglect of the Unified Government and others relating to or arising out of this Work. Any payment, however, final or otherwise, shall not release the Contractor or his sureties from any obligations under the Contract Documents or the Performance Bond and Payment Bonds.

27. INSURANCE.

27.1 The Contractor shall purchase and maintain during the term of this contract such insurance as will protect him and the Unified Government of Wyandotte County/Kansas City, Kansas, from claims set forth below which may arise out of or result from the Contractor's execution of the Work, whether such execution be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. The Unified Government of Wyandotte County/Kansas City, Kansas, shall be identified as an additional insured or provided with an owner's protective policy written on an occurrence basis on coverage set forth in Section 27.3 of this clause.

a. Claims under workman's compensation disability benefit and other similar employee benefits;

b. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

c. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

d. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and

e. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

27.2 Certificates of insurance acceptable to the Unified Government shall be filed with the Unified Government within ten (10) days of the Notice of the Award. These Certificates shall contain a provision that states, “Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions. At the discretion of the Unified Government, the Contractor shall file copies of endorsed insurance policies with the Unified Government prior to commencement of the Work.

27.3 The Contractor shall procure and maintain Contractor's General Public Liability and Property Damage Insurance, including vehicle coverage issued to the Contractor and protecting him and the Unified Government of Wyandotte County/Kansas City, Kansas, from all claims for personal injury, including death, and all claims for destruction of or damage to

property, arising out of or in connection with any operations under the Contract Documents, whether such operations be by himself or by any Subcontractor under him. Insurance may be combined Bodily Injury and Property Damage Liability but in no event shall the limit of liability be less than $500,000 for all damages arising out of bodily injury, including death, and all property damage sustained by any one person in any one accident, and $500,000 aggregate for any such damage sustained by two or more persons in any one accident.

27.4 The Contractor shall acquire and maintain, if applicable, Fire and Extended Coverage Insurance upon the Project to the full insurable value thereof for the benefit of the Unified Government, the Contractor, and Subcontractors as their interest may appear. This provision shall in no way release the Contractor's surety from obligations under the Contract Documents to fully complete the Project.

27.5 The Contractor shall procure and maintain at his own expense, during the Contract Time, in accordance with the provisions of the law of the State of Kansas, Worker's Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the Project and in case any Work is sublet, the Contractor shall require such Subcontractor similarly to provide Worker's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous Work under these Contract Documents at the site of the Project is not protected under Worker's Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide adequate and suitable insurance for the protection of his employees not otherwise protected.

27.6 The Contractor shall secure, if applicable, "All Risk" type Builder's Risk Insurance for Work to be performed. Unless specifically authorized by the Unified Government, the amount of such insurance shall not be less than the Contract price totaled in the Bid. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the Contract Time, and until the Work is accepted by the Owner. The policy shall name as the insured the Contractor and the Owner.

27.7 The Contractor, in addition to all other insurance requirements herein, shall procure and maintain insurance in the type and amount as may be required in any license, permit, or agreement obtained for the Project and which is necessary to complete the Work (i.e., Highway Permit, Railroad Crossing Agreement, Corps of Engineers Permit) regardless of who secured the license, permit or agreement.

28. CONTRACT SECURITY.

28.1 Where the contract is in excess of $50,000.00, the Contractor shall furnish the Unified Government with a Performance Bond in the amount of 100% of the Contract Price. Where the contract is in excess of $50,000.00, the Contractor shall furnish the Unified Government with a Labor and Material Payment Bond in the amount of 100% of the Contract Price. Bonds shall be delivered within ten (10) days of receipt of Notice of Award. The Performance Bond shall be conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions, and agreement of the contract documents. The Payment Bond shall be conditioned upon the prompt payment by the Contractor to all persons supplying labor and Materials in the prosecution of the work provided by the Contract Documents and shall comply with the requirements of K.S.A. 60-1111 including, but not limited to the requirement that it be filed with the Clerk of the Wyandotte County District Court. All bonds shall contain all terms and conditions contained in the provided bond form in the Contract Documents and shall be executed by a surety company authorized to do business in the State of Kansas. Attorneys-in-fact who sign bonds must file with each bond a certified and effective dated copy of the power of attorney form.

28.2 The expense of these bonds shall be borne by the Contractor. If at any time a surety on any such Bond is declared bankrupt or loses its right to do business in the State of Kansas, the contractor shall within ten (10) days substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Unified Government. The premiums on such Bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Unified Government.

29. ASSIGNMENTS.

29.1 Neither the Contractor nor the Unified Government shall sell, transfer, assign or otherwise dispose of any rights or obligation created by the Contract Documents or any portion thereof, or of his right, title or interest therein or his obligations thereunder, without written consent of the other party.

30. INDEMNIFICATION.

30.1 The Contractor will indemnify and hold harmless the Unified Government and the Engineer/Architect and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and Subcontractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

30.2 In any and all claims against the Unified Government and the Engineer/Architect, or their agents and employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workmen's Compensation acts, disability benefit acts or other employee benefits acts.

30.3 The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer/Architect, his agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

30.4 The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of Materials, workmanship and execution of the Work. Inspections may be made at the factory or fabrication plant of the source of Material supply.

31. SEPARATE CONTRACTS AND RIGHT TO ENTER TO PERFORM WORK.

31.1 The Unified Government may perform additional Work related to the Project by itself, or it may execute other Contract Documents containing provisions similar to these. The Contractor shall afford the Unified Government and other Contractors reasonable opportunity for the introduction and storage of their Materials and the execution of their Work, and shall properly connect and coordinate his Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of the Unified Government or any other Contractor, the Contractor shall inspect and promptly report to the Engineer/Architect any defects in such Work that render it unsuitable for such proper execution and results.

31.2 The Unified Government's right to perform work and enter other contracts shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the Unified Government or by other Contractors.

31.3 If the performance of additional Work by other Contractors or the Unified Government is not noted in the Contract Documents prior to the execution of the Contract Documents, written notice thereof shall be given to the Contractor prior to starting any such additional Work. If the Contractor believes that the performance of such additional Work by the Unified Government or other Contractors involves him in additional expense or entitles him to an extension of the Contract Time, he may make a claim therefor as provided in the Clause entitled "Changes" (Section 13 of the General Conditions).

32. SUBCONTRACTING.

32.1 The Contractor may utilize the services of specialty Subcontractors on those parts of the Work which, under normal contracting practices, are performed by specialty Subcontractors.

32.2 The Contractor shall not award subcontracts which total more than fifty (50) percent of the Contract Price, without prior written approval of the Unified Government.

32.3 Prior to the execution and delivery of the Contract Documents, the successful Bidder will submit to the Engineer/Architect for Unified Government's acceptance an updated list of the names of Subcontractors and Suppliers proposed for those portions of the Work and designating which Work each is to perform. For the purpose of reporting supplier participation, a reportable supplier is one who provides directly to the general contractor (first tier supplier). The general contractor is not required to report first tier supplier participation if the total purchases from the first tier supplier is less than $2,500.00. The Affidavit of Intended Utilization has been provided to facilitate this requirement. Failure to submit this form may be interpreted as non-responsiveness and will be grounds for rejection of bids. Upon contract completion, any changes in the list of subcontractors or suppliers used or payment amount must be submitted to Purchasing before final payment will be made.

32.4 Twenty-five (25) days prior to initiation of Work by any Subcontractor and Suppliers the Contractor shall submit such subcontractor's name to the Engineer/Architect for the Unified Government's approval. Ten (10) days prior to initiation of Work by such Subcontractor or Supplier, the Engineer/Architect shall notify the successful Bidder in writing if either the Unified Government or Engineer/Architect, after due investigation, has reasonable objection to any Subcontractor or Supplier on such list. The failure of the Unified Government or the Engineer/Architect to make objection to Subcontractor or Supplier shall constitute an acceptance of such Subcontractor or Supplier, but shall not constitute a waiver of any right of the Unified Government or the Engineer/Architect to reject defective Work, Material or Equipment, not in conformance with the requirements of the Contract Documents.

32.5 The Contractor will not make any substitution for any Subcontractor or Supplier who has been accepted by the Unified Government Engineer/Architect, unless the Engineer/Architect approves such a change in writing. The Contractor Utilization Plan may be used to facilitate this requirement. The failure of the Unified Government or the Engineer/Architect to make objection to Subcontractors or Suppliers shall constitute an acceptance of such Subcontractor or Supplier, but shall not constitute a waiver of any right of the Unified Government or the Engineer/Architect to reject

defective Work, Material or Equipment, not in conformance with the requirements of the Contract Documents.

32.6 The Contractor shall be fully responsible to the Unified Government for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

32.7 The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the Work of Subcontractor and to give the Contractor the same power as regards terminating any subcontract that the Unified Government may exercise over the Contractor under any provisions of the Contract Documents.

32.8 Nothing contained in these Contract Documents shall create any contractual relationship between any Subcontractor and the Unified Government.

33. ENGINEER/ARCHITECT'S AUTHORITY.

33.1 The Engineer/Architect shall act as the Unified Government's representative during the construction period. He shall decide questions which may arise as to quality and acceptability of Materials furnished and Work performed. He shall interpret the intent of the Contract Documents in a fair and unbiased manner and shall not be held liable for the result of any interpretation or decision rendered in good faith.

33.2 The Engineer/Architect shall not and will not be responsible for the Contractor's construction means, controls, techniques, sequences, procedures, or safety. Except the Engineer/Architect may direct the sequencing, phasing and date of performance of the work and may change the location and quantities of the work as necessary to meet the objectives listed below. No additional payment shall be made for delays arising from changes to sequence, phasing or date of performance that could be reasonably anticipated from the nature, location and time of year of the work.

a. To ensure the completion of priority elements of the project within the funds available;

b. To ensure the least practicable inconvenience to the public;

c. To ensure the compliance with weather and seasonal limitations;

d. To ensure the timely completion of field quality control testing and visual inspections;

e. To ensure the coordination of work of other contractors, utilities or Unified Government crews in the best interest of the Unified Government.

33.3 The Engineer/Architect shall promptly make decisions relative to interpretation of the Contract Documents.

33.4 The Engineer/Architect may make visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.

34. PROJECT REPRESENTATIVE.

The Engineer/Architect may provide one or more full time Project Representatives to assist the Engineer/Architect in carrying out his responsibilities at the site. The duties, responsibilities, and limitations of any such Project Representative shall be as follows:

34.1 Liaison

a. Serve as the Engineer/Architect's liaison with the Contractor working principally through the Contractor's superintendent.

b. Cooperate with the Contractor in his dealings with the various local agencies having jurisdiction over the Project in order to complete service connections to public utilities and facilities.

c. Assist the Engineer/Architect in obtaining from the Unified Government additional details or information, when required at the job site for proper execution of the Work.

34.2 Review of Work

a. Conduct on-site observations of the Work in progress for the Engineer/Architect as a basis for determining that the project is proceeding in accordance with the Contract Documents, and report to the Engineer/Architect whenever he believes that the Work should be stopped to insure that the completed Project will comply with the requirements of the Contract Documents.

b. Verify that tests, including equipment and systems start up, which are required by the Contract Documents are conducted and that the Contractor maintains adequate records thereof; observe, record, and report to the Engineer/Architect appropriate details relative to the test procedures and start ups.

c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the outcome of these inspections and report to the Engineer/Architect.

34.3 Interpretation of Contract Documents

a. Transmit to the Contractor the Engineer/Architect's interpretations of the Contract Documents.

34.4 Records

a. Maintain at the job site orderly files for correspondence, reports of job conferences,

shop drawings and other submissions, reproductions of original Contract Documents including all Addenda, Change Orders, and additional Drawings issued subsequent to the award of the contract, the Engineer/Architect's interpretations of the Contract Documents, progress reports, and other project related documents.

b. Keep a diary or log book, recording hours on the job site, weather conditions, list of visiting officials, daily activities, decisions, observations in general and specific observations in more detail as in the cases of observing test procedures.

c. Maintain a set of Drawings on which authorized changes are noted, and deliver to the Engineer/Architect at the completion of the project.

34.5 Guarantees, Certificates, Maintenance and Operation Manuals

a. During the course of the Work, assemble guarantees, certificates, maintenance operation manuals and other required data furnished by the Contractor and upon acceptance of the Project, deliver these documents to the Engineer/Architect for his review and forwarding to the Unified Government.

34.6 Completion

a. Prior to review for completion, submit to the Contractor a list of observed items requiring correction.

b. Conduct final review in the company of the Engineer/Architect and the Unified Government and prepare a final list of items to be corrected.

c. Verify that all items on final list have been corrected and make recommendations to the Engineer/Architect concerning acceptance.

34.7 Limitation of Authority - Except upon written instructions of the Engineer/Architect, the Project Representative:

a. Shall not authorize any deviation from the Contract Documents.

b. Shall not undertake any of the responsibilities of the Contractor, the Subcontractors or the Contractor's Superintendent.

c. Shall not expedite the Work for the Contractor.

d. Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.

e. Shall not authorize the Unified Government to occupy the Project in whole or in part.

35. LAND AND RIGHTS-OF-WAY.

35.1 Prior to issuance of Notice to Proceed, the Unified Government will have obtained all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise set forth in the Special Conditions or by Change Order.

35.2 The Unified Government shall provide to the Contractor written information which delineates and describes the land owned and rights-of-way acquired and any special requirements contained therein. (Shown on the drawings and/or in the Special Conditions.)

35.3 The Contractor shall provide at his own expense and without liability to the Unified Government any additional land and access thereto that the Contractor may desire for temporary construction facilities, for storage of Materials or for additional working area.

36. PERMITS AND LICENSES.

36.1 Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor unless otherwise stated in the Special Conditions. The Contractor shall comply with all requirements, furnish required bonds, carry required insurance, pay all inspection fees and comply otherwise with all requirements of all permits and licenses regardless of whom obtained same. Copies of permits and licenses obtained by others, if not included in the Contract Documents, are available at the Engineer/Architect's office during regular business hours. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified.

36.2 If the Contractor observes that the Contract Documents are at variance with other requirements, the Contractor shall promptly notify the Engineer/Architect in writing, and any necessary changes shall be adjusted in accordance with the Clause entitled "Changes" (Section 13 of the General Conditions).

37. GUARANTY.

37.1 The Contractor shall guarantee all Materials and Equipment furnished and Work performed. Furthermore, commencing on the Date the Unified Government accepts all Work, the Contractor also warrants and guarantees for a minimum of one year or such longer period as may be established for specific products or installations by the technical provisions that the accepted Work is free from all defects due to faulty Materials, Equipment or workmanship, and the Contractor shall promptly make corrections as may be necessary by reason of such defects and the repairs of any damage to other parts of the Work, including damage to adjacent existing improvements, utilities,

pavement and so forth, resulting from such defects. All Materials, Equipment or Work incorporated in correcting such defects shall also be warranted and guaranteed to conform with the Contract Documents for the applicable guarantee period in the Supplemental General Conditions.

37.2 The Unified Government will give Written Notice to the Contractor of observed defects with reasonable promptness. If for any reason the Contractor shall fail to make any such repairs, adjustments, including other Work that may be made necessary by such defects, within twenty (20) days after date such notice is served upon the Contractor, the Unified Government will have the right and authority to correct or cause the correction of the defects, including that which may be made necessary by said defects, and charge the Contractor for all costs thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

38. DISPUTES.

38.1 All controversies between the Unified Government and the Contractor which arise under, or are by virtue of these Contract Documents and which are not resolved by mutual agreement, shall be decided by the Procurement Officer in writing, within thirty (30) days after a written request by the Contractor for a final decision concerning the controversy; provided, however, that if the Procurement Officer does not issue a written decision within 30 days after written request for a final decision, or within such longer period as may be agreed upon by the parties, then the Contractor may proceed as if an adverse decision had been received.

38.2 The Procurement Officer shall immediately furnish a copy of the decision to the Contractor, by certified mail, return receipt requested, or by any other method that provides evidence of receipt.

38.3 Any such decision shall be final and conclusive, unless fraudulent, or the Contractor brings an action seeking judicial review of the decision in the Wyandotte County District Court.

38.4 The Contractor shall comply with any decision of the Procurement Officer and proceed diligently with performance of the Work pending final resolution by the Wyandotte County District Court of any controversy arising under, or by virtue of these Contract Documents, except where there has been a material breach of the Contract Documents by the Unified Government, provided, however, that in any event the Contractor shall proceed diligently with the performance of the Work where the Purchasing Director or head of a Purchasing Agency has made a written determination that continuation of Work under the Contract Documents is essential to the public health and safety.

39. TAXES.

39.1 Sales and compensating tax exemption certificate number will be provided by the Unified Government to the Contractor as set forth in K.S.A. 79-3606 (d) and (e), as may be amended.

39.2 If for any reason the exemption certificate number is not furnished the Contractor, the Unified Government will, upon Written Notice from the Contractor, execute a Change Order to compensate the Contractor for such sales and compensating taxes which would otherwise be legally exempted by said certificate number. (Section 13 of the General Conditions). Any adjustment in Contract Price made pursuant to this clause shall be determined in accordance with the Price Adjustment Clause of these Contract Documents (Section 14 of the General Conditions).

40. PROCESS AGENT.

40.1 If the Contractor is an individual, partnership or unincorporated association and if said Contractor is not a resident of the State of Kansas, said Contractor shall appoint in writing as such Contractor's agent, a resident of the County of Wyandotte, Kansas, as required by K.S.A. 16-113, as amended. Process for the Contractor may be served on such agent in any civil action which arises out of the Contract Documents. The appointment of such agent shall be filed with the Clerk of the District Court of Wyandotte County, Kansas. Any Contractor required hereunder to appoint such an agent shall not receive public moneys pursuant to the Contract Documents until the appointment has been made and filed.

41. SATURDAY, SUNDAY, HOLIDAY AND NIGHT WORK.

41.1 No Work shall be done on Saturday, Sunday, Unified Government designated holidays, or at night, without the written approval or permission of the Engineer/Architect in each case, except such Work as may be necessary for the proper care, maintenance and protection of Work already done or of Equipment and public property covered by the Contract Documents. Approval of the Engineer/Architect shall be sought at least forty-eight (48) hours in advance of such Work whenever practicable.

42. PUBLIC CONVENIENCE AND SAFETY.

42.1 The Contractor shall at all times so conduct his Work as to insure the least practicable obstruction to traffic. The convenience of the general public and the residents along the Project, and the protection of persons and property are of prime importance and shall be provided for by the Contractor in an adequate and satisfactory manner. When it is necessary for residents living along the Project to use a portion of road in the Project area, the Contractor shall maintain within the limits of these specifications, that portion of the road in a suitable condition for pedestrian and vehicular travel.

42.2 The Contractor shall be responsible for all traffic control devices necessary at the Project site,

including installation, maintenance and removal of such devices. All traffic control devices supplied by the Contractor shall comply with the standards of the Manual on Uniform Traffic Control Devices, the most current edition, and the Traffic Control Devices Handbook and amendments thereto. The Contractor shall submit a written plan for traffic control during the Project to the Traffic Regulations Division of the Public Works Department for approval prior to the commencement of the Project.

42.3 The Contractor shall contact the Traffic Regulations Division of the Public Works Department prior to any street closure or traffic restriction. The Contractor shall be responsible for notification of the police and fire departments in emergency traffic restriction situations.

43. PRE-CONSTRUCTION CONFERENCE.

43.1 Following execution of the Agreement between the Unified Government and the Contractor, but prior to the date established in the Notice to Proceed for commencement of the Work, a pre-construction conference shall be held at a date, time and place mutually acceptable to both parties to the Agreement unless otherwise waived by the Engineer/Architect. The conduct of the pre-construction conference is the responsibility of the Engineer/Architect and the prime purpose of the pre-construction conference will be to review the terms and conditions of the Contract Documents. Persons present at the pre-construction conference shall be determined by the Procurement Officer.

44. INTERRUPTION OF SERVICE.

44.1 When making preparations for making correction of the existing system or other work which will interrupt service to the utility users, the Contractor shall notify the affected users, stating the approximate time and duration of interruption of service. The Contractor shall notify the Unified Government authorities and the affected utility companies of any necessary interruption of service and shall limit such interruption to the duration mutually agreeable to all parties.

45. UTILITIES.

45.1 Location, size, material and depth shown on the drawing for existing utilities are based on information furnished by the utility companies from their records. Actual field locations have not been established by the Unified Government or Engineer/Architect. The Contractor shall investigate and verify plan locations and elevation of underground utilities in the field before commencing Work. Should it become necessary to temporarily move, shift, or relocate utility lines for the construction of this Project, the Work shall be arranged and paid for by the Contractor. Should it become necessary to permanently relocate utility lines to allow room for construction of said lines they shall be moved at no cost to the Contractor unless otherwise specified in the Special Conditions. The Contractor shall protect all railroad trackage, ties, ballast, utilities and structures encountered on or adjacent to the line of Work; damage to these facilities caused by the Contractor's Work shall be made good to the owner thereof by the Contractor without incurring any liabilities to the Unified Government or Engineer/Architect.

46. ADDITIONAL COPIES OF PLANS AND SPECIFICATIONS.

46.1 The Unified Government will furnish the Contractor up to 4 sets of Plans and Specifications exclusive of those obtained for bidding. Additional sets will be furnished, upon request, at the cost of reproduction.

47. WORK ON RAILROAD AND HIGHWAY RIGHTS-OF-WAY.

47.1 Installation of casing pipe, pipelines and appurtenances along or across railroad and highway rights-of-way, shall be made in strict accordance with the instructions and regulations of the respective railroad company, the Kansas Department of Transportation and Kansas Turnpike Authority. The cost of railroad, Kansas Department of Transportation, or Kansas Turnpike Authority inspectors and flagmen shall be borne by the Contractor. Performance Bonds and special insurance coverage required by either or each the railroad, Kansas Department of Transportation, and Kansas Turnpike Authority shall be furnished by the Contractor at no additional cost to the Unified Government.

48. RECORDS.

48.1 The Contractor shall maintain one record copy of all Contract Documents at the site in good order and annotated to show all changes made during the Work, including the location, size and type of exposed improvements and the limits of incompressible soils (rock, shale, etc.). These records shall be available to the Engineer/Architect during progress of the Work and shall be delivered to the Engineer/Architect upon completion of the Project.

49. HISTORICAL OR ARCHAEOLOGICAL DEPOSITS.

49.1 If during the course of construction evidence of deposits of historical or archaeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Unified Government who shall notify the Executive Director, Kansas Historical Society. No further disturbance of the deposits shall ensue until the Contractor has been notified by the Unified Government that he may proceed. The Unified Government will issue a Notice to Proceed only after the State official has surveyed the find and made a determination of value and effect and submitted such determination to the Unified Government. Compensation to the Contractor, if any, for lost time or changes in construction to avoid the

find shall be determined in accordance with the Price Adjustment clause. (Section 14 of General Conditions.)

50. FORTY (40) HOUR WEEK PROVISION.

50.1 Laborers, workmen or mechanics in the employ of the Contractor, Subcontractors or other persons doing or contracting to do the whole or a part of the work contemplated and described in these contract documents shall be paid wages at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty (40) hours in any workweek. The basic rate of pay shall not be less than the prevailing rate per hour, as provided elsewhere in these general conditions. A violation of this condition shall be a violation of that section of the Code Ordinances of the Unified Government of Wyandotte County/Kansas City, Kansas, that pertains to a forty (40) hour work week and shall be dealt with as provided for therein.

51. INTEREST PAYABLE ON CLAIMS.

51.1 Pursuant to Section 9-301 (Interest) of the Procurement Code, interest on amounts ultimately determined to be due to the Contractor shall be payable at the statutory rate applicable to judgments from the date the claim arose through the date of decisions or judgment, whichever is later.

52. MULTIPLE AWARDS.

52.1 The Unified Government reserves the right to make a multiple awards a multiple award may be made to two or more bidders or offerors for similar products when it is necessary for adequate delivery, services or product compatibility. Any multiple award shall be made in accordance with Sections 29-153-29-158 of the Unified Government Municipal Code.. Further, subsequent to award the Unified Government reserves the right to take separate bids if a particular quantity requirements arises which exceeds its normal requirement or amount specified in the Contract Documents, or if the Procurement Officer determines that quantities available under the Contract Documents will not meet a nonrecurring special need of the Unified Government. The Unified Government also reserves the right to procure internally.

53. INACCURATE PRICING DATA.

53.1 These Contract Documents may require submission by the Contractor of current cost or pricing data in accordance with Section 3-303 et. seq. of the Procurement Code. Such data will be required to be certified to by Contractor. Should the data certified by subsequently found to have been inaccurate, incomplete or noncurrent the Unified Government shall be entitled to an adjustment of the Contract Price, to exclude any significant sum by which the price was decreased because of the defective data. The price adjustment shall be done in accordance with R-3-303.06 of the Procurement Regulations.

54. PREVAILING WAGE RATE.

54.1 All construction projects in excess of $15,000 shall be subject to the following provisions:

a. The Contractor and Subcontractors shall define the jobs of workmen, laborers and craftsmen engaged in construction activities on this project by classifications listed in the United states Department of Labor General Wage Decision for Wyandotte County, Kansas. The Contractor and Subcontractors shall pay employees performing work on the job site at a rate not less than the current prevailing per diem wage rate applicable to each job classification, except as modified in 54.1 (b).

b. Apprentices and trainees registered in training programs approved by the Department of Labor, may be paid less, but not less than seventy percent (70%) of the applicable rate. Training certificate must accompany the weekly payroll reports.

c. Contractor shall submit weekly reports evidencing compliance. Each report shall be submitted no more than seven (7) days after the pay date which it documents; the reports shall be on a form approved by the Unified Government. No payments will be made unless weekly reports are current and approved by the Unified Government Construction Compliance Officer.

In addition to withholding payments for work previously performed, failure to submit weekly reports within the time period set forth in this contract document may result in the imposition of a fine pursuant to and as set forth in Ordinance No. 65739 and regulations adopted pursuant thereto. Information regarding fines may be provided at the preconstruction conference, is contained in applicable ordinances and regulations, and is available upon request.

d. Unified Government Construction Compliance Officer will be contacting and interviewing all employees on the job site to assure compliance.

54.2 The prevailing per diem wage rate is the required wages and fringe benefits on federal and federally assisted construction projects as determined by the United State Department of Labor in the General Wage Decision for Wyandotte County, Kansas which is current and effective ten days prior to the bid date. Bidders may rely on the wage decision or modification distributed at the pre-bid conference.

55. REMOVAL OF EMPLOYEES.

55.1 All Work under these Contract Documents shall be performed in a skillful and workmanlike manner. The Engineer/Architect may, in writing, require Contractor to remove from the Work any employee or supervisory personnel the Engineer/Architect deems

incompetent or otherwise objectionable.

56. NONDISCRIMINATION IN EMPLOYMENT. PROVISIONS MANDATED BY LOCAL, STATE AND FEDERAL GOVERNMENTS.

During the Performance of this contract, the Contractor agrees as follows:

56.1 The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, disability, age, national origin, or ancestry. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex, disability, age, national origin, or ancestry. Such action shall include, but not be limited, to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising: layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Unified Government setting forth the provisions of this non-discrimination clause.

56.2 The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, disability, age, national origin, or ancestry.

56.3 The Contractor will cause the foregoing provisions to be inserted in all subcontracts for any work covered by this Agreement so that such provisions shall not apply to contracts or subcontracts for standard commercial supplies or raw materials.

56.4 The Contractor shall assure that it and all subcontractors will implement the certificate of compliance in connection with this Agreement.

56.5 It the Contractor shall fail, refuse or neglect to comply with the terms of these contractual conditions, such failure shall be deemed a total breech of the Agreement and such Agreement may be terminated, canceled or suspended, in whole or in part, and the Contractor may be declared ineligible for any further Unified Government contract for a period of up to one year. Provided, that if an Agreement is terminated, canceled or suspended for failure to comply with this section, the Contractor shall have no claims for damages against the Unified Government on account of such termination, cancellation or suspension or declaration of ineligibility.

56.6 The Contractor shall assure that it is in compliance with and shall maintain sufficient records to document that, under all aspects of this Agreement, it has acted in a manner which is in full compliance with all applicable sections of the Equal Employment section of this contract and the following, as applicable: Title VI of the Civil Rights Act of 1964 (as amended) (42 USCS § 2000d et seq.); Title VII of the Civil Rights Act of 1964 (42 USCS §§ 2000e et seq.); Title VIII of the Civil Rights Act of 1968 (42 USCS § 3601 et seq.); the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101, and amendments thereto); the Kansas Act Against Discrimination (KSA § 44-1001 through 1004, 1992 Supp. and amendments thereto); Chapter 11 of the Procurement Code and Regulations of the Unified Government of Wyandotte County/Kansas City, Kansas, and amendments thereto; and §§ 18-86 and 87 of the 1988 Code of Ordinances of the Unified Government of Wyandotte County/Kansas City, Kansas, and amendments thereto. Such records shall at all times remain open to inspection by an individual designated by the Unified Government for such purpose.

56.7 The Contractor and the Unified Government, in carrying out this Agreement, shall also comply with all other applicable existing federal, state and local laws relative to equal opportunity and nondiscrimination, all of which are incorporated by reference and made part of this Agreement.

56.8 The Contractor will be required to conform to Equal Employment Opportunity and Affirmative Action requirements prior to the execution of this Agreement.

57. REVISIONS TO STANDARD GENERAL CONDITIONS.

57.1 Modifications to these General Conditions, if any, are made in the Supplemental Conditions. The Supplemental Conditions may contain additional conditions that are not modifications of a General Condition.

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UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS
ENGINEERING DIVISION
SUPPLEMENTAL GENERAL CONDITIONS

A. Pertaining to section 1, Definitions, of the General Conditions:

1. In section 1.9, Contract Documents, insert, "Standard Details, and Technical Specifications", after, "Technical Provisions."

2. In section 1.14, Drawings, insert, ", including Standard Details", after, "Engineer/Architect."

3. In section 1.29, Specifications, insert, "and Technical Specifications", after, "Special Conditions."

4. Add the following new paragraphs immediately after paragraph 1.40:

   1.41 STANDARD DETAILS – The part of the Contract Documents which show a common or repeated construction activity or practice required for the Project.

   1.42 TECHNICAL SPECIFICATIONS – A part of the Contract Documents consisting of written descriptions of a technical nature of materials equipment, construction systems, standards and workmanship required for the Project and which have been prepared and/or approved by the Engineer/Architect.

B. Pertaining to section 3, Schedules, Reports and Records for Public Projects, of the General Conditions, modify as follows:
Delete paragraph 3.3 in its entirety and replace with the following:

3.3 Prior to the commencement of Work, the Contractor shall submit to the Engineer/Architect for its review a preliminary cash flow schedule (graphic or tabular display) that indicates the anticipated value of work to be invoiced on a monthly basis through project completion. The cash flow schedule is for planning purposes of the Owner, only. Contractor's cash flow schedule will be acceptable to Engineer/Architect if it provides a reasonable allocation of the Contract Price over the Contract Time. Such acceptance will not impose on Engineer/Architect responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

Add the following paragraph:

3.4 The Contractor shall prepare a detailed weekly work schedule indicating the Work tasks and location(s) of work to be performed and the number of crews anticipated to be working on each of the Work tasks. Contractor shall submit the schedule to the Engineer electronically via email on the Thursday before the

schedule is to take effect.

D. Pertaining to section 25.2, Substantial Completion, Use of Facility, of the General Conditions:

1. "Substantial Completion" means that the facilities are completed to the point that wastewater/stormwater can be conveyed to the satisfaction of ENGINEER. All piping shall be installed and operational.

2. To be considered substantially complete, the following portions of the Work must be operational and ready for OWNER's continuous use as intended, including all specified startup and testing procedures:

    a. All storm sewer and sanitary sewer manholes/structures identified on the Drawings shall be installed / rehabilitated / replaced and tested.
    b. All pipe and fittings identified on the Drawings shall be installed / rehabilitated / replaced and tested.
    c. All active service connections shall be installed/reinstated.
    d. All affected traffic signals are in normal operation. Street restorations do not need to be fully completed, however temporary surfacing shall be provided such that streets are open and passable when active work is not being performed.
    e. All non-paved surfaces disturbed during construction shall be properly filled and graded and ready for final seeding or sodding and stabilized to prevent erosion.
    f. Existing sanitary and storm sewer and manholes/structures shall be abandoned and/or removed as shown on the drawings.
    g. Concrete channel lining at creek shall be fully restored.

3. Portions of the Work not essential to operation of the sewer, which can be completed without interruption of said system, may be completed after the Work is accepted as substantially complete, and may include the following items:

    a. Final restoration of pavement, sidewalks, curbs, and curb ramps
    b. Seeding and sodding
    b. Landscape work
    c. Fencing
    d. Punch list items

E. Pertaining to section 8, Substitutions, of the General Conditions: Replace section 8 of the General Conditions in its entirety with the following paragraphs:

8. SUBSTITUTIONS

    8.1 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type,

function, appearance, and quality required and not to limit competition. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

a. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this subparagraph 8.1.a., a proposed item of material or equipment will be considered functionally equal to an item so named if:

1. in the exercise of reasonable judgment Engineer determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;
2. Contractor certifies that: (i) there is no increase in cost to the Owner; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

b. Substitute Items

1. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under subparagraph 8.1.a., it will be considered a proposed substitute item.
2. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
3. The procedure for review by Engineer will be as set forth in subparagraph 8.1.b.4. and as Engineer may decide is appropriate under the circumstances.
4. Contractor shall first make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for work on the

Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by Engineer in evaluating the proposed substitute item. Engineer may require Contractor to furnish additional data about the proposed substitute item.

8.2 Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by Engineer will be similar to that provided in subparagraph 8.1.b.

8.3 Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 8.1. and 8.2. Engineer will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or-equal". Engineer will advise Contractor in writing of any negative determination.

8.4 Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

8.5 Engineer's Cost Reimbursement: Engineer will record time required by Engineer in evaluating substitute proposed or submitted by Contractor pursuant to paragraphs 8.1.b. and 8.2. and in making changes in the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project) occasioned thereby. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute.

8.6 Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense."

F. Pertaining to section 36, Permits and Licenses, of the General Conditions, add the following new paragraph at the end of Paragraph 36.1:

"Fees for permits of a temporary nature necessary for the prosecution of the Work issued by the Unified Government will be waived by the Unified Government for this project."

G. Pertaining to section 41, Saturday, Sunday, Holiday and Night Work, of the General Conditions, insert, "(between 7:00 pm and 7:00 am)" in paragraph 41.1 after "or at night".

H. Pertaining to section 18.4, Time Extension, of the General Conditions, add the following new paragraphs at the end of Paragraph 18.4, b.:

"c. Notwithstanding of and in addition to the rights afforded to the Contractor by Sections 18.4(a) and (b), above, the Unified Government, the Procurement Officer, the Engineer/Architect and the Contractor acknowledge and agree that the potential effects of the coronavirus disease ("COVID-19") pandemic on the construction industry and in the performance of construction projects are not yet fully known and are beyond the control of the Unified Government, the Procurement Officer, the Engineer/Architect and the Contractor. The effects of this pandemic may adversely affect the Contractor's workforce, the supply chain for Materials, the delivery of Materials and/or otherwise adversely impact the Contractor's ability to perform as planned, causing delays in the prosecution and completion of the Work and the Project. The Unified Government, the Procurement Officer, the Engineer/Architect and the Contractor hereby agree that documented delays resulting from the effects of the COVID-19 pandemic are beyond the control of the Unified Government, the Procurement Officer, the Engineer/Architect and the Contractor, and if such delays occur, the Contractor shall follows the provisions set forth in subparagraph a and b of this Section.

"d. In furtherance of subparagraph c, above, of the General Conditions, the Unified Government, the Procurement Officer, the Engineer/Architect and the Contractor acknowledge and agree that some of the Materials and products to be used and installed in the construction of this Project may become unavailable, be delayed in shipment and/or subject to price increases due to circumstances beyond the control of the Contractor, including the COVID-19 pandemic. If such products or materials become unavailable occur, the Contractor shall follows the provisions set forth in subparagraph a and b of this Section. If there is an increase in price of Materials, Equipment or products between the date of this contract and the time when the job is ready for the installation of the affected Material, the amount of the Contract Price may be increased to reflect the additional cost to obtain the Materials, provided that the Contractor gives the Engineer/Architect written notice and documentation of the increased costs. The Procurement Officer shall ascertain the facts and the extent of the cost increase and may increase the Contract Price when, in the judgment of the Procurement Officer, the findings of fact justify such an increase. However, that no increase in the Contract Price will be granted unless the Contractor furnishes to the Engineer/Architect proof that the Contractor has diligently made every effort to obtain such Materials and products to be used and installed in the construction of this

Project from all known sources within reasonable reach of the Work at the current Contract Price."

I. Pertaining to section 7.2, Inspection and Testing, of the General Conditions, remove and replace Paragraph 7.2, a. with the following:

"a. Contractor is responsible for acceptance tests on installed products and on products delivered for installation; such as field or laboratory tests for slump, air and strength of concrete, temperature of asphalt mixes, reference and relative density of asphalt mixtures, reference and relative density of embankment and fill material, infiltration/ exfiltration testing and televising of sewer mains, thickness and surface straight edging, and the like; except for those tests listed in "c." below. Engineer/Architect shall determine the time, location, and frequency of field testing and sampling. Contractor will provide the Unified Government with one copy of test results.

American Rescue Plan Act (ARPA) Contract Addendum

Notice: The contract or purchase order to which this addendum is attached is made using federal assistance provided to the Unified Government of Wyandotte County, Kansas City, Kansas (Unified Government) by the U.S. Department of Treasury under the American Rescue Plan Act ("ARPA Funds"), Sections 602(b) and 603(b) of the Social Security Act, Pub. L. No. 117-2 (March 11, 2021). In using such funds, the Unified Government must comply with the terms of ARPA, regulations issued by the U.S. Department of the Treasury ("Treasury") governing the expenditure of monies distributed from the ARPA Funds (including, without limitation, the Interim Final Rule (86 Fed. Reg. 26,786 (May 17, 2021)) and Final Rule (87 Fed. Reg. 4,338 (Jan. 27, 2022))), the Award Terms and Conditions applicable to the ARPA Funds, and such other guidance as Treasury has issued or may issue governing the expenditure of monies distributed from the ARPA Funds (collectively, the "Regulatory Requirements"). Additionally, pursuant to the Regulatory Requirements, the Unified Government must comply with the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200 other than such provisions as Treasury has determined or may determine are inapplicable to the ARPA Funds and pursuant to 2 C.F.R. §200.327 the Unified Government must include within any contract applicable provisions described in Appendix II to 2 C.F.R. Part 200, each of which is contained in this Addendum.

The following terms and conditions apply to you, the Contractor, as a contractor of the Unified Government, according to the Unified Government's Award Terms and Conditions signed on May 11, 2021; by ARPA and its implementing regulations; and as established by the Treasury Department.

1. **Breach of Contract.** Any breach of Contract by Contractor shall be governed by the termination and remedies provisions of the Contract. Additionally, in the event that the Unified Government incurs damages as a result of Contractor's breach, the Unified Government may pursue recovery of such damages from Contractor. The Unified Government retains the right to seek specific performance of the Contract at any time as authorized by law. The Unified Government further retains the right to otherwise pursue any remedies available to it as a result of the Contractor's breach, including but not limited to administrative, contractual, or legal remedies, as well as any applicable sanctions and penalties.

    a. *Remedies for Non-Performance.* If Contractor fails to perform any of its obligations under this Contract, the Unified Government may, at its sole discretion, exercise one or more of the following remedies, which shall survive expiration or termination of this Contract:

    b. *Suspend Performance.* The Unified Government may require the Contractor to suspend performance of all or any portion of the Work pending necessary corrective action specified by the Unified Government and without entitling Contractor to an increase in compensation or extension of the performance schedule. Contractor must promptly stop performance and incurring costs upon delivery of a notice of suspension by the Unified Government.

c. *Withhold Payment Pending Corrections.* The Unified Government may permit Contractor to correct any rejected Work at the Unified Government's sole discretion. Upon the Unified Government's request, Contractor must correct rejected Work at Contractor's sole expense within the time frame established by the Unified Government. Upon completion of the corrections satisfactory to the Unified Government, the Unified Government will remit payment to Contractor.

d. *Deny Payment.* The Unified Government may deny payment for any Work that does not comply with the requirements of the Contract or that Contractor otherwise fails to provide or complete, as determined by the Unified Government in its sole discretion. Upon the Unified Government's request, Contractor will promptly refund any amounts prepaid by the Unified Government with respect to such non-compliant Work.

e. *Removal.* Upon the Unified Government's request, Contractor will remove any of its employees or agents from performance of the Work, if the Unified Government, in its sole discretion, deems any such person to be incompetent, careless, unsuitable, or otherwise unacceptable.

2. **Equal Opportunity.** Contractor agrees to comply with the Equal Opportunity Clause provided under 41 CFR 60-1.4(a) (Government Contracts) and 41 CFR 60-1.4(b) (Federal Assisted Construction Contracts), in accordance with Executive Order 11246, "Equal Employment Opportunity," (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339) as amended by EO 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor." Contractor further agrees to include this provision, including the Equal Opportunity Clause or a reference thereto, in any subcontracts it enters into pursuant to the Contract.

During the performance of this Contract, the Contractor agrees as follows:

a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive

consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

c. The Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.

d. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other Contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

e. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

f. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

g. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government Contracts or federally assisted construction Contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

h. The Contractor will include the portion of the sentence immediately preceding paragraph 1.a. and the provisions of paragraphs 2a. through 2g. in every subcontract or purchase order unless exempted by rules, regulations, or orders of

the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

The Unified Government further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided,* that if the Unified Government so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the Contract.

The Unified Government agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of Contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any Contract or Contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government Contracts and federally assisted construction Contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon Contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (Contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such

applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

2. **Minority and Women Business Enterprises (if applicable to this Contract).** Contractor agrees to comply with the following when applicable: The requirements of Executive Orders 11625 and 12432 (concerning Minority Business Enterprise), and 12138 (concerning Women's business Enterprise, **when applicable**. Accordingly, the Contractor agrees to take affirmative steps to assure that small, women and minority businesses are utilized when possible as sources of supplies, equipment, construction and services. Affirmative steps shall include the following:

   a. Including qualified women's business enterprises and small and minority businesses on solicitation lists;

   b. Assuring that women's enterprises and small and minority businesses are solicited whenever they are potential sources;

   c. When economically feasible, dividing total requirements into smaller tasks or quantities so as to permit maximum participation by small and minority business, and women's business enterprises;

   d. Where the requirement permits, establishing delivery schedules which will encourage participation by women's business enterprises and small and minority business; and

   e. Using the services and assistance of the Small Business Administration, and the U.S. Office of Minority Business Development Agency of the Department of Commerce; and the North Carolina Office for Historically Underutilized Businesses.

   f. If any subcontracts are to be let, requiring the prime Contractor to take the affirmative steps in a through e above.

   For the purposes of these requirements, a Minority Business Enterprise (MBE) is defined as an enterprise that is at least 51 percent owned and controlled in its daily operation by members of the following groups: Black, Hispanic, Asian or Pacific Islander, American Indian, or Alaskan Natives. A Women Business Enterprise (WBE) is defined as an enterprise that is at least 51 percent owned and controlled in its daily operation by women. Additionally, an MBE or WBE qualifies as a "small business" if it is independently owned and operated and is qualified under the Small Business Administration criteria and size standards at 13 C.F.R. Part 21. The Unified Government maintains an online directory of W/MBE businesses, which can be accessed at: https://purchasing.wycokck.org/eprocurement/C/WYCOKCK2/SupplierDiversity.aspx.

3. **Debarment and Suspension (applies to all purchases).** Contractor attests that it is

not listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

a. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the Contractor is required to verify that none of the Contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

b. The Contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

c. This certification is a material representation of fact relied upon by the Unified Government. If it is later determined that the Contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to the Unified Government, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

d. The Contractor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The contractor further agrees to include a provision requiring such compliance in its lower tier covered transactions.

4. **Byrd Anti-Lobbying Amendment, 31 U.S.C.§ 1352, as amended (applies to all purchases).**

a. Contractor certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Contractor shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier, up to the recipient who in turn will forward the certification(s) to the awarding agency.

b. ***Purchases over $100,000 – Contractors must sign the anti-lobying certificationin the Forms section of this Project Manual and shall cause any subcontractors with a subcontract (at any tier) exceeding $100,000 to file with the tier above it the same certification.**

5. **Labor Standards.** Contractor and any subcontractors performing work under the contract shall comply, as applicable, with the:

   a. *Davis-Bacon Act* (40 U.S.C. §§276a to 276a-7). Davis-Bacon requirements do not apply to this contract. The Unified Government, however, encourages Contractor to use strong labor standards that offer wages at or above the prevailing rate and include local hire provisions.

   b. *Copeland "Anti-Kickback" Act* (40 U.S.C. §276c and 18 U.S.C. §874). The Unified Government shall report all suspected or reported violations to Treasury.

   c. *Contract Work Hours and Safety Standards Act* (40 U.S.C. §§327-333) regarding labor standards for federally-assisted construction sub-agreements. **(applies only to purchases over $100,000, when laborers or mechanics are used).** Where applicable, all contracts in excess of $100,000 that involve the employment of mechanics or laborers shall include a provision for compliance with 40 U.S.C. 3702 and 3704 of the Contract Work Hours and Safety Standards Act, as supplemented by Department of Labor regulations (29 CFR part 5). Under Section 3702 of the Act, each contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard workweek of 40 hours. Work in excess of the standard workweek is permissible provided that the worker is compensated at a rate of not less than 1 1/2 times the basic rate of pay for all hours worked in excess of 40 hours in the workweek. The requirements of 40 U.S.C. 3704 are applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

6. **Clean Air Act & Federal Water Pollution Control Act (applies to purchases of more than $150,000.)**

   a. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.

   b. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

   c. Contractor agrees to report each violation of the Clean Air Act and the Water Pollution Control Act to the Unified Government and understands and agrees that the Unified Government will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

   d. Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance.

7. **Access to Records (applies to all purchases).**

   a. Contractor agrees to provide the Unified Government, U.S. Department of Treasury, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purpose of making audits, examinations, excerpts, and transcriptions. The Contractor agrees to permit any of the foregoing parties to reproduce by any means or to copy excerpts and transcriptions as reasonably needed and agrees to cooperate with all such requests.

   b. Contractor agrees to provide the Treasury Department or authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.

   c. No language in this contract is intended to prohibit audits or internal reviews by the Treasury Department or the Comptroller General of the United States.

   d. Contractor agrees to retain all records covered by this section through December 31, 2031, or such longer period as is necessary for the resolution of any litigation, claim, negotiation, audit, or other inquiry involving the contract.

8. **Rights to Inventions Made Under a Contract or Agreement.** Contracts or agreements for the performance of experimental, developmental, or research work shall provide for the rights of the Federal Government and the recipient in any resulting invention in accordance with 37 CFR part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreement," and any applicable implementing regulations.

3. Prohibition on certain telecommunications and video services or equipment). Contractor certifies that it will comply with 2 CFR §200.216 regarding the prohibition on certain telecommunications and video surveillance services or equipment. Contractor is prohibited from obligating or expending loan or grant funds to: (1) Procure or obtain; (2) Extend or renew a contract to procure or obtain; or (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered "telecommunications equipment" is telecommunications equipment produced by **Huawei Technologies Company or ZTE Corporation** (or any subsidiary or affiliate of such entities).

   a. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

b. Telecommunications or video surveillance services provided by such entities or using such equipment.

c. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

9. **Procurement of Recovered Materials.** (applies only if the work involves the use of materials and the contract amount is greater than $10,000).
   a. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
      i. competitively within a timeframe providing for compliance with the contract performance schedule;
      ii. meeting contract performance requirements; or
      iii. at a reasonable price.

   b. Information about this requirement, along with the list of EPA-designated items, is found in 40 CFR Part 247 and available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/coomprehensive-procurement-guideline-cpg-program.

   c. The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

10. **Conflicts of Interest; Gifts and Favors.** Contractor understands that (1) the Unified Government will use ARPA funds to pay for this or a portion of this contract and (2) the expenditure of ARPA funds is governed by the Conflict of Interest Policy of the Unified Government and the regulatory requirements of 2 C.F.R.§200.318c.

   a. Contractor certifies to the Unified Government that as of the date of this agreement, to the best of its knowledge after reasonable inquiry, no employee, officer, elected official, or agent of the Unified Government involved in the selection, award, or administration of this contract (each a "Covered Individual"); no member of a Covered Individual's immediate family; no partner of a Covered Individual; and no organization (including Contractor) which employs or is about to employ a Covered Individual has a financial or other interest in, or has received a tangible personal benefit from, Contractor. Should Contractor obtain knowledge of any such interest, or any tangible personal benefit described in the preceding sentence after the contract date, Contractor shall promptly disclose the same to the Unified Government in writing.

   b. Contractor certifies to the Unified Government that it has not provided, nor

offered to provide, any gratuities, favors, or anything of value to an officer, employee, elected official or agent of the Unified Government. Should Contractor obtain knowledge of the provision, or offer of any provision, of any gratuity, favor, or anything of value to an officer, employee, elected official or agent described in the preceding sentence after the date of this Agreement, Contractor shall promptly disclose the same to the Unified Government in writing.

11. **Publications.** Any publications produced with funds from this award must display the following language: "This project is being supported, in whole or in part, by federal award number SLFRP3214 awarded to the Unified Government of Wyandotte County, Kansas City, Kansas by the U.S. Department of the Treasury."

12. **Increasing Seat Belt Use in the United States.** Pursuant to Executive Order 13043, 62 FR 19217 (Apr. 18, 1997), Contractor is encouraged to adopt and enforce on-the-job seat belt policies and programs for its employees when operating company-owned, rented or personally owned vehicles.

13. **Reducing Text Messaging While Driving**. Pursuant to Executive Order 13513,74 FR 51225 (Oct. 6, 2009), Contractor is encouraged to adopt and enforce policies that ban test messaging while driving and establish workplace safety policies to decrease accidents caused by distracted drivers.

14. **Assurances of Compliance with Title VI of the Civil Rights Act of 1964 (P.L. 88-352).** Contactor and any subcontractor, or the successor, transferee, or assignee of contractor or any subcontractor, shall comply with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. §§ 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 C.F.R. Part 22, which are herein incorporated by reference and made a part of this contract. Title VI also provides protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C.§§2000d et seq., as implemented by Treasury's Title VI regulations, 31 C.F.R. Part 22, and herein incorporated by reference and made a part of this contract.

15. **Other Non-Discrimination Statutes**. Contractor acknowledges that the Unified Government is bound by and agrees, to the extent applicable to contractor, to abide by the provisions contained in the federal statues enumerated below and any other federal statutes and regulations that may be applicable to the expenditure of Fiscal Recovery Funds. These include:

    a. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability;

    b. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794),

which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance;

c. the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age;

d. Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance; and

e. Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C.§§12101 et seq.), which prohibits discrimination on the basis of disability in programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.

16. **The Contractor shall assure that the above provisions are inserted into all subcontracts for any work covered by this Agreement and that Contractor and all subcontractors implement the certificates of compliance in connection with this Agreement.**

17. **Conflicts and Interpretation.** To the extent that any portion of this Addendum conflicts with any term or condition of this contract expressed outside of this Addendum, the terms of this addendum shall govern.

CONTRACTOR:

By: _____

Name: _____

Title: _____

By: _____

Name: _____

Title: _____

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS
ENGINEERING DIVISION
SPECIAL CONDITIONS

A. Pertaining to section 2509.3, Manhole Materials, of the Technical Provisions, delete the second sentence of Paragraph C in its entirety.

B. Pertaining to section 2509.3, Manhole Materials, of the Technical Provisions, replace "twelve (12)" with "eight (8)" in the second sentence of Paragraph D.3.

C. Pertaining to section 1101.6, General Requirements for UG Administered Projects, of the Technical Provisions, delete paragraphs F.1 and F.2 and replace them with the following:

"1. For projects lasting longer than 45 calendar days at a single site use Project Sign detail UG 1000-A."

2. "For projects lasting 45 days or less in a single location use Project Sign detail UG 1000-B

D. Pertaining to section 1101, General Requirements for UG Administered Projects, of the Technical Provisions, add the following new paragraph at the end of Paragraph 1101.5:

"Unified Government permits that may be required for construction are: right-of-way use permit, haul permit, land disturbance permit, and street closure permit."

E. Pertaining to section 2500, Sanitary Sewer, of the Technical Provisions, add the following new paragraphs at the end of Paragraph 2505.4:

"2505.5 Bypass Pumping

"Contractor shall provide bypass pumping for sewage flows as follows:

"A. Line segments scheduled for replacement (open cut excavation and pipe bursting/reaming), point repairs, and CIPP rehabilitation shall have all flows bypassed around them. The pumping system shall be sized for normal to peak flow conditions. Contractor shall maintain an operational backup pump on site. Direct discharge of flow to surrounding area drainage or separate storm sewer system is unacceptable. Do not attempt flow diversion on combined sewers or storm sewers if rainfall is anticipated before completion of the installation can be completed.

"B. The upstream manhole shall be monitored at all times, and an emergency deflate system shall be incorporated so that plugs may be removed at any time without requiring confined space entry. A plug shall be used to stop the sewage from reaching the line segment or manhole being lined or replaced. Remove plug at end of each working day and place relined, replaced, and existing sections and temporary or permanent service tie-ins back in service."

F. Pertaining to section 2101.3, Permits, of the Technical Provisions, add the following new paragraphs at the end of Paragraph 2101.3:

"Unified Government permits that may be required for construction area: right-of-way use permit, haul permit, land disturbance permit, and street closure permit."

FORMS

RELATIONS BETWEEN CONTRACTOR AND LABOR

The Contractor shall make a good faith effort to employ local labor within the Kansas City, Kansas Area insofar as it is available, for all work, except key positions. For purposes of this subparagraph, "local labor" is defined as resident of the Kansas City, Kansas Area for three (3) months next preceding the letting of this contract. "Key Position" is defined as superintendent, foreman, or timekeeper. If local labor is not available in sufficient quantities within the Kansas City, Kansas Area to prosecute and complete the work sufficiently, the Contractor may recruit labor from outside the area, only after he or she has satisfied the Engineer that a good faith attempt has been made to recruit local labor and only with the permission of the Engineer. It shall be understood that in the event of a reduction in labor force, preference will automatically be given to local residents of the Kansas City, Kansas Area.

COPELAND ANTI-KICKBACK ACT

The contractor and all subcontractors shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR, Part 3). This Act provides that each contractor or subgrantee shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled.

Additional Requirements when MBE/WBE Goals are Established

Additional Requirements when MBE/WBE Goals are Established

When goals for MBE/WBE participation are established in the agreement, all the additional requirements, information, instructions and contract conditions in this section shall apply.

General.

Coordinator's authority. Coordinator shall mean the coordinator of the office of supplier opportunity. Subject to the appeals process included in the code, the coordinator shall make the final determination whether a bid meets the project goal or shows adequate good faith as set out in the Chapter 18 of the Code of the Unified Government of Wyandotte County/Kansas City, Kansas, Article V. SUPPLIER OPPORTUNITY

Commercially useful function. Only the work performed by a MBE or WBE providing a commercially useful function shall count toward meeting the utilization goal. Commercially useful function means real and actual services that are a distinct and verifiable element of the contracted work based upon private sector trade or industry standards. A MBE or WBE performs a commercially useful function when it is responsible for executing the ordinary and necessary work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. In determining commercially useful function the following guidelines will apply:

- MBE/WBE relationship to prime contractor: To count toward the project goal a MBE/WBE may be the prime contractor, part of a joint venture, a subcontractor, or a supplier.
- MBE/WBE qualification: To count toward the project goal a MBE/WBE must be certified in accordance with Sec. 18-158 of the Unified Government Supplier Diversity Ordinance.
- Materials: Expenditures for materials, supplies, and equipment obtained from a supplier who is a MBE/WBE shall count toward the project goal. Expenditures for materials, supplies, and equipment paid to MBE/WBEs that are not suppliers may count toward the utilization goal only to the extent they are fees or commissions charged for providing a bona fide service in the procurement of personnel, facilities, equipment, materials, or supplies required for performance of the work.

Instructions to Bidders.

Purpose of the goals. The purpose of the MBE/WBE goal is to secure bids from and negotiate price with eligible MBE and WBE subcontractors prior to submission of the bid.

Prior to Bid:

- Prior to the submission of the bid the bidder must select one of the *Means of Compliance with MBE and WBE Utilization Goals* listed in the supplemental general conditions of these additional requirements. If bidder selects the documentation of good faith effort as

the means of compliance, bidder shall execute and document the good faith efforts necessary for compliance prior to the bid opening.
- If the bidder is a joint venture with a MBE/WBE venturer to be counted toward the project goal, bidder must submit to the coordinator the joint venture agreement no later than close of business 3 calendar days prior to the bid opening.

Documentation Submitted with the Bid:

- Bidder must submit with the bid a completed and signed Affidavit of Intended Utilization on the form provided.
- If the utilization indicated on the Affidavit of Intended Utilization does not meet or exceed the utilization goals for the project, the bidder must also submit with the bid documentation of the good faith effort as indicated in the attached Good Faith Outreach Manual.

Documentation Submitted after bid prior to recommendation for award:

- Within 2 days of the bid the low bidder, and any other bidder who wishes to be considered in the event of the ineligibility of the low bidder, shall submit, on the forms provided, a completed, signed and notarized Contractor Utilization Plan and a completed, signed Letter of Intent to Subcontract from each MBE/WBE subcontractor listed in the Contractor Utilization Plan.

Evaluation of responsiveness:

- Failure to provide the documentation at the times required above is sufficient for a finding of non-responsiveness and a declaration of default of the bid, in which case the bid security shall become the property of the Unified Government. The Unified Government may waive irregularities and informalities in its determination of responsiveness.

Conditions of the Contract

When goals for MBE/WBE participation are established in the agreement, the following become general conditions of the contract.

Add GC 3.2.a to read as follows:

3.2.a Within five working days following commencement of work on a contract, the contractor shall submit to the coordinator of the office of supplier opportunity a duplicate of the project schedule that sets forth in detail the anticipated utilization of all MBEs and WBEs on the contract. In the event of a contract performance delay of more than one-third of the originally estimated length of time between project notice to proceed and completion, the contractor shall submit to the coordinator of the office of supplier opportunity not later than the originally estimated date of project completion, a revised schedule for utilization of all MBEs and WBEs on the contract.

Add GC 19.1.i.a to read as follows:

19.1.i If the Contractor fails to follow the Contractor Utilization Plan, except as provided for in General Condition 100 Race and Gender Conscious Remedies.

Add GC 25.1.a to read as follows:

25.1.a Contractor shall promptly render payment to all joint venturers, subcontractors and suppliers on a contract. Contractor shall provide with each pay request to the Unified Government, beginning with the second pay request, a partial claim releases from joint venturers, subcontractors and suppliers in form and content satisfactory to the Unified Government or shall provide, at the Unified Government's sole option, alternative proof of payment to subcontractors and suppliers in form and content approved by the coordinator of the office of supplier opportunity, evidencing that all joint venturers, subcontractors, and suppliers have been duly paid out of the proceeds of the contractor's payments from the Unified Government, unless a bona fide dispute, documented in writing, exists between the contractor and the unpaid joint venturer, subcontractor or supplier.

Add General Conditions 100 through 104 to read as follows:

100. Race and Gender Conscious Remedies. Except as provided below, the Contractor shall maintain, for the duration of the contract, the level of MBE and WBE participation identified in the Contractor Utilization Plan.
   a. Substitutions: Contractor shall not terminate, modify the work of, or otherwise fail to utilize a MBE or WBE that was originally listed in the Contractor Utilization Plan to satisfy the project goal without substituting another MBE or WBE performing the same commercially useful function and dollar amount, or demonstrating each element of modified good faith effort to substitute another MBE or WBE.
   b. Changes in scope: Contractor shall immediately notify, in writing, the coordinator of the office of supplier opportunity of any agreed-upon increase or decrease in the scope of work of the contract.
      i. An increased scope of work that cannot be performed by existing project subcontractors or by the contractor shall be subject to a utilization goal equal to the original utilization goal for the contract. The contractor shall satisfy such goal as respects the changed scope of work by soliciting new MBEs or WBEs in accordance with GC 101, or the contractor must show each element of modified good faith set out in GC 102.
      ii. If the Unified Government decreases the scope of work affecting MBEs or WBEs performing on the contract the contractor, the evaluation of achievement of the utilization goal will be based on the intended utilization without the decrease in scope.
      iii. If the change in scope results from adjustments to quantities in a unit price contract, the evaluation of achievement of the utilization goal will be based on the intended utilization without the decrease in scope, provided that the firm completing the work on the affected items is the firm originally indentified in the Contractor Utilization Plan.

c. Coordinator's authority. Subject to the appeals provisions of the contract, the coordinator of the office of supplier opportunity shall make the final determination of eligible costs and whether the utilization goal and/or good faith effort was achieved.

101. Means of compliance with MBE and WBE utilization goals: Contractor shall address the project goal established in the agreement through one or more of the following subsections:
   a. The Contractor is a MBE or WBE, the value of the commercially-useful function to be self-performed by the MBE or WBE shall count toward the project goal.
   b. If the Contractor is a joint venture that includes one or more MBEs or WBEs, and the joint venture agreement was submitted prior to the date of the bid in accordance with the instructions to bidders, and the joint venture agreement was reviewed and approved by the coordinator of the office of supplier opportunity, then the value of the commercially useful function to be performed by the MBEs or WBEs in the joint venture shall count toward the project goal.
   c. The Contractor utilizes MBEs or WBEs as subcontract, or suppliers, and the MBEs WBEs are identified in the Contractor Utilization Plan, and the plan was submitted as instructed in the instructions to bidders and the plan was reviewed and approved by the coordinator, then the value of the commercially useful function to be performed by such MBEs and WBEs shall count toward the project goal.
   d. If the Contractor has not fully met the project goal by other means established above, but has demonstrated, during the evaluations of bids, that it has made good faith efforts to meet such goal, and that such demonstration has been reviewed and approved by the coordinator.

102. Modified good faith effort for MBE and WBE utilization: In the event of an increase in scope of work or in event of the termination or replacement of a MBE or WBE subcontractor or joint venturer, for which contractor is in unable to achieve the utilization goal due to failure to recruit additional MBEs or WBEs, the following modified good faith efforts must be completed. Failure to show good faith efforts in any of the following categories shall render its overall good faith efforts showing insufficient and its contract performance in non-compliant.
   a. Contractor shall notify, in writing, the coordinator of the office of supplier opportunity with respect to the contractor's intention to terminate or replace a MBE or WBE originally identified for participation in the bid or proposal upon which the contract was awarded. Contractor shall identify the reason for the termination or replacement and the type of work or services to be substituted.
   b. Contractor shall use the most current directory from the Office of Supplier Opportunity to contact MBEs and WBEs that are eligible in the applicable area of work or supply at the time of the modified good faith effort.
   c. Contractor shall provide documentation of the efforts to contact appropriate MBEs and WBEs within the same identified type of work. Copies of fax and e-mail, or a telephone call log will be acceptable.
   d. Documentation of the modified good faith efforts must be submitted to the coordinator before the payment to the contractor of the next progress or other partial payment or fund release under the contract.

103. **Contract sanctions for failure to comply with Race and Gender conscious remedies to facilitate participation by minority and women business enterprises.** In the event that the coordinator of the office of supplier opportunity determines that a contractor has not complied with the Race and Gender conscious remedies contained in this contract, the coordinator may assess the contractor a civil, remedial penalty of not more than 150 percent of the contract amount that would have been allocated to one or more MBEs or WBEs but for the contractor's noncompliance. Any assessed civil penalties may be offset against any amount, including but not limited to contract retainage, otherwise due and owing to the contractor on the contract. In assessing a civil penalty the coordinator may reduce or waive all or part of the penalty in consideration of the following factors:
    a. The length of the period of noncompliance;
    b. The contractor's history of previous noncompliance with any provision of the Unified Government's Supplier Opportunity code,
    c. The monetary impact of the civil penalty on the contractor in correcting the noncompliance; or
    d. Other facts and circumstances relevant to the noncompliance of the contractor.

104. Burden of Proof. Whenever the Coordinator of the office of supplier opportunity conducts an investigation of compliance with these provisions, the Contractor shall cooperate fully with the investigation, and shall provide complete, truthful information to the coordinator, and shall bear the burden of proving compliance with the Unified Government's race and gender conscious remedies.

UNIFIED GOVERNMENT GOOD FAITH OUTREACH MANUAL

UNIFIED GOVERNMENT GOOD FAITH OUTREACH PROGRAM

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I. Program Summary

The Good Faith Outreach Program is a component of the Unified Government Supplier Diversity Program and applies to City-funded construction contracts in excess of $250,000. When Federal or State funding sources impose additional requirements, those requirements as defined in the contract documents replace the requirements of this program.

The Unified Government is committed to maximizing subcontracting opportunities for certified M/WBE firms. Bidders should be fully informed of Good Faith Outreach Program as set forth in this document.

This program is subject to policies and requirements established by the Unified Government Supplier Diversity Program. Bidders are advised to be fully informed of the requirements set forth in this document. Failure to comply with the City's Supplier Diversity Program may cause a bid to be rejected as non-responsive.

Terms and conditions of the Good Faith Outreach Program apply to City-funded construction projects in excess of $250,000. At the City's sole discretion, these requirements may be waived in advance on projects deemed inappropriate for subcontracting participation. When State and/or Federal funding sources require affirmative action goals, those goals as defined in the contract documents replace requirements of the Supplier Diversity Program.

II. GOOD FAITH OUTREACH OVERVIEW

This program requires bidders to make subcontracting opportunities available to a broad base of qualified subcontractors and to achieve a minimum level of M/WBE subcontractor participation as identified for eligible projects. To be eligible for award, the apparent low bidder must meet or exceed the M/WBE project goals or submit documentation of their good faith outreach efforts within two (2) working days following the close of business on the day bids are opened. Should it become necessary to evaluate the efforts of bidders beyond the apparent low bidder, each additional firm shall receive five (5) working days for submittal of documentation commencing on the date of notification. Notification can be verbal or in writing. Failure to submit required documentation within this time frame will cause a bid to be rejected as non-responsive.

For assistance or further information about the *Good Faith Outreach Program*, contact the Supplier Diversity Program Manager at 913-573-5439.

III. Definitions

A. Bidder means a business enterprise that submits a bid on a construction contract that is offered for competitive bidding by the Unified Government.

B. Good Faith Outreach Efforts: Affirmative steps taken by a bidder prior to bid opening to ensure maximum effort to recruit subcontractors, including Minority Business Enterprises (MBEs) and Woman Owned Enterprises (WBEs), as sources of supplies, construction and other services whenever possible. Required steps for documenting outreach efforts are outlined in Paragraph V of this document.

C. Minority business enterprise or MBE means a business enterprise that is owned and controlled by one or more minority individuals and that is certified as a minority business enterprise by one of the entities set forth in section 18-158(a)(1) of the Unified Government Code of Ordinances.

D. Subcontract: Agreement between a prime contractor and an individual, firm or corporation for performance of particular portion(s) of work for which prime contractor has obligated itself.

E. Subcontractor: An individual, firm or corporation having a direct contract with prime contractor for performance of portion(s) of work to be constructed under the contract, including furnishing of labor, materials or equipment.

F. Woman business enterprise or WBE means a business enterprise that is owned and controlled by one or more women who are citizens or lawful permanent residents of the United States and that is certified as a woman business enterprise by one of the entities set forth in section 18-158(a)(1) of the Unified Government Code of Ordinances.

IV. Good Faith Outreach Indicators

Documentation of a bidder's outreach efforts will be reviewed by Unified Government according to the indicators listed below to verify that bidder made subcontracting opportunities available to a broad base of qualified subcontractors, negotiated in good faith with interested subcontractors, and did not reject any bid for unlawful discriminatory reasons.

Failure to submit Good Faith Efforts will render a bid non-responsive and will result in its rejection. Indicators are judged on a pass/fail basis, i.e., either full or zero credit can be achieved for compliance with each item as set forth below:

	Good Faith Outreach Indicator
1.	**Attended pre-bid meetings scheduled by the Unified Government**
2.	**Contacted and followed up with eligible M/WBE business in the applicable trades that were known to the contractor, or available on State, County, or other maintained lists, to submit a quote at least 10 days before the bid date and notified them of the nature and scope of the work to be performed**
3.	**Made construction plans, specifications and requirements available for review by prospective M/WBE businesses, or provided these documents to them at least 10 days before the bids are due**
4.	**Initiated and documented correspondences with M/WBE trade, community, or contractor organizations that provide assistance in recruiting M/WBE subcontractors or suppliers**
5.	**Broken down or combined elements of work into economically feasible units to further facilitate M/WBE participation**
6.	**Advised M/WBE subcontractors and suppliers in obtaining bonds, lines of credit or insurance**
7.	**Negotiated in good faith with interested M/WBE subcontractors/suppliers and did not reject them as unqualified without sound reasons based on their capabilities**
8.	**Placed ads soliciting M/WBE subcontractors/suppliers in a publication targeting M/WBE subcontractors/suppliers not less than 10 days prior to bid**

V. Documentation of Good Faith Outreach Efforts

1.	**Attended pre-bid meetings scheduled by the Unified Government**

Bidder attended pre-bid meeting scheduled by the City to inform all bidders of requirements for subject project. A sign in sheet will be distributed at all pre-bid meetings. It is the bidder's responsibility to sign in on the list.

Required documentation: The project manager will have record of the pre-bid sign in sheet..

2.	**Contacted and followed up with eligible M/WBE subcontractors and suppliers certified in the applicable trades**

Bidder contacted certified M/WBE business in the trades present on the project. The M/WBE businesses must be certified in the trade for which they are being asked to submit quotes on..

Required documentation: A completed call log, copies of emails/faxes, certified mail receipts or any other documents illustrating communications to M/WBE businesses. These documents must show evidence of receipt by the M/WBE subcontractor/supplier.

3.	**Made the construction plans, specifications, and requirements available for review by prospective M/WBE subcontractors and suppliers**

Bidder provided interested M/WBE subcontractors and suppliers with access to plans, specifications and requirements for subject project.

Required documentation: Contents of advertisements or written notices to subcontractors should demonstrate compliance with this indicator.

4.	**Initiated and documented correspondences with M/WBE trade, community or business organizations**

Not less than ten (10) calendar days prior to bid submittal, bidder requested assistance from agencies which recruit and place M/WBE subcontractors or suppliers. A list of such agencies is available from the Unified Government. Other organizations which promote M/WBE subcontractor or supplier activities may also be contacted.

Required documentation: Submit copy of each fax, letter, or email sent to outreach agencies requesting assistance in recruiting subcontractors. Faxed copies must include fax transmittal confirmation slip showing date and time of transmission. Mailed letters must include copies of metered envelopes or certified mail receipts. All communications must include the Unified Government project name, name of bidder, and contact person's name and phone number.

5.	**Broken down or combined elements of work to further facilitate M/WBE participation**

Bidder must demonstrate that reasonable efforts were taken to subdivide portions of work to increase opportunities for M/WBE participation.

Required documentation: Documented communications between prime and subcontractors or suppliers demonstrating that individual scopes of work were modified to facilitate M/WBE participation

6.	**Advised M/WBE subcontractors and suppliers in obtaining bonds, lines of credit or insurance**

Bidder made efforts to advise and assist interested subcontractors in obtaining bonds, credit lines and insurance required for subject project.

Required documentation: Contents of advertisements (Indicator 8) or written notices to subcontractors (Indicator 2) will determine compliance with this objective.

7.	**Negotiated in good faith with interested M/WBE subcontractors and suppliers.**

Bidder acted in good faith with interested subcontractors and has rejected no bid other than for legitimate business reasons.

Required documentation: Submit: a) Copies of all subcontractor bids or quotes received; and b) Summary sheet organized by work type listing subcontractor company names with bid amounts for each work type. Identify selected subcontractor for each work type. If bidder elects to use own forces to perform a work type, include bid to show own costs for the work. Copies of bids or quotes from subcontractors and suppliers must also be included if those bids are used toward achievement of the M/WBE utilization goal and the business must also be listed on the Contractor Utilization Plan.

8.	**Placed ads soliciting subcontractors/suppliers in a publication targeting M/WBE subcontractors/suppliers not less than 10 days prior to bid**

Not less than ten (10) calendar days prior to bid submittal, bidder conducted an advertising campaign designed to reach all segments of the Kansas City metropolitan business community by advertising in either newspapers, trade association publications, special interest publications, trade journals, community papers or other media. Advertisement must be specific to the project, not generic, and may not be a plan holder advertisement provided by the publication. Advertisement must be worded to ensure it does not exclude or limit number of potential respondents and must include:

Unified Government project name and number;
Name of bidder;
Areas of work available for subcontracting;
Contact person's name and phone number;
Information on availability of plans and specifications;
Bidder's policy concerning assistance to subcontractors in obtaining bonds and credit lines and/or insurance

Required documentation: Submit copies of advertisements and proof of publication dates.

Affidavit of Intended Utilization

Processing Instructions: Submit this form with your bid. MBE/WBE Goals must be met or evidence of Good Faith Efforts must be submitted with bid. Use additional forms as necessary to list all MBE/WBEs proposed.

Bidder know as_____hereby states his intent that on the _____ project, Project # _____, Bidder intends to use the following subcontractors and suppliers to achieve the M/WBE goals established for this project:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$		,as %:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$		,as %:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$		,as %:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$		,as %:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$		,as %:

Project Goals: MBE%_____ WBE%_____
Intended Utilization: MBE%_____ WBE%_____
The M/WBE goals established for this project will☐ or will not☐ be met by the participation shown in this affidavit.

Submitted By: _____

Date: _____

Contractor Utilization Plan

Processing Instructions: This form is due within 2 days of bid opening or proposal due date. MBE/WBE Goals must be met or evidence of Good Faith Efforts must be submitted with bid. Use additional forms as necessary to list all MBE/WBEs proposed.

Bidder know as_____hereby states his intent that on the _____ project, Project # _____, Bidder intends to use the following subcontractors and suppliers to achieve the M/WBE goals established for this project:

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$	,as %:	

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$	,as %:	

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$	,as %:	

Firm Name:	Address:	
Contact:	Phone:	Fax:
Trade:	LBE☐ MBE☐ WBE☐	Certification Agency:
Total value of subcontract, in dollars:$	,as %:	

Project Goals: MBE%_____ WBE%_____
Intended Utilization: MBE%_____ WBE%_____
The M/WBE goals established for this project will☐ or will not☐ be met by the participation shown in this affidavit.

Submitted By: _____

Date: _____

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

My Commission Expires_____ _____
Notary Public

Letter of Intent to Subcontract

Processing Instructions: This form is due within 2 days of bid opening or proposal due date. A Letter of Intent to Subcontract must be submitted for each M/WBE subcontractor listed on the Contractor Utilization Plan. MBE/WBE Goals must be met or evidence of Good Faith Efforts must be submitted with bid.

Bidder know as _____ hereby states his intent that on the
Prime Contractor
_____ project, Project # _____, bidder intends to

enter a contractual agreement with _____, who will
M/WBE Subcontractor

provide the following goods / services in connection with the above referenced project:

Scope of Work: _____

Total value of subcontract: $_____

Percentage of total contract: %_____

Subcontractor:
I intend to work on the above named project, perform the indicated scope of work, and receive the indicated compensation contingent upon award of the contract to the aforementioned Prime Contractor.

_____
Signature: Sub Contractor

_____
Print Name

_____
Title Date

Prime Contractor:
I intend to utilize the above named M/WBE subcontractor on the referenced project for the scope of work indicated contingent upon award of the contract to my firm.

_____
Signature: Prime Contractor

_____
Print Name

_____
Title Date

- This form is required only for purchases of more than $100,000 -

31 CFR Part 21 – New Restrictions on Lobbying
CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of their knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all contractors shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Ch. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

_____ Date: _____

Signature of Contractor's authorized official

_____

(Print name of person signing above)

_____

(Print title of person signing above)

Core4 Tax Clearance Process & Contact List

Tax Clearance Process: The vendor must sign the attached forms RD-C3 form for the City of Kansas City, Missouri and the Multi-Jurisdictional Core 4 Property Tax Clearance Certification and e-mail or fax to the numbers listed below. The vendor should receive a letter or notice from the City of Kansas City, Missouri Revenue Department that certifies that their taxes are current. (Sample letter attached) Next the vendor should fill out the attached Multi-Jurisdictional Core 4 form and e-mail or fax to Jackson County, Johnson County and the Unified Government of Wyandotte County/Kansas City, Kansas. The vendor should receive three (3) responses from those entities that they are tax compliant. Those responses along with the letter from Kansas City, Missouri must be presented to the Unified Government Department of Procurement and Contract Compliance PRIOR to the Unified Government of Wyandotte County/Kansas City, Kansas issuing a Notice to Proceed to the successful vendor.

Jackson County, MO
Primary: Barbara Casamento, Purchasing Manager, Jackson County bcasamento@jacksongov.org 816-881-3253

Johnson County, KS
Primary: Greg Baldwin, Deputy Treasurer, Johnson County, KS
taxinfo@jocogov.org 913-715-2609

Back Up: TFM-TreasuryServices@jocogov.org

Unified Government of Wyandotte County
Primary: Sharon Reed, Procurement Manager, UG
sreed@wycokck.org, 913-573-5465

Kansas City, MO
Primary: Cassy Midgyett, Interim Administrator Supervisor, Kansas City, MO cassy.midgyett@kcmo.org 816-513-4929

Back Up: Eric Davison, Financial Manager of Operations, Kansas City, MO
Eric.davison@kcmo.org 816-513-4927

MULTI-JURISDICTION- CORE4
PROPERTY TAX CLEARANCE CERTIFICATION

(Jackson County, MO, Unified Government of Wyandotte County, KS & Johnson County, KS)

Business to Be Certified:

1. Business Name: _____

   DBA Name: _____

2. Business Address: _____
   Street City, State Zip

3. Contact Information: _____ _____
   Phone E-mail

Business Owner/Taxpayer To Be Certified (Attach additional sheets if more owners exist for your business.)

Owner Name: _____

Owner Residence Address: _____
Street City, State Zip

Authorization/Signature

This Authorization shall expire one (1) year from the latest date below certified and is renewed upon agency request.

I, the undersigned Business Owner/Taxpayer, hereby hold each CORE4 entity named below harmless from any and all liability relating to unauthorized disclosure of confidential tax information resulting from release of information related to this Core4 Tax Clearance Authorization under all applicable confidentiality laws including federal, state, or local, including any damages sustained by wrongful transmission of confidential tax information to any other person.

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS AUTHORIZATION, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT IS TRUE, CORRECT AND COMPLETE.

Further, I hereby certify that I am the Owner/Taxpayer named herein or that I have the authority to execute this Authorization on behalf of the Owner/Taxpayer hereinabove named.

_____
Owner/Taxpayer

CORE4 CERTIFICATION

I, the undersigned CORE4 representative, do herby certify that property taxes levied for the preceding year against the owner/taxpayer shown above have either been paid in full, have been paid for the first half of the preceding year or that satisfactory evidence has been presented to this office that said owner/taxpayer had no taxable property for the preceding year. I further certify that property taxes levied for the preceding year against owner/taxpayer showing above have also been paid in full; have been paid for the first half of the preceding year or that satisfactory evidence has been presented to this office that said owner/taxpayer had no taxable property for the preceding year;

OR

Tax Clearance Not Granted ☐ Entity_____

Tax Clearance Not Granted ☐ Entity_____

Tax Clearance Not Granted ☐ Entity_____

JACKSON COUNTY, Missouri on this date: _____, by _____
Purchasing Agent/Mgr/ County Designee

UNIFIED GOVERNMENT/ KC, KS on this date: _____, by _____
Contract Compliance Officer/Designee

JOHNSON COUNTY, KS on this date: _____, by _____
County Treasurer/Designee

FORM **RD-C3**
12/12

City of Kansas City, Missouri - Revenue Division
CLEARANCE REQUEST FORM

Phone: (816) 513-1135

Fax: (816) 513-1264
E-file: www.kcmo.org/revenue

Federal ID (FEIN)		
Name (Business Name and DBA)		
Address (include City, State & Zip)		
☐ **Check this box if you wish to receive this letter by fax**	Fax Number	
Request Submitted By (Print Name)	Title (If Applicable)	
Signature	Phone Number	Date

PLEASE ALLOW SEVEN (7) BUSINESS DAYS FOR PROCESSING

PLEASE SEND COMPLETED FORM(S) TO:

Kansas City's Business Customer Service
Center 1118 Oak St.
Kansas City, MO 64106

KANSAS CITY
MISSOURI

Finance Department

Revenue Division

1118 Oak Street
Kansas City, MO 64106-2786

Phones (816) 513 1135
Fax1 (816) 513 1264
Email1 revenue@kcmo.org
kcmo.gov/revenue

Letter ld1 1.2222222222
Date1 09-Jan•2015
Taxpayer ld1 ...*** J204

Tree Trimming LLC
123 Anywhere
KANSAS CITY MO 64134 1916

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This notice certifies that **Tree Trimming LLC** is current as of this date with all taxes and licenses under the jurisdiction of the City of Kansas City, Mo., Finance Departmenr/Revenue Division.

This is a **SAMPLE** Tax Clearance Letter

Mr. Fred Jones

Commissioner of Revenue

IMPORTANT INFORMATION:

Due to the confidential nature of tax information, this notice is provided directly to the taxpayer.

Visit kcmo.gov/quicktax to view the status of your account and for online filing

TECHNICAL SPECIFICATIONS

SECTION 1100 – PROGRESS AND PAYMENT

PART 1 - GENERAL

1.01 Measurement and Payment

A. Scope: This section lists bid items, their unit of payment, method and limits of measurement, and subsidiary work included in the pay item.

B. Entire Cost: The unit prices shown in the bid shall reflect the entire cost for the construction of the complete work, in conformance with the Drawings and specifications. Cost for items called for in or reasonably inferred as necessary from the construction documents, for which a specific unit price or lump sum price is not listed in the bid, shall be included in the price for the closest applicable items.

C. Non-Pay Items Subsidiary to the Work as a Whole: The following items are subsidiary to the whole work. The cost of these items shall be balanced throughout the separate pay items. Timely completion of subsidiary work shall be a condition for recommendation of progress payments.

Subsidiary items: all supervision, testing, labor, materials, equipment, and all necessary incidentals required to furnish and install the Work, as well as payment for mobilization, bonds, insurance, permits, and licenses; profit, overhead, markups, safety, and coordination; Contractor's supervision, work plan, progress schedules, and site meetings; environmental controls; temporary facilities; temporary fencing; all erosion control materials and installation; all clearing and grubbing; connection to existing manholes, including installation of new line into the manhole, reshaping the invert to accept the flows; connection to existing pipes; trench excavation; rock excavation; embedment; backfill, granular trench backfill; disposal of excavated material not used as backfill; dewatering as required; bypass pumping; compaction; granular backfill material or concrete required by trench widths exceeding the maximum allowable trench width for any pipe as shown on the Drawings; concrete encasement as indicated on the Drawings; impervious ditch checks as indicated on the Drawings; existing utility removal, replacement and relocation; parking and traffic control; photographic record; job site water, electrical power, trash and sanitary services, field office, protection and restoration of existing improvements and utilities; adjustment, relocation and repair of existing water service lines including service meter boxes and service shut off valves; protection and repair of completed portions of the work; correction of defective work; surface restoration; replacement of unsuitable pipe foundation material; tree removal and saving; required herewith

Subsidiary items shall also include field inspection and verification of existing conditions as necessary to perform the work, including confirmation of depths, diameters, and materials; presence of drop pipes; number and size of pipes entering/existing manholes, prior to installation.

D. The Contractor shall accept the compensation, as provided in the Contract, in full payment for furnishing all materials, labor, tools and equipment necessary to the completed work and for performing all work contemplated and embraced under the Contract; also, for loss or damage arising from the nature of the work, or from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner, and for all risks of every description connected with the prosecution of the work; also, for all expenses incurred in consequence of the suspension or discontinuance of the work as herein specified; and for completing the work according to the Drawings and Specifications.

E. Contractor shall make partial payments to Subcontractors for work completed.

F. The Supplemental General Conditions establish the responsibility for performing various tests and inspections. Tests that are the responsibility of the Contractor and his suppliers are subsidiary to the related item.

G. Measurement and payment for each work item shall be in accordance with the following:

A. MOBILIZATION

ITEM A-1 Mobilization

A. Mobilization is a lump sum (LS) item and shall not exceed 3.5% of the calculated Base Bid Adjustment Unit Price Extension Subtotal, respectively for above line items.

B. This item shall be paid with the first Application for Payment.

B. INTERNAL CCTV SEWER PIPE INSPECTIONS

ITEM B-1 through B-3: CCTV Inspections

A. Cleaning shall include light cleaning, as well as any heavy cleaning of 8-inch and larger sewer pipe necessary to perform CCTV inspections. Heavy cleaning with root cutters and mechanical chains are included in the cost of this item. Contractor shall submit supporting documentation, CCTV, and written explanation to Owner if the rehabilitation method shown on the Drawings is recommended to be changed. The cleaning and CCTV will be paid by linear foot (LF) inclusive of all pipe diameters.

B. Cleaning shall include light cleaning, as well as any heavy cleaning of sewer pipe necessary to verify the pre-construction condition for each main sewer segment designated.

C. Measurement and payment for pre-cleaning will be made for each line segment and will be limited to each line segment's actual length from inside edge of manhole to inside edge of manhole. No additional payment will be made for subsequent cleaning and CCTV and no additional payment will be made for mainline sewer segments requiring reverse set-up or for locating manholes to perform complete CCTV.

D. Contractor shall submit preliminary CCTV along reports with NASSCO coding prior to payment of this item. CCTV data shall be reviewed and approved by Owner prior to payment being made.

C. PAVEMENT AND MISCELLANEOUS REMOVAL AND RESTORATION

ITEM C-1 through C-6 Removals

Payment for Removals shall be in accordance with the unit prices set forth in the Contractor’s proposal for each item removed.

The unit price shall be the total cost for, but not limited to, furnishing all supervision, labor, materials, equipment, and all necessary incidentals needed to remove pavement, sidewalk, pipe, trees, and structures as shown, specified, and directed. The unit price shall include, but not be limited to, traffic control; safety equipment; site preparation and excavation; disposal of excavated material not used for backfill; dewatering/bypass pumping as necessary; backfilling and compaction; final grading; debris disposal; erosion control; cleanup; and surface restoration to match or exceed existing conditions; temporary fencing; clearing and grubbing; installation and subsequent removal of silt fencing and/or erosion control devices as required.

All paving items including curb & gutter, driveways, sidewalk, and street pavement shall be removed to existing joints or to full depth sawcuts. Driveway removal quantities are included with Pavement Removals. Removal of existing ADA curb ramp areas will be measured as sidewalk removal. Removal of existing inlet throats will be measured as curb removal.

ITEM C-7: Abandon Pipe In-Place, Fill with Flowable Fill

This item shall apply to pipes 12-inch and larger that are to be abandoned in place. Measurement shall be per cubic yard of flowable fill placed.

Payment shall be full compensation for exposing pipe to be abandoned, plugging each end with concrete or grout, fully filling the interior of the pipe with flowable fill. The unit price shall include, but not be limited to, traffic control; safety equipment; site preparation and excavation; disposal of excavated material not used for backfill; dewatering/bypass pumping as necessary; backfilling and compaction; final grading; debris disposal; erosion control; cleanup; temporary fencing; clearing and grubbing; installation and subsequent removal of silt fencing and/or erosion control devices as required.

ITEM C-8: Abandon Manhole In Place, Fill with Flowable Fill

This item shall apply to manholes that are to be abandoned in place. Measurement shall be per cubic yard of flowable fill placed.

Payment shall be full compensation for plugging each pipe connection with concrete or grout, removal to the top 3-feet of the structure, fully filling the interior of the manhole with flowable fill. The unit price shall include, but not be limited to, traffic control; safety equipment; site preparation and excavation; disposal of excavated material not used for backfill; dewatering/bypass pumping as necessary; backfilling and compaction; final grading; debris disposal; erosion control; cleanup; temporary fencing; clearing and grubbing; installation and subsequent removal of silt fencing and/or erosion control devices as required.

ITEM C-9: Brace Street Lighting or Power Poles

This item shall apply to bracing of street lighting or power poles performed by BPU and charged to the Contractor for utility construction

or re-construction of curb returns. Payment shall be made per each required street light or power pole braced buy BPU.
Payment shall be full compensation for Contractor's coordination with BPU and BPU fees for work performed.

ITEM C-10: Remove and Reinstall Sign

This item shall apply to the removal of street and traffic signs to accommodate utility construction. Payment shall be made per each required street sign removal and reinstallation.
Payment shall be full compensation for removing the street sign, storage of the sign and post, and reinstallation at or near its existing location.

ITEM C-11: Remove and Reinstall Fire Hydrant

This item shall be measured and paid per each fire hydrant removed and reinstalled to accommodate utility construction.
Payment shall be full compensation for closing hydrant valves, removing hydrant and necessary fittings, storage of the hydrant and fittings, and reinstallation and returning the fire hydrant to service following utility pipe installation, backfill and compaction of excavations, and returning the area to original surface grades. New hydrant locations shall be coordinated with BPU Water and installed to their standards.

ITEM C-12: Remove and Replace Concrete Channel Lining, 5" Thick

This item shall be measured and paid by the square foot where the existing concrete lined channel is required to be removed to complete the utility construction.
Construction of this item includes removal of existing concrete lining to the nearest existing joint, compaction and preparation of subgrade per Specification Section 2201, furnishing and compacting granular subbase, restoration of perforated subdrain, and placement of a 5-inch thick reinforced concrete slab as detailed on the plans.

ITEM C-13: Construct Concrete Curb & Gutter

This item shall be paid per the lineal foot price included in the bid. Measurement shall be made along the back of curb and include measurement through new inlet throats, including the width of the new inlet.
Construction of Concrete Curb & Gutter shall be in accordance with Specification Section 2209.

ITEM C-14 Construct Concrete Sidewalk, 4-Inch Thick

This item shall be paid by the square foot and constructed at the various widths shown on the Drawings.
Construction of Concrete Sidewalk shall be in accordance with Specification Section 2301.

ITEM C-15 Construct ADA Ramps

This item shall be paid by the square foot and constructed at the various locations and configurations shown on the Drawings.
Construction of ADA Ramps shall be in accordance with Specification Section 2301.

ITEM C-16: Construct Concrete Driveway

This item shall be measured and paid by the square foot where driveways are required to be removed to complete the utility construction. Construction of Concrete Driveway shall be in accordance with Specification section 2301.

ITEM C-17: Construct Trench Patch, 6-Inch Concrete

This item shall be paid per lineal foot of trench as measured along centerline of pipe as installed.

Construction of this item includes removal of existing pavement to 1-foot beyond the limits of the pipe trench on both sides, compaction and preparation of subgrade per Specification Section 2201, placement of a 6-inch thick non-reinforced concrete slab over the trench which will become a subbase for final asphalt surfacing. Concrete trench patch may be poured flush with surface of existing asphalt; however, in that case concrete trench patch must be 8 inches thick instead of 6 inches thick to account for 2 inches of milling performed under Item C-18. Asphalt surfacing over the concrete trench patch shall be paid under item C-18.

ITEM C-18: Roadway Mill and Asphalt Overlay

Item shall be constructed in accordance with Specification Section 2205. Final asphalt paving over concrete trench patching shall also be measured for payment under this item. Asphalt paving over concrete trench patching shall extend a minimum of one-foot beyond the trench patch on both sides. If edge of concrete trench patch is within 3-feet of new or existing curb, asphalt removal and new asphalt overlay shall extend to the curb line.

ITEM C-19: Clearing and Grubbing

Payment for this item(s) shall be per lump sum in accordance with the unit price set forth in the Contractor's proposal. The unit price shall be the total cost for, but not limited to, furnishing all mobilization, supervision, labor, materials, equipment, disposal, and all necessary incidentals needed to remove all vegetative matter such as trees, brush, down timber and other objectionable materials found on or above the surface of the site; including removing and disposing of all buildings, fences, lumber, waste dumps, trash, and removing vegetative matter such as stumps, roots, buried trees and brush encountered below the surface of the ground or subgrade, whichever is lower. Clearing and grubbing shall be in accordance with Section 2101.

ITEM C-20: Sodding

Sodding shall be measured and paid at the price per square yard included in the bid. Sodding shall be placed to restore all residential yards and park areas disturbed by utility construction. Sodding shall be in accordance with Section 2402.

ITEM C-21: Relocate Water Service Line

This item shall be measured and paid per each water service line relocated to accommodate utility construction due to grade or alignment conflicts with the proposed sewer. Water service lines cut and reconnected to accommodate sewer trenching or shoring only will not be measured and paid for in this item and will be incidental to sewer construction.

Payment shall be full compensation for shutting off existing service at the corporation stop, removing necessary fittings, reinstallation of up to 20-feet of water service line, testing, and disinfection, returning the water service line to service following utility pipe installation, backfill and compaction of excavations, and returning the area to original surface grades. New water service line locations shall be coordinated with BPU Water and installed to their standards.

ITEM C-22: Remove and Reinstall Fence

This item shall be paid per lineal foot for all fences required to be removed to accommodate utility construction. Fences shall be replaced with existing materials as removed or new materials of the same type if damaged during removal or storage. No separate measurement shall be made of the various fence materials required to be removed and reinstalled.

Fence construction shall be in accordance with Section 2307.

D. STORM SEWER PIPE AND MANHOLE CONSTRUCTION

ITEM D-1 through D-5: Storm Sewer Pipe Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal. Measurement shall be along centerline of pipe from inside wall of structures, and include the length measured through any bends or fittings.

Materials and construction shall be in accordance with Section 2602.

ITEM D-6 through D-9: Storm Sewer Manhole Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal. Measurement shall be for each manhole of each specific diameter constructed to a depth of 8-feet or less.

Manhole construction shall be in accordance with Section 2604.

ITEM D-10 through D-13: Additional Depth Beyond 8-Feet for Manhole Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal. Measurement shall be from invert of the manhole to the top of the casting, less 8-feet.

Manhole construction shall be in accordance with Section 2604

ITEM D-14: Storm Sewer Inlet Construction

Payment for this item(s) shall be in accordance with the unit price per each set forth in the Contractor's proposal. Measurement shall be made for inlets constructed at the dimensions shown in the proposal. No

separate measurements shall be made for inlets constructed as Setback or In-line. Inlet construction shall be in accordance with Section 2604. Inlet throats and gutter aprons in front of the inlet will be measured separately and paid for as lineal feet of new curb and gutter.

ITEM D-15: 36-Inch Diameter Storm Sewer Pipe Bend

This item shall be measured and paid per each bend installed in accordance with the unit price set forth in the Contractor's proposal. The unit price shall be payment over and above the lineal foot price for storm sewer pipe that will be paid through the fitting.

The unit price shall be the total cost for, but not limited to, furnishing all mobilization, supervision, testing, labor, materials, equipment, and all necessary incidentals needed to construct the fitting either by manufactured or cast-in-place methods.

Construction shall be in accordance with Section 2602.

ITEM D-16: Stormwater Pre-treatment Device

Payment for this item(s) shall be per lump sum in accordance with the unit price set forth in the Contractor's proposal.

The unit price shall be the total cost for, but not limited to, furnishing all mobilization, supervision, testing, labor, materials, equipment, and all necessary incidentals needed to furnish and install the pretreatment device as shown on the drawings, and to clean and maintain the pretreatment device after installation until final completion of the project. The pretreatment device equipment shall be in accordance with manufacturers specifications and as shown on the Drawings. The Contractor shall supply an operations and maintenance manual including manufacturers detailed drawings, dimensions, parts listings, and operation and maintenance instructions for the pretreatment device.

ITEM D-17: 36-Inch Storm Sewer Pipe Outfall at Creek

Payment for this item shall be lump sum in accordance with the unit price set forth in the Contractor's proposal. Price includes manufacturing or fabrication of beveled end of pipe to conform to creek bank slope, and reinforced concrete encasement of the storm sewer pipe according to the details on the plans.

The unit price shall be the total cost for, but not limited to, furnishing all mobilization, supervision, testing, labor, materials, equipment, and all necessary incidentals needed to furnish and install the outfall pipe section as shown on the drawings.

E. SANITARY SEWER PIPE AND MANHOLE CONSTRUCTION

ITEM E-1 Sanitary Sewer Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal for the pipe diameter specified. Measurement shall be made for each pipe diameter along the centerline of the pipe from inside wall of structure to inside wall of structure. Construction shall be in accordance with Section 2501 through 2506.

ITEM E-2 Sanitary Sewer Manhole Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal. Measurement shall be for each manhole of each specific diameter constructed to a depth of 8-feet or less. Manhole construction shall be in accordance with Section 2509.

ITEM E-3 Additional Depth Beyond 8-feet for Manhole Construction

Payment for this item(s) shall be in accordance with the unit price set forth in the Contractor's proposal. Measurement shall be from invert of the manhole to the top of the casting, less 8-feet for each diameter of manhole constructed.

Manhole construction shall be in accordance with Section 2509.

ITEM E-4 6-Inch Diameter Sanitary Sewer Lateral

Payment for this item(s) shall be in accordance with the lineal foot unit price per each set forth in the Contractor's proposal. Only sewer laterals required to be relocated due to grade or alignment conflicts with new sewer construction shall be measured for payment. Sewer lateral removed and replaced to accommodate sewer trenching or shoring shall be considered incidental to sewer construction.

Measurement shall be along pipe centerline including measurement through the fittings from the point of connection to the existing pipe to the wye fitting connection. No separate payment will be made for fittings other than the payment for lineal footage of sewer lateral measured through the fitting. Construction shall be in accordance with Section 2501 through 2506.

ITEM E-5 Sanitary Sewer Lateral Wye Connection

Payment for this item(s) shall be in accordance with the unit price per each set forth in the Contractor's proposal. No measurement will be made for different main line pipe sizing or lateral pipe sizing installed. Construction shall be in accordance with Section 2501 through 2506.

F. MISCELLANEOUS

ITEM F-1. Project Signs

Payment for this item(s) shall be per each in accordance with the unit price set forth in the Contractor's proposal for furnishing and installing project signs.

The unit price shall be the total cost for, but not limited to, furnishing signs, installation at locations provided by the Owner, maintenance of sign during the duration of the project, and removal and disposal of the sign after project completion.

ITEM F-2 Traffic Control

Payment for this item(s) shall be in accordance with the lump sum unit price set forth in the Contractor's proposal. No measurement shall be made and payment shall be based on the overall percentage of completion of the project.

Traffic control shall be in accordance with Section 2305.

ITEM F-3 Bypass Pumping

Payment for this item(s) shall be per lump sum in accordance with the unit price set forth in the Contractor's proposal. No measurement shall be made and payment shall be based on the percentage of sanitary sewer pipe completed for the project.

ITEM F-4 Erosion and Sediment Control

Payment for this item(s) shall be in accordance with the lump sum price set forth in the Contractor's proposal. No measurement shall be made and payment shall be based on the overall percentage of completion of the project.

Erosion and Sediment Control shall be in accordance with Section 2150.

ITEM F-5 Construction Staking

Payment for this item(s) shall be in accordance with the lump sum unit price set forth in the Contractor's proposal. No measurement shall be made and payment shall be based on the overall percentage of completion of the project.

AL. ALLOWANCE

ITEM AL-1 through AL-2: Allowances

Additional work requested by the Owner that is not specifically stated in the construction contract documents shall be paid as part of these Line Items.

Contractor's maximum upper limit for compensation includes a total allowance amount of $350,000 not yet authorized by Owner that may be required throughout the course of the work. This allowance amount shall not be utilized unless specifically authorized in writing by the Owner to perform additional work. Additional work shall not be performed, nor is the Contractor approved to utilize any of the allowance amount, unless the Owner provides written authorization to Contractor that includes the scope of the work to be performed and a maximum billing limit for compensation that has been mutually agreed upon.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION 1100

DIVISION 33 UTILITIES

SECTION 1400 - PROJECT INTERNAL TELEVISION INSPECTION

PART 1 - GENERAL

1.01 WORK INCLUDED IN THIS SECTION

A. This Section governs closed circuit televising and concurrent video recording of the main storm and sanitary sewer line segments. The Contractor shall provide the Owner with a high quality internal color video recording showing both the pre- and post-construction conditions, including the restored connections.

B. Pre-construction internal CCTV inspection shall be completed for all existing sanitary and storm sewer lines scheduled for replacement (open cut excavation and pipe bursting/reaming), point repairs, CIPP rehabilitation, abandonment, removal, and reuse. Pre-construction internal CCTV inspection for lines scheduled for both point repairs and CIPP shall be performed prior to construction of the point repair.

C. Completed pre-construction internal CCTV inspection recordings shall be reviewed and accepted by the Engineer prior to construction.

D. Post-construction internal CCTV inspection shall be completed for all sanitary and storm sewer lines installed/rehabilitated/replaced by open cut excavation and pipe bursting/reaming, point repairs, and CIPP rehabilitation. Post-construction internal CCTV inspection for lines with both point repairs and CIPP shall be performed after the CIPP work has been completed.

E. The CCTV inspection shall be completed from manhole/structure to manhole/structure.

F. Contractor shall provide and have on site, heavy cleaning and root cutting equipment for use during CCTV inspection. Contractor shall include the cost for heavy cleaning and root cutting in their bid proposal.

1.02 REVISIONS OF STANDARDS

A. When reference is made to a Standard Specification i.e. ASTM, ANSI, AWWA, MCIB, the Specification referred to shall be understood to mean the latest revision of said specification as amended at the time of the Notice to Bidders, except as noted on the Drawings.

1.03 SUBMITTALS

A. The Contractor shall provide certifications or shop drawings on all materials provided under these specifications in accordance with the General Requirements.

1.04 QUALITY ASSURANCE:

A. The project internal video shall be performed by a qualified commercial or individual company who is familiar with television inspection equipment and is PACP (Pipeline Assessment Certification Program) certified by NASSCO (National Association of Sewer Service Companies).

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROJECT VIDEO RECORDING:

A. A high quality project video recording of existing internal conditions shall be created and updated by the Contractor prior to beginning construction and after construction is complete. The pre- and post-construction videos shall conform with PACP standards. The following locational information shall be provided on color audio-video tape recordings:

B. Audio: Each recording shall begin with a verbal description of the current date, project name and municipality and be followed by the site number, general location, i.e. project street address, upstream and downstream manhole and direction of progress. Audio should also include location of all pipe defects and conditions, and service connections with addresses. The project location shall be the location of the upstream manhole.

C. Video: Transparent information must appear on the viewing screen at all times. This information shall contain the site number, upstream manhole number, downstream manhole number, month, day, year, and continuous footage. All pipe conditions and service connections with addresses shall be noted at the appropriate locations.

D. All video shall be properly identified by Owner, date, Contractor, video number, location, project name and municipality in a manner acceptable to the Owner.

E. Any portion of the video recording not conforming to specifications shall be rejected.

F. All video shall be provided to the Owner on an electronic storage medium with a Windows Media Video (**.WMV**) format. Each line segment shall be recorded on a separate file with the upstream and downstream manhole numbers in the file name.

G. Allowable Flow Depth: When depth of flow in the upstream manhole of the line segment being inspected is above the maximum allowable level for television inspection, the flow shall be reduced. The depth of flow shall not exceed the levels shown below for the respective pipe sizes, as measured in the manhole at the time of inspection:

Pipe Dia. (inches)	Max Flow Depth (% of Dia.)
≤ 10	20
12 - 24	25
≥ 27	30

H. Remote Inspection. Television inspection shall be done one line segment at a time. The inspection shall proceed from one manhole to another starting either upstream or downstream and completing in that order for the entire line. When an obstruction prevents the camera from passing through the entire segment, the inspection shall be continued from the opposite manhole before proceeding to the next segment.

I. The camera shall be moved through the line at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the camera be pulled at a rate greater than thirty feet (30') per minute. The camera shall be moved through the line by conventional means of manual winches, power winches, or transporter units with tracks which do not obstruct camera view or interfere with proper documentation of the sewer conditions. In instances where manual or remote power winches are used to pull the camera through the sewer, constant two-way communication shall be set up between the two manholes of the line being inspected.

J. The camera shall pause as it approaches a service so that the connection between the pipe and the service can be evaluated. The lens shall then rotate to display the interior of the service. The service inspection should identify any visible roots, cracks, or capped risers.

3.02 TELEVISION INSPECTION EQUIPMENT:

A. Television Inspection Equipment. Inspection of sewer line segments shall be performed using color camera units specifically designed and constructed for the method of inspection performed. Skids or tracks attached to the camera unit shall be designed for the size of pipe being televised. Units shall have either an automatic or remote focus and iris controls, and the complete systems shall be operable in conditions of one hundred percent (100%) humidity.

B. A Pan and Tilt viewing camera with the ability to view into the service laterals shall be used for 8" sewer lines and larger. A mini-camera may be utilized where necessary if the 8" camera setup is blocked. Each service lateral or tap shall be inspected to determine operational status and condition of the piping at the mainline connection. The Pan and Tilt viewing camera shall have a three hundred and sixty degree (360 degree) vertical rotation and a two hundred and seventy degree (270 degree) horizontal rotation.

C. Lighting shall be suitable to allow a clear picture of the entire periphery of the main sewer pipe. Lighting shall operate in a manner that allows the viewed object to be illuminated no matter what angle of the camera lens. The lighting shall be built into the unit so that the lamps remain aligned with the lens. A minimum illumination of three (3) lux with a light color in the twenty-two hundred to thirty-two hundred degree Kelvin (2200 degree – 3200 degree K) range shall be provided.

D. The Contractor shall have the necessary camera skids, floats, and rafts available to allow inspection of lines in a manner acceptable to the Engineer under live flow conditions. The complete video system (camera, lens, lighting, cables, monitors and recorders) shall be capable of producing a picture quality acceptable to the Engineer, and if unsatisfactory, the equipment shall be removed and no payment shall be made for unsatisfactory inspections.

E. Blowers shall be used to clear suspended moisture or fog in pipes prior to inspection. Filming may commence only when ambient temperature above ground is forty degrees Fahrenheit (40 degrees F) or more.

3.03 DELIVERABLES

A. Prior to initiating field work, Unified Government will provide the Contractor with a Project Tracking Spreadsheet that includes each pipe to be inspected as part of the project. The upstream and downstream manholes numbers and certain pipe characteristics will be provided. The deliverables described below shall be submitted by the Contractor.

B. Prior to the first invoice, the Contractor shall coordinate with the Unified Government Project Manager to determine the appropriate PACP Export Version to use on this project and the Contractor will submit an electronic sample of each deliverable to the Unified Government Project Manager for approval. The sample shall include at least two inspections. The intent of this deliverable is to resolve data collection formatting issues early in the project execution process. The Unified Government Project Manager and Unified Government IT Representatives will review the submittal and coordinate resolution of data format issues with the Contractor.

C. With each invoice, the Contractor shall submit one external hard drive that includes the Video Files, Condition Reports, and the Project Tracking Spreadsheet updated to reflect each pipe invoiced to date on the project. Starting with the second invoice submittal, the Contractor and Unified Government will exchange external hard drives so that Unified Government always has one external hard drive that includes all inspection work invoiced to date. The Condition Report shall include the Owner name, street address,site number, upstream and downstream manhole numbers, date, time, location of defects and conditions, service connections with addresses, and any other relevant data.pipe attributes, and observations coded. The Project Tracking Spreadsheet shall indicate which inspections are complete to date and any pipe characteristics where the observed value differs from the value provided. A folder shall be

created for each pipe inspected. The folder shall be named based on a concatenation of the upstream and downstream manhole numbers. If the inspection work is associated with construction work, a second level of the folder structure should indicate whether the inspection occurred before or after construction. The Video File and Condition Report should be organized into this folder structure. The Project Tracking Spreadsheet shall be placed at the root level of the folder structure (i.e., not placed in any folder).

D. At the end of the project, in addition to the hard drive submitted for the final invoice, the Contractor shall also submit a second hard drive that contains a single PACP Export database and the associated Video Files that can be imported into Unified Government's inspection database of record. This submittal shallinclude all inspections associated with the project including pre-construction and post- construction inspections.

3.04 QUALITY

A. Any video recording not acceptable to the Owner shall be refilmed (start to finish) at no additional charge to the Owner. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified.

PRE-CONSTRUCTION CCTV LIST				
UPSTREAM STRUCTURE ID	**DOWNSTREAM STRUCTURE ID**	**FLOW TYPE (STORM/ SANITARY)**	**DIAMETER (IN)**	**ESTIMATED LENGTH (LF)**
096-513-IT	096-512-IT	Storm	12	25
096-512-IT	096-676-MH	Storm	15	24
096-544-IT	096-545-IT	Storm	18	30
096-610-IT	096-662-DP	Storm	15	63
096-518-IT	096-519-MH	Sanitary	12	9
096-517-IT	096-519-MH	Storm	12	13
096-519-MH	096-138-MH	Storm	24	18
096-547-IT	096-548-MH	Storm	8	18
096-546-IT	096-548-MH	Storm	12	18
096-548-MH	UNK	Sanitary	24	150
096-545-IT	096-547-IT	Storm	UNK	135
096-543-IT	096-544-IT	Storm	12	33
096-536-IT	096-039-MH	Storm	12	17
096-540-IT	096-039-MH	Storm	12	13
096-617-IT	096-616-IT	Storm	12	28
096-616-IT	096-691-MH	Storm	12	35
096-691-MH	096-044-MH	Storm	12	26
096-045-MH	096-044-MH	Storm	12	47
096-068-MH	096-045-MH	Sanitary	12	300
096-071-MH	096-044-MH	Sanitary	18	550
			Total:	**1552**

END OF SECTION 1400

TECHNICAL PROVISIONS

TECHNICAL PROVISIONS

A separate volume titled "Technical Provisions and Standard Drawings for Roads and Sewers", prepared by the Engineering Division, Public Works Department, Kansas City, Kansas contains technical provisions applicable to this job and are hereby included by reference. The latest edition of the Technical Provisions can be found at the Wyandotte County Website –www.wycokck.org- under Departments pull down menu under Public Works. The revision posted at the time of the pre-bid conference shall apply.

If there is a conflict between the Technical Provisions and the Technical Specifications, the Technical Specifications shall take precedence.

TECHNICAL PROVISIONS

Section 1100

General Requirements



Unified Government of Wyandotte County

January 2022

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SECTION 1101 GENERAL REQUIREMENTS FOR UG ADMINISTERED PROJECTS

1101.1 Scope

This Section covers the relationship of the Technical Provisions to the General Conditions and drawings, permit requirements, limits of construction, general requirements for measurement of installed quantities, water and electrical power, posting of no parking areas, mobilization, photographic record, site restoration, and clean up.

1101.2 Applicability

This Section applies only to construction contracts administered by the Unified Government Public Works Department.

1101.3 Related Work

The General Conditions contain other administrative and procedural requirements related to the sequencing and prosecution of the work. The location of specific topics is given below:

A.	Progress Schedules	GC - 3
B.	Shop Drawing Submittal Procedures	GC - 5
C.	Uncovering Untested Work	GC - 7
D.	Substitutions	GC - 8
E.	Staking	GC - 10 and SGC - 3
F.	Contractor's Superintendent	GC - 12
G.	Construction Methods	GC - 12
H.	Job Site Safety	GC - 11 and GC - 42
I.	Change Order Procedure	GC - 13
J.	Correction of Defective Work	GC - 20
K.	Duration of Performance Bond	GC - 37
L.	Weekend and Holiday Work	GC - 41 and GC - 50
M.	Utility Coordination	GC - 11 and GC - 45
N.	Record Documents	GC - 48
O.	Historical and Archeological Deposits	GC - 49

1101.4 Reference Standards

The following standards are referenced throughout the Technical Provisions and Special Conditions. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

KDOT Standard Specifications: shall mean the Standard Specifications for the State Road and Bridge Construction by the Kansas Department of Transportation.

ASTM: shall mean a standard specification by the American Society for Testing and Materials, current edition.

1101.5 Permits

Unified Government permits that may be required for demolition are: haul permit for on road transport of rock, earth, or used building materials; oversized load permit for transport of oversized or overweight equipment or salvaged materials; burn permit for on-site burning of trees and brush; land disturbance permit of area of operations exceeds 1 acre; and blasting permit for use of explosives. Off-site disposal sites located in Kansas City, Kansas require permit from Unified Government building inspection. The contractor shall obtain all necessary permits.

1101.6 Contractor Requirements

A. Submittals: The following shall be submitted by the Contractor prior to starting construction:

1. Project Superintendent's name and contact information.
2. Progress Schedule, Schedule for Payments, Subcontractor list, including estimated values of the work to be provided to each Subcontractor.
3. Copies of construction easement agreements between the Contractor and private parties.
4. Shop Drawings
5. Pre-Project Photographic or Video record of existing conditions.

B. Progress Schedule, Updates, and Site Meetings:
Contractor shall submit initial project schedule at the preconstruction meeting. Contractor shall update the schedule in writing when accumulated variance makes the initial schedule unusable, as determined by Engineer. Contractor shall give Engineer oral notification 48 hours in advance of changes in work location or activity. Contractor and his subcontractors shall attend site meetings as required to fully coordinate the project with Engineer. Failure to provide schedule, to give advance notification, or to fully coordinate the project may result in closure of the work site.

C. Limits of Construction:
Construction activity (including demolition, clearing, storage of equipment and materials, installation of materials and equipment, and employee parking) shall be restricted to the right-of-ways, easements, Unified Government-owned property indicated on the drawings, and other areas secured by Contractor by private agreement. Engineer shall be informed of Contractor's private arrangements for construction easements and shall be supplied a copy of the written agreement.

D. Measurement of Installed Quantities:
Contractor shall provide a responsible individual to work with a representative of Engineer to measure all quantities to be paid by unit price. Measurements of work completed shall be made at the end of each day's work. Said measurements shall be the basis of payment, as no remeasurement shall be made at completion of the project.

E. Water and Electrical Power:
Contractor shall provide water and electrical power required for the work. Cost of water and power shall be subsidiary to the work as a whole.

F. Project Sign:
The Project sign shall vary by duration of project. Sign shall be black on white of durable weatherproof

construction with professional layout of information:

1. For projects lasting longer than 45 calendar days at a single site sue Project Sign detail UG 1101-A.
2. For projects lasting 45 days or less in a single location use Project Sign detail UG 1101-B.
3. For Emergency repairs no sign is required.
4. The contractor shall prominently place the project sign, inspect regularly, clean, repair or replace as needed.

G. Parking Control:

Contractor shall identify where on-street parking must be temporarily prohibited. Engineer will provide temporary signs and direct the installation. Contractor shall provide labor and equipment for installation and subsequent removal of temporary signs. Temporary parking prohibitions shall be posted at least 48 hours in advance of the effective date of parking prohibition. Unified Government will assist in the removal of illegally parked cars. projects lasting 45 days or less in a single location use Project Sign detail UG 1000-B.

H. Photographic Record:

The contractor shall provide photographic record of existing conditions prior to the start of any work and update as necessary throughout the duration of the project. The intent of this requirement is to protect Unified Government and Contractor from claims of inadequate restoration and to protect the property owner from less than complete restoration. Contractor shall maintain photographic records in good order throughout the term of the Contract surety bond or bonds. Photo record shall be delivered to Engineer only when so indicated in the Special Conditions, or when requested by the Engineer. Individual photos shall be made available to Engineer when damaged claims are alleged. If photographic record can not be provided the fault will fall upon the contractor and the contractor will be expected to remedy the claim at their cost.

1. Recorded items shall include private improvements scheduled to be removed and replaced; structures scheduled to remain that may be exposed to ground vibrations or settlement due to adjacent excavation; curbs, walks, and drives scheduled to remain that may be exposed to concentrated construction loads; and trees, shrubs, and turf scheduled to remain within the limits of construction.
2. Each photograph or video shall:
    i. show sufficient detail to evaluate surface conditions.
    ii. Identify the project, approximate station, direction and date of view.
    iii. Provide photographic record images in a digital format with a minimum size of 8.0 megapixels.
3. Contractor shall give Engineer 24 hours' notice of photographic work, so Unified Government representative can accompany Contractor during photography:
    i. Prior to commencing work in an area to photographically record designated items.
    ii. 24-hour notice shall be waived for photographic record during emergency condition

SECTION 1102 INSPECTION OF LAND DEVELOPMENT

1102.1 Scope

This section covers third party inspection of developer-installed improvements to be accepted for public maintenance. Topics included are inspector and laboratory qualifications, responsibility for cost of inspection, reporting requirements, pavement mix design, required tests and inspections, remedial tests, corrective actions and extended maintenance bonds.

1102.2 Applicability

These minimum inspection requirements apply to all sanitary sewer, storm sewer, and pavements built by private parties with the intent to dedicate such facilities to the Unified Government for ownership and maintenance. Also covered are all curb, gutter and sidewalk located in public rights-of-way built as part of land development. Construction not subject to these requirements are: driveway installation and repair of curb or walk on previously developed lots, repairs by franchised utilities and projects administered by the Unified Government Public Works Department and the Board of Public Utilities. following terms have the meanings indicated:

1102.3 Construction Standards

Construction shall conform to the Unified Government's minimum construction standards printed as "Technical Provisions and Standard Drawings for Roads and Sewers". Copies are available on the Unified Government's website. Design and construction shall also conform to the separation and protection standards of the Kansas Department of Health and Environment.

1102.4 Definitions

The following terms have the meanings indicated:

A. County Engineer: Throughout this section County Engineer shall mean the Unified Government County Engineer or his designee.

B. Construction Engineer: A professional engineer licensed in the State of Kansas, experienced in civil site design and construction, whose relationship to the Owner is that of independent contractor, and who is familiar with the design. Construction Engineer may be an employee of the inspection firm or may be independent of it. Proposed Construction Engineer and all changes in Construction Engineers shall be subject to the approval of the County Engineer.

1102.5 Responsibility for Costs

The developer of the property will pay costs of inspection except the Unified Government will pay cost of the first TV inspection of sanitary sewer lines and storm sewer lines. The developer will pay cost of re-televising lines that fail TV inspection.

1102.6 Laboratory Qualifications

Tests shall be conducted by an independent construction materials testing laboratory certified in soils, asphalt

and concrete by AASHTO or A2LA, and subject to approval by the County Engineer. The laboratory shall have the staff, equipment, qualifications, and experience to perform the tests in accordance with the specified standards. Laboratory may be part of the inspection firm or may be independent of it.

1102.7 County Engineer's Approval of Construction Observers

At any time during the construction of the development or review of the construction, the County Engineer may disqualify the Construction Engineer, the inspection firm, the field inspector, or the laboratory based on failure to demonstrate qualifications, or upon failure to provide timely inspection, or upon discovery of a misrepresentation by the Construction Engineer, the inspection firm, the field inspector or the laboratory in the report prepared for this or any other development in Kansas City, Kansas. In the event of disqualification after the start of the project, all inspection performed by the disqualified firm or individual shall be considered null and void; and the work shall be inspected by alternate means or the remedial inspections and extended maintenance bond provisions shall apply.

1102.8 Mix Designs

Both paving contractor and inspection firm shall review and indicate by their signatures that mix designs for asphalt and concrete meet the minimum construction standards. Mix designs shall be tested by a laboratory independent of the asphalt supplier and shall have been prepared within 12 months prior to construction.

1102.9 Maintenance Bond

A. Prior to the Unified Government acceptance of private development construction, a single performance and maintenance bond from a surety company authorized to do business in the State of Kansas, as Surety, shall be submitted to the County Engineer. Amount of maintenance bond shall be 100 percent of construction cost. Bond shall indemnify the Unified Government of Wyandotte County/Kansas City Kansas for losses arising from defective materials and installation during the term of the bond. Process agent for the Surety must be named and address provided: Process agent must be a resident of the State of Kansas. Terms and conditions shall be as printed on Attachment B Maintenance Bond form following this section.

B. Extended Maintenance Bond: Where required due to failure to inspect, surety for extended maintenance shall consist of some combination of the following:

1. Bond equal to the estimated reconstruction costs from a surety company authorized to do business in the State of Kansas
2. Lien against unencumbered real property located in the State of Kansas whose appraised value is equal to the value of the estimated reconstruction costs
3. Cash or cash equivalents equal to the value of the estimated reconstruction costs to be held in escrow by an escrow company located in Wyandotte County.

1102.10 Other Enforcement

No certificate of occupancy for any structure in the development will be issued until both the Construction Engineer's certification and a complete inspection firm's report have been reviewed and approved by the County Engineer and all corrective actions have been completed.

1102.11 Repair of Pavement Cores

Pavement cores shall be repaired by the paving contractor and observed by the inspection firm. Cores in both concrete and asphalt pavements shall be filled full depth with street pavement mix Portland cement concrete. Mix shall be rodded for consolidation, struck off flush with pavement and cured with a curing compound.

1102.12 Construction Engineer's Responsibility

The Construction Engineer shall:

A. Be familiar with the design and design intent of the proposed construction,
B. Review adequacy of construction staking and take relative measurements of installed features,
C. Review, approve and record minor deviations from the design,
D. Review, correct and deliver to the Unified Government sanitary and storm sewer record drawings,
E. Observe sewer and manhole tightness tests. After pipe passes tightness tests, notify the County Engineer that the system is ready for TV inspection. Review TV inspection report; propose corrective actions to County Engineer for approval and to direct corrections.
F. Conduct prepaving inspection to accept street width, subgrade elevation and cross slope, curb dimensions, and confirm manhole and valve box adjustments.
G. Conduct paving inspection or review inspection firm's logs of paving inspection to confirm pavement thickness.
H. Observe pavement trueness tests for arterial and collector roads. Observe water ponding depths on all pavements with minimum slope. See Part 1 for reference to pavement trueness testing criteria and corrective action.
I. Review inspection firm's report for uncorrected deficiencies; propose corrective actions to County Engineer for review and direct corrections.
J. Complete and sign the following compliance statement. Proposed amendments to the compliance statements shall be explained in writing and are subject to review of the County Engineer.

> "Based on familiarity with the design concept and requirements of the Unified Government, on site observations, review of construction staking by others and measurements made personally, review of the inspection firm's report, and on prior review and approval of design deviations all conducted by me or by my qualified staff, it is my professional opinion that for the development known as Name of Development:
>
> 1. Corrective actions for deficiencies listed in the inspection firm's report have been taken as directed by the County Engineer, documentation is attached.
> 2. Deviations from plan deliver the intended system performance, deviations are marked on record drawings; one copy of the street, storm sewer, and sanitary sewer record drawings has been submitted with an approved digital format to the County Engineer, one copy of the street and storm sewer record drawings has been submitted on Mylar to the County Engineer.
> 3. Sewers and manholes meet tightness requirements, lines have been televised by Unified Government and passed, and reports are attached.
> 4. The installed locations of public improvements are in substantial conformance to the construction plans; road widths are within 2 inches of plan dimension; manhole covers and valve boxes are adjusted to the grade and cross slope of the street; collector and arterial roads meet pavement trueness standards; water ponding depth is within specified tolerance;

curb, walk and pavement dimensions are within tolerance; concrete joints are located, prepared, and sealed within tolerance; and all disturbed survey monuments are re-established.

1102.13 Inspection Firm's Report

The inspection firm shall submit a final inspection report to the County Engineer and the Construction Engineer. The report shall consist of a compliance statement, a list of uncorrected deficiencies, a statement identifying what if any items are required to have extended maintenance bonds, inspector's logs documenting all site visits, test results, and mix designs bearing acceptance signatures of both the paving contractor and the inspecting firm.

Compliance statement is printed below. Proposed amendments to the compliance statements shall be explained in writing and are subject to review of the County Engineer.

> "Based on the required field observations or remedial tests, along with the required field and laboratory tests, all conducted by me or by my qualified staff, it is my professional opinion that the specific items of work listed below and completed as part of Name of Development meet the minimum construction standards of the Unified Government of Wyandotte County/Kansas City, Kansas or that the uncorrected deficiencies are prominently listed at the front of this report. Construction Engineer shall:
>
> **A.** Roadway embankments were constructed from acceptable material and meet the embankment foundation, placing, and compaction requirements.
> **B.** Roadway subgrades meet the preparation, compaction and moisture content requirements. Subgrade stabilization was either not required or properly executed.
> **C.** Utility trenches and inlet and manhole excavations under and adjacent to pavements were backfilled with the required granular material and the backfill meets the compaction requirements. Utility trenches in non-paved areas were backfilled with acceptable materials and meet the compaction requirements.
> **D.** Concrete curbs gutter and sidewalk meet the mix, thickness, and environmental limits at time of placing, finish, jointing, and curing requirements.
> **E.** Sanitary and storm sewer mains meet the material, bedding, tapping and alignment requirements.
> **F.** Manholes and inlets meet the material, backfill, and compaction requirements.
> **G.** Asphalt job mix complies with the Unified Government Technical Provisions. Asphalt pavements meet the requirements for job mix, total thickness, lift thickness, machine placement requirements, environmental limits and mix temperatures at time of placement, and compaction requirements.
> **H.** Concrete pavements meet mix, base, thickness, reinforcement and doweling, environmental limits, finish, and curing requirements.
> **I.** All items requiring extended maintenance bond due to lack of timely testing are listed prominently at the front of this report.

Extended maintenance bond requirements are included in Part 3 of this Specification.

Inspector's log shall at a minimum show the date and time of each visit on the site, record work observed, note deficiencies and corrective actions taken, and record environmental conditions applicable to the current work effort. The record of each visit shall be initialed by the inspector. Test results shall indicate location of the work

sampled, specified limits, and tested values. Failed tests shall be highlighted and annotated to indicate remedial action. The reviewer in the inspection firm shall initial each laboratory report.

1102.14 Inspection Firm's Observation and Tests

The concurrent and alternate, postconstruction observations and inspections listed below shall be conducted by the inspecting firm. Inspection and testing frequencies are listed. Observations shall cover all applicable requirements of the current work. Where daily, but not continuous, observation is required, times of inspection shall vary randomly. Work that fails a concurrent inspection shall be corrected and retested.

A. Review job mixes for asphalt and concrete.

B. Embankment Foundation: Observation of the prepared embankment foundation shall be made for all roadway fill sections prior to the placement of fill. Verify clearing, topsoil stripping, foundation scarification and compaction. Identify and establish stabilization method for unsuitable foundation material.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

C. Roadway Embankment: Daily, but not continuous, observation and compaction testing shall be made for roadway embankments over 4 feet deep. Observe that soil moisture, lift thickness and compaction effort is appropriate for the soil. Observe embankment is benched where required. Perform in-place moisture and density test at a spacing not to exceed 600 foot per lane and at vertical intervals not to exceed 2 foot.

Alternate post-construction test for embankments: Bore, obtain split tube sample and perform density tests at the required sample spacing. Bores shall be made at the edge of the pavement; or conduct a falling weight deflectometer tests at spacing not to exceed 100 feet along the each lane, alternating wheel paths. Analyze for pavement durability. Pavement durability shall meet or exceed 20 years.

D. Utility Lines: Continuous observation of sanitary and storm pipe materials and pipe laying procedures shall be made. Continuous observation of sanitary and storm trench backfill shall be made.

Daily, not continuous, observation of other utility trench backfill shall be made.

Observe that appropriate granular material or embankment compaction techniques are used under pavements in all trenches. Where backfill material is AB-3 or excavated material, perform in-place moisture and density of the trench every 300 feet and at vertical intervals not to exceed 2 feet to a depth of 6 feet.

Alternate post-construction test for utility trench backfill in trenches not under pavement: Expose and test backfill of the trench every 300 feet and at vertical intervals not to exceed 2 feet to a depth of 6 feet. Pull mandrel through PVC sewer main to demonstrate less than 3% initial deflection.

Alternate post-construction test for utility trench backfill in trenches under pavement: Conduct falling weight deflectometer tests at spacing not to exceed 100 feet along the centerline of the trench and

analyze for pavement durability. Pavement durability shall meet or exceed 20 years. Pull mandrel through PVC sewer main to demonstrate less than 3% initial deflection.

E. Manholes and Inlets: Observation of all manholes and inlets shall be made prior to backfill. Visually inspect invert shape, wall embedment in base, pipe connection, exterior damp proofing, finish quality of barrels and boxes and tops, installation of gaskets, sealant for manhole casting, grout bed for inlet top, and weight and wording of covers.

Alternate post-construction test for manholes and inlets: Conduct hydrostatic test and visual inspection of invert, pipe penetration and cover casting.

F. Subgrade: Observation of prepared subgrade shall be made within 48 hours of paving operations. If precipitation occurs between the prepaving inspection and paving operations the prepared subgrade shall be observed for standing water or soft spots immediately before paving. Prepaving inspection shall include the following:

1. Proof-roll subgrade with fully loaded dump truck, or equivalent, to identify soft areas.
2. One nuclear density test at subgrade surface not to exceed 200 feet per lane (not required for city – capital projects).
3. If observation of trenches required to have granular fill was not completed concurrent with the work, expose and test at required spacing.
4. Verify Construction Engineer has made prepaving measurements.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

G. Asphalt Paving: Continuous observation of paving operations shall be made. For asphalt observe tack coat, color of delivered asphalt, placement and strike off procedure, lift thickness, and compaction effort. Tests on asphalt shall include density tests, stability tests, flow tests, extraction-gradation tests, and 2 nuclear density tests for each 2000 tons cumulative.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

H. Concrete Curb and Walk: Continuous observation of each concrete placement for curb and walk shall be made. Observe form support, form release agent, material placement, fiber reinforcing, shaping, finishing, jointing and application of curing material. Tests shall include examination of ticket for mix design, air content, slump and temperature and one set of 4 cylinders for each 25 cubic yards (500 linear feet of curb or 220 square yards of sidewalk) or fraction thereof for each day's placement. One cylinder shall be broken at 7 days, and two at 28 days with one as reserve. Confirmation that curing material is in place shall be made within 24 hours of the concrete placement.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

I. Concrete Paving: For concrete observe form support and bond break, placement of dowel baskets and reinforcing, prewetting of subgrade, material placement, strike off and consolidation, finishing, jointing and application of curing membrane. Tests on concrete pavement shall include examination of ticket for mix design; determination of unit weight, air content, slump and temperature; and casting one set of 4 cylinders for each sample lot. A sample lot is the first 25 CY placed and each additional 400 CY or fraction thereof for each day's placement. One cylinder shall be broken at 7 days, and two at 28 days.

One cylinder shall be held in reserve.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

J. Major Structures: Acceptance sample testing frequencies for Portland Cement Concrete for Bridges and Major structures: one set for approximately every 300 cubic yards concrete or as required for acceptance. Minimum of 1 set per job and class of concrete.

No equivalent post-construction tests. See remedial tests and extended maintenance bond, below.

1102.15 Remedial and Corrective Action

A. Tests and Extended Maintenance Bond: Remedial Tests and Extended Maintenance Bond: If the required inspections, for which no equivalent post-construction tests exist, were not performed during the work the remedial tests and maintenance bond extensions listed below shall apply. The extension of the maintenance bond shall be in addition to the normal length of maintenance bond for new development.

1. Failure to observe embankment foundation has no remedial action. A one-year extension of maintenance bond shall apply. Amount of extended of maintenance bond shall cover cost of all work.
2. Failure to observe and test curb and walk placement shall be abated by examination of finish, shape, presence of fiber reinforcing. A two-year extension of maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all concrete curb and walk.
3. Failure to make prepaving inspection or to observe paving operations in asphalt pavements shall be abated by conducting a falling weight deflectometer test at spacing not to exceed 100 feet along the each lane, alternating wheel paths. Analyze for pavement durability. Pavement durability shall meet or exceed 20 years. A two-year extension of maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all asphalt pavements.
4. Failure to make prepaving inspection or to observe paving operations in concrete pavements shall be ameliorated by sampling concrete cores at a spacing not to exceed 600 feet per lane, staggered, measuring pavement and base thickness, conducting a compressive strength test on the core, and visually confirming fiber content. Cores shall be replaced with road mix concrete. A two-year extension of the maintenance bond shall also apply. Amount of extended maintenance bond shall cover cost of all concrete pavements.

B. Corrective Action for Failure of Concurrent Tests: If any part of the work fails a concurrent test, the contractor shall take action to correct the failed work and shall adjust methods and materials to avoid additional failures. Appropriate corrective action may include adjustment of forms, lines and grades, removal of rejected material from the job site, adjustment of mixes, postponing work until environmental conditions are favorable, moisture control of soil, tillage and recompaction of soil, stabilization of subgrade with rock or fly ash, identification and sealing of leaks, removal and replacement of work, or other actions as directed by the Construction Engineer.

C. Corrective Action for Failure of Post-Construction Tests: If any part of the work fails a post construction alternative test or post construction remedial test, the Construction Engineer shall propose corrective

action for review by the County Engineer. Appropriate corrective actions may include removal and replacement of work, addition of asphalt overlays, diamond grinding for pavement smoothness, lining or spot repair of sewers manholes or inlets, negotiated payment to offset cost of accelerated maintenance and replacement by the Unified Government, or other actions as approved by the County Engineer. KDOT performance price adjustments for pavement thickness and smoothness may be a starting point for price negotiations.

END OF SECTION

TECHNICAL PROVISIONS

Section 2100

Clearing, Grubbing, Excavation and Site Preparation

Unified Government of Wyandotte County

January 2022

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SECTION 2101 EXCAVATION, CLEARING, GRUBBING, AND SITE PREPARATION

2101.1 Scope

This section governs the furnishing of all labor, materials, and equipment for the performance of all clearing, grubbing, and demolition within the limits of work as shown on the Plans and in accordance with the Standard Drawings, the Specifications, and the Special Provisions.

2101.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

UG
2150 Erosion and Sediment Control
2201 Subgrade Preparation
2203 Aggregate Base Course
2307 Fencing
2700 Structures

ASTM
ASTM C 150 Standard Specification for Portland Cement
ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C 33 Standard Specification for Concrete Aggregates
ASTM C 494 Standard Specification for Chemical Admixtures for Concrete
ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM C 1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4832 Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition
KDOT AB-3 Aggregate Base

1101.3 Permits

Unified Government permits that may be required for demolition are: haul permit for on road transport of rock, earth, or used building materials; oversized load permit for transport of oversized or overweight equipment or salvaged materials; burn permit for on-site burning of trees and brush; land disturbance permit of area of operations exceeds 1 acre; and blasting permit for use of explosives. Off-site disposal sites located in Kansas City, Kansas require permit from Unified Government building inspection.

2101.4 Definitions

The following terms have the meanings indicated:

A. Clearing: Clearing shall consist of removing all vegetative matter such as trees, brush, down timber and other objectionable materials found on or above the surface of the site. It shall include removing buildings, fences,

lumber, waste dumps and trash and the salvaging of such materials as may be specified and disposing of the debris.

The Contractor shall not occupy any portion of the Project Site prior to the date established in the Notice to Proceed without prior approval of the Owner.

B. Grubbing: Grubbing shall consist of removing and disposing of all vegetative matter such as stumps, roots, buried trees and brush encountered below the surface of the ground or subgrade, whichever is lower, which have not been included in Section 2101.4.A entitled "Clearing".

Trees to be removed shall be completely removed, including stump and large roots, unless such removal may result in damage to existing utilities. In that event, trees shall be sawn off not more than four (4) inches above the ground and the stump shall be removed to twelve (12) inches below finish grade.

In all cases of grubbing, the vegetative matter shall be removed to a minimum depth of 12 inches below ground line or subgrade, whichever is lower, except as provided in Section 2101.4.C.

When deleterious materials are encountered below ground line which may be detrimental to the proposed improvement, these materials shall be removed to a depth necessary to provide adequate support for the proposed improvement.

C. Site Preparation: Site Preparation shall consist of all initial preparation work for the project site and includes, but is not limited to: steps to minimize site disturbance of existing vegetative, structures and private property; phasing and sequence construction activities into logical work zones; installation of erosion control measures; topsoil stripping, stockpiling and spreading; identifying haul roads, construction entrances and/or exits, construction parking areas; mailbox and fencing adjustments; etc. All site preparation shall be considered incidental unless such site preparation is listed separately in the Contract Documents.

D. Demolition and Removal: This work shall consist of demolishing, removing, and disposing of all structures and improvements within the construction limits unless included in other items of work as shown on the Plans or in the Special Provisions. This work shall apply to all structures and improvements, whether on, above or below the surface of the ground or subgrade.

Demolition and removal shall include but not be limited to items such as buildings, drainage structures, pipes, pavements, fences, retaining walls, guard rails, and signs.

Items such as fences, drainage structures, streetlighting, signing and guard rails shall be salvaged and relinquished to the appropriate owner or relocated, where indicated on the Plans.

Relocation of signs, fences, guardrails, etc. shall be considered incidental to removal work except where such relocation is listed separately in the Contract Documents.

All pipes which are to be abandoned shall be removed unless otherwise shown on the Plans or approved by the Engineer.

E. Trees: Vegetative growth 6 inches in diameter and larger, measured 3 feet above ground shall be classified as a tree.

F. Brush: Vegetative growth less than 6 inches in diameter, measured 3 feet above ground shall be classified as brush.

2101.5 Construction

A. Erosion and Sediment Control: Comply with Section 2150 Erosion and Sediment Control.

B. Limits of Work: The limits for clearing, grubbing, and demolition shall extend to the construction limits unless otherwise shown on the Plans. Contractor shall do all clearing necessary for performance of their work and shall confine their operations to that area provided through easements, licenses, agreements and rights-of-way. The Contractor's entrance upon any lands outside of that area provided by easements, licenses, agreements or public rights-of-way, shall be at the Contractor's sole liability.

In the event construction limits have not been indicated on the Plans, the limits for clearing, grubbing, and demolition shall not extend beyond the limits of the Owner's property, right-of-way, or easements.

C. Protection of Greenery, Existing Structures and Private Facilities: The Plans will designate trees, shrubs or other plants that are to be saved and the Contractor will take necessary steps to protect this greenery. All reasonable effort shall be made to save as many trees as possible. If trees can be saved by trimming, this shall be done in accordance with acceptable pruning practices. Trees may be pruned, upon prior approval of the Engineer, but only in accordance with the best practices of arboriculture in respect to the individual species with due regard to their natural form and growth characteristics.

Small Plants and Flowers: At least two weeks prior to the start of construction, property owners shall be notified by the Contactor of the proposed starting date. The purpose of this notification is so that the property owners can remove any small plants or flowers that they, the property owners, desire to save.

Existing structures within or adjacent to the construction limits that are not to be removed or demolished, shall be protected by the Contractor during their construction. Any private facilities such as house sewer laterals which are disturbed or damaged by the Contractor's work, shall be repaired by the Contractor prior to the close of the work day. This repair shall be made in a manner sufficient to restore utility service to that property. Restoration of utilities damaged by the Contractor shall be restored as directed by the utility company at no additional cost to the Owner. Unless otherwise provided in Basis of Payment no separate or additional payment will be made for any work in connection with removal, relocation or restoration of obstructions and existing facilities.

D. Surface Obstructions: Natural obstructions, existing facilities and improvements encountered during site preparation shall be removed, relocated, reconstructed or worked around as herein specified. Care shall be used while performing site preparation work adjacent to any facilities intended to remain in place. Except as otherwise specified, the Contractor shall be responsible for any damage to existing facilities and improvements and any repairs required shall be promptly made at the Contractor's expense. Waste materials shall be disposed of in a satisfactory manner off the work site.

E. Surface Obstructions for Pipeline Trenches: Sidewalks, curb and gutter, drainage structures and similar obstructions shall be tunneled under if tunneling is best suited, otherwise the obstruction shall be cut in straight lines or removed to the nearest construction joint if located within five feet of the center-line of the trench. In no case shall the joint or line of cut be less than one foot outside the edge of the trench. Surface obstructions removed to permit construction shall be reconstructed as specified and to the dimensions, lines and grades of original construction.

F. Embankment Areas: When undisturbed stumps and roots are encountered where the fill depth will exceed 3 feet, the stumps and roots may be left in place provided they do not extend more than 3 inches above the original ground line.

G. Borrow Areas: All stumps, roots and other objectionable matter shall be removed from the borrow material

used for embankment or fill. The borrow area shall be left in a well-drained and smooth condition.

H. Backfilling the Site: All trenches, holes, pits, and basement areas resulting from the operations of clearing, grubbing, demolition and removal on the site, shall be backfilled with suitable material placed and compacted in conformance with applicable sections of these specifications.

I. Disposal of Materials: All materials with the exception of those which are designated for salvage or which are used in the embankment in conformance with this specification, shall become the Contractor's property and shall be disposed of by Contractor, outside the project limits at a site as approved by the Owner, unless otherwise indicated on the Plans. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing shall be a subsidiary obligation of the Contractor.

J. Hazardous Materials

1. In the event hazardous waste as defined by the Resource Conservation and Recovery Act of 1976 (PL94-580) are encountered, work shall be halted and the Owner shall be notified. Work shall be resumed only after the Owner notifies the Contractor. Regulation of removal, handling and disposal of hazardous wastes is the responsibility of Federal and State agencies.

2. All other items classified as "hazardous" shall be disposed of in accordance with the applicable codes. The Contractor shall refer to Section 2150 entitled "Erosion and Sediment Control".

K. **I**tems to be Left in Place: In removing items such as concrete pavements, curbs, curb and gutter, sidewalks and similar objects where portions of these objects are to be left in place they shall be removed to an existing joint or a new joint, sawed to a minimum depth of 2 inches or ¼ the slab thickness, whichever is greater. This joint shall be to true line and vertical face. Sufficient portions of such items shall be removed to provide the proper grade and connection to the new work.

L. Mailboxes: Mailboxes shall be maintained in the manner that the Postal Service requires to prevent interruption of mail delivery.

M. Fences: Refer to Section 2307 for fencing.

N. Property Pins: The Contractor shall preserve all property corners, pins or markers. In the event any property corners, pins, or markers are removed by the Contractor, such property points shall be replaced at the Contractor's expense and shall be reset by competent surveyors properly licensed to do such work. In the event such points are section corners or Federal land corners, they shall be referenced and filed with the appropriate authority.

O. Subsurface Obstruction of Pipeline Trenches: Where existing utilities and service lines are to be encountered, the Owner thereof shall be notified by the Contractor at least 48 hours (not including weekends and/or holidays) in advance of performing any work in the vicinity. All excavation, pipeline installation and backfilling work in the vicinity of such utilities shall be accomplished in the manner required by the respective Owner and, if requested, under their direct supervision. The Contractor shall be responsible for any and all damages to a public or private utility that may occur as the result of the construction.

The Contractor shall make a reasonable effort to ascertain the existence of obstructions and shall locate obstructions by digging in advance of machine excavation where definite information is not available as to their exact location. Where such facilities are unexpectedly encountered and damaged, responsible officials and other affected utilities shall be notified and arrangements made for the prompt repair and restoration of service.

SECTION 2102 GRADING

2102.1 Scope

This section governs the furnishing of all labor, materials, and equipment required to excavate, place, remove, dispose or compact materials encountered within the limits of the project as shown on the Plans and in accordance with the Standard Drawings, the specifications, and the Special Provisions.

2102.2 Definitions

The following terms have the meanings indicated:

A. Grading: Grading as used herein shall mean the performance of all excavation, embankment, and backfill in connection with the construction of all improvements.

B. Excavation: Excavation is defined as the removal of materials from the construction area to the lines and grades shown on the Plans and includes trenching for pipelines, utilities, and structures.

1. Unclassified Excavation: Unclassified excavation is defined as the removal of all material encountered regardless of its nature. All material excavated will be considered as Unclassified Excavation unless otherwise specified in the Contract Documents.

2. Rock Excavation: Rock excavation is defined as the removal of all rock ledges 6 inches or more in thickness, and detached rock or boulders having a volume of more than 1 ½ cubic yards and shale occurring in its natural state, hard and un-weathered.

    a. A rock ledge is defined as a continuous body of rock which may include thin interbedded seams of shale or other soft materials less than 12 inches thick. The vertical limit of each ledge shall be defined by interbedded seams of soft materials 12 inches or more in thickness. The beds of soft interbedded material 12 inches or more in thickness shall not be included in the measurement for "Rock Excavation" but shall be included in the measurement for "Earth Excavation".
    b. The following items shall not be considered as rock excavation: soft or disintegrated rock or flowable backfill (CLSM) which can be removed with a pick or digging machine; loose, shaken or previously blasted rock; broken stones and rock which may fall into the trench from outside the limits of excavation.
    c. When solid rock (including non-diggable flowable backfill (CLSM)) is unexpectedly discovered, the Contractor shall notify the Owner.

3. Earth Excavation: Earth excavation is defined as the removal of all material not defined as rock.

4. Trench Excavation: Trench excavation is defined as excavation to the width and depth as necessary to lay the pipe to the grade line as indicated on the Plans and in the specifications.

5. Tunneling, Boring and Jacking: Includes all underground horizontal excavations necessary to install the pipeline to the grade line as indicated on the Plans and in the specifications.

C. Trench Foundation: The area at the bottom of the excavation shall be composed of a stable material capable of supporting the placement of bedding material, pipe, or structures.

D. Unstable Foundation: Materials encountered in the bottom of the trench deemed as unsuitable by the Engineer to afford a sufficiently stable pipe foundation.

E. Flowable Backfill / Controlled Low Strength Material (CLSM): A mixture of portland cement, fly ash (optional), fine aggregate, water, and admixtures (as approved by the Engineer) proportioned to a consistency to fill voids without vibration. Flowable Backfill (CLSM) shall consist of:

1. Cement: The portland cement shall conform to ASTM C 150, Type 1 or Type II.

2. Fly ash: Fly ash, when used, shall conform to the requirements of ASTM C 618 Class C or F.

3. Fine Aggregate: Fine aggregate shall conform to ASTM C 33.

4. Mixing Water: Mixing water shall conform to ASTM C 1602.

5. Admixtures: Air entrainment, when used, shall conform to ASTM C 260. Water reducing admixtures, when used, shall conform to ASTM C 494. All other admixtures shall only be used when approved by the Engineer.

6. Other materials: Proposed replacement or supplementary materials shall be approved by the Engineer and in conformance with current NRMCA or ACI guidelines for CLSM.

Flowable Backfill (CLSM) compressive strength testing results are required for approval of mix design prior to placement of flowable backfill. Compressive tests are to be conducted at 7 and 28 days in accordance with ASTM D 4832. CLSM shall have a minimum and maximum 28-day design compressive strength of 50 psi and 125 psi, respectively. The unit weight of the CLSM shall be a minimum of 125 lbs. per cubic foot (pcf). All tests necessary for determining conformance with the requirements specified herein will be at the Contractor's expense.

F. Bedding: The placing and compacting of the aggregate material above the stable foundation and below the pipes or structures.

G. Embedment: The placing and compacting of approved material surrounding the pipe up to a maximum of 12-inches above the top of pipe.

H. Embankment or Backfill: The placing and compacting of approved material in the construction areas to the lines and grades shown on the Plans.

1. Unsuitable Material: Muck, frozen material, organic material, topsoil, or rubbish. Rock with a maximum dimension greater than 24 inches is also defined as unsuitable. Topsoil is unsuitable for embankment and backfill but may be used as the surfacing for graded areas to be seeded or sodded (see Section 2400).

2. Suitable Material: Suitable material is defined as entirely imperishable with that portion passing the No. 40 Sieve having a liquid limit not exceeding 40 and a plastic index not exceeding 25, when tested in accordance with ASTM D 4318.

    a. Rock Embankment: Material for rock embankment shall be free of unsuitable material and shall contain, by volume, greater than 10 percent rock or gravel having a maximum dimension greater than 3 inches but not greater than 24 inches.
    b. Earth Embankment: Material for earth embankment shall be free of unsuitable material and shall, contain by volume, less than 10 percent rock or gravel having a maximum dimension

greater than 3 inches.

3. Pipe Backfill: Pipe backfill materials shall be furnished and installed to complete the work shown on the Plans or as called for in the Contract Documents.

   a. Select Earth Backfill Material: Select earth backfill shall be finely divided job excavated material free from debris, organic matter, rocks larger than one (1) inch and/or frozen materials.
   b. Other Earth Backfill: Other backfill may be job excavated material free from debris and organic matter. No rock greater than three-inches in diameter shall be placed in any trench excavation as backfill unless approved by the Engineer.
   c. Aggregate Backfill Material: Approved material meeting ASTM C33 requirements and the specified gradations.
   d. Flowable Backfill (CLSM): See Section 2102.2.E.

I. Borrow: Approved material excavated from an area outside of the project limits and required for the construction of the embankment.

J. Waste: Waste is defined as excavation material not used in the embankment and disposed of outside of the embankment areas.

K. Structures: Used herein refers to culverts, storm sewer and/or sanitary appurtenances, and similar construction. See Section 2700 for other structures.

2102.3 Construction

A. The Contractor shall adhere to any and all statutes regarding the notification of utilities prior to beginning any work within public right-of-way. The relocation and/or protection of any utility that is shown on the Plans, that lies within a utility easement and is endangered by this construction shall be the responsibility of the Contractor.

B. The Contractor shall make every reasonable effort to protect private facilities. These facilities may not be shown on the Plans. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary arrangements for repairs to the facilities for continuous service prior to the close of that workday.

C. It shall be the responsibility of the Contractor to protect all property lot corners and control monumentation. Should it be necessary to disturb any such monument, whether stake, pin, bar, disk, box, or other, it remains the responsibility of the Contractor to reference such markers prior to removal, reset them, and file such relocations or monumentation documents as the law may require. Any such references, removal, replacement and certification of monuments shall be performed by a registered licensed surveyor. A copy of all such certification documents shall be provided to the Owner prior to final payment. Any monument destroyed or improperly reset by the Contractor may be replaced by the Owner to the standards required by law at the expense of the Contractor.

D. Grading, excavation, and backfilling for all improvements, shall be made to the lines, grades, and cross sectionsindicated by the Plans.

E. In addition, to any erosion control measures shown on the Plans, the Contractor shall schedule and conduct their operation in such a manner and shall provide any necessary control facilities to protect downstream and adjacent properties from pollution, sedimentation, or erosion caused by the grading operations. Any pollution or damage occurring shall be the responsibility of the Contractor. See Section 2150 Erosion and Sediment

Control.

F. During construction, the graded area shall be maintained by the Contractor in such condition that it will be well drained at all times. Roadway ditches, channel changes, inlet and outlet ditches and other ditches in connection with the roadway shall be cut and maintained to the required cross section. All drainage work shall be performed in proper sequence with other operations. All ditches and channels shall be kept free of debris or obstructions not identified in the erosion control plan.

G. All suitable material removed by excavation shall be used as far as practicable in the formation of embankment as required to complete the work. The Contractor shall sort all excavated material and stockpile when necessary, so as to provide suitable materials for embankments.

H. After removal of the roadway excavation material to the required section, all material between lines 1 foot outside of the curbs and within the top 6 inches of the subgrade shall be compacted to 95 percent of maximum density for the material as defined in Section 2102.6.F.

I. Rock encountered within the full width of the roadway, toe of slope to toe of slope, shall be undergraded to an elevation of 6 inches below the finished subgrade elevation. Care shall be taken to avoid overshooting when blasting. Rock shall be removed in such a manner as to leave no excessive water pockets in the surface.

J. Blasting: When blasting is permitted, the Contractor shall use the utmost care to protect life and property. The Contractor shall obtain any required permits from the agency having site jurisdiction and shall comply with all laws, ordinances, and the applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property, and he shall be responsible for all damage caused by his or his subcontractor's operations. The contractor shall meet the following requirements:

1. Permit: Blasting permits are required for every project using explosives. Permits for storage and use of explosives shall be applied for at the Unified Government's Fire Prevention office. If requested additional permits may need to be obtained from the Unified Government's Engineers office. Documents required for processing permits include but may not be limited to:
   a. Certificate of Insurance for Catastrophic Coverage - A certificate separate from the one covering the work as a whole will be required. The insurance limit will be a minimum of $5,000,000.00. Based on the location of the proposed blasting, the limit may be increased, so consultation with the Unified Government Engineer's office prior to application is encouraged. The specific language requirements for insurance certificates contained in the General Conditions shall apply.
   b. Blasting Bond - The amount of bond is the maximum amount established in the UFC, $100,000.00
   c. Blaster and User license issued by the State of Kansas
   d. Blaster and User business license issued by the Unified Government
   e. Pre-blast survey

   Permits shall be kept on site for the duration of basting operations.

2. Pre-Blast Survey: The contractor shall obtain a pre-blast survey. Preblast survey shall be conducted by an independent, neutral blasting consultant who regularly performs preblast surveys. Two copies of the signed written summary shall be submitted to Engineer.

   Preblast survey shall record photographic and verbal documentation of preblast damage to the exterior and interior of structures within 300 feet of the proposed blast points. Verbal documentation may be either written text or audio tape, with written transcripts as required by Engineer to evaluate

claims. Minimum photographic record shall be digital format, with a minimum of 8.0 mega pixel sensor size. Submit digital files as required by Engineer to evaluate claims. Transcript and files requested by Engineer to evaluate claims shall be supplied at no additional cost to the Unified Government. Survey records shall be kept on file by the blasting consultant for a minimum of 5 years.

If access to the interior of buildings is denied, the survey record shall contain a returned certified letter to the tenant or owner of the building as proof of attempts by the blasting consultant to gain entry. Letter shall explain the purpose of the survey and have attached the survey and signed denial of access statement, which clearly represents the purpose of the preblast survey and explains the contact procedure with the blasting consultant.

3. Protection of Existing Structures: Minimum protection from noise, flyrock, and ground vibration is described below. Contractor shall take whatever additional protective measures he deems necessary.
   a. Noise: No building shall be exposed to a peak sound level in excess of 130 dB, when measured by instrument with a low frequency limit of 6 hertz or lower.
   b. Flyrock: No flyrock shall leave the construction limits. Overburden or blasting mats shall be used where necessary to prevent unsafe conditions.
   c. Ground Vibration: Ground vibrations shall be monitored by a seismograph located at the nearest building (or if the nearest building is distant, the seismograph may be located at a reasonable distance from the blast in the direction of the nearest building). Seismographs used for monitoring ground vibrations shall record peak particle velocity and frequency in 3 mutually perpendicular directions.

      The peak particle velocity shall not exceed 1.0 inches/second for frequencies greater than 11 hertz, and shall not exceed 0.50 inches/second for frequencies of 11 hertz and less.

4. Safety: Blasting operations shall be conducted by the blaster(s) named in the permit. Storage, transportation, handling, use, and disposal of explosives shall conform to the requirements of the UFC.

5. Blasting Records: The blaster shall retain a record of blasts for a minimum of 5 years. Upon request, these records shall be made available to Engineer or the public for review. Records shall contain the company name of the contractor doing the blasting; the location, time, and date of blast; the name, signature, and certification number of the blaster; type of material blasted; type of explosive; total weight of explosive detonated in an 8 millisecond period; sketch of blast area including number, diameter and depth of holes, burden, spacing, delay pattern; initiation system; mats or other protection; identity, distance, and direction of the nearest building; noise and seismic records.

No blasting shall be performed without the meeting the appropriate criteria above.

L. No Blasting Areas: No blasting of any kind for rock excavations or any other purpose will be allowed unless noted otherwise on the Plans or permitted by the Unified Government Fire Prevention Office.

M. Areas of undergrading or overbreakage in rock between lines 1 foot outside of the curbs shall be backfilled with spalls, rock fragments or a granular type material. Backfill materials shall have a plasticity index not to exceed 10 and a gradation such that at least 50 percent of the material will be retained on the No. 4 Sieve.

N. Cribbing and Sheeting: The Contractor shall furnish, install, and maintain such sheeting, bracing, and other components, as may be required to support any excavation and to prevent any movement which could in any way injure or delay the work or endanger adjacent pavement, building, or other structures. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and

consolidated.

For the purpose of preventing injury or property damage, Contractor may leave in place all sheeting or bracing, and other items to be embedded in the backfill of the trench. No sheeting or bracing, however, shall be left in place within 5 feet of the surface without the written permission of the Engineer.

2102.4 Excavation, Trenching, And Backfilling For Pipe And Structures

A. Dewatering of Excavation

1. The Contractor shall maintain a dry and stable excavation, obtain necessary permits, and provide for the proper method of discharging water from the work site at all times until installation is completed.

2. The Contractor shall not allow hydrostatic pressure flotation or other adverse effects to cause damage to the structure or pipeline.

3. Proper dewatering techniques are the Contractor's responsibility. All work performed by the Contractor that is adversely affected by his/her failure to adequately dewater trenches will be subject to rejection by the Engineer. The Contractor shall repair and/or replace affected structures or pipelines.

4. The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made as part of the work.

5. Grading shall be done to prevent surface water from flowing into trenches or other excavations, and to maintain the flow of water in natural watercourses on or adjacent to the site. Any water accumulating in trenches or other excavations shall be removed by pumping or by other approved methods.

B. Trench Excavation: Trenches shall be excavated to the width and depth as necessary to lay the pipe to the grade line as indicated on the Plans with proper pipe embedment. The Contractor shall perform excavation of materials encountered in accordance with Section 2102.3, regardless of material type, to the depths indicated on the drawings or as otherwise specified herein. Excavated materials are to be deposited beside trenches and excavations to avoid overloading, and to prevent slides or cave-ins, transported to the spoil banks, or used for backfilling. All excavated materials not required or not suitable for backfill shall be removed and disposed of off the site by the Contractor as part of the Work. The trench excavation opened at one time shall be limited by the nature of the soil and other safety considerations.

1. All pipeline excavation work shall be accomplished under the supervision of a person employed by the Contractor or his subcontractor and experienced with the materials and procedures which will provide protection to existing improvements, including utilities and the proposed pipeline.

2. The alignment, depth, and pipe subgrades of all trenches shall be determined by a laser beam parallel to the pipe invert.

3. Deviation from the indicated alignment will not be permitted except under special circumstances, subject to approval of the Engineer.

4. Trenches that are parallel to structures, pavements or walls shall be no closer than 18 inches from the closest edge of footings or pavement. Also, no parallel trench shall extend in depth below a plane having a downward slope of 1 horizontal to 2 vertical starting from a line 9 inches above the bottom edge of footings or pavement. The bottom of pavement shall be the lowest improved section of pavement to include chemically stabilized subgrade or aggregate base layers.

5. When pipe is to be installed in embankment or fill, the embankment shall be constructed in accordance with Section 2102.6 and shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the pipe trench.

6. The Contractor shall not open more trench in advance of pipe laying than is necessary. Four hundred (400) feet will be the maximum length of open trench allowed on any line under construction. All open trenches shall be adequately protected.

7. Undercutting of trench walls is not permitted.

8. Option to Trenching: Contractor may perform excavation by tunneling methods as set forth herein at no additional cost to the Owner provided prior written approval for each such location is obtained from the Engineer. The Contractor shall submit to the Engineer, prior to actual work, a written description of his proposed operation. It shall include the types and locations of shafts, methods to provide safe support strength for the pipeline when the shafts or bore pits exceed maximum allowable trench widths and other features that would affect the pipeline. Tunneling shall be done with a minimum inconvenience and disturbance to the general public and abutting property owners.

C. Trench Widths: Trenches shall be excavated to a width that will provide adequate working space and pipe clearances for proper pipe installation, jointing, and embedment. Over-excavation shall be replaced with granular bedding material or flowable backfill (CLSM). See applicable Plans, Standard Drawings, and manufacturers' recommendations for trench widths for pipe installations.

D. Preparation of Pipe Subgrade: Pipe subgrade shall be prepared to provide uniform and continuous support of pipe. The trench bottom shall be evenly graded. Areas that are too high shall be shaved as required. Any portions of the trench that are found to be too low shall be filled with suitable materials, thoroughly compacted, and brought to true grade, allowing for placement of bedding material as shown in the Standard Drawings.

E. Trench Bottom in Rock Excavation: Where rock is encountered in excavation, the rock shall be removed to provide a minimum clearance of 6 inches below and 6 inches along each side of the pipe.

F. Replacement of Unsuitable Pipe Foundation Material

1. If unstable subgrade conditions are encountered and it is determined by the Engineer that the excavation bottom will not provide suitable support, the Contractor shall remove all unstable or unsuitable material over the entire width of the trench to the depth required by the Engineer to provide a stable foundation. Removal shall not be less than 6 inches.

2. Materials so removed shall be replaced with bedding aggregate material as specified herein. Bedding material shall be mechanically compacted over the entire width of the trench and shall be brought to proper grade, shape, and elevation for the installation of the pipe as shown on the Plans or Standard Drawings.

G. Granular Bedding Materials: Granular bedding material shall meet ASTM C33 with one of the following gradation requirements:

Sanitary Sewer Bedding Material Gradation Limits (% Passing)	
Sieve Size	3/4"
1"	100

3/4"	90 – 100
3/8"	20 – 55
No. 4	0 – 5
No. 8	0 – 2

Storm Sewer Bedding Material Gradation Limits (% Passing)			
Sieve Size	3/4"	1/2"	3/8"
1"	100		
3/4"	90 – 100	100	
1/2"		80 – 100	
3/8"	20 – 55	40 – 77	100
No. 4	0 – 10	0 – 15	30 – 40
No. 8	0 – 5	0 – 5	0 – 4

H. Pipe Embedment: All sanitary sewer and storm sewer pipe shall be bedded in bedding aggregate as specified herein.

1. Bedding shall cover the entire width of trench.

2. The first layer of bedding placed on the bottom of excavation shall be in accordance with Figures 1 through 3.

3. Bedding at bottom of trench, in the middle 1/3 of trench under the pipe shall be loose.

4. After pipe is placed, bedding material shall be placed in layers in accordance with manufacturer's recommendations.

5. Second layer of bedding material shall be placed under the lower haunches of the pipe up to the springline (center of pipe). Material shall be spaded to be place under haunches and compacted at the springline elevation prior to placing additional bedding material.

6. The third layer of bedding material shall be placed to 12 inches over the top of pipe.

7. Contractor shall take measures to prevent pipe from floating during placement of bedding material so that pipe maintains proper line and grade as shown on the Plans.

I. Trench Backfill

1. Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction.

2. The Contractor shall remove from the project site waste material, trees, organic material, rubbish, or other deleterious materials.

3. All trash and debris shall be removed from the pipeline excavation prior to backfilling.

4. Backfill material shall be carefully placed to avoid damage to or displacement of the pipe, other utilities or structures.

5. Unless otherwise specified, all trenches and excavations around structures shall be backfilled to the

original ground surface.

6. Outside of paved areas, the backfill material shall be placed in layers not exceeding 8-inches in loose thickness and be compacted to at least 90% of maximum density. Compaction testing shall be at the discretion of the Engineer.

7. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.

8. The combination of the thickness of the layer, the method of compaction and the type of compaction equipment used shall be at the discretion of the Contractor subject to obtaining the required densities.

J. Trench Backfilling in Street or Alley Right of Way and under Pavement

1. Narrow Trench: Suitable backfill material for trenches 24 inches or less in width and shall be flowable backfill (CLSM).

2. Standard Trench: Suitable backfill material for trenches between 24 to 48 inches wide shall be either flowable backfill (CLSM) or dense, well-graded aggregate base material. Aggregate base material shall meet the requirements for KDOT AB-3.

3. Wide Trench: Suitable backfill material for trenches greater than 48 inches wide shall be either flowable backfill (CLSM) or dense, well-graded aggregate base material. Aggregate base material shall meet the requirements for KDOT AB-3.

4. Suitable Backfill Material outside of paved areas within Right of Way, and all areas outside Right of Way, may be suitable material as specified for "Earth Embankment" in Standard Specifications, Section 2102.2.H. Suitable Backfill Material may also be other trench backfill material (flowable backfill or aggregate base) depending on site conditions, trench widths or at the direction of the Engineer.

5. Aggregate backfill material placed between lines one foot behind curbs, or edge of uncurbed pavement, shall be meet density and testing requirements as outlined in Section 2203 Aggregate Base Course.

6. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.

7. Backfill shall be place in compacted in layers not exceeding 8-inches in loose thickness and be compacted to at least 95% of maximum density at optimum moisture ± 3% as determined by ASTM D 698. Each lift shall be compacted and tested to the required density prior to the next lift being placed. Testing shall be performed by a qualified testing lab hired by the Contractor and approved by the Owner.

8. A minimum of one compaction test shall be taken for each lift of earth embankment backfill or dense, well-graded aggregate base material for each road crossing or each 50 feet of trench length under pavement.

9. Testing shall be performed by a qualified testing lab hired by the Contractor and approved by the Owner.

10. Laboratory compaction test and index property test results for each material used on site shall be

submitted to the Engineer prior to construction. Any work by Contractor prior to test submittals and subsequent Owner review and approval shall be work done at the Contractor's risk.

11. Test reports shall be submitted to the Engineer daily. The reports shall clearly indicate the location of all tests by street name, station and/or lot number, type of backfill material, utility type, and depth of test. The reports shall include the results of all tests (pass or fail) and all re-tests.

12. All test reports shall be submitted prior to receiving approval of subgrade for curb and pavement installation. Pavement, curb or other surface features placed prior to receiving subgrade approval shall be placed at the Contractor's risk.

K. Flowable Backfill (CLSM) Installation

1. Flowable Backfill (CLSM) shall be constructed to the configuration and the lines and grades shown on the Plans, or as directed by the Engineer. No additional payment will be allowed for placement beyond these limits.

2. The producer may cut back on the quantity of water incorporated during batching with the approval of the Engineer. Additional water may be added on-site to achieve the intended consistency. The final mix unit weight and compressive strength shall fall within the specified ranges as described in Section 2102.2.E.

3. No Flowable Backfill (CLSM) shall be placed on frozen ground or in standing water.

4. When the ambient temperature is either falling or forecasted to fall below 35^0 F within 24 hours of its proposed placement time, the Contractor may submit the use of cold weather methods for approval by the Engineer.

5. Care shall be taken to prevent the movement of any conduit, pipe or structure from the designated location or intrusion of flowable backfill into undesirable locations. If such movement or intrusion occurs, the Engineer may require the affected structure to be excavated and replaced to the proper grade at the Contractor's expense.

6. If flowable backfill is placed in more than one layer, loose and foreign material shall be removed prior to placing the next layer.

7. No flowable backfill shall be covered or accepted until a minimum compressive strength has been attained, as demonstrated by failure to deform or crush underfoot. If the flowable backfill does not harden to required strength, the flowable backfill shall be removed and replaced with an acceptable material at the Contractor's expense. Acceptance of the flowable backfill shall be based on visual inspection.

8. Random compressive strength testing may be conducted at the Owner's expense to verify compliance with strength requirements. Compressive tests shall be in accordance with ASTM D 4832.

L. Trench Checks

1. Install where shown on the Plans.

2. The backfill above the trench check shall meet the specifications for backfill material.

M. Excavation by Tunneling or Boring: Where depth of trench and soil conditions will allow it, tunneling may be required under pavement, railroad tracks, or other surface structures. Tunnel sections shall provide adequate clearance for pipe and workers for proper lining, grading, and jointing the pipe installed therein.

All tunnel excavation shall provide an excavation conforming to the outside diameter of the casing and/or carrier conduit. The excavation shall be to an alignment and grade which will allow the carrier conduit to be installed to proper line and grade as shown on the Plans and as established in Section 2505.2.H. Conduct excavation in a manner to prevent disturbing overlying and adjacent material. Perform dewatering and chemical soil stabilization or grouting if necessary, due to existing field conditions.

N. Settlement: The Owner may perform periodic inspections to ensure that no settlement has occurred. The Contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within two (2) years of time after final acceptance of the contract under which the work was performed.

The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within thirty (30) days after notice from the Owner. Should the Contractor fail to make such repairs the Owner may cause repairs to be made and the cost of these repairs shall be the responsibility of the Contractor.

O. Excavation and Backfilling for Piping and Structures

1. All structure foundations shall be founded on stable, undisturbed subgrade. Excavation shall be sufficient to provide at least 12 inches clear between the outer surfaces of the structure (including formwork) and the embankment or timber that may be used to hold and protect the excavation.

2. Unsuitable or unstable foundation soil that will not properly support the structure, as determined by the Engineer, shall be removed to the depth required and the excavation backfilled to the proper grade with compacted bedding material or other material approved by the Engineer.

3. All excavations for structure shall be kept dry; no reinforcing steel shall be installed in water; and no water shall be permitted to inundate the reinforcing steel before concrete has been placed.

4. Street Right-of-Way Areas: All structures located under or within paved or graveled areas shall be backfilled with flowable backfill (CLSM) to a level flush with the top of pavement subgrade. Structures located under or within vegetated areas shall be backfilled with flowable backfill (CLSM) to a level twelve inches below finish grade and consolidated topsoil. The external opening surfaces of weep holes shall be covered with hardware cloth and surrounded with a minimum of three cubic feet of consolidated granular bedding material.

5. Areas other than Street Right of Way: All structures located under or within paved or graveled areas shall be backfilled with flowable backfill (CLSM) to a level flush with the top of pavement subgrade. Structures located under or within vegetated areas shall be backfilled with CLSM, untreated compacted aggregate, consolidated granular bedding material, or compacted soil to a level twelve inches below finish grade. The external opening surfaces of weep holes shall be covered with hardware cloth and surrounded with a minimum of three cubic feet of consolidated granular bedding material. The top twelve inches shall be backfilled with topsoil.

6. Backfilling

    a. No backfill shall be placed over or around any structure until the concrete or mortar therein has attained a minimum strength of 2000 psi and can sufficiently support the loads imposed by the backfill without damage.

b. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement or floating of the structure. Any damage caused by premature backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.

c. Backfill shall be placed and compacted on all sides of the structure simultaneously, and operations shall be so conducted that the backfill is always at approximately the same elevation on all sides of the structure.

d. No excavated rock larger than 3 inches maximum dimension shall be placed within 1 foot of the exterior surface of any structure except as allowed with flowable backfill (CLSM) placement.

e. No backfill material containing rock, or detritus from rock excavation, shall be placed in the upper 24 inches of the excavation.

f. Large rock may be placed in the remainder of the backfill upon approval of the Engineer. Approved rock material shall be placed so that it is well separated, allowing proper compaction of soil backfill around the rock material.

g. All excavation shall be backfilled to the lines and grades shown on the Plans.

h. After the required curing time, backfill shall be placed and compacted in layers. Contactor shall monitor impact of placement, vibration and related work so not to damage or disturb structures.

i. Backfill shall be place in compacted in layers not exceeding 8-inches in loose thickness and be compacted to at least 95% of maximum density at optimum moisture ± 3% as determined by ASTM D 698. Each lift shall be compacted and tested to the required density prior to the next lift being placed. Testing shall be performed by a qualified testing lab hired by the Contractor and approved by the Owner.

j. In no instance shall backfill be dumped, bulldozed, or otherwise deposited in bulk upon the newly constructed structure.

P. Backfill of Drainage Course Crossings

1. Excavation in rock to a distance of 10 feet beyond each bank (measured perpendicularly to the stream flow) shall be backfilled with concrete to the existing rock elevation. The excavation above the rock elevation shall be backfilled with soil above that concrete encasement or as indicated on the Plans.

   The soil placed above the encasement shall be compacted to at least 95% of maximum density at optimum moisture ± 3% as determined by ASTM D 698.

2. Pipe placed in an excavation in soil shall be encased in concrete to a minimum of 1 foot above and below the pipe and backfilled with soil above that concrete encasement or as indicated on the Plans. The soil placed above the encasement shall be compacted to at least 95% of maximum density at optimum moisture ± 3% as determined by ASTM D 698.

2102.5 Undergrading

A. Where materials are encountered which are deemed as unsuitable by the Engineer for use in the work, they shall be removed to the depth and limit as ordered by the Engineer. Areas undergraded shall be backfilled with one of the following materials:

1. Replacement with suitable materials from excavation on the work site or from an off-site borrow area, compacted to the required moisture and density requirements where practicable.

2. Mixing of stone base or rock materials, hydrated lime, portland cement or fly ash into the sub-grade.

3. Placement of compacted aggregate.

4. Rock fragments or spalls. A granular type material having a plasticity index not to exceed 10 and a gradation such that at least 50 percent of the material will be retained on the No. 4 Sieve and not more than 40 percent will pass the No. 10 Sieve.

5. A material meeting the requirements of Section 2102.2.H.2.

2102.6 Embankment

A. This section governs embankment for all improvements. The embankments shall be constructed using suitable materials, as herein defined, procured from excavations made on the project site or from borrow areas as required to complete the grading work.

B. Starting the Embankment: Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than 1 vertical to 4 horizontal, the existing slope shall be benched or stepped in approximately 24 inch rises as the new fill is brought up in 8 inch maximum layers or lifts. The material bladed out, the bottom of the area cut into, and the embankment material being placed, shall be compacted to the required density. Material cut out, bladed into place and compacted shall not be measured and paid for directly but will be considered as incidental work.

The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material removed before starting the embankment work. Where embankments 2 feet or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared ground surface shall be compacted to the specified density. Where embankments greater than 2 feet in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces no larger than 18 inches maximum dimension, left in place and the embankment started thereon.

C. Placing Earth Embankment: Earth shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed 8 inches maximum in thickness (loose state) and shall be compacted to not less than the required density before the next layer is placed thereon. As the compaction of each layer progresses, continuous blading, or dozing will be required to level the surface and to ensure uniform compaction. Embankment construction shall not be performed when material contains frost, is frozen or is snow covered.

D. Placing Earth and Rock Embankment: When earth and stone or rock fragments are mixed in the embankment, all stones or rock fragments exceeding the thickness of the compacted lift shall be disposed of by being incorporated into the embankment outside the limit of the proposed paved areas. The thickness of the layer in these areas may be increased if necessary to accommodate the rocks, but shall not exceed 12 inches in thickness (loose state). The stones or rock fragments are to be placed so there will be no nesting.

E. Consolidated Rock Embankment: When the excavated material consists predominantly of stone or rock fragments of such size that the material cannot be placed in layers of the thickness prescribed, such material shall be placed in the embankment in layers having a thickness of the approximate average size of the larger rocks but not to exceed 24 inches. Rocks or boulders too large to permit placing in a 24 inch layer shall be reduced in size as necessary to permit placement. Rock shall not be dumped in place but shall be distributed by blading or dozing in a manner to insure proper placement in final position in the embankment. Voids shall be filled with smaller stones, earth, sand, or gravel. Each layer shall be thoroughly consolidated before the next layer is placed.

Rock embankment shall be capped with 3 feet of soil material on all sides. The soil cap material shall not contain material having a maximum dimension greater than 3 inches.

F. Compacting the Embankment: Before placing any embankment, the surface of the existing ground shall be prepared as specified herein, moistened as required, and the top 6 inches compacted to a density of 90 percent as prescribed by the following paragraph:

All embankment shall be compacted to a density of at least 90 percent of the maximum density for the material used as determined by ASTM D 698 with a moisture range sufficient to allow for proper compaction. In addition to the above required compaction, the subgrade between lines 1 foot outside of the curbs and within the top 6 inches of the subgrade in cut sections and the top 18 inches in fill sections shall be compacted to a density of at least 95 percent of the maximum density for material used as determined by ASTM D 698 and with a tolerance of ± 3% of the optimum moisture at maximum density.

All work involved in either adding moisture to or removing moisture from embankment materials to within these moisture limits shall be considered incidental to the completion of the grading operation.

G. Moisture – Density Determination: In-place density and moisture content of the embankment will be determined by an acceptable method as approved by the Engineer.

H. Testing

1. Laboratory compaction test and index property test results for each material used on site shall be submitted to the Engineer prior to placement. Any work by Contractor prior to test submittals and subsequent Engineer review and approval shall be work done at the Contractor's risk.

2. In-Place Density/Moisture tests shall be taken at the frequency of 4 per day per spread, with a minimum of one test per lift.

3. Test reports shall be submitted to the Engineer daily. The reports shall clearly indicate the location of all tests by street name, station and/or lot number, type of material, and elevation of test. The reports shall include the results of all tests (pass or fail) and all re-tests.

4. All test reports shall be submitted prior to receiving approval of subgrade for subsequent work. Pavement, curb, other surface features or utilities placed prior to receiving embankment approval shall be placed at the Contractor's risk.

I. Backfilling Curb and Gutter: Backfilling behind curb or curb and gutter shall be done within seven (7) days after being laid unless otherwise approved by the Engineer. The material used to fill the void behind curb or curb and gutter shall be free of rock and debris and shall be of a type that will leave no voids to pocket water. Unless otherwise shown on the contract drawings, the finish grading from the back of the curb to the right-of-way line and/or utility easement line or construction easement line shall be performed to provide a smooth transition between existing yard grades at the right-of-way line and/or easement line to the curb so that positive drainage will exist.

The top portion of the backfill within right-of-way areas shall be finished with at least 6 inches of topsoil corresponding to, or better than, that underlying adjoining sodded areas. Topsoil shall be approved by the Engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled for the purpose during excavating and grading operations. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by discing or scarifying to a minimum depth of two (2) inches to permit bonding of the topsoil to the underlying surface.

2102.7 Finishing

A. In areas where sodding or seeding is proposed, the upper 12 inches of the surface area shall be earth material free of rocks greater than 1 inch in diameter. The top 6 inches shall be topsoil suitable for sustaining grass or sod.

B. Except where other permit or utility work is in progress, the graded surface shall be made free of rock, concrete, and brick, or fragments thereof, or rubbish and shall be finished to the lines, grades, and cross-section indicated on the Plans, including shoulder, berm and sidewalk spaces.

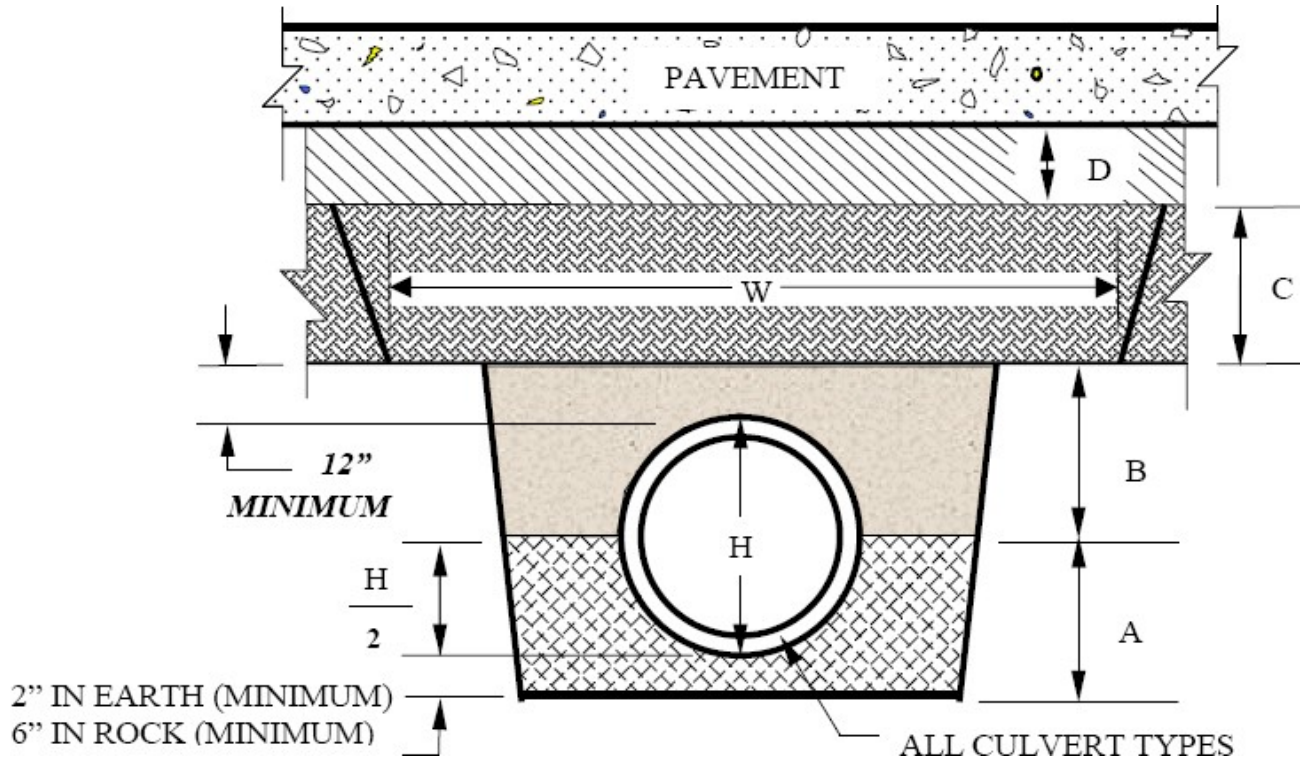
C. The Contractor shall repair any damaged surface, and shall not use any finishing equipment that will leave a marred surface. When the subgrade preparation is included as a part of the finishing, the work shall be accomplished according to the requirements of Section 2201 entitled “Subgrade Preparation”, and shall be considered incidental to finishing the grading work.

2102.8 Cleanup

Cleanup shall follow the work progressively and final clean-up shall follow immediately behind the finishing. The Contractor shall remove from the site of the work all equipment, tools and discarded materials, and other construction items. The entire right-of-way or easement shall be left in a finished and neat condition. Cleanup shall be considered as incidental to the completion of grading work.

SECTION 2103 BACKFILL DETAILS

2102.1 Figure 1 - Deep Sewer Lines Using Earth Compaction Equipment, or in Depths Exceeding 30" of Cover)



A- Consolidated granular bedding material.

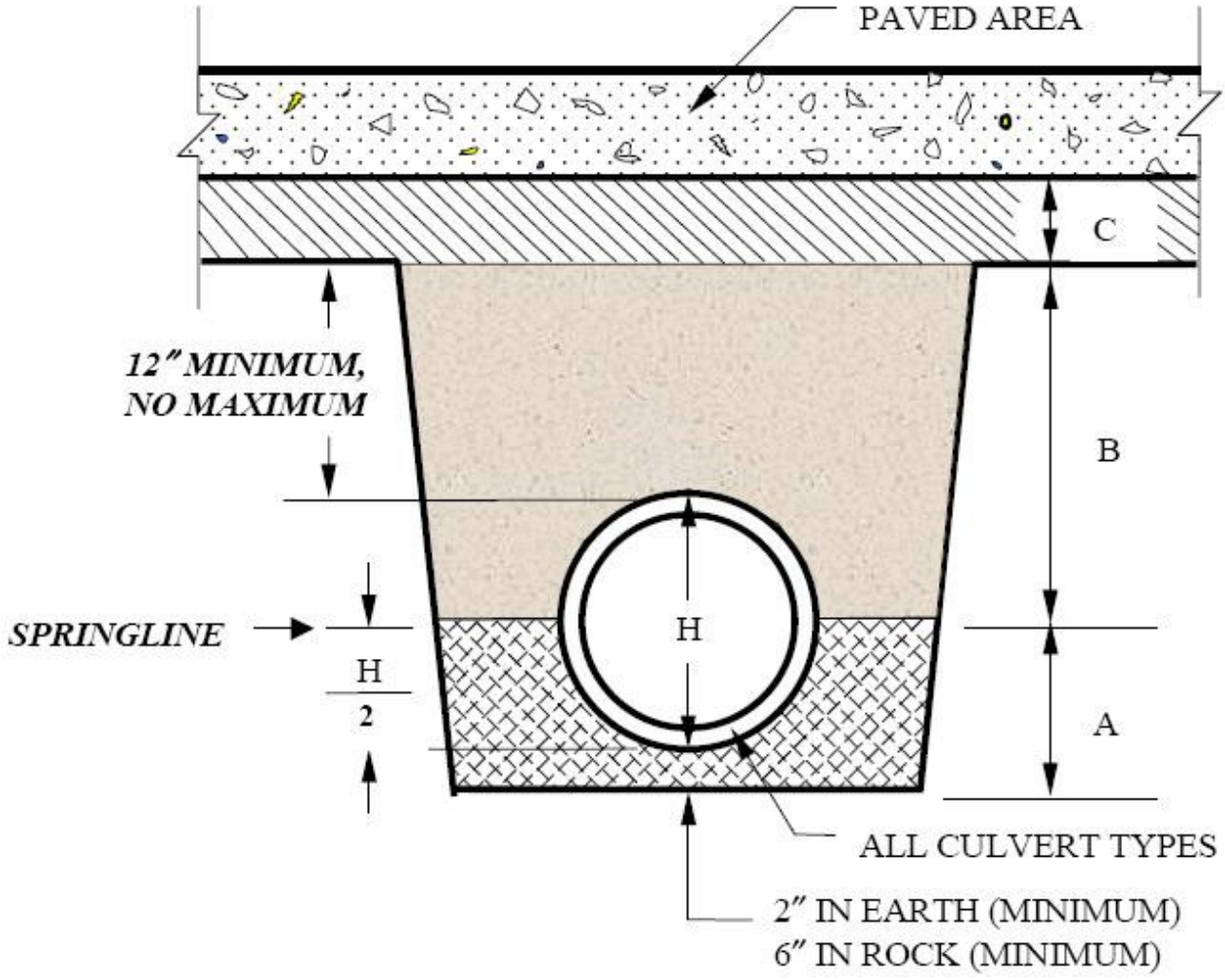
B- Granular bedding material or Flowable Backfill (CLSM).

C – Compacted Embankment - 2102.6. Lift thickness shall not exceed the capability of the equipment being utilized to achieve the proper density and consolidation, and in no case shalla lift exceed twelve inches for soil. The minimum width, W, shall be two feet wider than the width of the required compaction device, or five feet, whichever is greater.

D – Compacted Subgrade - Subgrade thickness shall be as specified in Table 1 of Section5206 and as directed by the Engineer. Subgrade preparation shall be done in accordance with Section 2201 and shall consist of aggregate for base course, stabilized subgrade, or compacted soil – in accordance with the associated Sections 2201, 2202, and 2203.

2102.2 Figure 2 - Deep Trenches Without Roadway Compaction Equipment, or Shallow Trenches Having Less than 30" of Cover

The following cross-sectional view of typical storm sewer trench construction under street, alley pavements, and entrances Figure 2, shall apply to all storm sewer backfill areas where deep trenches are not widened to allow heavy roadway compaction equipment. Figure 2 shall also apply to shallow (30" to 18" from top of pipe to bottom of pavement) roadway trenches:



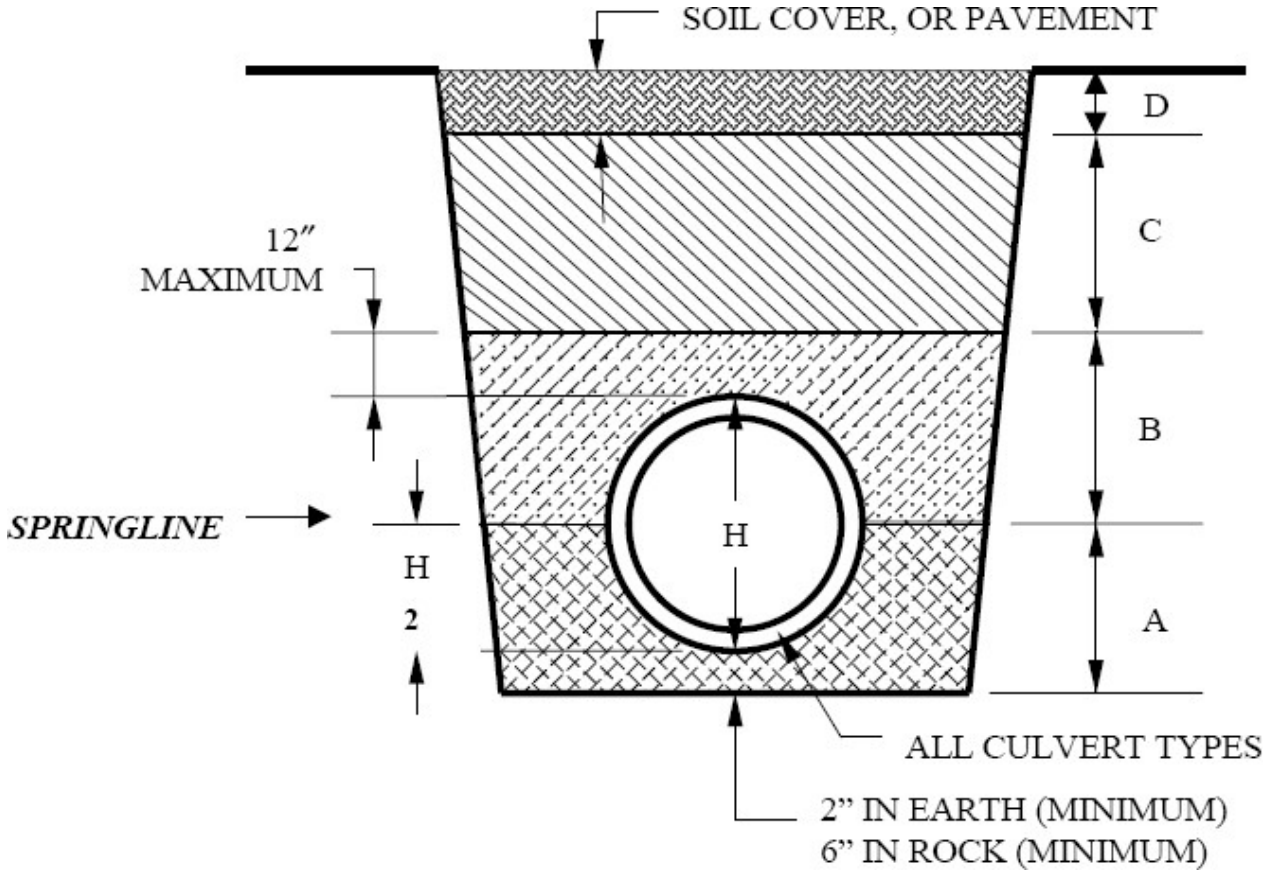
A- Consolidated granular bedding material.

B- Granular bedding material, hand compacted soil - 95% of max. density using ASTM D 698,or Flowable Backfill (CLSM). Maximum lift thickness 6”. Granular bedding material shall be used in Zone B for all pipe except reinforced concrete pipe.

C – Compacted Subgrade - Subgrade thickness shall be as specified in Table 1 of Section5206 and as directed by the Engineer. Subgrade preparation shall be done in accordance with Section 2201 and shall consist of aggregate for base course, stabilized subgrade, or compacted soil – in accordance with the associated Sections 2201, 2202, and 2203.

2102.3 Figure 3 - Trenches Outside of Street Pavements

Trench backfilling in areas other than street and alley pavements where the near edge of trench is behind the back of curb:



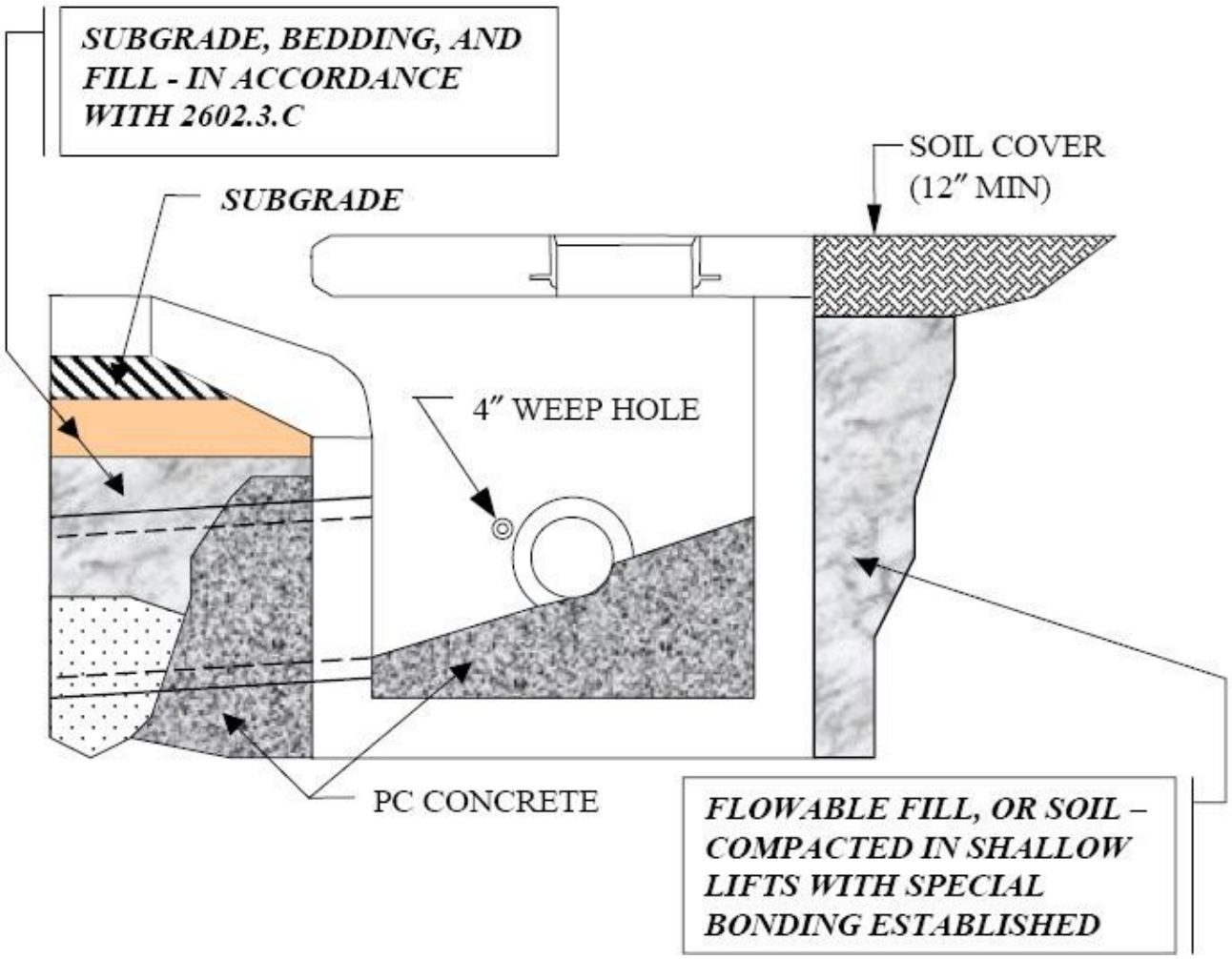
A – Consolidated granular bedding material.

B – Consolidated granular bedding material, flowable backfill (CLSM), or compacted soil –compacted to 90% of maximum density using ASTM D 698. Maximum lift thickness for thegranular or soil materials shall be six inches.

C – Consolidated granular bedding material, flowable backfill (CLSM), or compacted soil – compact to approximate density of adjacent soil but not less than 90% of maximum densityusing ASTM D 698. Lift thickness shall not exceed the capability of the equipment being utilized to achieve the proper density and consolidation; however, in no case shall it exceedsix inches for soil.

D – Soil Cover – Soil cover shall be as specified in Section 2102.7. The top twelve inchesshall be consolidated soil; the top six inches shall be topsoil suitable for sustaining grass.

2102.4 Figure 4 – Structures Adjacent to Street Pavements



Note: Weep hole shall be backed by filter fabric or hardware cloth, and 3 cubic feet of granular material.

END OF SECTION

TECHNICAL PROVISIONS

Section 2200

Paving



Unified Government of Wyandotte County

January 2022

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SECTION 2201 SUBGRADE PREPARATION

2201.1 Scope

This section governs the furnishing of all labor, materials and equipment for the preparation of subgrade as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions. This section includes subgrade preparation at locations which have been previously graded in accordance with the requirements of Section 2100 "Clearing, Grading, Excavation and Site Preparation".

2201.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

D 698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

2201.3 Definitions

A. Subgrade: Subgrade is defined as a well graded and compacted layer on which base and subsequent courses are placed.

B. Subgrade Preparation: Subgrade preparation is the repeated operation of fine-grading and compacting the subgrade until the specified lines, grades, and cross-section, as indicated on the Plans are obtained and the materials are compacted to the specified depth and density.

2201.4 Construction

A. General: The subgrade surface shall be brought to the specified lines, grades and cross-section by adding or removing material and compacting to the specified density. Tolerance allowed on all lines, grades and cross-sections shall be no more than 1/4 inch.

B. Compacting the Subgrade: Unless otherwise specified, the top 6 inches of subgrade for pavements shall be compacted to 95% of the standard proctor maximum density for the material used as determined by ASTM D 698 and within a tolerance of plus 3% and minus 3% of the optimum moisture content. The tolerance applies only to the top 6 inches.

C. Protection and Maintenance of Subgrade: The subgrade shall be protected from action of the elements or others. Any action (e.g. settlement or erosion) that damages the subgrade or any subgrade that has become unacceptable prior to placing the pavement thereon, shall be repaired and the specific lines, grades, cross-section, tolerance, density, and moisture content range reestablished.

D. Cleanup: Subgrade cleanup shall follow the work progressively. The Contractor shall remove from the project site all rubbish, surplus or discarded material, unsuitable material, and any equipment, tools and temporary construction items used for the preparation of the subgrade.

E. Roll Testing: Once the subgrade has been brought to the final plan elevation, but prior to approval of the subgrade for paving, all lanes shall be roll tested in their entire length. The subgrade will not be acceptable if rutting, pumping, or deformation of the subgrade results from the roll test. This testing will be done by the contractor and will be in addition to the applicable moisture and density testing.

Equipment for roll testing shall be a tandem dump truck (one front and two rear axles) carrying a minimum load of twenty (20) tons.

The truck shall proceed slowly along each traffic lane, allowing the Engineer to walk alongside and observe the results. Areas failing the roll test will be reworked and retested prior to approval of the subgrade for paving.

SECTION 2202 SUBGRADE STABILIZATION

2202.1 Scope

This section governs the furnishing of all labor, materials and equipment for the stabilization of subgrade as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions. This work shall consist of the addition of self-cementing fly ash or lime to soil, mixing and compacting the material to the required density to develop a stabilized subgrade section. This applies to natural ground or fills and shall be constructed as specified herein and in conformity with the typical sections, lines and grades as shown on the Plans or as established by the Engineer.

2202.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM
C 25 Standard Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
D 698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
D 5239 Standard Practice for Characterizing Fly Ash for Use in Soil Stabilization
D 6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

AASHTO
T 99 Standard Method of Test for Moisture-Density Relations of Soils Using a 5.5 lb. Rammer and a 12 inch Drop
M 216 Standard Specification for Lime for Soil Stabilization

2202.3 Materials

A. Fly Ash: Fly Ash shall comply with the physical requirements of ASTM D 5239, paragraph 6.4 maintaining a minimum compressive strength of 500 psi at 7 days and the chemical requirements of ASTM C 618, Table 1 for Class C fly ash, unless otherwise shown on the Plans. The source of the ash shall be selected by the Contractor and approved by the Engineer in advance of stabilization operations in order that the required laboratory tests can be completed prior to construction without delaying the work. Certification shall be provided by the supplier that the fly ash used on the project meets the above criteria. Fly ash shall be stored and handled in closed weatherproof containers until distribution. Fly ash exposed to moisture prior to mixing with soils shall be discarded.

B. Lime: Lime shall be hydrated or quicklime conforming to the requirements of AASHTO M 216. Contractor shall provide certification that the product complies. Hydrated lime shall contain not less than ninety (90) percent calcium hydroxide Ca(OH)2, and quicklime shall have a minimum available lime percentage (CaO) of 90%, as determined by ASTM C 25. Lime shall be introduced to the subgrade in a slurry form. When quicklime is used, slake it at the jobsite to manufacture hydrated lime slurry. The Contractor shall submit calculations to the Engineer that determines the amount of water needed to make a slurry with a percent solids between 20 and 40 percent. The Contractor will then determine the concentration strength of the lime slurry and the rate of application to obtain the lime percentage specified in the Contract Documents.

C. Water: Water used for mixing shall be clean and potable. For lime stabilization, it shall be added during mixing,

remixing and compaction operations, and during the curing period to keep the cured material moist until covered. If water is not included in the Contract Documents as a pay item, it is subsidiary to other Contract items.

D. Soil: The subgrade soil to be stabilized shall be uniform in quality and gradation and free from rubble, rubbish, vegetation, and stones larger than 1" diameter.

2202.4 Composition

Fly ash shall be applied at a rate determined by laboratory testing using the materials from the site and the specific fly ash to be supplied unless otherwise designated by the Contract Documents. Testing shall be the responsibility of the Contractor and is subsidiary to other items. The minimum application rate shall be 15% unless testing indicates otherwise.

Lime shall be applied at a rate determined by laboratory testing using the materials from the site and the specific lime to be supplied unless otherwise designated by the Contract Documents. Testing shall be the responsibility of the Contractor and is subsidiary to other items. The minimum application rate shall be 5% (by weight) unless testing indicates otherwise.

2202.5 Thickness

The thickness of the completed, compacted soil mixture shall be 6 inches or as called out in the Plans or Special Provisions. The thickness shall not be less than the specified minimum. Check thickness and when found to be ½ inch or more out of tolerance, the contractor shall correct the area represented by the checked location at no additional cost.

2202.6 Equipment

The machinery, tools, and equipment necessary for proper execution of the work shall be on the project and approved by the Engineer prior to beginning construction operations. Utilize spreading equipment capable of producing a consistent application rate. Blending of the soil mixture shall be accomplished by equipment with a recycling or mixing drum, positive depth control, and automatic water proportioning system that provides consistent results. Compaction shall be achieved using pneumatic or vibratory sheepsfoot or padfoot rollers capable of meeting the compaction requirements. Final surface compaction may be completed with a steel wheel or rubber-tired roller.

All machinery, tools and equipment use shall be maintained in a satisfactory and workmanlike manner.

2202.7 Construction

A. General: It is the primary purpose of this specification to secure a completed section of treated material which contains a uniform mixture with no loose or segregated areas, has a uniform density and moisture content and is well bound for its full depth. It shall be the responsibility of the Contractor to regulate the sequence of his/her work, to process a sufficient quantity of material to provide a completed section as shown on plans, to use the proper amounts of fly ash or lime, to achieve final compaction within the specified time, to maintain the work, and to rework the lifts as necessary to meet the above requirements.

B. Weather Limitations**:** The soil mixture shall not be mixed while the soil is frozen, the temperature is below 40°F or when conditions indicate that the atmospheric temperatures may fall below 40°F within 24 hours.

C. Preparation of Subgrade: Before other construction operations are begun, the area to be stabilized shall be cut and shaped in conformance with the lines and grades shown on the plans. All areas shall be firm and able to support, without displacement, the construction equipment and the compaction hereinafter specified. Soft or

yielding subgrade shall be corrected by the Contractor using a method approved by the Engineer.

D. Moisture Control: Moisture control shall be achieved through use of a controllable water additive system capable of being regulated to the degree necessary to maintain moisture contents within the recommended range.

1. For fly ash, the required moisture content will be established by laboratory tests with the site soils and specific fly ash to be used, determined in accordance with ASTM D 698 or AASHTO T 99. Laboratory testing shall be the responsibility of the Contractor and is subsidiary to other items. Final moisture content of the mix, immediately prior to compaction shall be +/- 3 percentage points of the optimum moisture content as determined by laboratory testing unless otherwise specified in the Contract Documents. If moisture contents exceed the specified limits, additional fly ash may be incorporated to lower moisture contents to the required limits. Lowering moisture contents by aeration following addition of fly ash will not be allowed.

2. For lime, the required final moisture content of the lime-soil mix will be established by laboratory tests with the site soils and specific lime to be used, determined in accordance with ASTM D 698 or AASHTO T 99. Laboratory testing shall be the responsibility of the Contractor and is subsidiary to other items. During mixing and compaction operations, the moisture content of the mix shall be a minimum of 3 percentage points above the optimum moisture content as determined by laboratory testing, unless otherwise specified in the Contract Documents. After completion of the preliminary mixing operation and during the aging period, the surface shall be kept moist by spraying with water. Following the final mixing operation and compaction, the surface shall be kept moist by spraying with water until covered by a subsequent layer of material or sealed with a bituminous prime coat applied at a minimum rate of 0.15 gallons per square yard. Other curing methods may be submitted by the Contractor for consideration by the Engineer.

E. Application of Material

1. Fly Ash: Immediately prior to application of fly ash, the areas shall be scarified to allow for uniform distribution. The use of scarification equipment with positive depth control is required and should be performed to a depth between four inches (4”) and one inch (1”) less than the specified depth of treatment. The fly ash shall be spread only on that area where the placement, mixing and compaction operations can be completed within 2 hours.

   The fly ash shall be spread uniformly over the top of the subgrade – the use of a controlled application system approved by the Engineer is preferred but the Contractor may submit an alternate method of spreading for approval that provides uniform distribution at the specified rate of application. The amount of fly ash spread shall be the amount required for mixing to the specified depth which will result in the percentage determined by laboratory testing as described in section 2202.4 Composition.

   The fly ash shall be distributed in a manner that reduces the scattering of fly ash by wind to a minimum. Fly ash shall not be applied when wind conditions, in the opinion of the Engineer, are detrimental to a proper application or becomes objectionable to adjacent property owners.

   The mixing operation shall be completed within 30 minutes of the addition of water to the subgrade.

2. Lime: Immediately prior to the application of the lime, the areas shall be scarified to allow for uniform distribution. The use of scarification equipment with positive depth control is required and should be performed to a depth between four inches (4”) and one inch (1”) less than the specified depth of treatment.

   Lime slurry is to be applied with equipment that can regulate the amount passing through the nozzles

and the speed of travel to place the specified amount on the soil with a uniform lime distribution. The concentration of the lime slurry should allow for the application of the correct quantity of lime without adding an undue amount of excess moisture. The Contractor is responsible for testing the concentration of the lime suspension a minimum of once per day or once per batch, whichever is greater.

Application of the lime slurry should occur on the same day the slurry is produced. Continuously agitate the lime slurry once it is produced.

F. Mixing

1. Fly Ash: The full depth of the treated subgrade shall be mixed with a rotary pulvamixer which utilizes a direct hydraulic drive. Fly ash shall not be left exposed for more than 30 minutes after distribution. Water shall be added through a spray bar in the mixing drum capable of uniformly applying sufficient quantities of water to achieve the required moisture content of the soil-fly ash mixture. The system shall be capable of being regulated to maintain moisture contents within the recommended range.

   Mixing shall continue until a homogeneous, friable mixture with zero clods greater than 1-1/2" in size remain and no more than 50% of the mixture is retained on a ½" sieve.

2. Lime: The mixing process for lime includes preliminary mixing, aging, and final mixing. The preliminary mixing should occur immediately following the introduction of the lime slurry to the subgrade. The equipment used for mixing shall have positive depth control with a visual depth indicator and be capable of mixing the full specified depth of treatment to within ½" tolerance. The mixing equipment should also have a travel speed indicator and controllable water additive system. Preliminary mixing shall continue until the material is uniformly mixed, at a minimum moisture content of 3% above optimum and with zero clods greater than 2" in size remaining. Perform a minimum of two passes over all treated areas with the mixer. Upon completion of the preliminary mixing, seal the mixture to prevent moisture loss by lightly rolling with a pneumatic or steel drum flat roller.

   Aging should occur for a minimum of 24 hours and a maximum of 72 hours unless approved otherwise by the Engineer.

   Following the aging period, the final mixing is performed by re-mixing the entire treated area until the mixture contains zero clods greater than 1.5" and has 95% of the mixture passing the 1" sieve and 60% of the mixture passing the No. 4 sieve. The mixture should be brought to a moisture content of a minimum of 3% above optimum for compaction.

G. Compaction

1. Fly ash: Compaction of the soil-fly ash mixture shall begin immediately after mixing of the fly ash and be completed within two hours following incorporation of fly ash. Compaction of the mixture shall continue until the entire depth of mixture is uniformly compacted to the specified density using vibratory sheepsfoot or pad foot rollers. A pneumatic rubber tire or smooth wheel steel drum roller may be used to complete the compaction of the surface. A test for both density and moisture content of the soil-fly ash mixture shall be taken for each 750 square yards of material placed with a minimum of one test per day of production. The field density of the compacted mixture shall be at least 95 percent of the maximum density established by laboratory tests using the site soils and specific fly ash to be used, determined in accordance with ASTM D 698. Laboratory testing shall be the responsibility of the Contractor and is subsidiary to other items.

   The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 6938. When ASTM D 6938 is utilized for testing purposes, the nuclear gauge shall be calibrated within the

last year. Calibration and operation of the gauge shall be in accordance with the requirements of the manufacturer. The operator of the nuclear gauge must show evidence of training and experience in the use of the instrument. The gauge shall be standardized daily in accordance with ASTM D 6938, paragraph 8.

Final acceptance of the compaction is dependent upon passing visual roll testing. This will be observed and approved by the Engineer. All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required and remixing and re-compacting with additional fly ash if beyond the 2 hour limit. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

Should the material, due to any reason or cause, lose the required stability, density and finish before the work is accepted, it shall be reprocessed, recompacted and refinished at the sole expense of the Contractor. Reprocessing shall follow the same pattern as the initial stabilization including the addition of fly ash.

2. Lime: Compaction of the soil-lime mixture shall begin immediately after final mixing. Compaction of the mixture shall continue until the entire depth of mixture is uniformly compacted to the specified density using vibratory sheepsfoot or pad foot rollers. A pneumatic rubber tire or smooth wheel steel drum roller may be used to complete the compaction of the surface. A test for both density and moisture content of the soil-lime mixture shall be taken for each 750 square yards of material placed with a minimum of one test per day of production. The field density of the compacted mixture shall be at least 95 percent of the maximum density established by laboratory tests using the site soils and specific lime to be used, determined in accordance with ASTM D 698. Laboratory testing shall be the responsibility of the Contractor and is subsidiary to other items.

   The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D 6938. When ASTM D 6938 is utilized for testing purposes, the nuclear gauge shall be calibrated within the last year. Calibration and operation of the gauge shall be in accordance with the requirements of the manufacturer. The operator of the nuclear gauge must show evidence of training and experience in the use of the instrument. The gauge shall be standardized daily in accordance with ASTM D 6938, paragraph 8.

   Final acceptance of the compaction is dependent upon passing visual roll testing. This will be observed and approved by the Engineer. All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required and remixing and re-compacting.

   The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereon or the work is accepted.

   Should the material, due to any reason or cause, lose the required stability, density and finish before the work is accepted, it shall be reprocessed, recompacted and refinished at the sole expense of the Contractor.

H. Finishing (Trimming) & Curing

1. Fly ash: After each layer or course of the fly ash treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The finished surface of the final layer shall not vary more than 3/8 inch when tested with a 10-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor, at his/her own expense, in a manner satisfactory to the Engineer.

After the fly ash treated course has been finished as specified herein, the surface shall be protected against rapid drying by one of the following methods for a period of not less than three days or until the pavement section is placed.

a. Maintain in a thorough and continuously moist condition by sprinkling with water.
b. Apply an asphalt prime coat emulsion curing seal approved by the Engineer at a rate of 0.15 gallons per square yard.
c. Other options for maintaining moisture may be submitted in writing for approval by the Engineer.

Restrict construction traffic from operating on the treated subgrade until it can withstand the loads without damage or deformation.

Protect the treated subgrade from freezing throughout the protection period.

2. Lime: After each layer or course of the lime treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The finished surface of the final layer shall not vary more than 3/8 inch when tested with a 10-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor, at his/her own expense, in a manner satisfactory to the Engineer. After the lime treated course has been finished as specified herein, the surface shall be cured by one of the following methods for a period of not less than three days and maintained until placement of the subsequent course (base or pavement) or up to seven days, whichever occurs first:

a. Maintain in a thorough and continuously moist condition by sprinkling with water.
b. Apply an asphalt prime coat emulsion curing seal approved by the Engineer at a rate of 0.15 gallons per square yard.
c. Other options for a curing seal may be submitted in writing for approval by the Engineer.

Restrict all construction traffic (except watering equipment) from operating on the treated subgrade during the curing period. Restriction may be lifted after three days if treated subgrade has gained sufficient strength to withstand the loads without damage or deformation.

Protect the subgrade from freezing throughout the curing period.

I. Maintenance: The contractor shall maintain, at his/her own expense, the entire treated subgrade in good condition from the start of work until all the work has been completed, cured, and the pavement is placed.

SECTION 2203 AGGREGATE BASE COURSE

2203.1 Scope

This section governs the furnishing of all labor, materials and equipment for the placement of aggregate base course and underdrains, including pipe, geotextiles and granular filter material as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2203.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
C 33 Standard Specification for Concrete Aggregates
C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 117 Test Method for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing
C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates C
142 Test Method for Clay Lumps and Friable Particles in Aggregates
C 150 Standard Specification for Portland Cement
D 75 Practice for Sampling Aggregates
D 695 Test Method for Compressive Properties of Rigid Plastics
D 1621 Test Method for Compressive Properties Of Rigid Cellular Plastics
D 2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D 3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
D 4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D 4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
D 4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
D 5821 Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
F 758 Standard Specification for Smooth-Wall Polyvinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

AASHTO

M 252 Corrugated Polyethylene Drainage Tubing
T 99 The Moisture-Density Relations of Soils Using a 5.5-lb. (2.5 kg) Rammer and a 12-in. (305 mm) Drop

2203.3 Materials

A. Untreated Compacted Aggregate: This base course material shall consist of crushed stone aggregate with not more than 1.0% clay lumps and friable particles in accordance with ASTM C 142, and free from vegetable or other deleterious substances. The abrasion loss shall be no more than 35% when tested in accordance with ASTM C 131. That fraction passing the 1 inch sieve and retained on the No. 4 sieve shall have a loss not greater than 18% by weighted average for magnesium sulfate method (12% maximum loss if tested using sodium sulfate method) of ASTM C 88 Soundness Test at 5 cycles. That fraction of the material passing the 1-inch sieve and retained on the No. 4 sieve shall contain less than 20% by weight of flat and elongated particles

when tested in accordance with ASTM D 4791 (flat being a ratio of 1 to 3 between thickness and least width and a ratio of 1 to 3 between the least width and length). The material shall consist of angular particles with no less than 90% of particle count having two or more fractured surfaces. The gradation in percentages by weight passing square mesh sieves shall be in accordance with ASTM C 136 and as follows:

Sieve Designation (Square Opening)	Percentage by Weight Passing Sieve
1-1/4 in (31.5 mm)	100
1 in (25.0 mm)	72 – 100
3/4 in (19.0 mm)	60 – 90
3/8 in (9.5 mm)	43 – 74
No. 4 (4.75 mm)	28 – 60
No. 10 (2.00 mm)	16 – 40
No. 40 (425 um)	3 – 22
No. 200 (75 um)	0 – 15

In addition to the above limits, the difference between the "Percent Passing Square Mesh Sieve" of successive sieve sizes shall not exceed 25 percent.

That fraction of the material passing the No. 40 sieve shall have a plasticity index not to exceed 8 when tested in accordance with ASTM D 4318.

B. Drainable Base: All drainable base materials shall have a minimum coefficient of permeability of 1000 ft/day as determined by the test method described in 2203.4.E Permeability Test Procedure.

1. Portland Cement Concrete Drainable Base: This item shall consist of an open-graded drainable base composed of mineral aggregate, Portland cement and water mixed in a central mixing plant and placed on a prepared course in accordance with these specifications and shall conform to the lines, grades, thicknesses and typical cross sections shown on the Plans.

    a. Coarse Aggregate
        i. General: Coarse aggregate shall be 3/4 inch maximum size consisting of crushed gravel or crushed stone and shall meet the requirements of ASTM C 33 and quality requirements of 2203.3.A.
        ii. Gradation shall be ASTM C 33, Size 67.
    b. Fine Aggregate: Fine aggregate shall consist of natural sand or manufactured sand meeting the requirements of ASTM C 33.
    c. Cement: Portland cement shall conform to the requirements of ASTM C 150, Type I or Type **II.** Substitution of fly ash or other pozzolan for Portland cement shall be in conformance with Section 2208.
    d. Water: Water used in mixing or curing shall be clean and free of oil, salt, acid, alkali, sugar, vegetable or other substances injurious to the finished product as possible. Water known to be of potable quality may be used without testing.
    e. Admixtures: The use of any material to be added to the mixture shall be approved by the Engineer.
    f. The Contractor shall furnish vendor's certified test reports for the materials used in the project. The report shall be delivered to the Engineer as part of the mix design before permission to use the materials is granted.
    g. Proportions: The Contractor shall submit a mix design containing the quantity of each material to the Engineer including certifications of materials used. The Contractor will be responsible for preparing the drainable base mix design at no cost to the Owner. The testing laboratory preparing the mix design shall comply with Section 2203.3.B.2.e. The mix design shall include

the following:

Cement Content
Water-Cement Ratio - Approximately 0.36
Coarse Aggregate
Fine Aggregate
All Admixtures
Coefficient of Permeability - Tested per Section 2203.4.E

h. Compressive Strength: Proportions will be such to produce a compressive strength of 800 psi in 28 days as determined by test cylinders made in accordance with ASTM C 31 and tested in accordance with ASTM C 39. A strength of 500 psi will be required prior to any traffic being allowed on the surface.

2. Plant Mix Bituminous Drainable Base: This item shall consist of an asphalt stabilized drainable base course composed of mineral aggregate and bituminous material mixed in a central mixing plant and placed on a prepared course in accordance with the specifications and shall conform to the lines, grades, thicknesses, and typical cross sections shown on the Plans. Each course shall be constructed to the depth, typical section, or elevation required by the Plans and shall be rolled, finished, and approved before the placement of the next course. A prime coat will be used on the subbase prior to placement of the first course, and no tack coat will be used between courses.

a. Aggregate: Aggregate shall consist of crushed stone or crushed gravel and be free of organic materials.
   i. Coarse Aggregate: Coarse aggregate shall comply with Section 2203.3.A except wear may not exceed 50 % in accordance with ASTM C 131.
   ii. Aggregate shall contain at least 70% by weight of individual pieces having two fractured faces and 85% by weight having at least one fractured face as determined by ASTM D 5821.
   iii. The aggregate shall not contain more than 8%, by weight, of flat and elongated pieces, when tested in accordance with ASTM D 4791 (ratio = 5:1).
   iv. Sampling: ASTM D 75 shall be used in sampling the coarse aggregate.

b. Bituminous Material: The asphalt cement shall be in conformance with Section 2205.3.A. The type and grade of asphalt used shall be specified in the mix design but shall not be lower than a PG 64-22.

c. Preliminary Material Acceptance: Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

Coarse Aggregate - Percent of wear, soundness.

Bituminous Material - The certification(s) shall show the appropriate ASTM test(s) for each material, the test results, and a statement that the material meets the specification requirements.

d. Job Mix Formula. (JMF): No bituminous mixture for payment shall be produced until the Engineer has approved a JMF in writing. The method of determining the proper asphalt content is to store the mix trial batches in the laboratory overnight (15-18 hrs) at 140°F. The proper asphalt content will then be selected visually.

The asphalt content mix is selected from the batch from which a small amount of asphalt drains to the bottom of the pan and the mix still appears glossy. A heat resistant, clear glass dish may be used for better visibility of the drained asphalt. The asphalt content may be

varied as necessary during construction to meet this requirement.

The aggregate shall be of such size that the percentage composition by weight will conform to the gradation of gradations specified in Table 2, when tested in accordance with ASTM C 117 and C 136. The gradation shall be on the coarse side of the Master Band.

TABLE 2. PLANT MIX BITUMINOUS DRAINABLE BASE MASTER GRADATION	
Sieve Designation (Square Opening)	Percent by Weight Passing Sieve
1-1/2 in (37.5 mm)	100
1 in (25.4 mm)	90 – 100
3/4 in (19.0 mm)	75 – 100
1/2 in (12.5 mm)	70 – 90
3/8 in (9.5 mm)	50 – 70
No. 4 (4.75 mm)	20 – 40
No. 8 (2.36 mm)	15 – 25
No. 30 (637 um)	5 – 15
No. 200 (75 um)	0 – 3

Recommended Asphalt Cement Content 2.0% – 3.5%

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the supply source.

The job mix tolerance shown in Table 3 shall be applied to the JMF to establish a job control-grading band. The resulting job control grading band must comply with the Master Gradation criteria.

TABLE 3. JOB MIX FORMULA TOLERANCES (Based on Single Test)	
Material	**Tolerance Plus or Minus**
Aggregate passing No. 4 (4.75 mm) sieve or larger	5.00%
Bitumen*	0.40%
Temperature*	20 degrees F

*Unless otherwise approved by the Engineer.

The aggregate gradation may be adjusted within the limits of Table 2 as directed, without adjustments in the Contract unit prices.

Should a change in sources of materials be made, a new JMF shall be established before the new material is used.

Dry aggregate gradations will be made at least twice daily. The aggregate gradation shall be tested by the Contractor in accordance with ASTM C 117 and C 136 and the results submitted to the Engineer within 24 hours.

The JMF shall be submitted in writing by the Contractor and approved by the Engineer prior to the start of paving operations. The job mix shall have been prepared no more than 12 months prior to submittal and shall include as a minimum:

Percent passing each sieve
Percent of asphalt cement
Asphalt designation and certifications
Mixing temperature
Compaction temperature
Temperature of mix when discharged from the mixer
Percent fractured faces
Percent elongated particles

The Contractor shall submit samples to the Engineer, upon request, for job mix formula verification testing.

e. Testing Laboratory: The laboratory used to develop the JMF formula shall meet the requirements of ASTM D 3666.

C. Underdrains: Underdrains shall consist of the following materials unless otherwise specified in the Plans, Standard Drawings, or Contract Documents.

1. Aggregate: Blanket underdrain aggregate and pipe underdrain aggregate shall be clean or washed aggregate and conform to requirements of Section 2203.3.A with the following gradations:

TABLE 4. BLANKET UNDERDRAIN AGGREGATE	
Sieve Designation (Square Opening)	Percent by Weight Passing Sieve
1-1/2 in (37.5 mm)	100
1 in (25.4 mm)	90 – 100
3/4 in (19.0 mm)	60 – 90
3/8 in (9.5 mm)	-----
No. 4 (4.75 mm)	20 – 40
No. 8 (2.36 mm)	-----
No. 16 (1.2 mm)	0 – 10
No. 30 (0.6 mm)	-----
No. 50 (0.3 mm)	0 – 7
No. 100 (150 um)	0 – 2

TABLE 5. PIPE UNDERDRAIN AGGREGATE	
Sieve Designation (Square Opening)	Percent by Weight Passing Sieve
1-1/2 in (37.5 mm)	-----
1 in (25.4 mm)	-----
3/4 in (19.0 mm)	100
3/8 in (9.5 mm)	85 – 100
No. 4 (4.75 mm)	-----
No. 8 (2.36 mm)	40 – 60
No. 16 (1.2 mm)	-----
No. 30 (0.6 mm)	5 – 30
No. 50 (0.3 mm)	-----
No. 100 (150 um)	1 – 2

2. Underdrain Pipe

a. Polyvinyl chloride pipe shall meet the requirements of ASTM F 758/D 3034.
b. Corrugated Polyethylene Tubing may be used only outside of traffic areas and driving surfaces. The tubing shall be the heavy duty type and shall meet the requirements of AASHTO M 252. In addition, the tubing shall have a minimum pipe stiffness of 30 psi at 10% deflection.
c. All underdrain pipes shall have a nominal minimum inside diameter of six inches unless shown otherwise on the Plans.
d. Perforations shall be approximately circular and cleanly cut; shall have nominal diameters not less than 3/16-inch nor more than 3/8-inch; and shall be arranged in at least two rows parallel to the axis of the pipe.
e. Fittings shall be of the same composition and have the same physical properties as the pipe and shall not restrict flow.

3. Geocomposite Edge Drain

a. Edge drain shall consist of a plastic core completely surrounded by geotextile. The core shall provide a minimum of 10 percent open area to facilitate water entry or cross flow and shall be composed of plastic which is physically and chemically stable under a normal range of conditions.
b. The edge drain shall have nominal dimensions of 1 to 1-1/2 inches in thickness and 12 inches in height.
c. The edge drain shall have a minimum flow capacity of 15 gallons per minute per foot of width as determined by ASTM D 4716 when tested under a confining stress of 10 psi or more at a gradient of 0.1 or less.
d. The edge drain shall have a minimum compressive strength of either 7,000 psf at a maximum deformation of 10 percent of the original thickness when tested in accordance with ASTM D 1621, or 8,000 psf at a maximum deformation of 20 percent when tested in accordance with ASTM D 695.
e. Geotextile shall have an apparent opening size (AOS) corresponding to a U.S. sieve number greater than 50 but not exceeding 100.

4. Geotextile: Geotextile for use with pipe and edge underdrains shall be a nonwoven geotextile and shall meet the requirements of Section 2605.2.C.

2203.4 Construction

A. Untreated Compacted Aggregate

1. Subgrade: Prior to placement of base course material the previously prepared subgrade surface shall be cleared of all foreign substances and restored in shape, tolerance and density as specified in Section 2201 entitled "Subgrade Preparation".

2. Material Placement: The material shall be uniformly spread in successive layers to such depth that when compacted, the base will meet the minimum thickness specified. The Contractor may construct the base in any number of layers that he chooses except that in no case shall any individual layer have a compacted thickness of more than 6 inches. Each layer shall be compacted as hereinafter specified before any succeeding layer is placed.

3. After spreading a layer of material, water in an amount sufficient to insure the desired compaction shall be added and uniformly mixed with the aggregate in a manner to prevent segregation. Excess moisture resulting in runoff shall be avoided. If for any reason, the material and subgrade become too wet to permit satisfactory work, they shall be allowed to dry to a moisture content that will permit

satisfactory work.

4. The material shall meet the required specifications immediately before compaction operations are commenced. If, for any reason, segregation occurs in excess of 10% variation from the gradation required by this specification or the materials become contaminated, such segregated or contaminated materials shall be removed and replaced with suitable materials at the expense of the Contractor. The limited segregation of 10% variation will be ascertained by a sieve analysis of a minimum 100 pound sample taken from the in-place base course.

5. However, for untreated compacted aggregate base, segregated surface areas may be corrected by adding limestone screenings of such gradation and quantity as required to fill the surface voids and firmly bind the loose material in place. Screenings so used in correcting segregated surface areas will be subsidiary.

6. Shaping and compacting shall be carried on continuously until a true, even and uniform surface of proper grade and cross-section is obtained, and until the density of the complete base is at least95% of maximum density as determined by AASHTO T 99. The proper moisture content shall be maintained by wetting the surface as required during shaping and compacting operations. Final rolling shall be accomplished by use of a self-propelled smooth-wheeled roller.

B. Portland Cement Concrete Drainable Base

1. Spreading: The base material shall be spread to the lines and grades shown on the Plans. Any material which becomes mixed with soil or other contaminants shall be removed and replaced with fresh mixture.

2. Compaction: After spreading and/or trimming, the base material shall be uniformly compacted by making a minimum of 2 coverages with a steel wheeled roller meeting the requirements of Section 2205.8.B. The compaction process may be adjusted on the project by the Contractor with approval of the Engineer to assure uniform compaction of the drainable base material. In areas not accessible by the roller, the base material shall be compacted by mechanical hand methods. Compaction must be completed within 2 hours of the time water is introduced to the mixture.

3. If after spreading and compacting the base is not to the required lines and grade, the Contractor shall trim the base by means of an electronically controlled machine utilizing string line controls for grade. The Engineer reserves the right to direct the Contractor to suspend all operations if the Contractor produces excessive fines in the trimming process which are viewed by the Engineer to be detrimental to the permeability of the base. Appropriate corrections to the trimming process shall be made by the Contractor prior to beginning again.

4. After compaction of the drainable base, the Contractor shall protect the surface from damage and/or contamination. If the integrity of the drainable base is disturbed at any time prior to placement of the succeeding pavement course the area shall be removed and replaced with new material and compacted to conform to the original lines and grades at the Contractor's expense. Any removed material shall not be reincorporated into the drainable base or other drainage features.

5. Curing Of The Drainable Base Material: The Contractor will be required to provide a curing plan to the Engineer.

6. Temperature Limitations: The air temperature must be between 50°F and 90°F for drainable base construction. The Engineer may order operations to cease in hot windy conditions if it appears the mixture is drying out prior to achieving initial set.

7. Construction Joints: The formation of all joints shall be made in such a manner as to ensure a continuous bond between old and new sections of the course. All joints shall present the same texture and smoothness as other sections of the course.

8. All contact surfaces of previously constructed courses shall be cleaned of all dirt or other objectionable materials, and thoroughly moistened with water prior to placing the new material.

9. Thickness: The thickness of the base course may be measured by cores taken at intervals determined by the Engineer.

C. Plant Mix Bituminous Drainable Base

1. Test Section: Prior to full production, the Contractor shall prepare and place a section of drainable base according to the JMF. The amount of mixture should be 80 tons and may be placed as part of the project. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the course represented by the test section.

2. Two random samples of mixture may be taken at the plant and tested for aggregate gradation and asphalt content. The test section shall be considered acceptable if the gradation and asphalt content are within the limits specified in Tables 2 and 3.

3. If the initial test section should prove to be unsatisfactory to the Engineer, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. If the second test section also does not meet specification requirements, both sections shall be removed at the Contractor's expense. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Any additional sections that do not conform to specification requirements shall be removed at the Contractor's expense. Full production shall not begin until a satisfactory section has been constructed and accepted by the Engineer. The test sections that meet the specification requirements shall be paid for in accordance with project quantities.

4. The Contractor shall perform job mix control testing at the start of plant production and in conjunction with the calibration of the plant for the JMF. It should be recognized that the aggregates produced by the plant may not satisfy the gradation requirements or produce a mix that exactly meets the JMF. In those instances, it will be necessary to reevaluate and redesign the mix using plant-produced aggregates. Specimens should be prepared and the optimum bitumen content determined in the same manner as for the original design tests.

5. Weather Limitations: The bituminous mixture shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than 40 degrees F or the wind chill factor is less than 35 degrees F. The temperature requirements may be waived by the Engineer; however, all other requirements including compaction shall be met.

6. These materials will be placed, handled, hauled and accepted based on requirements of Section 2205.

D. Underdrains

1. General: Underdrains shall be constructed as shown on the Plans or Standard Drawings. The exact location and layout of underdrains and/or edge drains as shown on the Plans shall be subject to revision by the Engineer during construction.

2. Excavation

a. Trenches for all lateral and longitudinal underdrains shall be excavated to the dimensions, depths and elevations shown on the Plans or Standard Drawings or as ordered by the Engineer. In case of a conflict, where the actual elevation of the strata or stratum to be intercepted is found to vary from Plan elevation, the stratigraphy shall govern in the installation of underdrains.
b. Trench bottoms for perforated pipe underdrain and edge drain shall be in firm material (no mucky or soupy condition existing) and constructed to permit the placing of three inches (3") of aggregate underneath the pipe. If unstable material is encountered in the bottom of the trench, the trench shall be over excavated to firm material.
c. Minimum width of trench shall be as shown in the Plans or in the specifications or the Standard Drawings.

3. Laying Pipe

a. All underdrain pipe shall be laid carefully to Plan line and grade.
b. All pipe shall be laid on a minimum grade of one percent unless otherwise shown on the Plans.
c. All dead ends of pipe underdrains shall be completely closed with a cap of the same material as the pipe.
d. All junctions and turns shall be made with wyes, tees, and bends as supplied by the manufacturer of the pipe.
e. Perforations shall be laid down unless otherwise indicated on the Plans.

4. Installing Edge Drain

a. Installation shall be in accordance with manufacturer's instructions.
b. Each length of drain shall be joined to the adjacent length prior to installation. Splices shall keep adjoining lengths in proper alignment, shall not separate during installation, shall have the same or greater compressive strength than the geocomposite drain, and shall be sealed against infiltration of backfill material.
c. Drain shall be placed in the center of the trench and held in place with a temporary support while blanket underdrain aggregate backfill is placed.
d. The placement of the edge drain and the first lift of backfill shall be accomplished in a single continuous operation.

5. Backfilling

a. Backfilling the trenches of lateral and longitudinal underdrains shall not be started until approved by the Engineer.
b. The trenches shall be backfilled to the specified elevations and in accordance with the Plans, specifications or Standard Drawings.
c. The backfill material shall be placed in such a manner as to prevent formation of large cavities in the backfill and walls of the trench.
d. Overbreakage due to blasting of rock in trench excavation and widening due to caving of trench walls or overbreakage at construction outcrops shall be backfilled with aggregate approved by the Engineer.

E. Permeability Test Procedure for Drainable Base

This test method is used to determine the permeability of unbound and bound aggregate base material. Bound base material will use Portland cement or asphaltic cement as a cementing agent.

1. Unbound Base and Base Bound with Portland Cement

    a. Apparatus

        i. Mold: A cylindrical metal mold with an approximate inside diameter of 6" and a minimum height of 6". The mold shall be equipped with a removable collar at least 2" in height and a removable base plate. The base plate may be used as part of the permeability test equipment. If so, the base plate must exceed the permeability of the material being tested. A #40 screen shall be placed on top of the base plate to prevent test material from being lost through the base plate during compaction and permeability testing.

        ii. Standpipe: A standpipe with the same diameter as the removable collar for the mold with a minimum height of 8.5". The standpipe shall be equipped with an overflow outlet.

        iii. Rammer: A mechanically operated metal rammer equipped to control the height of drop to 12" plus or minus 1/16" above the elevation of the sample. The rammer shall be equipped to distribute the blow uniformly over the sample surface. The rammer shall have a rigid flat faced "pie shaped" foot and a nominal weight of 5.50 lbs. The "pie shaped" foot shall be a sector of 6" diameter circle and shall have an area equal to that of a 2" circular foot.

        iv. Straight edge: A rigid steel straight edge with one edge beveled, at least 8" in length.

    b. Sample preparation

        i. Obtain a 50 lb. to 60 lb. sample, dry if necessary.

        ii. Mix a sufficient amount of aggregate and cementing agent, if required, to fill the mold 1 and 1/2 times.

        iii. Add the appropriate amount of water and thoroughly mix.

        iv. Place the assembled mold on the rigid base and fill approximately 1/2 full of the loose moist material. Compact the layer with 25 blows of the rammer with the blows being distributed uniformly over the surface of the layer. Place three additional approximately equal layers of material in the mold and compact each layer in a similar manner (four layers total).

        v. After the fourth layer has been compacted, remove the collar and trim excess material level with top of the mold.

        vi. Cure Portland cement treated specimens by covering with plastic, to prevent drying for 3 days at room temperature.

        vii. Unbound specimens do not need to be cured before testing.

2. Asphalt Bound Aggregates

    a. Apparatus

        i. Mold: A cylindrical mold with an inside diameter of approximately 6" and a minimum length of 4.5". The mold is open at each end and is equipped with a removable collar and a base plate about 0.5" thick.

        ii. Specimen Mold Holder: The specimen mold holder has a semi-circular base and a flanged top to hold the specimen mold in place during the compaction process. Any equivalent hold down device that performs the same function is satisfactory.

        iii. Compaction Hammer: The compaction hammer consists of a hammer having a flat circular tamping face 5.88" in diameter and appropriate extension rod with handle which acts as guide for a free falling weight. The weight shall weigh 22.5 lbs. and have a free fall of 18" plus or minus 0.1". The hammer may be operated manually or

be driven with a motor.

iv. Compaction Pedestal: The compaction pedestal is a wood block approximately 12" x 12" x 18". A 12" x 12" x 1" steel plate is securely fastened to the top of the block. The pedestal is set on and securely fastened to a solid concrete slab with the vertical axis plumb and the top level.

v. Heating Equipment: Ovens or hot plates for heating aggregates, bituminous material, specimen molds, compaction hammers and other associated items required for mixing and molding. It is recommended that, when possible all heating units be thermostatically controlled to maintain the required temperature within ±5°F. Suitable shields, thick steel plates or pans of sand shall be used on the surfaces of hot plates to minimize locally overheating.

vi. Mixing Apparatus: Mechanical mixing is recommended. Any type of mechanical mixer may be used provided it will produce a well coated, homogeneous mixture of the required amount in the allowable time and further that the mixing paddle or whip does not fracture or pulverize aggregate fractions during the mixing process. The bowl employed with the mixer shall be such a nature that essentially all of the batch can be removed. More than one mixing bowl is recommended unless the mixer is equipped with a heating jacket to keep the bowl heated during the mixing process.

b. Determination of Mixing and Compacting Temperature

i. The temperature to which the asphalt cement must be heated to produce a viscosity of 85 ± 10 SFS shall be the mixing temperature.

ii. The temperature to which the asphalt cement must be heated to produce a viscosity of 130 ± 15 SFS shall be the compacting temperature.

c. Sample Preparation for Laboratory Prepared Mix

i. Combine the dry individual aggregates to produce desired combined aggregate with a batch weight of approximately 8.9 lbs. This should be sufficient to produce a compacted specimen 3.75 ± 0.125 inches thick. Adjust the weight of the batch as needed to produce a compacted specimen of 3.75 ± 0.125 inches thick.

ii. Prepare a minimum of two aggregate and asphalt specimens. The first specimen shall be mixed and thrown away. This sample is to "butter" the mixing bowl and paddle and thus reduce material loss when mixing the test specimen.

iii. Heat the aggregate and asphalt within the limits of mixing temperature determined in Section 2203.4.E.2.b. Charge the mixing bowl with the heated aggregate and form a crater in the top. Add the required amount asphalt and mix the aggregate and asphalt until coated at least 2 minutes. Care should be taken to keep all of the sample in the mixing bowl during this process.

d. Compaction of Specimen

i. Prior to the addition of the asphalt to the batches, thoroughly clean the specimen mold assembly and the face of the compaction hammer and heat the mold assembly and hammer to a temperature between 200°F and 350°F. Assemble the mold, base plate and collar and place a paper disc cut to size in the bottom of the mold.

ii. Place the hot batch of aggregate-asphalt mixture in the mold, spade vigorously with a heated spatula or trowel 15 times around the perimeter and 10 times over the interior of the mold. Smooth the surface of the mix to a slightly rounded shape. The temperature of the mix prior to compaction shall be within the limits in Section 2203.4.E.2.b. Place a paper disc on top of the mix.

iii. Place the mold assembly, including the collar, on the pedestal, fasten securely with the mold holder and apply 20 blows with the compaction hammer. Each blow must have the prescribed free fall of 18" with the axis of the compaction hammer held perpendicular to the base of the mold assembly during the compaction process. Remove the base plate and collar, and reverse and reassemble the mold. Apply the specified number of blows to the reversed specimen. After compaction remove the mold assembly from the pedestal, remove the collar and base plate and cool the

specimen in the mold until the mold can be handled comfortably with bare hands. Asphalt treated samples do not need to be cured before testing, only cool to the touch.

3. Test Procedure

a. Assemble test equipment, base plate, mold with specimen, and standpipe.

b. Prior to conducting the test, allow a sufficient amount of water to pass through the specimen to cause all air to be expelled from the specimen. (Establish reservoir around the base with water open to atmospheric pressure.)

c. Conduct Constant-Head Permeability test and report coefficient of permeability "k". Repeat a minimum of two additional times until two runs agree reasonably well.

d. Constant-Head Permeability:

$$k = \frac{QL}{Aht}$$

Q = quantity of water discharged (volume)
L = length of specimen
A = cross-sectional area of specimen
h = hydraulic head (height column of water above discharge)
t = elapsed time of test
k = coefficient of permeability (length/time)

Note: For very permeable material, maintain elevation of water above the sample for 3 minutes then measure Q (flow).

SECTION 2204 PRIME AND TACK COAT

2204.1 Scope

This section governs the furnishing of all labor, materials and equipment for the application of liquid asphalt to a prepared pavement (concrete, asphaltic concrete), or granular base as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2204.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM
D 140 Practice for Sampling Bituminous Materials

2204.3 Materials

A. The type and grade of asphalt material to be used as prime or tack coat shall be designated by the Engineer in the Plans or in the Special Provisions. If not specified in the Plans or Special Provisions, the Contractor shall submit proposed type and grade of asphalt material to the Engineer for approval. The liquid asphalt material to be used for surface preparation shall be as listed in the following table:

Material to be Treated	Application Usage	Type of Emulsion of Grade of Cutback	Application Rate (Gal/SY) (L/SM)	Application Temperature ^{0}F (^{0}C)	Cure Time at 70^{0}F (21^{0}C)
Existing Asphalt or Concrete Surface	Tack	RC-70	0.05-0.10 Gal/SY (0.23-0.46 L/SM)	150 – 225 (65 – 107)	1 – 6 hrs
	Tack	SS-1 SS-1h CSS-1 CSS-1h	0.05-0.15 Gal/SY (0.23-0.69 L/SM)	70 – 160 (22.5 – 42)	1 – 3 hrs
Treated Base (lime, flyash, cement)	Prime	MC-30 MC-70	0.1-0.3 Gal/SY (0.46-1.38 L/SM)	85 – 120 (29 – 49)	12 – 24 hrs
	Prime	SS-1 SS-1h CSS-1 CSS-1h	0.1-0.3 Gal/SY/in (0.46-1.38 L/SM/mm)	70 – 160 (20 – 70)	24 – 48 hrs
Untreated Aggregate Base w/ Fines	Prime	MC-30 MC-70	0.1-0.3 Gal/SY (0.46-1.38 L/SM)	85 – 120 (29 – 49)	12 – 24 hrs
Untreated Aggregate Base w/o Fines	Prime	MC-250	0.2-0.5 Gal/SY (0.92-2.30 L/SM)	85 – 120 (29 – 49)	12 – 24 hrs
Untreated Aggregate Base	Prime	SS-1 SS-1h CSS-1 CSS-1h	0.1-0.3 Gal/SY/in (0.46-1.38 L/SM/mm)	70 – 160 (20 – 70)	24 – 48 hrs
	Prime	EAP PAE, or PEP	0.1-0.3 Gal/SY (0.46-1.38 L/SM)	70 – 160 (20 – 70)	12 – 24 hrs

The asphalt material shall conform to the latest ASTM specifications for "Asphalt Cements and Liquid Asphalts." Sampling shall be in accordance with ASTM D 140.

B. Sand Cover, if used, shall be any clean granular mineral meeting the following grading requirements. When tested with laboratory sieves 100% shall pass the No. 4 (4.75 mm) sieve and not more than 2% shall pass the No. 200 (75 um) sieve. The moisture content of the sand shall not exceed 3% by weight.

C. Asphalt materials shall be approved by the Engineer prior to use in the work. The Engineer may accept a certified analysis by the material supplier laboratory when a copy of the certified analysis accompanies each shipment of asphalt to the project. The Engineer reserves the right to perform tests of the asphalt received on the job.

2204.4 Construction

A. Pressure Distributor: The distributor shall be so designed, equipped, maintained and operated that liquid asphalt at even heat may be applied uniformly on variable widths of surface up to 15 feet at readily determined and controlled rates from 0.02 to 1.00 gallon per square yard, with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.02 gallons per square yard. Distributor equipment shall include a tachometer, pressure gauges, a calibrated tank and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically. The calibration of all distributors must be approved by the engineer, and the contractor shall

furnish all equipment, material and assistance necessary if calibration is required.

B. Preparation of Existing Surface

1. For tack coats: The existing surface shall be free of dust, loose material, grease or other foreign material at the time the tack is applied. Preparation of the surface is to be performed by the contractor before the tack is applied and is subsidiary to other items in the Contract.

2. For prime coats: the surface to be primed shall be shaped to the required grade and cross section, shall be free from ruts, corrugations, segregated material or other irregularities, and shall be uniformly compacted by rolling. The surface shall be firm and slightly damp when primer is applied. Delays in priming may necessitate reprocessing or reshaping to provide a smooth compacted surface.

C. Application of Asphalt Material

1. For Tack Coats: Asphalt emulsion shall be applied uniformly with a pressure distributor at the rate specified in the Contract, or as revised by the Engineer to be within a minimum of 0.05 and a maximum of 0.15 gallons per square yard. Water may be added to the asphalt emulsion and mixed therewith in such proportion that the resulting mixture will contain no more than 50% of added water, the quantity of added water to be approved by the Engineer. The application of the resulting mixture shall be such that the original emulsion will be spread at the specified rate. The asphalt emulsion shall be heated at the time of application to a temperature in accordance with the limits provided in Sec 2204.3, or as specified in the Contract Documents. The tack shall be properly cured and the tacked surface shall be cleaned of dirt and other foreign material before the next course is placed.

   The tack coat shall be applied in such manner as to cause the least inconvenience to traffic and to permit one-way traffic without pickup or tracking of the asphalt emulsion.

2. For Prime Coats: Bituminous material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. The subgrade shall be moistened before the prime is applied. The application rate shall be as specified in the Contract Documents or as approved by the Engineer between 0.1 and 0.5 gallons per square yard. The primer shall be heated at the time of application to a temperature in accordance with the limits provided in Sec 2204.3, or as specified in the Contract Documents.

   Care shall be taken that the application of bituminous material at overlap locations is not in excess of the specified quantity, per square yard. Building paper shall be placed over the end of the previous applications and the joining application shall start on the building paper. Building paper used shall be removed and satisfactorily disposed of. Pools of primer material remaining on the surface after the application shall be removed.

   When traffic is maintained, not more than one half of the width of the section shall be treated in one application and one-way traffic will be permitted on the untreated portion of the roadbed. As soon as the bituminous material has been absorbed by the surface and will not pick up, traffic shall be routed to the treated portion and the remaining width of the section will be primed.

   The primer shall be properly cured, and the primed surface shall be cleaned of dirt and surplus sand before the next course is placed.

D. Application of Sand Cover: If the asphalt material is not completely cured within the maximum specified curing time, sufficient sand shall be spread over the surface with a mechanical spreader to blot up the excess asphalt. The rate of application shall be specified or approved by the Engineer. Prior to placing an asphalt paving course, all loose sand shall be swept from the primed surface.

SECTION 2205 ASPHALTIC CONCRETE SURFACE AND BASE

2205.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction of asphalt concrete base and/or asphalt concrete surface as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2205.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 117 Test Method for Materials Finer than 75- um (No. 200) Sieve in Mineral Aggregates by Washing
C 127 Test Method for Specific Gravity and Absorption of Coarse Aggregate
C 128 Test Method for Specific Gravity and Absorption of Fine Aggregate
C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
C 142 Test Method for Clay Lumps and Friable Particles in Aggregates
D 75 Practice for Sampling Aggregates
D 140 Practice for Sampling Bituminous Materials
D 979 Practice for Sampling Bituminous Paving Mixtures
D 1188 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D 2041 Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures (comparable to AASHTO T209)
D 2172 Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures
D 2726 Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
D 2950 Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
D 3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Bituminous Paving Materials
D 4552 Practice for Classifying Hot-Mix Recycling Agents
D 4791 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
D 5444 Test Method for Mechanical Size Analysis of Extracted Aggregate
D 6307 Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
D 6373 Specification for Performance Graded Asphalt Binder

AASHTO

T 166 Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
T 245 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
T 269 Standard Method of Test for Percent Air Voids in Compacted Dense and Open Asphalt Mixtures (ASTM Designation: D 3203/D 3203M-11)
T 283 Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
T 312 Standard Method of Test for Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

Asphalt Institute

"Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types", MS-2, latest edition

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition

National Institute of Standards and Technology
Handbook #44, "Specifications, Tolerance and other Technical Requirements for Commercial Weighing and Measuring Devices"

2205.3 Materials

No material shall be used until it has been approved by the Engineer. All costs associated with material testing, certification and the preparation of trial mixes to determine the job mix formula shall be the responsibility of the Contractor. Representative samples of all materials proposed for use under these specifications shall be submitted by the Contractor to a properly certified testing laboratory approved by the Owner, at the Contractor's expense, for testing and the preparation of trial mixes to determine the job-mix formula. Tests required by this specification for field verification of the mix shall be the responsibility of the Contractor at the Contractor's expense, unless specified otherwise. The Engineer reserves the right to perform additional testing to verify conformance with the requirements specified herein. These tests will be performed under the supervision of the Engineer without cost to the Contractor, unless specified otherwise in the Contract Documents.

A. Asphalt: Asphalt cement used in the manufacture of asphalt paving mixtures shall conform to the Performance Graded system. The PG graded material used shall conform to the provincial grade used by the local DOT or as designated by the Engineer. In the Kansas City Metropolitan area, the provincial grade is a PG64-28 but PG 64-22 is commonly used so either is deemed acceptable.

B. These general usage guidelines may not address all project conditions. The Engineer apply sound pavement design principles when designating mix type and selecting asphalt cement grade based upon individual project conditions. The Federal Highway Administration makes available LTPPBIND software that will assist with asphalt grade selection for specific projects.

The asphalt cement shall conform to ASTM D 6373. Sampling shall be in accordance with ASTM D 140.

The Contractor or asphalt supplier shall submit a temperature-viscosity chart showing the recommended mix and compaction temperatures for non-modified asphalts and shall provide the specific gravity of the asphalt.

C. Aggregate: The quality of aggregates used in Asphaltic Concrete shall conform to the following:

Coarse Aggregate (Retained on the No. 4 Sieve)
LA Abrasion (ASTM C 131) ..... 40% loss (maximum)
Soundness using Mag. Sulfate (ASTM C 88, 5 cycles) ..... 18% loss (maximum)
Soundness using Sodium Sulfate (ASTM C 88, 5 cycles) ..... 12% loss (maximum)
Total shale, clay, coal and lignite content (ASTM C 142) ..... 1.0% by weight (max)

Fine Aggregate (Passing the No. 4 Sieve)
Organic content ..... 1% maximum
The parent material of manufactured sand must also meet the requirements for coarse aggregate shown above.

Sampling shall be in accordance with ASTM D 75. Gradation analysis shall be in accordance with Standard Method of Test for Material Finer than No. 200 (75 um) Sieve in Mineral Aggregates by Washing, ASTM C 117 and Standard Method Test for Sieve Analysis of Fine and Coarse Aggregate, ASTM C 136. All aggregate quality tests must have been run within 12 months of the submission date of a mix design.

D. Commercial Mix: Providing a commercial mix will only be permitted when specified in the Contract Documents or approved in writing by the Engineer. Contractor shall adhere to the most current State Department of Transportation standard specifications governing commercial mix asphalt for the state the work is being performed in. Example: for Kansas, Standard Specifications for State Road and Bridge Construction, 2015 Edition, Section 611.

2205.4 Mixing and Proportioning

A. Composition of the Mix: Asphaltic concrete mixtures shall consist of Mineral Aggregates and Asphalt Cement within the following limits for the type specified.

	ASPHALTIC CONCRETE-TYPE					
	1-01	**2-01**	**3-01**	**4-01**	**5-01**	**6-01**
Percent by Weight of Total Mixture						
Asphalt Cement	4-6	4-7	4-7	5-7.5		
Aggregate - U.S. Standard						
Square Sieve Size Total Percent Passing by Weight						
1 ½" (37.5 mm)	100	--	--	--	--	--
1" (25.0 mm)	75-100	100	--	--	100	--
¾" (19.0 mm)	60-85	80-100	100	--	95-100	100
½" (12.5 mm)	--	--	85-100	100	--	86-100
3/8" (9.0 mm)	40-65	60-80	70-90	85-100	--	75-100
No. 4 (4.75 mm)	30-50	48-65	50-70	55-75	--	--
No. 8 (2.4 mm)	19-36	35-47	37-47	39-50	28 min	28 min
No. 16 (1.2 mm)	13-26	25-36	26-36	27-38	--	--
No. 30 (0.6 mm)	--	18-30	18-30	19-30	--	--
No. 50 (0.3 mm)	--	12-22	12-22	11-23	--	--
No. 100 (150 µm	4-12	6-14	6-15	6-16	--	--
No. 200 (75 µm)	2-10	3-10	4-10	4-10	2-6	2-6

In addition to the above limits, the difference between the "Percent Passing Square Mesh Sieve" of successive sieve sizes shall not exceed 25 for types 1-01, 2-01, 3-01, and 4-01.

That fraction of material retained on the No. 4 (4.75-mm) Sieve-shall be composed of particles with not less than 75% having two or more fractured faces for asphalt types 1-01, 2-01, 3-01, and 4-01, and not more than 20% by weight of that fraction shall be composed of flat or elongated particles based on a ratio of 5:1 when tested in accordance with ASTM D 4791. For Asphalt Types 5-01 and 6-01 only, the total aggregate (coarse aggregate, fine aggregate, and the material passing the No. 200 sieve (75um) shall contain not less than 85% crushed material for intermediate course and surface course.

It shall be noted that when the gradation varies appreciably from the single point gradation used in the mix design, the test properties of the mix will be out of specification. This condition can occur even though the gradation meets the tolerances below.

The job-mix formula shall be within the limits specified above. The maximum permissible variation from the job-mix formula, within the specification limits, shall be as follows:

Permissible Gradation Variation from Mix Design Percent by Wt. of Total Mix:

U.S. Standard Sieve Size	Type 1-01, 5-01, 6-01	Type 2-01, 3-01, 4-01
No. 4 and larger	5.0	4.0
No. 8, 16, 30, 50	4.0	3.0
No. 200	2.0	1.0

Permissible Oil Content Variation from Mix Design:

Type 1-01, 5-01, 6-01 – 0.5%
Type 2-01, 3-01, 4-01 – 0.3%

B. Asphalt Mix General Usage:

	Surface	Base
Arterial	5-01, 6-01	5-01
Collector	5-01, 6-01	5-01
Local/Access	5-01	5-01
Paved Trail	2-01, 3-01, 4-01, 5-01	1-01.2-01.5-01
Recreational Surface	4-01	1-01, 2-01, 5-01
Parking Lot	2-01, 3-01, 5-01	1-01, 2-01, 5-01

Generally, mix types 1-01, 2-01, 3-01 and 4-01 are composed of local materials and are appropriate for general use other than roadways. **Unless specified otherwise in the Contract, Plans or Special Provisions, only mixes 5-01 and 6-01 should be used for roadways.** The Contractor may submit a written request to use mix 1-01 for pavement base or mix 3-01 for pavement surface.

Mix type 2-01 is acceptable for surfacing, but is generally more open-graded than the other surface mixes, and may not provide a tightly sealed surface.

Mix type 4-01 is very susceptible to rutting and is only recommended for non-vehicular use.

C. Asphalt Hot-Mix Recycling

1. General: Except as modified herein, Recycled Asphaltic Concrete (RAC) shall be equal to that produced as new material. Reclaimed Asphalt Pavement (RAP), Fractionated Reclaimed Asphalt Pavement (FRAP) and/or Reclaimed Aggregate Materials (RAM) shall represent no more than 30% of the composition for all surface mixtures and no more than 40% of the composition for all base mixtures. However, for base mixtures using FRAP, the composition may be no more than 50%.

   Recycled Asphaltic Concrete may contain combinations of FRAP, RAP, RAM, coarse aggregate, fine aggregate, mineral filler, asphalt cement, recycling agent, anti-stripping agent and approved additives to produce an acceptable mixture. Recycled Asphalt Shingles (RAS) are not allowed. Recycled Asphaltic Concretes shall be designated by prefacing the type with "RC," such as "RC Type 1-01".

2. FRAP is defined as having two or more stockpiles, where RAP is processed into coarse and fine fractions. The fine FRAP stockpile will contain only material passing the ¼ inch screen. The coarse FRAP stockpile will contain milled material retained on the ¼ inch screen and passing the ¾ inch screen. FRAP may be comprised of coarse or fine FRAP or a combination thereof. Utilize a separate cold feed bin for each stockpile of FRAP used. Do not blend coarse and fine FRAP either in the stockpile or in a cold feed bin. Add FRAP to the mix through the RAP collar. Sources and types FRAP must be recorded and submitted to the Engineer upon request. The FRAP used in production shall be similar in composition (extracted gradation and asphalt content) to the source used for design.

3. Materials Evaluation: All recycled materials shall have the following tests performed in addition to those required in Section 2205.4.D:

a. A sieve analysis shall be performed on FRAP, RAP and/or RAM in accordance with ASTM C 117, "Standard Test Method for Material Finer than No. 200 Sieve (75 um) in Mineral Aggregates by Washing" and ASTM C 136, "Standard Method for Sieve Analysis of Fine and Coarse Aggregates" after extraction of asphalt.

b. Asphalt content analysis shall be performed for FRAP or RAP in accordance with Method "A" of ASTM D 2172, "Standard Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures" where the FRAP or RAP content exceeds 30%. For mixtures with FRAP or RAP contents less than 30%, asphalt content may be determined using ASTM D 6307.

c. The asphalt cement used shall be determined as follows:
   i. For FRAP or RAP contents of up to 20%, the asphalt grade shall be as specified in the mix design.
   ii. For FRAP or RAP contents from 20% up to 30%, the asphalt grade shall be decreased one temperature range. For example, a design PG 64-22 would be decreased to a PG 58-28.
   iii. For FRAP or RAP contents from 30% to 50%, the asphalt grade of the new asphalt shall be determined using the procedures outlined in MS-2, latest edition, Appendix A. This would likely result in a PG 52-34.

d. All sources of material for use in RAC must be approved by the Engineer prior to use.

4. Material Requirements

   a. New asphalt cements added to the aged asphalt shall meet the requirements of Section 2205.3.
   b. Recycling Agents, if used, shall meet the requirements of ASTM D 4552, "Standard Practice for Classifying Hot Mix Recycling Agents".
   c. The FRAP, RAP and/or RAM stockpiled at the plant site shall be maintained in stockpiles separated into surface and base. The RAP and/or RAM shall be processed such that 100% will pass the 1-1/2 inch (38 mm) sieve and 90% will pass the 1-inch (25.4 mm) sieve.
   d. The final product shall be free of foreign matter (e.g., old planer teeth, ice, wood, soil, broken sewer castings, loop detector wire, protective membranes, rubberized joint filler materials and foil turn lane markers, trash, debris, etc.).

5. Mix Design Requirements: The necessary steps for a final mix design for recycled mixtures shall be done in accordance with the Asphalt Institute's Manual MS-2 latest edition in the appendix entitled "Mix Design Using RAP". If there is a change in the RAP and/or RAM percentage from the original amount of RAP and/or RAM in the mix design, a new mix design must be submitted.

6. Asphalt Plant Requirements: All delivery tickets shall designate the type of recycled mix, (RC-Type 1-01, RC-Type 2-01, RC-Type 3-01, etc.).

D. Mix Design Criteria: Laboratory Test Specimen(s) of mixes 1-01, 2-01, 3-01 and 4-01, combined in proportions of the job-mix formula, shall be prepared and tested in accordance with AASHTO T 245 and the volumetric properties of the compacted paving mixtures as calculated by ASTM procedures using Chapter 4 of the Mix Design Methods for Asphalt Concrete and other Hot-Mix Types (MS-2), latest edition, Asphalt Institute referred hereafter as "MS-2". The Marshall procedure shall be as specified in Chapter 5 of the MS-2.

For mixes 5-01 and 6-01, the procedures outlined in Asphalt Institute's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types (MS-2)", latest edition, must be used to prepare the asphalt samples for design and quality control testing. The gyratory values for the SuperGyratory Compactor (SGC) to be used for this purpose are $N_{initial} = 6$, $N_{design} = 50$, and $N_{max} = 75$. At $N_{initial}$, the specific gravity of the specimen must be

90.5% or less of G_{mm}, at N_{max} the specific gravity of the specimen must be 98.0% or less of G_{mm}. The Voids in the Mineral Aggregate (VMA) shall be as specified in Chapter 5 of the MS-2.

The material for the theoretical specific gravity (G_{mm} per ASTM D 2041) and the material for the Marshall specimens and Super Gyratory Compactor specimens (pucks) shall be cured at 285+/-5ºF for four hours in a closed oven after the mix is produced in the laboratory. Also, the plant produced mixture shall be tested when the mix is four hours old when preparing a mix design but may be tested when at least two hours old for production testing. The mixture shall be transported to the laboratory in an insulated container and then stored in a laboratory oven at 285 +/-5°F for the remainder of the curing period. This procedure shall be used when the water-absorption as determined by ASTM C 127 and ASTM C 128 of any aggregate in the mixture exceeds 1.25%. The mixture shall be compacted at 285 +/-5°F. If total mix aggregate absorption exceeds 2.0%, the laboratory may use the G_{mm} dryback option within the test method.

Test requirements and criteria for the paving mixes under these specifications shall be as follows:

Marshall Stability: 1500 lbs. (6672 N) minimum (Types 1-01, 2-01, 3-01, and 4-01)

No. of compaction blows: 50 (Types 1-01, 2-01, 3-01, and 4-01)

Flow: 0.08-0.16 inches maximum (Types 1-01, 2-01, 3-01, and 4-01)

Air Voids:	Percent
Base & Surface (Types 5-01 & 6-01)	3-5
Base & Surface (Types 1-01, 2-01, 3-01, and 4-01)	2-5

Voids filled with asphalt (VFA)	Percent
Types 5-01 & 6-01	65-75

Voids in Mineral Aggregate (VMA) for Types 5-01 & 6-01 (Nominal Max Size as defined in MS-2)	Percent (min.)
3/4" (19 mm)	13
1/2" (12.5 mm)	14
3/8" (9.5 mm)	15

The VMA for Mix Types 5-01 & 6-01 shall be the minimum value allowed. For these mixes, the asphalt content should be just to the left side of the low point on the VMA vs. Asphalt Percent curve, not to the "wet" or right (increasing) side of the curve. Nominal maximum sized as defined in MS-2 means the sieve size where the next smaller sieve size (from Table in Section 2205.4.A) retains at least 10% of the sample.

The VMA requirements shown represent values that may be higher than those obtained in the KC Metropolitan area using locally available materials. The minimum values are values recommended by the Asphalt Institute in MS-2, latest edition, for high quality asphaltic concretes, but may require the use of non-local aggregates. VMA values shown are for 4% air voids and should be used for the design of conventional roadway pavements.

During production, the air voids can be expected to vary plus or minus 1% of the design value of 4%. For Mix Types 1-01, 2-01, 3-01, and 4-01, 3% - 4% air voids may be used for design and production may be allowed to vary plus or minus 1% of the design value.

The ratio of minus 200 (75 um) material to % Effective asphalt cement (P_{eff}) based on the weight of the aggregate shall be between 0.6-1.4 for Mix Types 5-01 and 6-01.

The blend of FRAP, RAP and/or RAM and virgin aggregates or non-recycled asphalts shall be checked for resistance to stripping using AASHTO T 283 to determine if an anti-stripping agent is needed. The index of

retained strength shall exceed 75% for Mix Types 1-01, 2-01, 3-01, and 4-01, and 80% for Mix Types 5-01 and 6-01.

E. Sampling and Testing of the Mixture: All Mix Types shall be sampled in accordance with ASTM D 979 and tested in accordance with AASHTO T 245, ASTM C 136, ASTM C 117, AASHTO T 312, AASHTO T 269, AASHTO T 166, AASHTO T 283, ASTM D 2041, ASTM D 2726, ASTM D 1188, ASTM D 2950, ASTM C 127 and ASTM C 128, as specified herein. The mixtures will be tested for binder content in accordance with ASTM D 2172 or D 6307. The recovered aggregate will be sieved in accordance with ASTM D 5444.

F. Mixture Temperature Requirements: The temperature of the completed mix at the plant and at the paver shall be set by the Contractor/Producer who shall consider hauling and placing conditions, asphalt specifications as set forth in Section 2205.3, and weather limitations set forth in Section 2205.9.B. The temperature of Mix Types 5-01 and 6-01 shall not exceed 315° F at the point of discharge from the asphalt plant.

When the mix is produced in a batch-type plant, the aggregate shall be weighed accurately in the designated proportions to provide the specified batch weight. The temperature of the aggregate at the time of introduction into the mixer shall be determined by the Contractor/Producer, with a tolerance of + or - 25º F. In no case, however, shall the temperature of the mixture exceed the maximum temperature recommended by the manufacturer or supplier of the asphaltic cement (generally 350º F).

G. Control of Mixing Time: The Contractor/Producer shall control mixing time to produce asphaltic concrete that is uniformly and thoroughly coated with asphaltic cement.

H. Preparation of Asphalt Cement: The asphalt shall be heated so that it can be distributed uniformly throughout the mix. For mixing applications, the specified temperature generally will be such that the asphalt viscosity is within the range of 150-190 centistokes and shall not exceed 350º F. The material shall be sufficiently fluid to produce a complete coating on every particle of aggregate within the specified mixing time.

The Contractor/Producer shall maintain calibrated temperature monitoring equipment at the point of discharge from the asphalt plant and at the asphalt tank, and shall supply temperature records upon request.

I. Preparation and Handling of Aggregate: Coarse and fine aggregate shall be stored at the plant in such a manner that the separate sizes will not become intermixed. Cold aggregates shall be carefully fed to the plant in such proportions that surpluses and shortages in the bins will not cause breaks in the continuous operation. When loading aggregate into stockpiles, and into cars, barges, and trucks, the material shall be placed in such a manner as to prevent segregation of aggregate sizes. Stockpiles shall be built in uniform layers not exceeding 5 feet in depth.

1. Samples of coarse and fine aggregate shall be submitted to the Engineer for testing upon request. The Contractor/Producer shall be responsible for the preparation and handling of aggregates to insure that the cold-feed gradations fall within the mix design limits. Cold-feed gradation tests shall be taken as requested by the Engineer.

2. Drying: The aggregate shall be thoroughly dried and heated to provide a paving mix temperature within a tolerance of + or – 25º F of that specified by the approved mix design. The moisture content of the heated and dried aggregate shall not exceed 0.5%. The quantity of material fed through the dryer shall in all cases be held to an amount which can be thoroughly dried and heated.

J. Inspection and Control of Asphalt Mixing Plant

1. Tests: During production the plant shall have the specified tests performed by an approved laboratory. These may include: asphalt (binder) content, aggregate gradation after removal of asphalt, density,

stability, % voids, VMA, VFA, theoretical specific gravity, bulk specific gravity, maximum theoretical density, maximum theoretical specific gravity, tensile strength ratio, etc. Properties of the plant produced mix shall be determined using uncompacted mix sampled behind the paver. Laboratories shall be approved if they are:

a. Accredited in accordance with ASTM D3666; and/or
b. Approved for Superpave asphalt testing by the State Highway Department in the state where the plant is located.
    i. The individual performing the test must carry a state certification for Superpave testing.
    ii. The laboratory must have an annual certification by an independent testing agency of all testing equipment used for Superpave mix designs, and must also have the Marshall hammer weight and height of drop certified by that same agency.

2. Availability of test reports: The results of the latest current test report shall be furnished to the Engineer upon request. All test reports shall be kept at the plant, and shall be made available upon request. If the mix is found to be outside of tolerance, or outside the specification limits as specified in Section 2205.4, correction shall be made. Test reports shall be furnished on the appropriate attached "Asphalt Concrete Test" form or a similar form containing equivalent information.

3. Frequency of testing for mixes 1-01 through 4-01: the tests listed in paragraph 1 shall be performed a minimum of once for every 3000 tons of asphalt production (minimum of once per day when the plant has produced at least 200 tons and at discretion of Engineer if less than 200 tons produced) except during initial startup, or whenever the production asphalt fails one of the following conditions at which time they will be tested every 1000 tons until 4 consecutive tests show compliance with the specifications:

    a. Production void content measured at the plant discharge is less than 2% or more than 5%.
    b. Extracted gradation of the production asphalt exceeds the permissible gradation variation for the mix type being produced.
    c. Asphalt cement exceeds the content variation for the mix type being produced.

4. Frequency of testing for mixes 5-01 and 6-01: the tests listed in paragraph 1 shall be performed once per day of production, or every 1000 tons, whichever is less frequent except during initial startup (if less than 200 tons produced testing is at discretion of Engineer); or whenever the production fails one of the following conditions at which time they will be tested every 500 tons, or twice per day of production, whichever is less frequent until 4 consecutive tests show compliance with the specifications:

    a. Production void content measured at the plant discharge is less than 3% or more than 5%.
    b. Extracted gradation of the production asphalt exceeds the permissible gradation variation for the mix type being produced.
    c. Production VMA measured at the plant discharge is below the design minimum VMA.
    d. Production VFA measured at the plant discharge is outside the allowable range.
    e. Production dust to binder ratio is outside the allowable range.

5. Redesign of Asphalt mixes: If four consecutive tests performed as described in paragraph 3 or 4 above show noncompliance with the specifications as enumerated in the subparagraphs of paragraph 3 or 4 above, production of that type of asphalt will immediately cease, and may not be resumed until a new mix design is submitted and approved, or the plant can demonstrate to the Engineer an ability to meet specifications. Resumption of asphalt production after a mix redesign or failure of four consecutive tests to meet specifications will be treated as an initial startup for testing purposes.

MARSHALL ASPHALTIC CONCRETE TEST (Verified Mix Design)
(Types 1-01, 2-01, 3-01, 4-01)

Description:				
Pavement Type:				
LAB ID:		LOT		
Sample Date:		Belt		Tons
Sample ID:		Hot Mix		Tons
Supplier:				

Sieve Size	Belt Sample	Hot-Mix Sample*	Single Point Job-Mix Formula	Job-Mix Formula Tolerances
1" (25 mm)				
3/4" (19 mm)				
1/2" (12.5 mm)				
3/8" (9.5 mm)				
No. 4 (4.75 mm)				
No. 8 (2.36 mm)				
No. 16 (1.18 mm)				
No. 30 (600 um)				
No. 50 (300 um)				
No. 100 (150 um)				
No. 200 (75 um)				

ASTM C 136, C 117, D 5444

*Uncompacted Behind Paver
**total mix basis
***total aggregate

EXTRACTION DATA - ASTM D6307 or D 2172	FRAP	Sample	Plant Setting	Recycled AC%
%AC**				
%AC**				

Aggregate Type	%***	Aggregate Type	%***

MARSHALL CHARACTERISTICS (ACCEPTANCE CRITERIA)			
Compaction Blows (average of 3 specimens) = 50			
	Sample*	Specifications*	
Stability, lbs (kg)		Min	AASHTO T 245
Flow, 1/100 in (mm)		Max	AASHTO T 245
% Voids		3-5	
% VFA			
Density, pcf (kg/cu.m)		-----	ASTM D 2950, D 2726, or D 1188
Max Theoretical Specific Gravity G_{mm}		-----	ASTM D 2041
Bulk Spec. Gr. of total Agg. Gsb		-----	ASTM C 127 & C 128
COMMENTS:			

LOT DENSITY SHALL BE TIED TO THE LOT AND DATE (Laboratories shall conform to ASTM D 3666)

SUPERPAVE ASPHALTIC CONCRETE TEST (Verified Mix Design)
(Types 5-01, 6-01)

Description:				
Pavement Type:				
LAB ID:		TIME		TONS
Sample Date:		Belt		
Sample ID:		Hot Mix		
Supplier:				

Sieve Size	Belt Sample	FRAP/RAP Sample*	Hot-Mix Sample*	Master Grade Limits	Cal. Single Point
1" (25 mm)					
3/4" (19 mm)					
1/2" (12.5 mm)					
3/8" (9.5 mm)					
No. 4 (4.75 mm)					
No. 8 (2.36 mm)					
No. 16 (1.18 mm)					
No. 30 (600 um)					
No. 50 (300 um)					
No. 100 (150 um)					
No. 200 (75 um)					

ASTM C 136, C 117, D 5444

*Uncompacted Behind Paver
**total mix basis
***total aggregate

EXTRACTION DATA - ASTM D6307 or D 2172	FRAP	Sample	Plant Setting	Recycled AC%
%AC**				
%AC**				

Aggregate Type	%***	Aggregate Type	%***

VOLUMETRIC DATA 6" NOMINAL SIZE Gyratory Specimens			
Gyrations (avg. of 2 specimens) @ 280-290 deg F – AASHTO T312 N_{des} = 50 N_{ini} = 6 N_{max} = 75	Sample*	Specifications*	
Mix bulk specific gravity @ N_{des}, G_{mb}		---	
% Voids @ N_{des}		3.0-5.0	AASHTO T 269
% VMA @N_{des}, G_{sb} basis			
% VFA @ Ndes		9.0–11.0	=%VMA-%Voids
% G_{mm} @ Nini		85-91	AASHTO T 166
Ratio (-) 75 um (No. 200) to % Eff. Binder		0.6-1.4	
Tensile Strength Ratio, %		80 minimum	AASHTO T 283
Max Theoretical Specific Gravity G_{mm}		-----	ASTM D 2041
Max Theoretical Density, pcf		-----	
Effective Specific Gravity Agg., G_{se}		-----	
Bulk Specific Gravity of Total Agg., G_{sb}		-----	ASTM C 127 & C 128
Specific Gravity of Asphalt, G_b		-----	
COMMENTS:			

2205.5 Asphalt Mixing Plant

Plants used by the Contractor for preparation of the asphalt paving mix shall conform to the following requirements:

A. Field Testing Laboratory: The Contractor shall provide a laboratory building or room at the plant site, for the exclusive use of the Engineer for performing tests, keeping records, and making reports at such times as the Engineer is performing those actions.

The Contractor shall also furnish necessary laboratory sieves and a powered shaker device for sieve analysis, scales, ignition oven and supplementary equipment to make aggregate sieve analysis, asphaltic concrete paving mixture analysis, and paving mixture density tests. This equipment shall be in good working condition and properly calibrated.

B. The asphalt producer shall establish a quality control plan and shall maintain records. The quality control plan required by the state highway agency is a suggested standard. Upon request by the Engineer, the quality control plan shall be submitted for review and approval.

2205.6 Transportation of Mix

The mix shall be transported to the job site in vehicles with tight metal bottoms, clean of all foreign material which may affect the mix. If a release agent is used, it must comply with State and Federal environmental regulations.

The dispatching of the vehicles shall be so scheduled that all materials delivered may be placed in daylight unless the Engineer approves artificial light. Delivery of the material to the paver shall be at a uniform rate and in an amount within the capacity of the paving and compacting equipment.

Haul trucks shall be provided with covers of sufficient size and weight to completely cover the truck bed to protect the load and to prevent cooling of the upper surface. Failure to have the load completely covered shall be sufficient cause for rejection of the entire load. The load shall remain covered until the truck is next in line to be unloaded. In no case shall a load remain uncovered for more than 10 minutes before starting to use the load. If for any reason there is a delay in completely using a load, the remaining part of the load shall be recovered until it can be used. It shall be the responsibility of the Contractor to inform all truck drivers of these provisions before starting work.

2205.7 Scales and Weighing of Vehicles

The vehicle's tare and gross weight shall be established by weighing the vehicle on a certified scale. The tare weight will be established at least twice each day. The vehicle, when establishing tare, shall be clean, bed empty, fuel tanks filled and shall have all side and back boards in place.

A. Measurement by weight: Measurement will be made by weighing each truck load on scales conforming to the requirements of Section 2205.7.B “Vehicle Scales”.

B. Vehicle Scales: Vehicle scales shall be approved by the Engineer and shall conform to the requirements specified herein. The specifications, tolerances, and other technical requirements for weighing and measuring devices as recommended by the National Conference on Weights and Measures and published in the National Institute of Standards and Technology Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, and supplements thereto or revisions thereof, shall apply to all vehicles scales used.

C. Scale acceptance shall be based on one of the following:

1. A valid certification or seal of approval by the Division of Weights and Measures from the state.

2. A certification of calibration from a commercial scale service company showing that the scale meets the requirements of these specifications. The Contractor shall furnish the certification of calibration to the Engineer.

D. Scale Calibration: Scales shall have been calibrated within the nine month period prior to any material being delivered, or at any time the Engineer has cause to question the accuracy of the scale. Scales shall meet the requirements of Accuracy Class III L as defined in Handbook 44 (above).

Verification of a vehicle scale may be required by weighing a hauling unit on another recently calibrated and certified scale.

If equipment to be weighed is of such length that all axles cannot be weighed simultaneously, a level paved surface shall be provided permitting those axles not on the scale platform to be supported by the paved surface. The approach shall be at least as wide as the platform and of sufficient length to insure the level positioning of vehicles during weight determinations. The weighing shall be performed with all brakes released. If equipment to be weighed is equipped with an air bag suspension unit on any axle, the equipment including semi-trailers or pup trailers shall be weighed on vehicle scales of sufficient size to weigh all axles of the combination simultaneously.

All costs incurred in obtaining a certification of calibration or verification shall be borne by the Contractor.

2205.8 Asphalt Paving Equipment

All asphalt paving equipment used by the Contractor shall meet the requirements of this section and shall be maintained in acceptable mechanical condition. Equipment shall be serviced and lubricated away from the paving site. Units that drip fuel, oil, grease or other fluids shall be removed from the project until such leakage is corrected.

A. Pavers and Laydown Machines: Mechanical self-powered pavers shall be capable of spreading the mix within the specified tolerances, true to the line, grade and crown indicated on the Plans.

Pavers shall be in good working condition, equipped with quick and efficient steering devices and shall be capable of traveling both forward and in reverse. They shall be equipped with hoppers and distributing screws that place the mix evenly in front of the adjustable screeds. They shall be equipped with either a vibrating screed or a tamping bar immediately preceding a static screed. There shall be sufficient auxiliary attachments for the paving machine so that it may be operated to lay the necessary width as determined in the field by the Engineer. Vibrating screed or tamp bars shall be provided for the full width of all paving operations.

The screed shall include a strike-off device which is effective on mixes at workable temperatures without tearing, shoving or gouging them, and which produces a finished surface of an even and uniform texture. The screed shall be adjustable as to the height and crown and shall be equipped with a controlled heating device for use when required. However, for irregular width paving, hydraulic extensions without tamping bars or a vibrating screed may be used only along the curb or outer edge of pavement.

1. Automatic Screed Controls: The paver shall be equipped with and use an approved system capable of automatically controlling the elevation and transverse slope of the paver screed unless otherwise directed by the Engineer. An erected stringline, traveling stringline or other approved device operating on the roadbed being paved or the surface of the previously placed lane shall be used to establish the grade reference. The grade reference device shall operate on either or both sides of the paver as required and shall be capable of maintaining the desired transverse slope regardless of changes in the screed elevation.

2. The traveling stringline shall be constructed in such a manner that it does not vibrate or cause the sensor to make erroneous readings during the laydown operation. The length of the beam to be used shall be approved by the Engineer and shall be between 20 feet and 40 feet.

3. The use of the automatic screed control devices on asphalt pavers will not be required for paving small irregular areas, entrances, approaches, or side street connections.

4. Automatic screed control devices will be required for matching the joint with all previously laid strips, except for those areas noted above.

B. Rollers: Compaction equipment shall consist of vibratory steel wheel, static steel wheel and pneumatic-tired rollers unless otherwise directed by the Engineer. They shall be self-propelled and equipped with such controls that starting, stopping and reversing direction can be accomplished without displacing the hot asphaltic concrete pavement.

Rollers shall be equipped with adjustable scrapers to keep the wheel surfaces clean and with efficient means of keeping them wet to prevent mixes from sticking. The roller surfaces shall have no flat areas, openings or projections that will mar the surface of the pavement.

1. Steel-Wheeled Rollers: Steel-Wheeled Rollers shall be self-propelled, vibratory two-axle tandem rollers. These rollers shall develop contact pressure of 250 to 350 pounds per inch of width (vibratory mode) or 150 to 180 pounds per inch of width (static). Rollers shall be in good working condition.

2. Pneumatic-Tired Rollers: Heavy pneumatic-tired rollers shall be self-propelled and shall consist of two axles on which are mounted an odd number of pneumatic-tired wheels. The roller shall have at least nine pneumatic-tired wheels mounted in such a manner that the rear group of wheels will not follow in the tracks of the forward group, but shall be spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth, inflated to 90 psi. Construction of the roller shall be such that each wheel is loaded to a minimum of 2,300 pounds.

3. In lieu of the above requirements, consideration will be given to use other types of equipment that are capable of producing equivalent results consistent with the requirements of the specifications. Any roller not meeting the requirements of paragraphs 1 and 2 above must be approved by the Engineer prior to use.

C. Pressure Distributor: The pressure distributor shall meet the requirements of Section 2204.4.A entitled "Pressure Distributor".

D. Hand Tools: The Contractor shall provide sufficient lutes, rakes, shovels, and other equipment as required to produce results consistent with the specifications.

2205.9 Construction

A. Preparation of the Area to be Paved: The area to be paved shall be true to line and grade, and shall have a properly prepared surface prior to the start of the paving operations. It shall be free from all loose or foreign material.

Where a base is rough or uneven, a leveling course shall be placed and properly compacted before the placing of subsequent courses.

When leveling course is not required, depressions and other irregularities shall be patched or corrected, and the

work approved by the Engineer before the paving operation begins.

The area to be paved shall be primed or tacked uniformly in accordance with the provisions of Section 2204 entitled "Prime and Tack Coat".

The surfaces of curbs, gutters, vertical faces of existing pavements and all structures in actual contact with asphalt mixes shall be painted with a thin, complete coating of tack to provide a closely bonded joint.

B. Weather Limitations: When the moisture of the aggregate in the stockpile or from the dryer interferes with the quality of mix production, or with normal plant operations, the mixing and placing of hot-mix asphalt will not be permitted without the permission of the Engineer. No mixture shall be placed on wet or frozen surface.

Hot Mix asphalt paving shall not be mixed or placed when the ambient air or base temperature is below the temperatures shown in the following table, or when there is frost in the subgrade or any other time when weather conditions are unsuitable for the type of material being placed without expressed approval of the Engineer.

Paving Course	Thickness (inches)	Air Temperature (Degrees F)	Road Surface Temperature (Degrees F)
Surface	All	50	55
Base	Less than 3	40	45
Base	3 or more	30	35

All bituminous mixtures shall be delivered to the paver at a temperature sufficient to allow the material to be placed and compacted to the specified density and surface tolerance. Minimum allowable temperature for the asphalt mix to be placed into the paver is 235º F. Regardless of the temperature, final acceptance of the asphalt mat shall be based on density determined in accordance with Section 2205.9.E.

C. Spreading and Finishing: The spreading and finishing of each course shall be to the thickness, cross slope, and width indicated on the Plans or Special Provisions. The thickness of individual layers shall not exceed the following for the respective type of mixture. The suggested minimum lift thickness shall be three times the nominal maximum size of the mix. Nominal maximum is defined as the first sieve size larger than the sieve which retains at least 10% of the aggregate by weight.

Asphalt Type	**Max. Compacted Lift Thickness**
Type 1-01	4"
Type 2-01	4"
Type 3-01	3"
Type 4-01	2"
Type 5-01	4”
Type 6-01	3”

Spreading and finishing shall be conducted in the following manner:

1. Mechanical Pavers: The base and surface courses shall be spread and struck-off with a mechanical paving machine meeting the requirements of Section 2205.8.A entitled "Pavers and Laydown Machines". The paving machine shall be operated so that the material does not accumulate and remain along the sides of the receiving hopper. The wings of the spreader hopper shall not be emptied (flipped) between truck loads.

    a. Equipment which leaves tracks or indented areas which cannot be corrected in normal operation, or which produces other permanent blemishes or fails to produce a satisfactory

surface, shall not be used.

b. The screed auger shall be operated approximately 3/4 full and the hopper conveyor shall not be allowed to run out of material during the paving operation. Sufficient trucks shall be used to continuously supply asphalt to the paver. Delays in the paving operation shall be kept to a minimum.

c. When using pavers in echelon, the second paver shall follow the edge of the material placed by the first paver. The length of each laydown pass shall be limited, depending on weather conditions, to assure a hot joint and obtain proper compaction.

2. Longitudinal joints and edges shall be constructed to true lines. Lines for the paver to follow in placing individual lanes will be established parallel to the centerline of the proposed roadway. The paver shall be positioned; and operated to follow closely the established line. Offset the longitudinal joint in successive courses by 6 to 12 inches. Longitudinal joints in the final surface layer shall be at the lane lines of the traveled way, but shall be offset to prevent lane separation pavement markings from falling on the joint. Any irregularities in alignment left by the paver shall be corrected directly behind the paver, prior to compaction. Distortion of the pavement during this operation shall be avoided. Edges against which additional pavement is to be placed shall be placed on a 30º (2:1) bevel, or as specified by the Engineer.

3. Transverse joints in succeeding courses shall be offset at least 2 feet.

4. The Contractor shall make every effort to minimize the number of passes heavy equipment makes over uncompleted roadway sections. The Contractor shall schedule and route his hauling operation to minimize hauling over a final course as much as feasible.

5. As soon as the first load of material has been spread, the texture of the unrolled surface shall be checked to determine its uniformity. Segregation of materials shall not be permitted. If segregation occurs, the spreading operation shall be immediately suspended until the cause is determined and corrected by the Contractor.

6. Any irregularities in the surface of the pavement course shall be corrected directly behind the paver. Excess material forming high spots shall be removed by a shovel or lute. Indented areas shall be filled with hot mix and smoothed. Broadcasting of material shall not be permitted.

7. Hand Spreading: In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand. The material shall be distributed uniformly to avoid segregation of the coarse and fine aggregate. Broadcasting of material shall not be permitted. During the spreading operation, all material shall be thoroughly and uniformly distributed by lutes or rakes. Material that has formed into lumps and does not break down readily shall be removed. Following placing and before rolling, the surface shall be checked with templates and straightedges and all irregularities corrected.

D. Compaction

1. General: The Contractor is responsible for development of a compaction procedure that will obtain the required density. A minimum of three rollers shall be used for compacting mixes on roadways (2 steel drum and 1 pneumatic tire) unless otherwise approved by the Engineer. For uses other than roadways, a minimum of two rollers shall be used unless otherwise approved by the Engineer. Rollers shall meet the requirements of Section 2205.8.B entitled "Rollers".

   Immediately after spreading, each course of the pavement mixture shall be uniformly compacted by rolling. The initial or "breakdown" rolling shall be accomplished with a steel-wheeled vibratory roller and shall take place as closely behind the laydown machine as the temperature and condition of the

mat will allow. The pneumatic-tired roller shall be used to knead and compact the pavement mixture following the initial rolling and preceding the final rolling. Care shall be exercised in the use of the pneumatic-tired roller to ensure that the pavement mixture is sufficiently cooled to avoid "picking up" of the mixture on the tires of the roller, and also to ensure that the pneumatic-tired rolling is completed before the mixture becomes too cool to allow satisfactory finish rolling. Final, or finish rolling, shall be done with a steel-wheeled roller in static mode. The sequence of rolling operations may be changed with the approval of the Engineer. Rolling shall be longitudinal, starting near the low or unconfined edge of the pavement, then to the other edge and finally progressing towards the center. Alternate trips of the roller shall be of slightly different lengths.

The motion of the roller shall be slow enough at all times to avoid displacement of the hot mixture (generally 3mph). Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected immediately by the use of rakes and fresh mixture when required. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excess water will not be permitted.

The surface of the mixture after compaction shall be smooth and true to established section and grade. Any surface which is segregated, or is in any way defective, shall be removed and replaced with fresh hot mixture at the Contractor's expense, and shall be immediately compacted to conform to the surrounding area.

2. Rolling Procedure: The Contractor is responsible for determining an acceptable rolling procedure that will provide a product that is uniformly compacted to the required density and true to line and grade. There are many possible variations that may accomplish this but the general order for rolling is:

   a. Transverse joint
   b. Longitudinal joint (if in echelon)
   c. Unconfined or low side edge
   d. Other edge
   e. Middle
   f. Intermediate rolling; same procedure as breakdown rolling but pneumatic roller should stay the thickness of the lift from the free edge
   g. Finish rolling

   When paving in echelon, 2-3 inches of the first mat shall be left unrolled, and rolled when the joint between the lanes is rolled, after the 2nd mat is placed. Edges shall not be exposed more than fifteen minutes without being rolled. Particular attention shall be given to the construction of transverse and longitudinal joints in all courses.

   In laying a surface mix adjacent to any finished area, it shall be placed sufficiently high so that, when compacted, the finished surface will be true and uniform. Where the grade is slight a level will be used to insure drainage to the desired outlet.

3. Transverse joints: The Contractor shall use a method of making a transverse construction joint that provides a thorough and continuous bond with acceptable surface texture and meeting the density requirements. The surface elevation should not vary more than 3/16” in 10’ when tested across the joint. If the joint has been distorted, it shall be trimmed to a line. The joint face shall be tacked before the fresh material is placed against it.

4. Longitudinal joints: When paving against existing asphalt pavement, the edge to be joined shall be tack coated. The paver screed shall be set to overlap the first mat by 1-2 inches. The elevation of the screed above the surface of the first mat should be equal to the amount of roll-down expected during

compaction of the new mat. For large aggregate mixes, the coarse aggregate in the material overlapping the cold joint should be carefully removed and wasted, leaving only the finer portion of the mixture. The overlapping material should be pushed with a lute or rake onto the side of the joint where the new pavement is located prior to compaction.

When paving against existing concrete pavement, curb and gutter or other structure, the edge to be joined shall be tack coated. The elevation of the screed above the surface of the first mat should be equal to the amount of roll-down expected during compaction of the new mat. Where drainage of stormwater will flow from the new mat onto abutting curb and gutter, add an additional ⅛" - ¼" of thickness to the new mat.

5. Breakdown Rolling: Steel wheel rollers as specified in Section 2205.8.B entitled "Rollers" shall be used for breakdown rolling. Breakdown rolling shall be performed as close behind the paver as necessary to obtain adequate density without causing undue displacement. The breakdown roller shall be operated with the drive wheel nearest the laydown machine. Exceptions may be made by the Engineer when working on steep slopes or super-elevated curves. Breakdown rolling sequencing is to be determined by the Contractor and approved by the Engineer.

6. Intermediate Rolling: Pneumatic-tired rollers as specified in Section 2205.8.B entitled "Rollers" shall be used for intermediate rolling unless otherwise approved by the Engineer. The intermediate rolling shall follow the breakdown rolling as closely as possible and while the paving mix is still of a temperature that will result in maximum density from this operation. Pneumatic-tired rolling shall be continuous after the initial rolling until all of the mix placed has been compacted to the required density. Turning of pneumatic-tired rollers on the hot paving mix which causes displacement shall not be permitted.

7. Finish Rolling: The finish rolling shall be accomplished before the material falls below a temperature of 175º F to allow for the removal of roller marks. All roller marks shall be removed by the finish rolling operation. All rolling operations shall be conducted in close sequence.

8. In places inaccessible for the operation of standard rollers as specified, compaction shall be performed by others means meeting the requirements of Section 2205.8.B entitled "Rollers." The Contractor shall ensure that the material is thoroughly compacted to the satisfaction of the Engineer. If approved by the Engineer, hand tamping, manual or mechanical, may be used in such areas, if the required density is met.

E. Density and Surface Requirements: The completed asphalt concrete paving shall have a density equal to or greater than 95% for Types 1-01 and 5-01 Asphalt Concrete Base and 96% for Types 2-01, 3-01, 4-01, 5-01, and 6-01 Asphalt Concrete Surface. Density is based on the density of laboratory specimens from plant produced mix prepared as specified in Section 2205.4.D entitled "Mix Design Criteria" and made from a sample representing the material being tested. Density testing shall conform to ASTM D 2950, ASTM D 2726, or ASTM D 1188.

If cores are used to determine density, one or more tests (one test equals three cores) will be taken for each tonnage lot and averaged to determine acceptance. The cores will be taken from random locations within the lane being paved, a minimum of 1' from any joint or edge. The Engineer will mark the locations of all cores.

All unsatisfactory work shall be repaired, replaced or corrected. The surface of the final course shall be of a uniform texture and conform to line and grade shown on the Plans. Allowable tolerance for the final surface of roadway pavement shall conform to the requirements of Section 2211 entitled "Smoothness". Tests for Plan grade conformance and surface smoothness shall be performed by the Contractor in the presence of the Engineer. Tests shall be performed at intervals as directed by the Engineer.

SECTION 2206 ASPHALT CRACK SEALING, ASPHALT CRACK FILLING, CHIP SEALING, SLURRY SEALING, AND MICRO-SURFACING

2206.1 Scope

This section governs the furnishing of all labor, materials and equipment for the performance of asphalt crack sealing, asphalt crack filling, chip sealing, slurry sealing and micro-surfacing as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2206.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 117 Test Method for Materials Finer than 75- um (No. 200) Sieve in Mineral Aggregates by Washing
C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
C 142 Test Method for Clay Lumps and Friable Particles in Aggregates
D 36 Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
D 140 Practice for Sampling Bituminous Materials
D 242 Standard Specification for Mineral Filler For Bituminous Paving Mixtures
D 244 Standard Test Methods for Emulsified Asphalts
D 946 Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
D 977 Standard Specification for Emulsified Asphalt
D 1073 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
D 2027 Standard Specification for Cutback Asphalt (Medium-Curing Type)
D 2028 Standard Specification for Cutback Asphalt (Rapid-Curing Type)
D 2397 Standard Specification for Cationic Emulsified Asphalt
D 2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
D 3381 Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
D 3910 Standard Practices for Design, Testing, and Construction of Slurry Seal
D 5078 Standard Specification for Crack Filler, Hot-Applied, for Asphalt Concrete and Portland Cement Concrete Pavements
D 6372 Standard Practice for Design, Testing, and Construction of Micro-Surfacing
D 6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

AASHTO

T 53 Softening Point of Bitumen (Ring-and-Ball Apparatus)
T 59 Testing Emulsified Asphalts
M 208 Standard Specification for Cationic Emulsified Asphalt

ISSA Bulletin #139 “Test Method to Classify Emulsified Asphalt/Aggregate Mixture Systems by Modified Cohesion Tester Measurement of Set and Cure Characteristics”

Manual of Uniform Traffic Control Devices, latest Edition (MUTCD)

2206.3 Crack Sealing/Filling

A. Crack Sealant Application: Material used for crack sealing shall be a modified asphalt product selected to be

compatible with the environment of application and found to meet the criteria of ASTM D 6690 with a modified resilience value between 30 and 60 percent, or material meeting the requirements of ASTM D 5078. Crack Sealing shall be understood to be the process of placing an asphaltic material into and/or above working cracks to prevent the intrusion of surface water and/or incompressibles into the crack. A working crack shall be understood to correspond to cracks that sustain more than 0.1 inch of movement during the course of the year.

B. Crack Filling Application: Material used for crack filling shall be a viscosity graded AC-20 asphalt product meeting the criteria of ASTM D 3381 Table 1, a penetration-graded asphalt product having a penetration number in the range of 85-100 measured in accordance with ASTM D 946, or material meeting the criteria of ASTM D 5078. Crack filling material may contain polyester or polypropylene fibers.

C. Material satisfying the criteria of a crack sealant may also be used as a crack filling material. Crack filling shall be understood to be the process of placing an asphaltic material into non-working cracks to substantially reduce water infiltration and reinforce adjacent cracks. Crack filling materials shall not be used for sealing pavements in preparation for an overlay.

D. Equipment

1. Router: This machine shall be an impact cutter head with a minimum of 6 tungsten-carbide cutters. The router blades shall be driven with a minimum 25-hp gasoline engine.

2. Compressor: The compressor shall be a two-stage compressor rated as a minimum 40 CFM unit capable of delivering compressed air to the nozzle at a minimum pressure of 100 psi. The compressor shall be equipped with a filter trap to eliminate oil and moisture from the air line.

3. Hot-Air Lance (HCA): The hot air lance shall be capable of delivering super-heated air at an exit temperature in excess of 1500 degrees F and at a velocity in excess of 1000 ft/sec against the side walls of the crack. The hose shall be wrapped with reflective tape to keep hoses together and to protect workers in low light situations.

4. Melter/Applicator

    a. The melting pot shall consist of double-boiler type jacket and shall be equipped with a full sweep agitator that promotes proper mixing and maintains uniform heat distribution throughout the melting pot. The melting pot shall have sufficient capacity of the heat transfer oil reservoir that heat transfer oil is able to come in contact with 100 percent of the outside area of the jacket. The melting pot shall be equipped with a drain plug to permit 100% of the heat transfer oil to drain from the boiler. The heat transfer oil shall consist of ISO grade 68.
    b. The heat transfer oil shall be heated with a properly sized vapor fuel LP or diesel fuel burner. The heat shall be applied directly to the bottom of the heat transfer tank. The burner shall be lit by an electric spark igniter controlled by a sensor, which detects a lack of burn or ignition and subsequently shuts down the fuel supply. The unit must be capable of starting at ambient temperature and bringing the sealant up to the required applications temperature within the period of approximately one hour while continuously agitating and recirculating the sealant. The unit shall have the capability of independently monitoring both the transfer oil and melting pot temperatures. The unit shall be capable of heating a variety of application materials within a range of temperatures between 200 º F and 425 º F. The sealant should not be heated to a temperature in excess of that specified by the manufacturer.
    c. The agitator and material pump shall be actuated by hydraulic motors driven by a single, pressure-compensated hydraulic pump. Hydraulic fluid should only be pumped to the agitator or material pump motor on demand.
    d. The sealant shall be applied to the pavement through an application system consisting of a pressure feed hose and wand. The hose shall be specially manufactured to handle liquid

asphalt products up to 450 º F at 350 psi working pressure. The hose shall not be less than 15 feet in length. The hand wand shall be constructed of steel of sufficient strength to withstand normal day-to-day operations. Material flow through the wand shall be controlled with a toggle switch. A squeegee shall be used to distribute the asphalt evenly and uniformly in the recommended configuration.

e. All equipment shall be in good working order, as determined by the Engineer, on a day-to-day basis. The Engineer shall not be responsible for payment of labor or rental charges on days when the equipment is not in good working order.

E. Preparation

1. Crack sealing shall be limited to working, transverse and longitudinal cracks that are more than 1/8-inch in width. Cracks 1/8- to 5/8-inches in width requiring sealing shall be routed to 5/8-inches in width. Cracks 5/8- to 1-inch in width requiring sealing do not require routing but shall be thoroughly cleaned and sealed. Cracks shall be sealed using either the Standard Reservoir and Flush or Standard Recessed Band-Aid configurations. Cracks greater than 1-inch in width shall be filled with either an emulsion slurry and sand, widened and backfilled with Hot-Mix Asphalt (HMA) in compliance with Section 2205, or repaired in a manner approved by the Engineer. Cracks requiring filling do not require any routing but simply thorough cleaning. Cracks shall be filled using either the Simple Band-Aid, Simple Flush Fill, or Capped configurations.

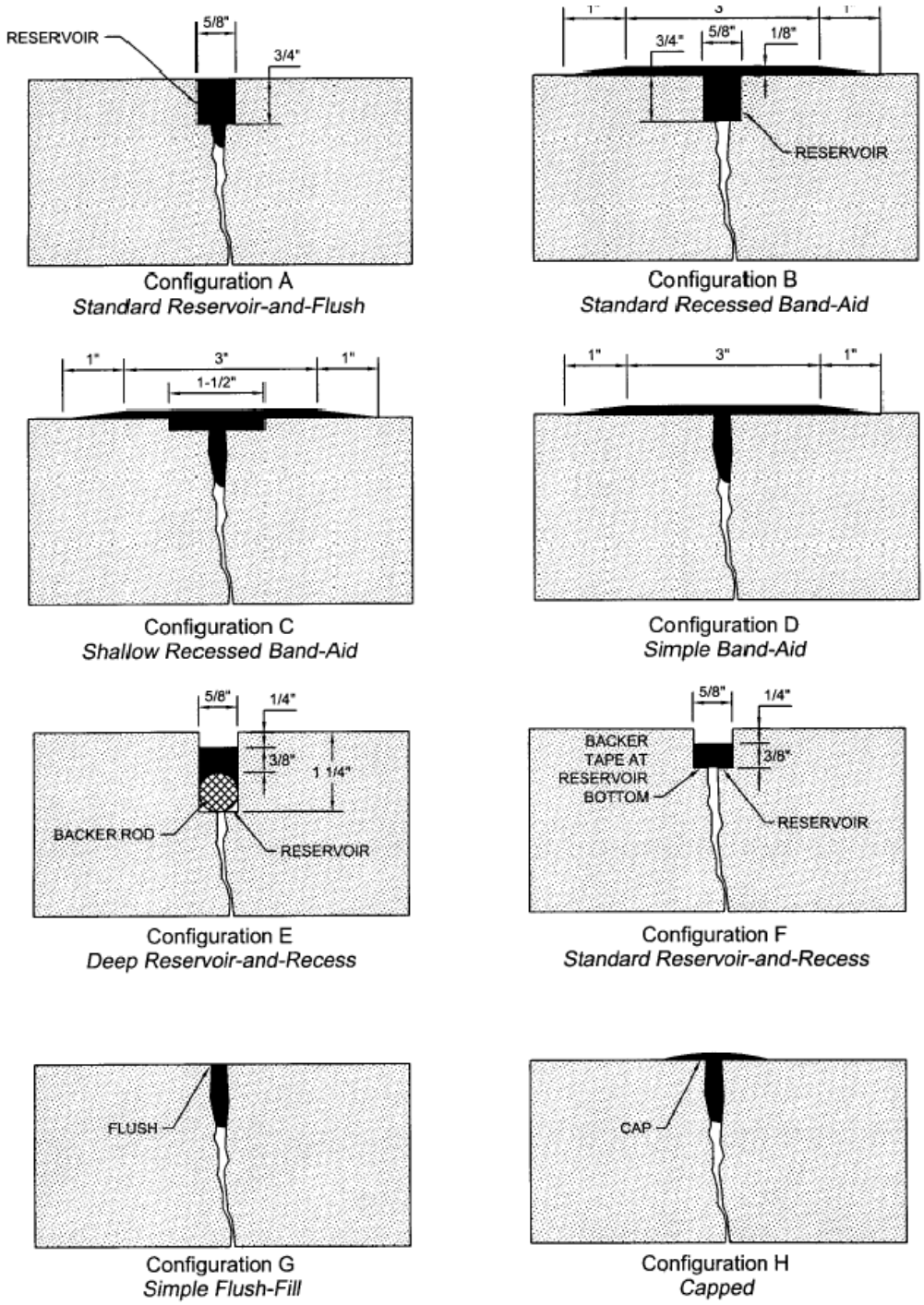
2. Cracks shall be clean and free of all deleterious materials, including any old sealant, incompressibles, and organic material. The crack shall be free of any standing water and any moisture along the sidewalls of the crack as evidenced by a darker color than the adjacent pavement. This shall be accomplished in one of three manners: wire-brushing – where the crack channels are cleaned with a mechanical wire brush followed by high-pressure compressed air; hot air blasting – where the crack channels are cleaned, heated, dried with hot compressed air (HCA) lance connected to a high pressure air compressor; or high-pressure air blasting – where the crack channels are cleaned with high-pressure compressed air. Pavement cracks to be sealed or filled shall be cleaned and dried using one of the methods described previously within 10 minutes of the application of the sealer/filler. Equipment for the two operations should be kept in a compact configuration such that not more than 50 feet separates equipment required by the two operations. Additionally, not more than 10 minutes time shall passed between the cleaning of a crack and the filling of the crack with the appropriate sealing/filling material.

F. Installation

1. Sealer/filler materials should not be applied when the pavement surface is wet or when the pavement temperature is less than 40 º F without the use of hot air blasting or the approval of the Engineer.

2. Sealant/Crack filler should be applied to fill the crack from the bottom to the top in order to prevent air bubbles from forming and creating a point of weakness in the sealant. Upon application, hot sealant/filler material should not make a hissing or popping noise indicative of moisture in the crack. Noises of this kind should indicate that additional drying of the crack is necessary in order to facilitate proper bonding of the material to the sidewalls of the crack. Application of the sealant/filler material shall be made in such a way as to completely fill the crack and provide enough excess to facilitate completion of the seal/fill consistent with the configuration selected. The use of a squeegee or applicator disk to shape the application material to conform to one of the material placement configurations shown on Figure 1 is required. Care shall be taken not to place any sealant/filler material on top of any pavement markings, manholes, or drainage castings. The Contractor shall be responsible to prevent tracking of the sealant/filler material onto the adjacent pavement surfaces to the satisfaction of the Engineer.

3. The manufacturer's technical representative shall be notified by the Contractor and shall be present during the initial installation. Prior to beginning the work, the Contractor will be required to demonstrate to the satisfaction of the Engineer and the manufacturer's representative his ability to apply the material in accordance with the manufacture's specifications. Operations and procedures which are considered by the Engineer as detrimental to the effectiveness of the material will not be permitted.



Material placement configurations for crack treatments

Figure 1

2206.4 Improved Street Chip Seal

A. Description: This work shall consist of the application of a thin, uniform layer of emulsified asphalt to the existing pavement surface in order to universally seal cracks from the intrusion of surface water. Cover aggregate shall then be uniformly distributed upon the asphalt layer and seated in place with the use of a rubber-tired roller. Any excess aggregate material shall be removed, leaving a durable wearing surface.

B. Material Requirements

1. Emulsified Asphalt

   a. The asphaltic sealant material applied to the roadway surface shall consists of a rapid-setting emulsified asphalt either an anionic RS-2 meeting the criteria of ASTM D 977 or a cationic CRS-2 meeting the criteria of ASTM D 2397. These materials may be modified with rubber products in the form of liquid latex, styrene-butidane-rubber, or styrene-butidane-styrene to enhance performance of the material as approved by the Engineer. If a polymer-modified material is used, the emulsified asphalt shall meet the additional specification criteria required by the Engineer.

   b. A sample of the emulsified asphalt may be taken from any of the distributors or delivery tankers on the job site. Failure of the emulsified asphalt to meet the material specification criteria at the time of application shall require the Contractor, at his own expense, to correct all unsatisfactory areas. No additional areas shall be sealed until correction has been made to the satisfaction or the Engineer.

2. Cover Aggregate – Pre-coated Chips

   a. Materials: Aggregate materials shall consist of an approximately cubic and uniformly-graded, hard, durable 100 percent crushed and washed limestone, sandstone, lightweight aggregate, basalt/porphyry, granitic material, steel slag, gravel, or chat. Chat is a by-product from the production of lead and zinc from the area located in southwestern Missouri, northeastern Oklahoma, and southeastern Kansas. Lightweight aggregate shall consist of expanded shale. The application rates reported in these specifications is for the Bethany Falls Limestone in the Kansas City area. The specific gravity of this material is approximately 2.58.

   b. Physical properties required of the aggregate materials:

Los Angeles Abrasion (ASTM C131)	35% loss (maximum)
Soundness using Mag. Sulfate (ASTM C 88, 5 cycles)	18% loss (maximum)
Soundness using Sodium Sulfate (ASTM C 88, 5 cycles)	12% loss (maximum)
Total Shale, clay, coal, and lignite content (ASTM C 142)	0.5% by weight (max)
Absorption	4.0% (max)

   c. Gradation: Gradation of cover aggregates shall conform to the following percentages:

Sieve Size	Percent Passing
3/4” (19mm)	100
1/2” (12.5mm)	90-95
3/8” (9.5mm)	30-50
No. 4 (4.75mm)	0-5
No. 8 (2.36mm)	0

d. Pre-coating of Chips: Aggregate chips shall be uniformly heated in a dryer until surface dry. All material shall be free of moisture, dust, and lumps and shall be approved by the Engineer prior to use. The aggregate chips shall then be pre-coated with 0.9%+ 0.025% a liquid asphalt cement having a viscosity of 2000 poise, +20%. The asphaltic material and hot aggregate shall be measured separately and accurately immediately before introduction into the mixer. Mixing shall be accomplished at a temperature between 275 º F and 325 º F, sufficient to produce a thoroughly and uniformly coated aggregate. The pre-coated chips shall be stockpiled at least 3 days prior to use.

3. Weighing: Weighing of cover aggregate shall be accomplished by the Contractor on scales that he furnishes for the purpose of weighing the cover aggregate as required in Section 2205.7 entitled "Scales and Weighing of Vehicles." All loads of cover aggregate will be weighed and evidenced by approved delivery tickets showing the net weight in pounds for each load. Two copies of each ticket shall accompany the load to the work site. Upon the load being incorporated in the work, the Engineer will sign both copies and one of these copies will be returned to the Contractor.

C. Spot Patching: Areas where base failure of the roadway has occurred, or where the surface is broken out shall be repaired prior to the sealing operation. The failed sections will be marked by the Engineer, and shall be removed by sawing a neat rectangular hole into the pavement. The failed material shall be removed without damage to the adjacent pavement. Where base failures have occurred, the pavement shall be removed to the subgrade which shall be corrected to the satisfaction of the Engineer prior to patching. Unstable material shall be overexcavated and replaced with base materials meeting the requirements of Section 2203. All surfaces shall be properly primed and tacked in accordance with Section 2204.

The prepared hole shall be patched with hot-mix asphaltic patching material by placing in layers not to exceed 2 inches; each layer being thoroughly compacted before the next layer is placed. After the patching material is placed and raked to a uniform surface, it shall be thoroughly compacted by rolling with a roller meeting the requirements of Section 2205.8. The edges shall be well bonded with the old surface. The completed patch shall be in the same plane as the existing pavement.

The asphaltic concrete used for patching at the different locations shall be as directed by the Engineer and shall conform to one of the mixes as set out in Section 2205.4.

D. Sealing

1. Cleaning: After all holes and cracks have been repaired to the satisfaction of the Engineer, and immediately before sealing the Contractor shall thoroughly clean the area to be sealed with a mechanical pickup type sweeper to insure proper adhesion of the new seal coat to the existing pavement. The street shall be dry before applying the seal coat.

2. Sealing: After the street has been prepared as set forth above the Contractor shall apply the emulsified asphalt by means of an approved distributor meeting the requirements of Section 2204.4. Provisions shall be made by the Contractor to properly protect the curbs and gutters from the asphaltic spray. Emulsified asphalt shall be applied at a rate between 0.28 and 0.35 gallons per square yard. The specific rate for each job will be determined by the Engineer in the field.

   Immediately after the application of the asphalt, the Contractor shall, by means of a self-propelled mechanical spreader, apply a uniform layer of cover aggregate. This material shall be spread at the rate specified by the Engineer. This rate shall be between 18 and 25 pounds per square yard of pre-coated limestone chips. The application rate shall be set to prevent bleeding of the asphaltic material through the cover aggregate. If material is spread on any area in excess of the amount specified by the Engineer, the surplus shall be immediately removed and placed elsewhere as directed. No payment will be made to the Contractor for the picking up and redistribution of such excess. Hand

spreading will be permitted only in those areas not accessible to the mechanical spreader.

Immediately after spreading the cover aggregate, the entire surface shall be rolled with multiple-wheel, pneumatic-type rollers meeting the requirements of Section 2205.8. Rolling shall be continued until a thoroughly compacted surface with a uniform aggregate coverage has been obtained, a minimum of 6 passes. The Engineer may require additional rollers if one roller cannot keep up with the operations. The first pass of the rollers over the cover aggregate shall not exceed 3 miles per hour. The rollers shall not exceed 5 miles per hour during any rolling operation.

Forty-eight hours after spreading the cover aggregate, the entire surface shall be swept with a mechanical pickup type sweeper to remove any loose or excess cover aggregate.

During the sealing operation as described above, the Contractor shall cooperate with the Engineer in arranging a program and schedule of work so traffic may be handled or routed around or through the section being sealed. Whenever possible, the street will be closed; but when this is not possible, the sealing will be done in strips while traffic is diverted to the balance of the street. No traffic will be permitted on the sealed portion of the roadway until rolling is completed. All traffic control signage shall conform to the MUTCD handbook for traffic control in work zones.

When bleeding occurs or more material is required, additional cover aggregate shall be spread as directed. As soon as the cover material has adhered to the surface, and the emulsion is thoroughly cured all excess cover aggregate shall be removed with a mechanical pickup type sweeper. This curing period is generally 48 hours, but may be adjusted by the Engineer.

2206.5 Unimproved Street Chip Seal

A. Description: This work shall consist of the application of a thin, uniform layer of liquified asphalt to the surface of the existing roadway which may either consist of an existing surface of asphaltic concrete pavement or a gravel-surfaced road. Cover aggregate shall then be distributed uniformly upon the liquified asphalt and seated in place with the use of a rubber-tired roller leaving a durable wearing surface.

B. Requirements for Liquified Asphalt Materials

Asphaltic materials used for the sealing of unimproved streets shall be liquified either by the introduction of a diluent (cutback) or by emulsification. The particular grade of cutback material for use on a particular roadway shall be determined by the Engineer. Cutback asphaltic materials shall comply with the requirements of either ASTM D 2027 or ASTM D 2028. The particular grade of emulsified asphalt material for use on a particular roadway shall be determined by the Engineer. Anionic emulsified asphaltic materials shall comply with the requirements for either a rapid or medium-setting emulsion as described in ASTM D 977 while cationic emulsified asphaltic materials shall comply with the requirements for either a medium or rapid-setting emulsion as described in ASTM D 2397.

C. Requirements for Cover Aggregate Materials

1. Aggregate materials shall consist of an approximately cubical and uniformly-sized, hard, durable 100 percent crushed and washed limestone, sandstone, lightweight aggregate, basalt/porphyry, granitic material, steel slag, gravel, or chat. Chat is a by-product from the production of lead and zinc from the area located in southwestern Missouri, northeastern Oklahoma, and southeastern Kansas. Lightweight aggregate shall consist of expanded shale. Due to the variation in specific gravities between these materials, the application rate will need to be adjusted to reflect the change in specific gravity. The application rates reported in these specifications is for the Bethany Falls Limestone in the Kansas City area. The specific gravity of this material is approximately 2.58.

2. Physical properties required of the aggregate materials:

Los Angeles Abrasion (ASTM C 131)	35% loss (maximum)
Soundness using Mag. Sulfate (ASTM C88, 5 cycles)	18% loss (maximum)
Soundness using Sodium Sulfate (ASTM C 88, 5 cycles)	12% loss (maximum)
Total Shale, clay, coal, and lignite content (ASTM C 142)	0.5% by weight (max)
Absorption	4.0% (max)

Aggregate chips applied to cutback asphalt shall be shown to have a moisture content less than 1 percent immediately prior to application. Aggregate chips applied to emulsified asphalt shall be shown to have a moisture content of 3 percent or less immediately prior to application.

Gradation for aggregate chips used for Single sealing:

Square Sieve Size	Percent Passing
1/2" (12.5mm)	100
3/8" (9.5mm)	80-100
No. 4 (4.75 mm)	0-26
No. 10 (2.00mm)	0-2

Gradation for aggregate chips used for the first application of a Double sealing:

Square Sieve Size	Percent Passing
3/4" (19mm)	100
1/2" (12.5mm)	90 to 100
3/8" (9.5mm)	40 to 70
No. 4 (4.75mm)	0 to 15
No. 10 (2.0mm)	0-2

Gradation for aggregate chips used for the second application of a Double sealing shall conform to the gradation for a Single sealing above.

The Contractor shall furnish scales for weighing cover aggregate as required in Section 2201.7 entitled "Scales and Weighing of Vehicles". All loads of cover aggregate will be weighed as required, and evidenced by approved delivery tickets showing the net weight in pounds for each load. Two copies of each ticket shall accompany the load to the work site. In order for the load to be received and incorporated into the work, both copies will be signed by the Engineer (or inspector) and one of these copies returned to the Contractor.

D. Sealing

Sealing shall be accomplished in the same manner as described in Section 2206.3.D except as modified herein. Where a seal coat is applied to a gravel-surface roadway the surface shall be prepared in accordance with Section 2204.4. The surface shall then be primed in accordance with Section 2204.4 prior to the application of the seal coat.

The application rate of cutback asphalt shall be in the range 0.25 to 0.45 gallons per square yard as directed by the Engineer or demonstrated to result in a satisfactory seal in a test strip provided by the Contractor. Anti-Strip agent may be added to Cutback Asphalt at a rate not to exceed 1 percent of the residual asphalt volume as directed by the Engineer in order to improve adhesion of the asphalt to the moist aggregates. The cutback agent shall be thoroughly mixed and blended with the cutback asphalt. The application rate of emulsified asphalt shall be in the range of 0.28 to 0.40 gallons per square yard as approved or directed by the Engineer. The distributor

used shall meet the requirements of Section 2204.4.

Limestone materials shall be spread at the rate specified by the Engineer with the range of 16 to 24 pounds per square yard.

Where double sealing is indicated on the Plans or required by the Engineer, the area shall be treated with two seal coats. The application rate of the asphaltic material for the first application shall be approximately one-half of that used for a single seal with the remainder applied during the second seal application. The application rate of the first application of cover aggregate shall be within the range specified for a single seal. The application rate of the second application shall be approximately one-half the application rate of the first layer.

2206.6 Improved Street Slurry Seal

A. Description: This work shall consist of the application of Slurry Seal Material to an existing surface. The Slurry Seal shall consist of a mixture of emulsified asphalt, mineral aggregate and potable water, properly proportioned, mixed and spread on the surface in accordance with this specification and as directed by the Engineer.

B. Material

1. Emulsified Asphalt: The emulsified asphalt shall conform to Grade SS-1h of ASTM D 977, for emulsified asphalt, or Grade CSS-1h of ASTM D 2397, for cationic emulsified asphalt. Quick-set emulsified asphalts QS-1h and CQS-1h may also be used. They shall conform to ASTM D 977 and ASTM D 2397 respectively, except that the test requirements for cement mixing and storage stability shall not apply. Refer to the International Slurry Surfacing Association (ISSA) Bulletin No. 139. The emulsified asphalt shall have not less than 60% residue after distillation when tested using ASTM D 244 and shall have a penetration of between 40 and 90 when tested using ASTM D 2397 at 77° F. Each load of emulsified asphalt delivered shall have a certificate of analysis/compliance matching the material used in the mix design.

2. Aggregate for Slurry Seal: The mineral aggregate used for this work shall be natural or manufactured crushed granite, slag, or chat which is a byproduct of the milling of lead and zinc ores and shall conform to one of the following grading requirements when tested in accordance with ASTM C 136 and ASTM C 117. All aggregate shall conform to the quality requirements of ASTM D 1073.

GRADING REQUIREMENTS FOR AGGREGATE			
Sieve Size	Amount Passing Sieves, Weight %		
	Type I	Type II	Tolerance
3/8 inch (9.5 mm)	100	100	
No. 4 (4.75 mm)	100	90 – 100	+/- 5%
No. 8 (2.36 mm)	90 – 100	65 – 90	+/- 5%
No. 16 (1.18 mm)	65 – 90	45 – 70	+/- 5%
No. 30 (600 um)	40 – 65	30 – 50	+/- 5%
No. 50 (300 um)	25 – 42	18 – 30	+/- 4%
No. 100 (150 um)	15 – 30	10 – 21	+/- 3%
No. 200 (75 um)	10 - 20	5 – 15	+/- 2%

The percent passing the No. 200 (75 um) sieve shall be determined by ASTM C 117.

3. Mineral Filler: Mineral Fillers are of two types, chemically active and chemically inactive. Both shall conform to ASTM D 242. Chemically active mineral fillers such as Portland cement, hydrated lime, and ammonium sulfate are used to improve workability, regulate the setting time, and, in some cases, to

alter the aggregate gradation. Chemically inactive mineral fillers such as limestone dust, fly ash, and rock dust are used mainly to alter aggregate gradation.

4. Water: All water used shall be potable and shall be free of harmful salts or contaminates.

5. Mix Design: The Engineer shall approve all slurry seal materials and methods prior to mixing and application. The Contractor shall submit a completed and tested slurry seal mix design for the Engineer's approval. The approved test method for emulsified asphalt slurry seal shall be found in ASTM D 3910. The mix design shall be made with the same materials the Contractor will be using on the project. The percentage of each material must be shown on the mix design. Proportions of the mixture shall be as follows unless variations are approved by the Engineer:

	TYPE I	**TYPE II**
Aggregate for Slurry Seal	8.0 to 12.0 lbs per sq yd 3.63 to 5.44 kg/m^2 (dry basis)	13.5 to 16.5 lbs per sq yd 7.32 to 8.95 kg/m^2 (dry basis)
Emulsified Asphalt (Residual Asphalt Content)	10.0 to 16.0% by weight of dry aggregate	7.5 to 13.5% by weight of dry aggregate
Mineral Filler	1.5 to 3.0% by weight of dry aggregate	1.5 to 3.0% by weight of dry aggregate
Water	Minimum amount necessary to obtain a fluid and homogenous mixture	Minimum amount necessary to obtain a fluid and homogenous mixture

Once the proper consistency is obtained, changes in proportioning of the various components of the mixture shall be held to a minimum.

6. Application Rates: The slurry seal mixture shall be of proper consistency at all times so as to provide the application rate required by the surface condition and shall be in accordance with the following:

Type I: 8.0 to 12.0 lbs per sq yd
Type II: 13.5 to 20 lbs per sq yd

Application rates are affected by the unit weight of the aggregate, the gradation of the aggregate and the demand of the surface to which the slurry seal is being applied.

7. Equipment: The slurry mixing machine shall be a continuous flow mixing unit and shall be capable of delivering accurately a predetermined proportion of aggregate, water and asphalt emulsion to the mixing chamber and to discharge the thoroughly mixed product on a continuous basis. The equipment shall be capable of pre-wetting the aggregate immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly blending all of the components together without violent mixing. The mixing machine shall be equipped with an approved fines feeder that includes an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer. The mineral filler shall be fed at the same time and location as the aggregate. The fines feeder shall be required whenever added mineral filler is a part of the aggregate blend. The mixing machine shall be equipped with a water pressure system and fog-type spray bar, adequate for complete fogging of the surface receiving slurry treatment. Attached to the mixer machine shall be a mechanical type squeegee distributor, equipped with flexible material in contact with the surface of the pavement to prevent loss of slurry from the distributor. It shall be maintained so as to prevent loss of slurry on varying grades and crown by adjustments to insure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width.

The box shall be kept clean and build-up of asphalt and aggregate on the box or in the corners shall not be permitted. Use of burlap drags or other drags shall be approved by the Engineer. Hand squeegees, shovels, and other equipment shall be provided if necessary to supplement the slurry mixing machine. Power brooms, power blowers, air compressors, and hand brooms suitable for cleaning the surface and cracks of the existing surface shall be implemented to provide a clean surface.

8. Construction Requirements

a. Surface Preparation: Immediately prior to applying the slurry, clean the surface of all loose material, mud spots, vegetation, and other objectionable material. Any standard cleaning method used to clean pavements will be acceptable except water flushing. A pickup sweeper must be used unless otherwise approved by the Engineer. Manholes, valve boxes, drop inlets, and other service entrances shall be protected from the slurry seal by a method approved by the Engineer.

b. Application: The surface shall be pre-wetted by fogging ahead of the slurry box unless waived by the Engineer. Water used in pre-wetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the slurry box. The slurry mixture shall be of the desired consistency upon deposit on the surface and no additional elements shall be added. Total time of mixing shall not exceed four (4) minutes. A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that a complete coverage is obtained. Overloading of the spreader shall be avoided. No lumping, balling, or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate shall be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry shall be removed from the pavement. No excessive breaking of emulsion shall be allowed in the spreader box. No streaks, such as those caused by oversized aggregate will be left in the finished pavement.

c. Hand Work: Approved squeegees shall be used to spread slurry in areas not accessible to the slurry mixer. Care should be exercised in leaving no unsightly appearance from the hand work.

d. Curing: Treated areas shall be allowed to cure for four hours, or until such time as the Engineer permits their opening to traffic.

e. Weather Limitation: The slurry seal shall not be applied if either the pavement or air temperature is below 60° F and falling. The mixture shall not be applied if the relative humidity exceeds 80%.

f. Traffic Control: Suitable methods shall be used to protect the slurry from all types of traffic until sufficiently cured to accept traffic. The length of time before traffic is permitted to use the surface depends on the type of emulsified asphalt, mixture characteristics, and weather conditions.

g. Lines: Care shall be taken to insure straight lines along curb and shoulders. No runoff on these areas will be permitted. Lines at intersections will be kept straight to provide good appearance.

h. Property Owners Notification: The Contractor shall supply and place door tags on the doors of all involved property owners. The door tag language shall be approved by the Engineer.

i. Provisions for Public Convenience During Sealing Operation: The Contractor shall provide and maintain sufficient signs, barricades, warning lights, flag persons and watch persons to protect the work and public in a manner satisfactory to the Engineer. Any areas damaged prior to acceptance by the Engineer shall be repaired at the Contractor's expense. "No Parking" signs will be furnished by the Contractor. These signs shall comply with the standards established by the MUTCD with regard to size, color, working height and placement. When "No Parking" signs are posted on the streets with parking meters, the Contractor shall cover the parking meter heads with cloth or paper bags. The Contractor shall take all necessary precautions to protect the public (pedestrian and vehicular) from flying

debris. The Contractor shall use warning signs and devices to warn motorists and pedestrians of work ahead.

2206.7 Improved Street Micro-Surfacing

A. Description: This work shall consist of the application of a polymer modified asphalt emulsion, mineral aggregate, mineral filler, potable water, and other additives, properly proportioned, mixed and spread on a paved surface in accordance with this specification and as directed by the Engineer.

B. Materials

1. Emulsified Asphalt: The emulsified asphalt shall be a quick wet polymer modified asphalt emulsion conforming to the requirements specified in ASTM D 2397 or AASHTO M 208 for Grade CSS-1h. The cement mixing test shall be waived for this emulsion. The polymer material shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process. The emulsified asphalt shall have not less than 62% residue after distillation when tested using ASTM D 244. The temperature for this test shall be held below 280° F. Higher temperatures may cause the polymers to break down. In addition, the emulsified asphalt shall have a penetration of between 40 and 90 when tested using ASTM D 2397 at 77° F (25° C) and shall have a minimum softening point of 135° F when tested using ASTM D 36. Each load of emulsified asphalt delivered shall have a certificate of analysis/compliance matching the material used in the mix design.

2. Aggregate for Micro-Surfacing: The aggregate shall be a manufactured crushed stone such as granite, or chat which is a by-product of the milling of lead and zinc ores. The aggregate shall be totally crushed with 100% of the parent aggregate being larger than the largest stone in the gradation to be used. The mineral aggregate used shall conform to one of the following grading requirements when tested in accordance with ASTM C 136 and ASTM C 117. All aggregate shall conform to the quality requirements of ASTM D 1073.

GRADING REQUIREMENT FOR AGGREGATE			
Sieve Size	Amount Passing Sieves, Weight %		
	Type I	Type II	Tolerance
3/8 inch (9.5 mm)	100	100	
No. 4 (4.75 mm)	90 – 100	70 – 90	+/- 5%
No. 8 (2.36 mm)	65 – 90	45 – 70	+/- 5%
No. 16 (1.18 mm)	45 – 70	28 – 50	+/- 5%
No. 30 (600 um)	30 – 50	19 – 34	+/- 5%
No. 50 (300 um)	18 – 30	12 – 25	+/- 4%
No. 100 (150 um)	10 – 21	7 – 18	+/- 3%
No. 200 (75 um)	5 - 15	5 – 15	+/- 2%

The combined aggregate prior to the addition of any chemically active mineral filler shall have a sand equivalent of not less than 65 when tested by ASTM D 2419. The aggregate shall have a weighed average loss not greater than 25% using magnesium sulfate when tested by ASTM C 88. Testing of abrasion resistance shall not exceed 30% when tested by ASTM C 131.

3. Mineral Filler: Mineral filler shall be any recognized brand of non-air entrained Portland cement or hydrated lime. The mineral filler shall be free of lumps and accepted upon visual inspections. The type and amount of mineral filler needed shall be determined by a laboratory mix design and will be considered as part of the aggregate gradation.

4. Water: All water used shall be potable and shall be free of harmful salts or contaminates.

5. Additives: Additives may be added to the emulsion mix or any of the component materials to provide the control of the quick-traffic properties. They must be included as part of the mix design and be compatible with the other components of the mix.

6. Mix Design: The Engineer shall approve all micro-surfacing materials and methods prior to mixing and application. The Contractor shall submit a completed and tested micro-surfacing mix design for the Engineer's approval. The approved test method for micro-surfacing shall be found in ASTM D 6372. The mix design shall be made with the same materials the Contractor will be using on the project. The percentage of each material must be shown on the mix design. Proportions of the mixture shall be as follows unless variations are approved by the Engineer.

	TYPE I	**TYPE II**
Aggregate for Micro-surfacing	10.0 to 20.0 lbs per sq yd 4.53 to 9.07 kg/m^2 (dry basis)	13.5 to 16.5 lbs per sq yd 7.32 to 8.95 kg/m^2 (dry basis)
Emulsified Asphalt (Residual Asphalt Content)	7.5 to 13.5% by weight of dry aggregate	7.5 to 13.5% by weight of dry aggregate
Polymer Based Modifier	Minimum of 3% solids based on asphalt weight content	Minimum of 3% solids based on asphalt weight content
Additive	As needed	As needed
Mineral Filler	0.0 to 3.0% by weight of dry aggregate	0.0 to 3.0% by weight of dry aggregate
Water	Minimum amount necessary to obtain a fluid and homogenous mixture	Minimum amount necessary to obtain a fluid and homogenous mixture

Once the proper consistency is obtained, changes in proportioning of the various components of the mixture shall be held to a minimum.

7. Application Rates: The Micro-Surfacing mixture shall be of proper consistency at all times so as to provide the application rate required by the surface condition and shall be in accordance with the following:

Type II: 10.0 to 20.0 lbs per sq yd
Type III: 15.0 to 30.0 lbs per sq yd

Application rates are affected by the unit weight of the aggregate, the gradation of the aggregate, and the demand of the surface to which the micro-surfacing is being applied.

8. Equipment

a. Micro-Surfacing Mixing Equipment: The micro-surfacing mixing machine shall be specifically designed and manufactured to lay micro-surfacing. The machine shall be self-propelled, continuous flow mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive, and water to a revolving multi-blade double-shafted mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler,

control additive, and water to maintain an adequate supply to the proportioning controls. On major highway work, the machine may be required to be a self-loading machine capable of loading materials while continuing to lay micro-surfacing. The self-loading machine shall be equipped to allow the operator to have full control of the forward and reverse speed during application of the micro-surfacing material and be equipped with opposite side drivers stationed to assist in alignment. The self-loading device, opposite side drivers stations, and forward and reverse speed controls shall be original equipment manufacturer designed.

b. Proportioning Devices: Individual volume or weight controls for proportioning each material, and used in material calibration, shall be provided and properly marked.

c. Calibration: Each mixing unit to be used in the performance of the work shall be calibrated prior to construction. Calibration documentation shall include an individual calibration of each material at various settings, which can be related to the machine metering devices. No machine will be allowed to work on the project until a calibration has been completed. Final calibration sheets shall be provided to the Engineer for acceptance.

d. Micro-Surfacing Spreading Equipment: The machine shall include a surfacing box with twin-shafted paddles or spiral augers fixed in a spreader box. A flexible front seal shall be provided to insure no loss of mixture at the road surface contact point. The rear flexible seal shall act as a final strike-off and shall be adjustable in width. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off box. The box shall have suitable means provided to side-shift the box to compensate for variations of pavement geometry. A secondary strike-off shall be provided to improve the surface texture. It shall have the same leveling adjustments as the spreader box.

e. Auxiliary Equipment: Hand squeegees, shovels, traffic control equipment, and other support and safety equipment shall be provided as necessary to perform the work.

f. Cleaning Equipment: Power brooms, pickup sweepers, power blowers, air compressors, and hand brooms suitable for cleaning shall be utilized to provide a clean surface.

9. Construction Requirements

a. Surface Preparation: Preparation should include crack sealing to minimize future reflective cracking. Immediately prior to applying the micro-surfacing, the surface shall be cleaned of all loose material, silt spots, vegetation, and objectionable material as determined by the Engineer. Any standard cleaning method used to clean pavements will be acceptable except water flushing. Manholes, valve boxes, drop inlets, and other service entrances shall be protected from the micro-surfacing by a method approved by the Engineer.

b. Application: If the pavement area to be covered is extremely oxidized and raveled or is concrete or brick, a tack coat may be required at the discretion of the Engineer. The tack coat shall conform to Section 2204 and shall be a SS or CSS grade. The tack coat shall be allowed to break sufficiently before the application of micro-surfacing. The surface shall be pre-wetted by fogging ahead of the spreader box unless waived by the Engineer. Water used in pre-wetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the spreader box. The micro-surfacing mixture shall be of the desired consistency upon deposit on the surface and no additional elements shall be added. A sufficient amount of material shall be carried in all parts of the spreader box at all times so that a complete coverage is obtained. Overloading of the spreader box shall be avoided. No lumping, balling, or unmixed aggregate shall be permitted. No streaks, such as those caused by oversized aggregate shall be left in the finished surface.

c. Hand Work: Areas which cannot be reached with the mixing machine shall be surfaced using approved hand squeegees to provide a complete and uniform coverage. If necessary, the area to be hand-worked shall be lightly dampened prior to mix placement. The same type of finish as applied by the spreader box shall be required.

d. Curing: Micro-surfacing shall be allowed to cure for one hour, or until the Engineer permits

opening the street to traffic.

e. Weather Limitation: Micro-surfacing shall not be applied if either the pavement or air temperature is below 60° F and falling. The mixture shall not be applied if the relative humidity exceeds 80%.

f. Traffic Control: Suitable methods shall be used to protect the micro-surfacing from all types of traffic until sufficiently cured to accept traffic. The length of time before traffic is permitted to use the surface shall be determined by the Engineer.

g. Lines: Care shall be taken to insure straight lines along curb and shoulders. No runoff on these areas will be permitted. Lines at intersections will be kept straight to provide good appearance.

h. Property Owners Notification: The Contractor shall supply and place door tags on the doors of all involved property owners. The door tag language shall be approved by the Engineer.

i. Provisions for Public Convenience During Surfacing Operation: The Contractor shall provide and maintain sufficient signs, barricades, warning lights, flag persons and watch persons to protect the work and public in a manner satisfactory to the Engineer. Any areas damaged prior to acceptance by the Engineer shall be repaired at the Contractor's expense. "No Parking" signs will be furnished by the Contractor. These signs shall comply with the standards established by the MUTCD with regard to size, color, working height and placement. When "No Parking" signs are posted on the streets with parking meters, the Contractor shall cover the parking meter heads with cloth or paper bags. The Contractor shall take all necessary precautions to protect the public (pedestrian and vehicular) from flying debris. The Contractor shall use warning signs and devices to warn motorists and pedestrians of work ahead.

SECTION 2207 COLD MILLING

2207.1 Scope

This section governs the furnishing of all labor, materials and equipment for the performance of cold milling pavement surfaces as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions. This work will consist of the removal of the existing surface, loading, hauling, and stockpiling, if required, of the milled material and the cleaning of the milled surface.

2207.2 Equipment

Milling the surface of pavements shall be completed by the use of a milling machine conforming to the following:

A. Machine: The cold milling machine shall be self-propelled and able to automatically control grade and slope of the milled surface. Operate the automatic grade and slope control from a travelling stringline a minimum of 30 feet long, attached the milling machine and operating parallel to the direction of travel. Other methods of positive grade control may be used if approved by the Engineer. The machine shall have the means of milling without damaging the remaining pavement (torn, gouged, shoved, broken, etc.). The machine shall be capable of blading the cuttings into a single windrow or depositing them directly into a truck.

B. Air Pollution: The machine shall be equipped with a dust suppression system including water storage tanks and high pressure spray bars.

C. Operating Width: It is desirable that the cutting width be greater than 6 feet. In the event the cutting width is less than 6 feet, a system of electronic grade control for consecutive passes will be required.

D. Cutting Drum: The cutting drum shall be totally enclosed to prevent discharge of any loosened material on adjacent work areas.

2207.3 Construction

A. Methods of Operations for Milling

1. Utilities: Street surfaces adjacent to manholes, water valves and other utility extensions shall be completely removed to the full depth of cut specified for the street unless otherwise specified by the Engineer.

2. Material Disposal: All material from the milling operation shall be removed immediately from the surface of the pavement and properly disposed of by the Contractor at an approved disposal area.

3. Surface Conditions: The drum lacing patterns shall produce a smooth surface finish after milling, with groove depths not to exceed 1/4 inch and groove spacing not to exceed 1 inch unless otherwise approved by the Engineer.

B. Types of Cuts to be made by Milling

1. Leveling: Sufficient passes shall be made such that all irregularities or high spots are eliminated, and that 100% of the surface is milled.

2. Average Depth: Sufficient passes, or cuts, shall be made in order to remove a specified depth over the entire street section. These depths will be designated in the Plans or Special Provisions.

3. Curb Cut: Sufficient passes or cuts shall be made to remove the specified depth at the curb for a specified width. These dimensions will be designated in the Plans or Special Provisions.

4. Bridge Deck Milling: Sufficient passes, or cuts, shall be made in order to remove the material as specified on the Plans or in the Special Provisions.

C. Cleanup: All loose asphalt and debris shall be removed from the street surface and curb and gutter. Any material and debris that adheres to the curb and gutter shall be removed.

D. Opening to Traffic: If the milled area will be opened to traffic prior to surfacing, provide a smooth riding surface by either milling or placing a wedge of hot mix asphalt or other approved material of a thickness and design that will remain in place under traffic. The transition between the milled area and transverse joints shall be a minimum of 1 vertical to 24 horizontal. The transition between the milled surface and manholes, utility fixtures or other appurtenances shall be a minimum of 1 vertical to 12 horizontal. Transitions shall be removed prior to surfacing.

SECTION 2208 PORTLAND CEMENT CONCRETE PAVEMENT

2208.1 Scope

This section governs the furnishing of all labor, materials and equipment for the placement of Portland Cement Concrete Pavement as shown on the Plans and in accordance with the Standard Drawings, the specifications, and the Special Provisions.

2208.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

A 615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A 775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars
A 1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 143 Standard Test Method for Slump of Hydraulic-Cement Concrete
C 172 Standard Practice for Sampling Freshly Mixed Concrete
C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C 309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C 1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

D 1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
D 2628 Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
D 2835 Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
D 6690 Standard Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements
D 7174 Standard Specification for Preformed Closed-Cell Polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction
E 965 Test Method for Measuring Surface Macrotexture Depth Using a Sand Volumetric Technique

AASHTO

M 148 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
M 213 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
M 324 Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements

KCMMB Kansas City Metro Materials Board Specifications

Kansas Department of Transportation

Standard Specifications for State Road and Bridge Construction, 2015 Edition

National Concrete Pavement Technology Center Guide Specifications for Concrete Overlays, September 2015, including latest revisions

2208.3 Materials

A. Concrete: Concrete shall conform to referenced specifications as called out in the Contract Documents. If no direct reference to concrete specifications is included in the Contract Documents, concrete shall meet KCMMB specifications.

1. If KCMMB concrete is specified, an approved KCMMB concrete mix shall be required.

2. Proposed concrete mix designs for use on the project shall be submitted to Engineer for approval at least two (2) weeks in advance of anticipated use. Mix design shall be approved prior to use of that mix.

3. Field testing of concrete shall be performed by the Engineer at the frequency required by the referenced specification. Unless otherwise specified, the following tests shall be performed once for every 50 cuyd of concrete placed:

    a. Sampling of fresh concrete per ASTM C 172
    b. Slump per ASTM C 143
    c. Air Content per ASTM C 231
    d. Temperature per ASTM C 1064
    e. Cylinders cast per ASTM C 31 and tested per ASTM C 39. Four cylinders shall be cast with one tested at 7 days, 2 tested at 28 days and one held in reserve.

4. For concrete overlays, material and construction specifications shall be governed by the National Concrete Pavement Technology Center Guide Specifications for Concrete Overlays, September 2015, including latest revisions.

B. Reinforcement

1. Bars: Non-epoxy coated bars shall conform to ASTM A 615. Epoxy coated bars shall conform to ASTM A 775.

2. Welded Steel Wire: Welded steel wire fabric shall conform to ASTM A 1064.

3. Supporting Elements: Representative samples of supporting elements shall be submitted and approved by the Engineer prior to their use in the project.

4. Fibers: When specified in the Contract Documents, fibers shall be incorporated into the concrete at the rate recommended by the manufacturer but no less than a minimum of 3 pounds per cubic yard of concrete for macro fibers and 1 pound per cubic yard of concrete for micro fibers. Fibers shall meet the requirements of KDOT Standard Specifications for State Road and Bridge Construction, 2015 Edition, Section 1722.2. Micro fibers are used to control plastic shrinkage cracks in concrete while macro fibers control cracking in hardened concrete and are often used as a substitute for traditional crack control steel reinforcing bars or mesh. In addition, macro fibers add toughness, and impact and fatigue resistance to hardened concrete.

C. Isolation Joint Fillers: Isolation joint fillers shall conform to ASTM D 1751, D 1752, or ASTM D 7174.

D. Joint Sealing Compounds: Joint sealing compounds shall conform to the standards for the type of sealant specified as listed in the following table:

Joint Seals and Sealants	AASHTO	ASTM

Hot-poured, Polymeric Asphalt Based	M 324	D 6690
Preformed Polychloroprene Elastomeric		D 2628
Lubricant for Installation of Preformed Seal	-----	D 2835
Preformed Expansion Joint Filler	M 213	D 1751, D 1752 or D 7174

E. Curing Membrane: All material to be used or employed in curing Portland Cement Concrete must be approved by the Engineer prior to its use. It shall be of the liquid membrane type and shall conform to ASTM C 309, Type II, Class B or AASHTO M 148, Type 2, white pigmented.

2208.4 Construction

Portland Cement Concrete Pavement shall be constructed to the configuration, and to the lines and grades shown on the Plans.

A. Grading, Subgrade Preparation and Base Course: All excavation, embankment, subgrade stabilization or aggregate base course required shall be as defined in Sections 2100 “Clearing, Grading, Excavation and Site Preparation”, 2201 "Subgrade Preparation", 2202 “Subgrade Stabilization”, and 2203 “Aggregate Base Course”. If areas of the subgrade are below the lines, grades and cross-sections shown on the Plans, they shall be brought to the proper line, grade and cross-section by one of the following:

1. Additional fill material placed in accordance with applicable sections.

2. Areas may be filled with additional thickness of Portland Cement Concrete Pavement.

B. Surface Preparation for Concrete Overlay: Prepare surface for concrete overlay as specified in the National Concrete Pavement Technology Center Guide Specifications for Concrete Overlays, September 2015.

C. Forms: All forms shall be in good condition, clean, and free from imperfections. Each form shall not vary more than 1/4 inch in horizontal and vertical alignment for each 10 feet of length.

1. Material & Size: Forms shall be made of metal and shall have a height equal to or greater than the prescribed edge thickness of the pavement slab. Wood forms may be substituted when approved by Engineer and if they are free from warp with sufficient strength for the intended application.

2. Strength: Forms shall be of such cross-section and strength, and so secured as to resist the pressure of the concrete when struck off, vibrated, and finished, and the impact and vibration of any equipment which they may support.

3. Installation: Forms shall be set true to line and grade, supported through their length and, joined neatly in such a manner that the joints are free from movement in any direction.

4. Preparation: Forms shall be cleaned and lubricated prior to each use and shall be so designed to permit their removal without damage to the new concrete.

D. Joints: Generally joints shall be formed at right angles to the true alignment of the pavement and to the depths and configuration specified by the appropriate standard or as modified by the Plans and specifications. For additional guidance on jointing, see American Concrete Paving Association jointing guides. All joints shall be sealed with sealant meeting the requirements of Section 2208.3.D. Unless specified otherwise on the Plans, specifications, Standard Drawings or Special Provisions, use hot-poured joint sealant.

1. Isolation Joints: Isolation joints shall be placed at all locations where shown on the Plans and Standard

Drawings or as directed by the Engineer.

a. Isolation joints shall extend the entire width of the pavement and from the subgrade to the surface of the pavement. The material will have a suitable tear strip or removable cap provided to allow for the application of the joint sealer to the required depth.
b. Under no circumstances shall any concrete be left across the isolation joint at any point.
c. Material: Isolation joints shall be formed by a one-piece, one inch thick preformed joint filler cut to the configuration of the correct pavement section.
d. Stability: Isolation joints shall be secured in such a manner that they will not be disturbed during the placement, consolidation and finishing of the concrete.
e. Dowels: If isolation joints are to be equipped with dowels they shall be of the size and type specified, and shall be firmly supported in place, by means of a dowel basket or other support method approved by the Engineer, which shall remain in place. Each dowel shall be lightly painted or greased with a product approved by the Engineer.

2. Contraction Joints: Contraction joints shall be placed where indicated and to the depth indicated by the Plans, specifications and Standard Drawings.

a. Method: Contraction joints shall be sawed.
b. When sawing joints, the Contractor shall begin as soon as the concrete hardens sufficiently to prevent excessive raveling along the saw cut and shall finish before conditions induce uncontrolled cracks, regardless of the time or weather. All sawed joints shall begin with a relief cut that shall be approximately 1/8 inch wide, and a minimum of 1/3 the thickness of the slab unless shown otherwise on the Plans. If the Plans indicate a joint width greater than 1/8" but with no backer rod, the Contractor may saw the initial relief cut to the full width. If a reservoir cut is specified that uses a backer rod, a second stage saw cut which widens the joints to allow the insertion of joint sealing material shall be performed. The second stage saw cut shall not be performed until the concrete is at least 48 hours old and shall be delayed longer when the sawing causes raveling of the concrete. If second stage sawing is performed prior to the completion of the curing period, the Contractor shall maintain the cure by use of materials approved by the Engineer.
c. The Contractor shall be responsible for using suitable methods to cut joints straight and in the correct location. The Contractor shall protect joints from damage until completion of the project and shall repair damaged joints to the satisfaction of the Engineer.
d. Where not indicated on the Plans or Standard Drawings, joint spacing for concrete overlays shall not exceed 12 times the thickness of the overlay, and shall be constructed such that the larger dimension of any panel does not exceed 125% of the smaller dimension. Joints of adjacent panels shall be aligned. Joints shall intersect pavement free edges at 90 degrees, and shall extend a minimum of 1 foot from the pavement edge. Saw joints shall be one-third the thickness of the slab, or two inches, whichever is greater.
e. For bonded concrete overlays, joints shall be located above existing joints, shall be sawed full depth plus one-half inch for overlays up to 4 inches in two stages. The first stage provides a relief cut approximately 1/8 inch wide.
f. Dowels: If contraction joints are to be equipped with dowels they shall be of the size and type specified and shall be firmly supported in place and accurately aligned parallel to the pavement line and grade with an allowable tolerance of 1/8 inch.

3. Longitudinal and Construction Joints: Longitudinal joints and construction joints shall be placed as shown on the Plans or where the Contractor's construction procedure may require them to be placed with approval of the Engineer. Longitudinal construction joints (joints between construction lanes) shall be keyed or tied joints of the dimensions shown on the Plans or Standard Drawings. Transverse construction joints of the type shown on the Plans or Standard Drawings shall be placed wherever concrete placement is suspended for more than 30 minutes. Unless shown otherwise on the Plans, do

not place a construction joint within 5 feet of another transverse expansion, contraction or construction joint.

4. Center Joints: Longitudinal center joints shall be constructed using the methods specified in Section 2208.4.D.2 "Contraction Joints".

5. Tie Bars: Tie bars shall be deformed steel of the dimensions specified by the Plans or Standard Drawings. Tie bars shall be installed at the specified spacing and firmly secured so as not to be disturbed by the construction procedure. Tie bars shall not be placed mechanically or by hand into the plastic concrete during the paving operation unless approved by the Engineer. Tie bars shall not be located within one foot of an intersecting joint.

E. Placing, Finishing, Curing, and Protection: Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of the applicable specification as stipulated in Section 2208.3.A. Prior to commencing construction, the Contractor shall furnish a concrete delivery plan which includes at a minimum the number of trucks which will be dedicated to the project, the location of the concrete plant, the route and distance from the plant to the job site, and the anticipated rate of concrete usage. It is essential that concrete be delivered in sufficient quantities to prevent stoppage of the paving operation.

1. Concrete Placement: The concrete shall be deposited on the subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation without the use of intermediate forms or bulkheads. The subgrade shall be moistened prior to the placement of concrete. The concrete shall be placed as uniformly as possible in order to minimize the amount of additional spreading necessary. The concrete shall not be permitted to drop freely a distance of greater than 3 feet. While being placed, the concrete shall be vibrated and compacted with suitable tools so that the formation of voids or honeycomb pockets is prevented.

   The concrete shall be well vibrated and tamped against the forms and along all joints. Care shall be taken in the distribution of the concrete to deposit a sufficient volume along the outside form lines so that the curb section can be consolidated and finished simultaneously with the slab.

   No concrete shall be placed around manholes or other structures until they have been brought to the required grade, alignment, and cross slope.

   Concrete shall not be allowed to extrude below the forms.

   Limitations for time of placement and other items not specifically covered by this specification shall be in accordance with the most recent Standard Specifications of the State Department of Transportation for the state the work is being performed in. The Engineer may extend placement time limitations based on field conditions and concrete consistency and workability.

2. Concrete Finishing Methods: The pavement shall be struck off and consolidated with a mechanical finishing machine. Hand finishing methods may be used for small or irregular areas. Furnish paving and finishing equipment applicable to the type of construction as follows:

   a. Slip-form Machines: Furnish slip-form machines capable of spreading, consolidating, screeding, and float finishing the freshly placed concrete in one pass to provide a dense and homogeneous pavement with minimal hand finishing.
   b. Self-Propelled Form-Riding Machines: Furnish mechanical, self-propelled spreading and finishing machines capable of consolidation and finishing the concrete with minimal hand finishing. Do not use machines that displace the fixed side forms.
   c. Manual Fixed-Form Paving Machines: Furnish spreading and finishing machines capable of consolidating and finishing the concrete with minimal hand finishing.

d. Hand Methods: When finishing by hand methods, concrete shall be consolidated by use of vibrating units operating in the concrete. Unless the vibrating apparatus is such that the full width of concrete is consolidated in a single passage, a definite system or pattern shall be used in the operation of the vibrator so the full width of concrete in each linear foot of lane will receive adequate and uniform consolidation. The system and methods of vibrating shall be subject to approval of the Engineer. Vibrating equipment shall, under no circumstances, be used as a tool for moving concrete laterally on the grade.

3. Concrete Finishing

a. Do not apply moisture (water, finishing aids, etc.) to the surface of the concrete pavement. The concrete should be provided with proper consistency and workability to place, strike off, consolidate, finish and texture without the addition of moisture. Only in the event of exceptional and unusual circumstances may the Engineer consider allowing a fine, fog mist to be added.

b. Floating: All surfaces shall be consolidated and floated after strike-off and prior to final surface finish.

c. Straightedging: Following the floating and while the concrete is still plastic, the surface shall be tested for trueness with a 10-foot straightedge placed parallel to the centerline and operated across the entire width of the pavement. The straightedge shall be advanced in successive stages not to exceed half its length and the operation repeated. Surface deviations greater than 1/8 inch shall be corrected and the straightedging repeated. Straightedging may be eliminated if the pavement smoothness is verified using a profilograph as specified in Section 2211.

d. Edging: Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be finished to 1/8” radius, or that shown on the Plans or Standard Drawings by the paving equipment, or with hand edging tools.

e. Final Surface Finish

i. Dragged Surface Treatment: For roadways with a design speed of 45 mph or less to be posted at 45 mph or less, astroturf or burlap shall be dragged longitudinally over the finished surface to produce a tight, uniform, textured surface, and the edges shall be rounded in a workmanlike manner.

For roadways to be posted at 50 mph or more, astroturf or burlap shall be dragged longitudinally over the finished surface to produce a tight, uniform, textured surface, and the edges shall be rounded in a workmanlike manner. The texture achieved by the astroturf or burlap drag shall be tested by the Contractor in accordance with ASTM E 965, "Test Method for Measuring Surface Macrotexture Depth Using a Sand Volumetric Technique", to ensure the texture is adequate for skid resistance. Test locations will be determined by the Engineer. The results of ASTM E 965 shall show an average texture depth of any lot, as defined below, and shall have a minimum value of 0.032 inch. Any lot showing an average of less than 0.032 inch but equal to or greater than 0.024 inch will be accepted as substantial compliance but the Contractor shall amend their operation to achieve the required 0.032 inch minimum depth. (It is not the intention of this tolerance to allow the Contractor to continuously pave with an average texture depth of less than 0.032 inch). Any lot showing an average texture depth of less than 0.024 inch shall require diamond grinding of the pavement represented by this lot to attain the necessary texture. Any *individual test* showing a texture depth of less than 0.020 inch shall require diamond grinding of the pavement represented by this lot to attain the necessary texture. Limits of any failing individual test shall be determined by running additional tests at 100 foot intervals before and after the failing test location. All testing of the surface texture shall be completed no later than the day following pavement

placement.

ii. Groove Treatment: For roadways to be posted at 50 mph or more, the surface of the traveled lanes shall be grooved in a transverse direction unless specified otherwise in the Plans, Special Provisions, or Specifications. If approved by the Engineer, a suitable longitudinal grooving or a dragged surface treatment as described in Section 2208.4.E.3.e.i may be used in lieu of the transvers grooving. Surface grooving shall be done with a mechanical device such as a wire broom or comb or by hand. The broom or comb shall have a single row of spring steel tines, rectangular in cross section, 1/8 inch to 3/16 inch wide; spaced on 3/4 inch centers of sufficient length, thickness, and resilience to form grooves to a depth of a minimum of 1/8 inch and a maximum of approximately 3/16 inch in the plastic concrete. If grooves are to be installed by hand, the proposed equipment and process to be used shall be approved by the Engineer. This operation shall be done at such time and in such manner that the desired surface texture will be achieved while minimizing displacement of the larger aggregate particles and before the surface permanently sets. Where abutting pavement is to be placed, the grooving should extend as close to the edge as possible without damaging the edge. If abutting pavement is not to be placed, the 6 inch area nearest the edge or 1 foot from the face of the curb is not required to be grooved. For small or irregular areas or during equipment breakdown, grooving may be done by hand methods.

4. Curing: As soon as practical after the concrete is finished it shall be cured with an approved curing method. If a liquid curing membrane is used, it shall be white pigmented and applied in accordance to the manufacturer's directions.

   a. Method of Applying Curing Membrane: A nozzle producing a uniform fan pattern will be used on all spray equipment when applying the liquid curing membrane. The curing compound should be applied immediately after final finishing, and before the loss of all free water on the surface of the concrete. Normally one smooth, even coat shall be applied at a rate of 150 to 200 square feet per gallon, but two coats may be necessary to ensure complete coverage and effective protection. Second coats should be applied at right angles to the first.
   b. Curing Formed Surfaces: If the forms are removed from finished concrete pavement within a period of 72 hours or if a slip-form paving machine has been used, all exposed surfaces shall be cured. Curing membrane damaged by joint sawing operations shall be repaired by the Contractor as directed by the Engineer.

5. Protection: The Contractor shall, at his own expense, protect the concrete work against damage or defacement of any kind until it has been accepted by the Engineer. All vehicular traffic shall be prohibited from using the new concrete pavement until the following criteria have been met:

   a. Construction traffic: New concrete pavement may be opened to light construction traffic after a minimum of four (4) days of cure time has elapsed and the joints have been protected from the intrusion of foreign material by an approved method. The Contractor may reduce this length of time by one of these options, performed at the expense of the Contractor:
      i. Achieve a minimum compressive strength of 70% of the 28 day design strength as determined in accordance with ASTM C 39.
      ii. Achieve a minimum flexural strength of 350 psi using a third point loading method.
   b. All traffic: New concrete pavement may be opened to all traffic after a minimum of seven (7) days of cure time has elapsed and the joints have been sealed in accordance with Section 2208.4.D. The Contractor may reduce this length of time by one of these options, performed at the expense of the Contractor:
      i. Achieve a minimum compressive strength of 100% of the 28 day design strength as determined in accordance with ASTM C 39.

ii. Achieve a minimum flexural strength of 450 psi using a third point loading method.

Concrete pavement that is not acceptable to the Engineer because of damage or defacement shall be removed and replaced, or repaired, to the satisfaction of the Engineer, at the expense of the Contractor.

6. Pavement Smoothness: If required by the Contract Documents, pavement smoothness shall adhere to Section 2211. If not required by the Contract Documents, the Engineer shall determine areas to be checked for surface tolerance by the Contractor. The areas identified by the Engineer shall be checked with a 10 foot straightedge placed parallel to the center line at any location within a driving lane. Areas showing high spots of more than 1/4 of an inch in 10 feet shall be marked and ground down with approved grinding equipment to an elevation where the area or spot will not show surface deviations in excess of 1/8 inch when tested with a 10 foot straight edge. Grinding will be performed on the full width of the lane failing to meet the above criteria. The cost of correcting the smoothness and any other associated costs such as traffic control shall be at Contractor's expense.

7. Diamond Grinding: If required by the Contract Documents or if pavement smoothness criteria from Section 2208.4.E or Section 2211 are not achieved, the Contractor shall grind the riding surface to reduce or eliminate the irregularities.

   a. Use a self-propelled grinding machine with diamond blades mounted on a multi-blade arbor. Avoid using equipment that causes excessive ravels, aggregate fractures, or spalls. Provide uniform texture the full width of the lane.
   b. Transverse grooving will not be required.
   c. Use vacuum equipment or other continuous methods to remove grinding slurry and residue. Prevent the grinding slurry from flowing across lanes being used by traffic or into streams, lakes, ponds or other bodies of water, inlets, storm sewer or other drainage system.
   d. After corrections have been made to the riding surface, test the pavement for smoothness using the same technique used to determine smoothness originally. Furnish and operate the smoothness measurement equipment, and evaluate the results as specified in Section 2211.
   e. Perform additional grinding as required to attain the required smoothness. Correct all deviations (in excess of 1/2 inch in a length of 25 feet or ¼ inch in a length of 10 feet) within each section regardless of the profile index value.

8. Temperature Limitation: Concrete work shall be in accordance with the requirements of the state DOT specifications for the state where the work is being performed.

9. Backfill: A minimum of 24 hours shall elapse before forms are removed and 5 days shall elapse or the concrete must have attained 75% of its 28 day compressive strength before pavement is backfilled unless otherwise approved by the Engineer.

10. Backfill shall be accomplished in accordance with Sections 2100 and 2201 entitled "Clearing, Grading, Excavation and Site Preparation" and "Subgrade Preparation".

11. The Contractor shall be responsible for the repair of any existing street pavement damaged by the construction to the satisfaction of the Engineer.

12. Joint Sealing and Cleanup: All joints shall be sealed with an approved joint sealer meeting the requirements of Section 2208.3 applied in accordance with this section and the manufacturer's directions within 7 days of the placement of the concrete and prior to the opening of the pavement to traffic. If pavement design does not specifically require the use of joint sealant, prepare the joint as described on the Plans or in the specifications.

The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the area of the construction.

2208.5 Integral Curb

If required by the Plans, Standard Drawings or Special Provisions, integral curbs shall be placed along the edges of all street pavement, except at such locations as the Engineer may direct.

The integral curb shall be constructed during or immediately following the finishing operation unless otherwise shown on the Plans. Special care shall be taken so that the curb construction does not lag behind the pavement construction and form a "cold joint".

Steel curb forms or integral slip-forming shall be required to form the backs of all curbs except where impractical because of small radii street returns or other special sections.

Concrete shall be consolidated with an approved vibrator.

Curbs shall be finished to the cross-section as shown on the Plans with a mule; or templates supported on the side forms and with a float not less than four feet in length, unless another method is approved by the Engineer.

The finished surface of the curb and gutter shall be checked for no more than 1/4 inch deviation by the use of a 10 foot straightedge and corrected if necessary.

Where grades are flat and while the concrete is still plastic, the flowline of the gutter should be checked by the Contractor to verify positive drainage.

Finishing, edging, curing, protection, jointing, temperature limitations and backfill shall all comply with Section 2208.4. The curb shall have a brush or broom finish.

2208.6 Repairing Defects

Any defect occurring prior to final acceptance of the project or the end of a Contract warranty period shall be repaired by removing and replacing the affected area to the nearest joint, or as directed by the Engineer. After project final acceptance or expiration of the warranty period, repair defects in conformance with the following. Do not begin corrective work until after submitting a plan and receiving the Engineer's approval for repair methods.

Defect Type	Defect Direction	Defect Location	Description	Repair Procedure	Alternate Procedure
Plastic Shrinkage Crack	Any	Anywhere	Only partially penetrates depth	Do nothing	Fill with HMWM2
Uncontrolled Crack	Transverse	Mid-slab	Full-depth	Saw and seal crack	LTR3
Uncontrolled Crack	Transverse	Crosses or ends at transverse joint	Full-depth	Saw and seal the crack; Epoxy uncracked joint	
Uncontrolled Crack	Transverse	Relatively parallel and within 5 ft of joint	Full-depth	Saw and seal the crack; Seal joint	FDR4 to replace crack and joint
Saw cut or Uncontrolled Crack	Transverse	Anywhere	Spalled	Repair spall by PDRS if crack not removed	

Uncontrolled Crack	Longitudinal	Relatively parallel and within 1 ft of joint; May cross or end at longitudinal joint	Full-depth	Saw and seal crack; Epoxy uncracked joint	Cross stitch crack
Uncontrolled Crack	Longitudinal	Relatively parallel and in wheel path 1-4.5 ft (from joint)	Full-depth, hairline or spalled	Remove and replace slab	Cross stitch crack
Uncontrolled Crack	Longitudinal	Relatively parallel and further than 4.5 ft from a long joint or edge	Full-depth	Cross-stitch crack; Seal longitudinal joint	
Saw cut or Uncontrolled Crack	Longitudinal	Anywhere	Spalled	Repair spall by PDRS if crack not removed	
Uncontrolled Crack	Diagonal	Anywhere	Full-depth	FDR4	
Uncontrolled Crack	Multiple per Slab	Anywhere	Two cracks dividing slab into 3 or more pieces	Remove and replace slab	

HMWM = High molecular weight methacrylate poured over surface and sprinkled with sand for skid resistance.
LTR = Load-transfer restoration; 3 dowel bars per wheel path grouted into slots sawed across the crack; Slots must be parallel to each other and the longitudinal joint.
FDR = full-depth repair; 10 ft long by one lane wide. Extend to nearest transverse contraction joint if 10 ft repair would leave a segment of pavement less than 10 ft long.
PDR = partial-depth repair; Saw around spall leaving 2 in between spall and 2 in deep perimeter saw. Chip concrete free, then clean and apply bonding agent to patch area. Place a separating medium along any abutting joint or crack. Fill area with patching mixture.
Cross-stitching: for longitudinal cracks only, drill ¾" holes at 35° angle, alternating from each side of joint on 30-36 inch spacing. Epoxy #5 epoxy coated deformed steel tie-bars into hole.

SECTION 2209 CURBING

2209.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction or reconstruction of curbing as shown on the Plans and in accordance with the Standard Drawings, the specifications, and the Special Provisions.

2209.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM

D 698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

2209.3 Materials

All Materials shall conform to Section 2208.3. Materials submittals and testing shall conform to Section 2208.

2209.4 Construction

The curbing shall be constructed or reconstructed to the configuration and to the lines and grades shown on the Plans.

A. Removal of Existing Curbing for Reconstruction: Existing curbing shall be totally removed to the nearest contraction or expansion (isolation) joint or with the approval of the Engineer it may be sawed provided no free section is left that is less than 5 lineal feet in length, and provided the entire curbing section is sawed a minimum of 2 inches below any exposed surface, or sufficiently to prevent disturbance or damage to all adjacent structures or slabs, whichever is greater.

B. Grading and Subgrade Preparation: All excavation or embankment shall conform to Sections 2100 and 2201 entitled "Clearing, Grading, Excavation and Site Preparation" and "Subgrade Preparation".

Compaction shall conform to Section 2201.4.B.

C. Forms: All forms shall be in good condition, clean, and free from imperfections. Each form shall not vary more than 1/4 inch in horizontal and vertical alignment for each 10 feet in length. Face forms will be used when feasible. Forms shall have a height equal to or greater than the height of the curb face being formed. The forms shall be set true to line and grade and shall be supported to stay in position while depositing and consolidating the concrete. The forms shall be designed to permit their removal without damage to the concrete. The forms shall be lubricated.

D. Slip-Form Curb Machine: A slip-form curb machine may be used in lieu of forms. The machine must be equipped with mechanical internal vibrators and be capable of placing curb to the correct cross section, line and grade within the allowable tolerances.

E. Joints: The joints shall be formed at right angles to the alignment of the curbing and to the depths specified by the appropriate Standard Drawing or as shown on the Plans. Joints should be aligned with concrete pavement joints where feasible.

1. Isolation Joints: Isolation joints shall be placed at all radius points, driveways, curb inlets, or where directed by the Plans or Engineer.

a. Material: Isolation joints shall be formed by a one piece, one inch thick preformed joint filler cut to the configuration of the correct curb section, and conforming to Section 2208.3.D.
b. Stability: Isolation joints shall be secured in a manner so they will not be disturbed by depositing and consolidating of concrete.
c. Edging: The edges of the joints shall be rounded with an edging tool of 1/4 inch radius.

2. Contraction Joints: Curbing shall have contraction joints at intervals of not less than 10 feet or more than 15 feet. They shall extend through the entire curb section from the top of the curb to a depth 2 inches below pavement surface.

a. Method: Contraction joints shall be formed or sawed.
i. When sawing joints, the contractor shall begin as soon as the concrete hardens sufficiently to prevent excessive raveling along the saw cut and shall finish before conditions induce uncontrolled cracks, regardless of the time or weather. When joint sealing backup material is specified with sawed joints, the first stage, which provides a relief cut shall be approximately 1/8 inch wide, and shall be to Plan depth. The second stage which widens the joints to allow the insertion of joint sealing backup material to Plan depth shall not be performed until the concrete is at least 48 hours old, and shall be delayed longer when the sawing causes raveling of the concrete. If second stage sawing is performed prior to the completion of the curing period, the Contractor shall maintain the cure by use of curing tapes, plastic devices, or other materials approved by the Engineer.
ii. When forming joints, templates shall be 1/8" metal cut to the configuration of the curbing section. The templates shall be secured at the proper locations so that they will not be disturbed by the depositing of concrete. The templates shall be removed as soon as the concrete has attained its initial set and finished with a ¼ inch radius on all exposed edges.
b. Joint Sealer: When specified, joint sealants shall conform to Section 2208.3.

F. Concrete Work: Concrete for curbing shall be placed in accordance with the requirements of Section 2208.4. Isolation and contraction joints shall be constructed as shown on the Plans, Standard Drawings, or where directed by the Engineer.

1. Concrete Placement: Concrete shall be mechanically vibrated and shall not be allowed to extrude below the forms to cause an irregular alignment of the abutting street pavement.

2. Finishing: After placing and initial strike-off the curb shall be tooled to the required radii. If the surface of the concrete is sufficiently wet that a ridge is formed at the inside of the radius tool, finishing will cease until the excessive moisture has evaporated.

After initial set, the face forms shall be removed and the surface finished to the required dimensions. No water, dryer, or additional mortar shall be applied to the free surface of the concrete.

The finished surface of the concrete shall be broomed perpendicular to the curb with a clean broom to provide an antiskid surface.

In all cases the finished curb shall have a true surface, free from sags, twists, or warps, and shall have a uniform color and appearance.

3. Curing: As soon as practical after the concrete is finished it shall be cured with a liquid curing membrane meeting the requirements of Section 2208.4.E.4, applied according to the manufacturer's

directions.

If front and/or back forms are removed from finished curbing within a period of 72 hours of placement these surfaces shall also be cured.

Wet burlap, cotton mat, waterproof paper, polyethylene sheeting or earth backfill is not an acceptable curing method for curbing.

4. Protection: The Contractor shall protect the concrete work against damage or defacement of any kind until it has been accepted by the Engineer. Concrete which is damaged or defaced, shall be removed and replaced, or repaired to the satisfaction of the Engineer, at the expense of the Contractor.

5. Temperature Limitations: Concrete work shall be performed in accordance with requirements of the state DOT specifications for the state where the work is being performed.

6. Backfill: Backfill shall conform to Section 2208.4.E.9. The Contractor shall be responsible for the repair of any pavement disturbed by the construction to the satisfaction of the Engineer.

7. Joint Sealing and Clean-Up: Unless otherwise specified or waived by the Engineer, an approved joint sealer shall be applied in accordance with the manufacturer's directions within 7 days of the placement of the concrete. The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the area of the construction.

8. Surface Tolerances: Curbing shall have a surface tolerance of 1/4 inch in 10 feet when checked with a ten foot straightedge.

9. Repairing Defects: Defects in the concrete shall be repaired in accordance with Section 2208.6.

SECTION 2210

This section has been intentionally left blank.

SECTION 2211 SMOOTHNESS

2211.1 Scope

This section governs the furnishing of all labor, materials and equipment for the determination of pavement surface smoothness, evaluation of results, and corrective actions as shown on the Plans and in accordance with the Contract Documents, Standard Drawings, the specifications and the Special Provisions.

2211.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition
Kansas Test Method KT-46 from KDOT Construction Manual, latest revision

2211.3 Equipment

Equipment for determination of pavement smoothness and performance of corrective actions shall be in compliance with the specifications of the Kansas Department of Transportation (KDOT), Sections 503 and 603.

2211.4 Construction

If specified in the Contract Documents, profilographing shall be performed on roadways classified as arterials, major collectors, freeways, expressways and interstates.

A. Exceptions: Unless otherwise specified in the Contract Documents, profilographing will not be required for local roads or minor collectors. In addition, other exceptions shall be as specified in the state DOT specifications for the state the work is being performed in.

1. Finished pavements on local roads, minor collectors and other areas exempted from profilographing shall be checked with a 10 foot straightedge placed parallel to the center line at any location within a driving lane. Areas showing high spots of more than 1/4 of an inch in 10 feet shall be marked and ground down with approved grinding equipment to an elevation where the area or spot will not show surface deviations in excess of 1/8 inch when tested with a 10 foot straight edge. Grinding will be performed on the full width of the lane failing to meet the smoothness criteria. The cost of correcting the smoothness and associated traffic control shall be at Contractor's expense.

B. Profilographing: Profilograph testing and evaluation shall be performed in accordance with the Kansas Department of Transportation (KDOT), Sections 503 and 603. Within two days after the paving, furnish the Engineer with the profilogram and its evaluation.

C. Corrective Actions: Corrective actions shall be performed at the Contractor's expense and in accordance with the Kansas Department of Transportation (KDOT), Sections 503 and 603.

D. Final Report: The Contractor shall submit a final report to the Engineer with final profilograph results verifying compliance with the specified pavement smoothness requirements.

E. Pay Adjustments: No pay adjustments (incentive or disincentive) shall be made to the smoothness or pavement items based on the results of the profilograph testing.

END OF SECTION

TECHNICAL PROVISIONS

Section 2300

Incidental Construction



Unified Government of Wyandotte County

January 2022

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2301 STANDARD SIDEWALKS, SIDEWALK RAMPS, DRIVEWAYS, AND BICYCLE /PEDESTRIAN PATHS

2301.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction or reconstruction of sidewalks, sidewalk ramps driveways, and bicycle/pedestrian paths as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2301.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ADAAG – ADA Accessibility Guidelines
Section 4.7 – Curb Ramps

PROWAG - Public Rights-of-Way Accessibility Guidelines

ASTM

A 615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A 775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
A 1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C 31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C 39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 143	Standard Test Method for Slump of Hydraulic-Cement Concrete
C 172	Standard Practice for Sampling Freshly Mixed Concrete
C 231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C 309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C 920	Standard Specification for Elastomeric Joint Sealants
C 1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
D 1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
D 2805	Standard Test Method for Hiding Power or Paints by Reflectometry
D 7174	Standard Specification for Preformed Closed-Cell Ployolefin Expansion Joint Fillers for Concrete Paving and Structural Construction

AASHTO

M 148	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

KCMMB Kansas City Metro Materials Board Specifications

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition

2301.3 Materials

A. Concrete: Concrete shall conform to referenced specifications as called out in the Contract Documents. If no

direct reference to concrete specifications is included in the Contract Documents, concrete shall meet KCMMB specifications.

1. An approved KCMMB concrete mix shall be required.

2. Proposed concrete mix designs for use on the project shall be submitted to Engineer for approval at least two (2) weeks in advance of anticipated use. Mix design shall be approved prior to use of that mix.

3. Field testing of concrete shall be at the Contractor's expense and performed by an ACI certified materials testing firm acceptable to the Owner. Unless otherwise specified, the following tests shall be performed once for every 50 cuyd of concrete placed:

    a. Sampling of fresh concrete per ASTM C 172
    b. Slump per ASTM C 143
    c. Air Content per ASTM C 231
    d. Temperature per ASTM C 1064
    e. Cylinders cast per ASTM C 31 and tested per ASTM C 39. Four cylinders shall be cast with one tested at 7 days, 2 tested at 28 days and one held in reserve.

B. Reinforcement: Reinforcement is not required unless shown on the Plans, Standard Drawings or in the Special Provisions. If specified to be used, reinforcement shall meet the following requirements:

1. Bars: Non-epoxy coated bars shall conform to ASTM A 615. Epoxy coated bars shall conform to ASTM A 775.

2. Welded Steel Wire: Welded steel wire fabric shall conform to ASTM A 1064.

3. Supporting Elements: Representative samples of supporting elements shall be submitted and approved by the Engineer prior to their use in the project.

4. Fibers: When specified in the Contract Documents, fibers shall be incorporated into the concrete at the rate recommended by the manufacturer but no less than a minimum of 3 pounds per cubic yard of concrete for macro fibers and 1 pound per cubic yard of concrete for micro fibers. Fibers shall meet the requirements of KDOT Standard Specifications for State Road and Bridge Construction, 2015 Edition, Section 1722.2. Micro fibers are used to control plastic shrinkage cracks in concrete while macro fibers control cracking in hardened concrete and are often used as a substitute for traditional crack control steel reinforcing bars or mesh. In addition, macro fibers add toughness, and impact and fatigue resistance to hardened concrete.

C. Isolation Joint: Isolation joints shall be formed by a one piece, 1/2-inch thick non–extruding preformed joint filler cut to the configuration of the abutting section. The filler material shall be full depth, and shall conform to ASTM D 1751, D 1752, or D 7174. ASTM D 1752 material shall be used against curved surfaces, around utility boxes or poles, or against other irregular surfaces, and may be used for all other applications.

D. Joint sealer shall meet the requirements of Section 2208.3 or may be an approved one-component, moisture-curing, non-priming, gun-grade, elastomeric polyurethane joint sealant that meets the requirements of ASTM C 920, Type S, Grade NS, Class 25, Use NT and M.

E. Curing Membrane: All material to be used or employed in curing Portland Cement Concrete must be approved by the Engineer prior to its use. It shall be of the liquid membrane type and shall conform to ASTM C 309, Type II, Class A or B or AASHTO M 148, Type 2, white pigmented.

2301.4 Construction

The sidewalks, sidewalk ramps, driveways or bicycle/pedestrian paths shall be constructed or reconstructed to the configuration, and to the lines and grades shown on the Plans. Generally sidewalks, sidewalk ramps, driveways, and bicycle/pedestrian paths should be constructed after the curbing. Sidewalk ramp construction shall comply fully with all requirements for sidewalks in this section and shall comply with the requirements of ADAAG Section 4.7 and the most current federal guidelines governing sidewalk ramps (i.e. PROWAG).

A. Removal: Existing sidewalks, sidewalk ramps, driveways, or bicycle/pedestrian paths shall be totally removed to the nearest contraction or isolation joint, unless otherwise specified by the Engineer. The section shall be sawed full depth.

B. Grading, Subgrade Preparation and Base Course: All excavation, embankment, subgrade stabilization or aggregate base course required shall be as defined in Sections 2100 “Clearing, Grading, Excavation and Site Preparation”, 2201 "Subgrade Preparation", 2202 “Subgrade Stabilization”, and 2203 “Aggregate Base Course”, except as follows:

1. Unless otherwise specified on the Plans, Standard Drawings or Special Provisions, the subgrade shall be compacted until no further consolidation of the material occurs using compaction methods approved by the Engineer. The Engineer will visually determine the acceptance of the subgrade. Satisfactory moisture content shall be achieved to provide sufficient compaction of material as approved by the Engineer.

   If during reconstruction operations additional fill material is needed beneath sidewalks or driveways it shall be untreated compacted aggregate conforming to Section 2203.3.A, placed in conformance with Section 2203.4.A.

C. Forms: All forms shall be in good condition, clean, and free from imperfections. Each form shall not vary more than 1/4 inch in horizontal or vertical alignment for each 10 feet in length.

1. Material and Size: Forms shall be made of metal unless otherwise approved by the Engineer and shall have a height equal to or greater than the depth of the sidewalk, driveway, or bicycle/pedestrian path section. Wood forms may be substituted when approved by Engineer and if they are free from warp with sufficient strength for the intended application.

2. Strength: Forms shall be of such cross–section and strength, and so secured as to resist the pressure of the concrete when struck off, vibrated, and finished, and the impact and vibration of any equipment which they may support.

3. Installation: The forms shall be set true to line and grade, supported through their length and joined neatly in such a manner that the joints are free from movement in any direction.

4. Preparation: Forms shall be cleaned and lubricated prior to each use and shall be so designed to permit their removal without damage to the new concrete.

D. Slip–form Machine: A slip–form machine may be used in lieu of forms. The machine must be equipped with mechanical internal vibrators and be capable of placing concrete to the correct cross section, line and grade within the allowable tolerances.

E. Grades and Slopes: The grade and slope along the length of the walk shall conform to the most current version of PROWAG. Unless shown otherwise on the Plans or directed by the Engineer, the cross slope shall be toward the street. The sidewalk cross slope shall be carried through driveways.

F. Joints: Unless directed by the Engineer the joints shall be formed at right angles to the alignment of the sidewalk, driveway, or bicycle/pedestrian path and to the configuration specified by the Plans or Standard Drawings.

1. Joint Patterns

   a. Sidewalk surfaces shall be marked with a transverse joint spaced at a distance equal to the width of the sidewalk. Sidewalks greater than 6 feet in width shall be divided by longitudinal joints spaced not less than 30 inches nor more than 60 inches with transverse joints spaced to form a square pattern. Edger tool marks shall remain showing unless the sidewalk is slip–formed and subsequently sawed. Curb joints should align with sidewalk joints where they abut.
   b. Concrete driveways and bicycle/pedestrian paths shall have a maximum slab dimension no greater than 10 feet, although widths no more than 24 times the slab thickness will be permitted to match existing joint patterns.

2. Isolation joints: Isolation joints shall be placed at locations shown on the Plans and Standard Drawings or as directed by the Engineer.

   a. General: The preformed isolation joint material shall be left 1/2-inch below the surface, or a suitable tear strip will be provided to allow for the application of the joint sealer.
   b. Stability: Isolation joints shall be secured in a manner so they will not be disturbed by depositing and consolidating the concrete.
   c. Edging: The newly poured edges of these joints shall be rounded with an edging tool of ¼ inch radius.
   d. Spacing: Isolation joints shall be placed at spacing indicated on the Plans or Standard Drawings. Spacing should not exceed 100’ from center to center.

3. Contraction joints: Contraction joints shall be 1-inch deep by 1/8-inch wide with 1/4-inch radii rounded edges.

   a. Edging: Edger marks shall remain showing unless the sidewalk, driveway or bicycle/pedestrian path is slip formed and subsequently sawed.
   b. Slip forming: Contraction joints may be sawed 1/8-inch wide by 1/3rd the thickness of the slab.
   c. Joint Sealer: Joint sealer is not required, unless otherwise specified in the Plans, Standard Drawings or Special Provisions.

G. Concrete Work: Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of the applicable specification as stipulated in Section 2208.3.A.

1. Concrete Placement: Deposit and consolidate concrete as close to the final position as possible, beginning at one corner of the forms. Perform necessary hand spreading with shovels or come–alongs, not with rakes or vibrators. All concrete shall be well vibrated unless approved otherwise by the Engineer. Do not walk in the fresh concrete with boots or shoes coated with earth or foreign substances. When concrete is placed on a sloped surface, begin concrete placement at the lowest area.

   Limitations for time of placement and other items not specifically covered by this specification shall be in accordance with the most recent Standard Specifications of the Kansas Department of Transportation. The Engineer may extend placement time limitations based on field conditions and concrete consistency and workability.

2. Finishing

   a. Strike off the concrete with a vibratory screed or a hand strike–off method when adequate consolidation is attained. Immediately after strike–off, the concrete may be bull-floated to remove any high or low spots. Minimize the use of the bull-float.
   b. Do not finish concrete with water standing on the surface. All edges of the slab shall be carefully finished with a 1/4-inch radius edger.
   c. After finishing, the surface of the concrete shall be broomed with a fine clean broom to provide an antiskid surface, and the edges and joints retooled unless slip-formed.
   d. In all cases the finished sidewalk, driveway, or bicycle/pedestrian path shall have a true surface, free from sags, twists, or warps, and shall have a uniform color and appearance.

3. Curing: As soon as practical after the concrete is finished it shall be cured with an approved liquid curing membrane applied according to manufacturer's directions.

   a. If forms are removed within a period of 72 hours of placement those formed surfaces shall also be cured.
   b. Wet burlap, cotton mats, waterproof paper, polyethylene sheeting or earth backfill shall not be acceptable as curing methods.

4. Protection: The Contractor shall protect the concrete work against damage or defacement of any kind until it has been accepted by the Engineer. Concrete which is damaged or defaced shall be removed and replaced or repaired to the satisfaction of the Engineer, at the expense of the Contractor.

5. Temperature Limitations: Concrete shall be placed in accordance with requirements of the state DOT specifications for the state where the work is being performed.

H. Backfill: A minimum of 24 hours shall elapse before forms are removed and 5 days shall elapse or the concrete must have attained 75% of its 28 day compressive strength before pavement is backfilled unless otherwise approved by the Engineer.

I. Backfill shall be accomplished in accordance with Sections 2100 and 2201 entitled "Clearing, Grading, Excavation and Site Preparation" and "Subgrade Preparation".

J. The Contractor shall be responsible for the repair of any street pavement damaged by the construction to the satisfaction of the Engineer.

K. Joint Sealing and Clean–Up: All isolation joints shall be sealed with an approved joint sealer meeting the requirements of Section 2301.3.D applied in accordance with Section 2208.4 and the manufacturer's directions within 7 days of the placement of the concrete and prior to the opening of the pavement to traffic.

L. The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, splatters and overspray from the construction area within 10 days unless otherwise directed by the Engineer.

M. Surface Tolerances: Sidewalks, driveways, and bicycle/pedestrian paths shall have a surface tolerance of 1/4 inch in 10 feet when checked with a 10 foot straightedge. Vertical deflections at sidewalk joints shall not exceed 1/4-inch.

N. Detectable Warnings: Detectable warnings are required standardized surface features built in or applied to walking surfaces on sidewalks or ramps to warn visually impaired people of hazards on a circulation path. Those hazards include, but are not limited to interfaces between sidewalks and areas where moving vehicles may be present. Detectable warnings shall be in accordance with PROWAG Section R305 and shall be on KDOT's "List of Prequalified Detectable Warning Surface Panels for Curb Ramps and Medians".

SECTION 2302 ASPHALT SIDEWALKS, DRIVEWAYS, AND BICYCLE/PEDESTRIAN PATHS

2302.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction or reconstruction of asphalt sidewalks, driveways, and bicycle/pedestrian paths as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2302.2 Asphalt Sidewalks

Asphalt shall not be used in the construction of any approved permanent sidewalk. Asphalt may be used as material for temporary sidewalks if approved in advance by the Engineer.

2302.3 Asphalt Driveways

Asphalt driveways may be constructed with prior approval of the Engineer in accordance with the provisions of Section 2205 "Asphalt Paving" and Section 2209 "Curbing" as applicable.

2302.4 Asphalt Bicycle/Pedestrian Paths

Asphalt bicycle/pedestrian paths shall be constructed in accordance with the provisions of Section 2205 “Asphalt Paving” and in accordance with the applicable provisions of Section 2302.3. Asphalt shall not be used in the construction of any permanent bicycle/pedestrian path in the Right-of-Way, without a written approval from the County Engineer.

SECTION 2303 ROCK BLANKET

2303.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction of a protecting blanket of rock or broken concrete on slopes, channel bank or stream banks as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2303.2 Materials

The material for rock blanket shall be durable stone or broken concrete containing a combined total of not more than ten percent (10%) of earth, sand, shale, and non–durable rock. It is preferable that the material contain a large percentage of pieces as large as the thickness of the blanket will permit, with enough smaller pieces of various sizes to fill the larger voids. Acceptance of quality and size of material may be made by the Engineer using visual inspection at the job site. If broken concrete is used, all reinforcing shall be removed prior to placement.

Rock Blanket shall be specified by class as shown in the following tables:

Class	Percent Heavier Than									
	1 Ton	1/2 Ton	1/4 Ton	250 lbs	200 lbs	180 lbs	75 lbs	60 lbs	10 lbs	5 lbs
1 Ton	50+	95+								
1/2 Ton	0	50+	95+							
1/4 Ton		0	50+				90+			
Facing					0		50+			90+
Light 24			0		50+					90+
Light18				0		5–15		50–70	85–100	

2303.3 Construction

A trench at the toe of the slope shall be excavated to the elevation as shown on the Plans or to a minimum of 2-feet when not shown. The slopes shall conform to the proper cross section and be compacted to a uniform density as required for adjacent material. The rock or broken concrete shall be placed on the slope, to the prescribed thickness, elevation and extent, and shall be manipulated so that the flat sides are in contact, thereby eliminating large voids. The outside of the blanket shall present an appearance free from segregation and with a proportionate amount of the larger pieces showing.

SECTION 2304 CONCRETE PAVER STONES (FOR MEDIAN TREATMENT)

2304.1 Scope

This section governs the furnishing of all labor, equipment and tools and for the performance of all work necessary to install concrete paver stones as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2304.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ASTM
C 67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
C 140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
C 418 Standard Test Method for Abrasion Resistance of Concrete by Sandblasting
C 936 Standard Specification for Solid Concrete Interlocking Paving Units

KCMMB Kansas City Metro Materials Board Specifications

2304.3 Materials

A. Interlocking Concrete Paver Stones (ASTM C 936)

1. Paver stones shall be cobblestone style consisting of full stones, 4-5/8" x 7" x 2-3/8"; two thirds stones, 4-5/8" x 4-5/8" x 2 3/8"; and one third stones, 4-5/8" x 2-5/16" x 2-3/8". The mix of stones sizes shall be approximately 28% full size, 57% two thirds size and 15% one third size.

2. Cementitous Materials: Materials shall conform to the ASTM, AASHTO and other referenced specifications as required by mix design specifications (KCMMB).

3. Aggregates: Aggregates shall conform to the ASTM, AASHTO and other referenced specifications as required by mix design specifications (KCMMB).

4. Other Constituents: Air–entraining agents, coloring pigments, integral water repellents, finely ground silica, etc. shall conform to ASTM standards where applicable, or shall be previously established as suitable for use in concrete.

5. Physical Requirements: The Contractor shall provide a certification showing compliance with the following requirements. The Engineer reserves the right to sample and test materials as deemed necessary.
    a. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall be not less than 8,000 psi with no individual unit strength less than 7,200 psi, with testing procedures in accordance with ASTM C 140.
    b. Absorption: The average absorption shall not be greater than 5% with no individual unit absorption greater than 7%.
    c. Durability: The manufacturer shall satisfy the Engineer either by proven field performance or the laboratory freeze–thaw test that the paving units have adequate durability.
        i. Proven Field Performance: Satisfactory field performance is indicated when units similar in composition, and made with the same manufacturing processes as those to be supplied to the Contractor, do not exhibit objectionable deterioration after at

least three years. The units used as the basis for proven field performance shall have been exposed to the same environmental factors as is contemplated for the units supplied to the Contractor.

ii. Freeze–Thaw Test: When tested in accordance with Section 8 of ASTM C 67, specimens shall have no breakage and not greater than 1.0% loss in dry weight of any individual unit when subjected to 50 freeze–thaw cycles. This test shall be conducted not more than 12 months prior to delivery of units.

d. Abrasion Resistance: When tested by sandblasting in accordance with ASTM C 418, specimens shall not have greater volume loss than 0.3 cubic inches per square inch. The average thickness loss shall not exceed 1/8-inch.

e. Permissible Variations in Dimensions: Length or width of units shall not differ by more than 1/16-inch from approved samples. Heights of units shall not differ by more than 1/8-inch from the specified standard.

f. Visual Inspection: All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction. Minor cracks incidental to the usual methods of manufacturer, or minor chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

6. Sampling and Testing: The Engineer or his authorized representative shall be accorded proper facilities to inspect and sample the units at the place of manufacture from the lot ready for delivery. Sampling and testing of units shall be in accordance with ASTM C 140 except as required.

7. Rejection: In case the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new test units shall be selected at random by the Engineer from the retained lot and tested at the expense of the manufacturer. In case the second set of test units fails to conform to specified requirements, the entire lot shall be rejected.

8. Expense of Tests: The expense of inspection and testing shall be borne by the Engineer except as specified otherwise above.

B. Base Course Concrete: Base course concrete shall conform to the requirements of an approved KCMMB 4K mix.

C. Sand for Laying Course: The sand for the laying course shall be well graded, clean, washed, sharp sand with 100% passing a 3/8" sieve size and a maximum of 3% passing a No. 200 sieve size. This is commonly known as manufactured concrete sand, limestone screening, or similar. Mason Sand will not be permitted.

2304.4 Construction

A. Product Handling: Paver stones shall be delivered and unloaded at jobsite on pallets and bound in such a manner that no damage occurs to the product during handling, hauling and unloading.

B. Edge Restraint: All edges of the installed paver stone shall be restrained by the concrete curb, concrete sidewalk, or another suitable method for preventing the movement of the edge stones.

C. Concrete Base Course: A concrete base course shall be constructed in accordance with the requirements of Section 2301. The base course shall be shaped to the grade and cross section as shown on the plans with an allowable tolerance of 1/4-inch. The base course shall be 4-inches thick, and should be graded to allow a 1-inch thick sand course between the base and the paving stones, unless shown otherwise on the Plans.

Payment for concrete base course shall be subsidiary to other bid items. The finished base course must be approved by the Engineer before the placement of the sand laying course. The uncompacted sand laying

course shall be spread evenly over the area to be paved and then screened to a level that will produce 1-inch thickness when the paver stones have been placed and vibrated. Once screened and leveled to the desired elevation, the sand laying course shall not be disturbed in any way.

D. Placing Paver Stones: The paver stones shall be installed in rows perpendicular to the major axis of the median being paved. Within each row the stone sizes shall be randomly mixed so that joints between stones are not normally aligned with joints between stones in adjacent rows. No joints shall be aligned for more than three consecutive rows. The paver stones shall be laid in such a manner that the desired pattern is maintained and the joints between the stones are as tight as possible. For maximum interlock it is recommended that joints between stones do not exceed 1/8 inch. String lines should be used to hold all pattern lines true.

The gaps at the edge of the paver surface shall be filled with standard edge stones or with stones cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic surface using a double–headed breaker or a masonry saw. However, when cutting precision designed areas, a masonry saw is recommended. Whenever possible, no cuts should result with a paver less than 1/3 of original dimension.

Paver stones shall be vibrated to their final level in the sand laying course by two or three passes of a vibrating compactor capable of 3,000 to 5,000 pounds compaction force with the surface clean and joints open. After vibration, clean concrete sand containing at least 30% of 1/8-inch particles shall be spread over the paver stone surface, allowed to dry, and vibrated into the joints with additional passes of the plate vibrator so as to completely fill the joints.

Surplus material shall then be swept from the surface. Upon completion of work covered in this Section, the Contractor shall clean up all work areas by removing all debris, surplus material and equipment from the site.

After final vibrating, the surface shall be true to grade and shall not vary by more than 1/4-inch when tested with a 10 foot straight edge at any location on the surface.

SECTION 2305 MAINTENANCE OF TRAFFIC

2305.1 Scope

This section governs the furnishing of all labor, equipment and tools and for the performance of all work necessary to provide Maintenance of Traffic as specified herein, as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2305.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

ATSSA
Quality Standards for Work Zone Traffic Control Devices

Manual of Uniform Traffic Control Devices, Part VI (MUTCD)

2305.3 General

The Contractor is required to maintain access for pedestrians and vehicles to all properties served by the streets and sidewalks impacted by the construction.

2305.4 Traffic Maintenance and Warning Devices

A. The Contractor will be responsible for arranging for installation of the necessary traffic control devices (with the exception of the barricades and other channelizing devices) a minimum of 48 hours prior to beginning the project so that inspection can be conducted by the Engineer.

Traffic maintenance devices including barricades, flashing lights, flaggers and other traffic control devices shall be in conformance with "Part VI of the Manual on Uniform Traffic Control Devices" latest edition.

B. Device Maintenance: The Contractor's representative will make daily inspections of the traffic control devices installed and maintain records of any maintenance required and the date on which it was completed. These records will be maintained for the duration of the project and be incorporated as part of the final records. It shall be the Contractor's responsibility to maintain all traffic control devices in proper working condition and placement at all times. The Contractor shall promptly correct any deficiencies in traffic control.

C. Traffic Control Plan Revisions: Engineer reserves the right to make adjustments or revisions in traffic handling requirements that may become necessary after construction has started. These changes will be determined on the basis of periodic inspections throughout the duration of the project. Notice of such change will be transmitted to the Contractor and it will be his responsibility to make the necessary changes as soon as practicable after receipt of the notification.

2305.5 Pedestrian Traffic Control

A. Devices: All traffic control along pedestrian routes (sidewalks) shall meet the requirements of sections of the latest version of the MUTCD. Particular attention should be paid to 6D.01and 6D.02 for pedestrian safety.

B. Pedestrian Route Closures: Pedestrian routes shall not be closed unless approved by the Engineer. If a

pedestrian route must be temporarily closed, an alternate accessible route must be maintained.

C. Pedestrian Access: Accessible pedestrian access to all buildings served by the sidewalk must be maintained at all times during the project.

D. Pedestrian Routes Protection: Existing pedestrian routes and alternate accessible routes shall be protected from construction activities at all times. This protection may include, but is not limited to, railings, fences, barricades, and covered walkways.

2305.6 Flashers and Other Traffic Control Devices

All traffic control devices shall be maintained in acceptable condition as defined by the latest ATSSA "Quality Standards for Work Zone Traffic Control Devices." Devices in unacceptable or marginal condition as determined above shall be removed from the job site and replaced with devices in acceptable condition.

SECTION 2306 PAVEMENT MARKINGS

2306.1 Scope

This section governs the furnishing of labor, equipment, and materials and for the performance of work necessary to furnish and install white and yellow permanent or temporary retro–reflectorized pavement marking materials as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2306.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used.

ASTM

C 321 Standard Test Method for Bond Strength of Chemical–Resistant Mortars
C 501 Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Tile Abraser
D 36 Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus)
D 92 Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
D 93 Standard Test Methods for Flash Point by Pensky Martens Closed Tester
D 256 Standard Test Method Methods for Determining the Izod Pendulum Impact Resistance of Plastic
D 476 Standard Specification for Titanium Dioxide Pigments, Type II Rutile
D 562 Standard Test Method for Consistency of Paints Using Stormer Viscosimeter
D 570 Standard Test Method for Water Absorption of Plastics
D 638 Standard Test Method for Tensile Properties of Plastics
D 711 Standard Test Method for No–Pick–Up Time of Traffic Paint
D 768 Standard Specification for Yellow Iron Oxide
D 868 Standard Test Method for Evaluating Degree of Bleeding of Traffic Paint
D 1152 Standard Specification for Methanol (Methyl Alcohol)
D 1155 Standard Test Method for Roundness of Glass Spheres
D 1199 Standard Specification for Calcium Carbonate Pigments
D 1210 Standard Test Method for Fineness of Dispersion of Pigment–Vehicle Systems by Hegman–Type Gage
D 1214 Standard Test Method for Sieve Analysis of Glass Spheres
D 1475 Standard test Method for Density of Paint, Varnish, Lacquer, and Related Products
D 2240 Standard Test Method for Rubber Property–Durometer Hardness
D 2243 Standard Test Method for Freeze–Thaw Resistance of Waterborne Coatings
D 2369 Standard Test Method for Volatile Content of Coatings
D 2805 Standard Test Method for Hiding Power of Paints by Reflectometry
D 3723 Standard Test Method for Pigment Content of Water Emulsion by Low Temperature Ashing
D 3960 Standard Practice for Determining Volatile Organic Content (VOC) of Paints and Related Coatings
D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by Taber Abraser
D 4061 Standard Test Method for Retroreflectance of Horizontal Coating
D 4366 Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
D 4796 Standard Test Method for Bond Strength of Thermoplastic Traffic Marking Material
D 5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
E 70 Standard Test Method for pH of Aqueous Solutions With the Glass Electrode
E 303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
E 308 Standard Practice for Computing the Colors of Objects by Using the CIE System
E 660 Standard Practice for Accelerated Polishing of Aggegrates or Pavement Surfaces Using a Small–Wheel, Circular Track Polishing Machine
E 1347 Standard Test Method for Color and Color–Difference Measurement by Tristimulus (Filter) Colorimetry
E 1349 Standard Test Method for Reflectance Factor and Color by Spectophotometry Using Bidirectional Geometry

AASHTO
M 247 Standard Specification for Glass Beads Used in Pavement Markings
M 249 Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form)
T 250 Standard Method of Test for Thermoplastic Traffic Line Material

Manual of Uniform Traffic Control Devices, latest Edition (MUTCD)

ACI
Federal Test Method Standard No. 141d, Method 4252 – Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing
Federal Test Method Standard No. 141d, Method 6242 – Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing
Federal Standard 595, Colors used in Government Procurement

Federal Specification TT–P–115a – Paint, Traffic (Highway, White and Yellow)
Federal Specification TT–P–1952B – Paint, Traffic and Airfield Marking, Water Emulsion Base

"Standard Color Chips for Highway Signs" (US Bureau of Public Roads, Washington D.C.)

KDOT Standard Specifications Section 2214.2.a(2)(d) Bond Strength

National Board of Fire Underwriters of the National Fire Protection Association Standards

2306.3 General

The permanent pavement markings shall be installed immediately after the roadway surface is complete unless prior approval is received by the Engineer. The installation of the yellow markings (as required) is the first priority. If the permanent markings cannot be installed and thus the roadway would be unmarked overnight, temporary removable markings shall be installed and remain until the permanent markings can be installed. The contractor shall make every possible effort to remove the temporary pavement markings and install permanent pavement markings within 48 hours. Only under extreme circumstances and with the approval of the Engineer, will the duration of the temporary pavement markings be extended. Under no circumstance should the temporary pavement markings be in place for more than 2 weeks. If permanent markings cannot be installed within the specified time then semi–permanent markings shall be installed following the guidelines as set forth in the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) Part VI, Sections F6 and G6. The temporary removable markings shall be removed prior to installation of the permanent markings. In situations where markings conflict with the traffic routing, such as a lane closure or a lane diversion, conflicting markings shall be removed prior to application of the next set of markings.

2306.4 Striping Applicability Chart

These charts provide guidance for the selection of striping materials:

Marking Material	Roadway Surface	Application	Durability
Thermoplastic	New asphalt	Permanent	High
Aggressive bond thermoplastic	Aged asphalt	Permanent	High
Preformed thermoplastic	Asphalt, concrete	Permanent	High
Cold plastic	Asphalt, concrete	Permanent	Moderate
Paint	All surfaces	Permanent, temporary	Low
Epoxy	All surfaces	Permanent	High
Temporary Tape (Type I)	All surfaces	Temporary	Low
Temporary Tape (Type II)	All surfaces	Temporary	Low
Line masking tape	All surfaces	Temporary	Low

Roadway Surface	Permanent Marking	Temporary Marking
New asphalt	Thermoplastic	Temporary Tape (I or II)
Old asphalt	Aggressive bond thermoplastic	Temporary Tape (I or II)
Slurry or microsurface	Thermoplastic	Temporary Tape (I or II)
Milled concrete or asphalt	Not applicable	Paint
Asphalt to be milled	Not applicable	Paint
Base asphalt	Not applicable	Paint, Temporary Tape (Type II)
New or old concrete	Aggressive bond thermoplastic, Epoxy	Paint
Concrete	Inlaid cold plastic	Paint
Diamond ground concrete	Epoxy	Paint

Note: Old asphalt is asphalt which is more than 6 months old, or which has been open to traffic.

2306.5 Symbol Applicability Charts

These charts provide guidance for the selection of text and non–text symbol materials:

Roadway Surface	Text Symbols	Temporary Text Symbols
New asphalt	Pre-formed thermoplastic	Temporary Tape (I or II)
Old asphalt	Pre-formed thermoplastic	Temporary Tape (I or II), paint
Slurry or microsurface	Pre-formed thermoplastic	Temporary Tape (I or II), paint
Milled concrete or asphalt	Not applicable	Paint
Asphalt to be milled	Not applicable	Paint
Base asphalt	Not applicable	Paint
New or old concrete	Inlaid cold plastic	Temporary Tape (I or II)
Concrete	Inlaid cold plastic	Temporary Tape (I or II)
Diamond ground concrete	Inlaid cold plastic	Temporary Tape (I or II)

2306.6 Prequalification

Refer to KDOT's "Index of Prequalified Materials and Material Sources" for a list of approved pavement marking materials.

2306.7 Materials

A. Pre–Mix Glass Spheres: Pre–mix glass spheres shall be uncoated and conform to AASHTO M 247 Type 1. The glass spheres used in the formulation shall be lustrous, free from film, scratches, and pits. The glass spheres shall also meet the following requirements:

1. Roundness: The roundness of the spheres shall be a minimum of 70% when tested in accordance with ASTM D 1155.

2. Gradation: The gradation when tested in accordance with the method provided in ASTM D 1214 (by use of U.S. Standard Sieves) shall be:

Size of Sieve	Mass % Passing
No. 18	80 – 100
No. 50	20 – 50
No. 80	0 – 10

3. Refractive Index: When tested by a liquid immersion method at 77° F, the refractive index of the spheres shall be a minimum of 1.50.

B. Drop–On Glass Spheres: The spheres shall be manufactured from glass of a composition designed to be highly resistant to traffic wear and to the effects of weathering. The particles shall be spherical in shape, containing not more than thirty percent (30%) of irregularly shaped particles. They shall be essentially free of sharp angular particles, and particles showing milkiness or surface scoring or scratching. They shall meet the requirements of AASHTO M 247 Type 1.

1. Gradation: The gradation when tested in accordance with the method provided in ASTM D 1214 (by use of U.S. Standard Sieves) shall be:

Size of Sieve	% Passing (by Weight)
No. 20	100
No. 30	80 – 100
No. 50	18 – 35
No. 80	0 – 10
No. 100	0 – 2

2. Refractive Index: When tested by a liquid immersion method at 77° F, the refractive index of the spheres shall be within the range of 1.50 to 1.60.

3. Moisture Proof Requirements: The spheres shall show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps. The spheres shall flow freely from dispensing equipment at any time when surface and atmospheric conditions are satisfactory for application.

C. Thermoplastic Pavement Markings: This specification covers a white and yellow thermoplastic reflectorized pavement marking material of a type that is applied to asphalt road surfaces in a molten state by mechanical means to receive a surface application of glass spheres, and which upon cooling to normal pavement temperature, produces an adherent reflectorized stripe of specified thickness and width and is capable of resisting deformation.

1. Characteristics: The material shall not exude fumes that are toxic, obnoxious or injurious to person or property, when it is heated to the temperature range specified by the manufacturer for application. It shall remain stable when held for 4 hours at this temperature, or when subject to three reheatings after cooling to ambient temperature.

   The temperature–viscosity characteristics of the plastic material shall remain constant throughout repeated reheatings, and shall show like characteristics from batch to batch. There shall be no obvious change in color of the material either as a result of repeated reheatings or from batch to batch.

   The thermoplastic material shall easily extrude from the equipment to produce a cross–section of line 90 to 125 mil thick, which shall be continuous and uniform in shape, and have clear and sharp dimensions.

2. Serviceability: The compound shall resist deterioration by contact with sodium chloride, calcium chloride or other chemicals used to prevent roadway ice, or because of the oil content of pavement materials or from oil droppings or other effects of traffic. The markings shall remain intact under normal traffic conditions at temperatures below 140° F.

3. Specific Gravity: The material's specific gravity shall not be less than 1.8 nor exceed 2.3 referred to water at 77° F when determined by a water displacement method at 77° F.

4. Set Time: When applied at the specified temperature and thickness, the material shall set to bear

traffic in not more than 2 minutes when the air temperature is 50° F and not more than 10 minutes when the air temperature is 90° F.

5. Composition: The thermoplastic pavement marking material shall be homogeneously composed of pigment, filler, resin binder and glass reflectorizing spheres. The solid resin shall be a "maleic–modified glycerol ester resin" (alkyd binder) comprising at least one–third of the binder compositions and be no less than eight percent (8%) by weight of the entire material formulation. The alkyd binder shall consist of a mixture of synthetic resins (at least one of which is solid at room temperature), and high boiling point plasticizers. The material shall not contain any petroleum derived ingredients. Yellow pigment shall be heat stabilized encapsulated lead chromate. The thermoplastic pavement marking material shall contain the following ingredients:

INGREDIENT (Percent by Weight)	WHITE	YELLOW
Binder	18.0 min.	18.0 min.
Titanium Dioxide	10.0 min.	-----
Glass Spheres	20.0 – 50.0	20.0 – 50.0
Lead Chromate	-----	2.0 – 4.5
Inert Fillers	42.0 max.	50.0 max.

The material shall be thoroughly mixed and furnished in a free flowing granular form. The material shall meet the requirements of this specification for a period of one year. The material shall readily melt in a uniform mixture. The material shall be free from all skins, dirt, and foreign objects. It shall be of such composition that it will not bleed, stain or discolor when applied to bituminous pavement. The manufacturer shall replace material not meeting the above requirements.

6. Color: The color of the thermoplastic material after heating for 4 hours ± 5 minutes at 425 ± 3° F shall conform to the following when tested by Federal Test Method Standard 141 Method 4252:

White	Federal Color Chip No. 17875 (Fed. Std. No. 595)
Yellow	Federal Color Chip No. 13538 (Fed. Std. No. 595)

7. Reflectance: The daylight luminous reflectance of the white material shall be not less than 75% when tested according to ASTM E 1347. The yellow shall have a minimum brightness of 45% relative to magnesium oxide, and shall be within the green and red tolerance of the "Standard Color Chips for Highway Signs (January 1939)" obtainable from the United States Bureau of Public Roads, Washington, D.C. (TT–P–115a).

8. Softening Point: After heating the thermoplastic material for 4 hours + 5 minutes at 425 ± 3° F and testing in accordance with ASTM D 36, the material shall have a softening point 215 ± 15° F.

9. Flowability: After heating the thermoplastic material for 4 hours ± 5 minutes at 425 ± 3° F and testing for flowability, the white thermoplastic shall have a maximum percent residue of 18% and the yellow thermoplastic shall have a maximum residue of 21%.

   After heating the thermoplastic material for 8.5 hours ± 5 minutes at 425 ± 3˚ F and testing for flowability, the thermoplastic shall have a maximum percent residue of 28%.

10. Indentation Resistance: Hardness shall be measured by a Shore Durometer, Type A2, as described in ASTM D 2240, except that the Durometer and the panel shall be at 77° F, and a 4.4 lb load applied. After 15 seconds, the reading shall be not less than 55.

11. Abrasion Resistance: The material shall not show a maximum loss of 0.02 ounces subjected to 200 revolutions on a Taber Abraser at 77° F, using H–22 calibrate wheels, weighted to 17.6 ounces. The wearing surface should be kept wet with distilled water throughout the test. The panel for this test shall be prepared by forming a representative lot of material at a thickness of 125 mil on a 4-inch square panel (thickness 0.050 + 0.001 inch) on which a suitable primer has been previously applied.

12. Low Temperature Impact Resistance: The materials shall not fracture when subjected to an impact of 64 inch pounds at –4° F, for at least 3 hours. The panel is then placed in an instrument also maintained at –4° F, consisting of a 10.5 pound freely falling weight controlled to drop vertically for 6-inches onto the surface of the panel, which it strikes with a hemispherical indentor having a radius of 0.28-inches.

13. Water Absorption: Materials shall have a maximum of 0.5 percent by weight of retained water when tested by ASTM D 570, procedure (A).

14. Yellowness Index: The white thermoplastic material shall not exceed a yellowness index of 0.15.

15. Flash Point: The thermoplastic material shall have a flash point not less than 475° F when tested in accordance with ASTM D 92.

16. Cracking Resistance: After heating the thermoplastic material for 4 hours + 5 minutes at 425 ± 3° F; applying to concrete blocks, and cooling 15 ± 3° F, the material shall show no cracks. Properly applied, the material shall show less than six stress cracks per ten lineal feet of markings independent of pavement fracturing and faulting, for at least six months.

D. Aggressive Bond Thermoplastic Pavement Markings: This specification covers a white and yellow adhesive thermoplastic reflectorized pavement marking material that is applied to road surfaces, including Portland Cement Concrete (PCC) and aged asphalt without need of a primer/sealer. The material is applied to the road surface in a molten state by mechanical means with surface application of glass beads. Upon cooling to normal pavement temperature, it produces an adherent reflectorized stripe of specified thickness and width with limited thermal/seasonal deformation. In order to qualify as a non–sealer thermoplastic that can be applied to concrete surfaces without a sealer, the material must meet or exceed the requirements listed below.

1. Characteristics: The thermoplastic material shall be homogeneously composed of pigments, resins, polymers (adhesive constituent), glass reflectorizing spheres and other fillers. The thermoplastic material shall be available in a variety of surface delineation colors from the same manufacturer. The manufacturer shall have the option of formulating the material according to their own specifications.

   However, certain physical and chemical requirements specified must be satisfied in order to qualify as a non–primed striping application for PCC and aged asphalt surfaces.

   The material shall not exude fumes which are toxic or injurious to persons or properties upon heating to application temperature.

2. Specific Gravity: The specific gravity of the white and yellow thermoplastic pavement marking material shall not exceed 2.15.

3. Composition: The pigment, intermix reflectorizing spheres, and fillers shall be uniformly dispersed in the resin and polymer upon heating to application temperature. The material shall be free of dirt and foreign matter and must meet or exceed the compositional requirements (percentage by weight) indicated below. The total resin/binder content must be 22% min. – 26% max. (weight) of total product ingredients.

Test Component	White	Yellow (Lead Chromate)	Yellow (Heavy Metal Free)
Glass Beads	30% min.	30% min.	30% min.
Pigment – Ti02	10% min.	N/A	N/A
Yellow (PbCr03)	N/A	2% min.	Federal Color
Resin/Binder Content	22% min.	22% min.	22% min.
Inert Fillers	42.0 max.	50.0 max.	At manufacturer's discretion

4. Color: The thermoplastic material after heating for four hours ± 5 min. at 425 ± 3° F and cooled to 77 ± 3° F shall meet the following:

White	Daylight reflectance at $45^0 – 0^0$ – 80% min.
Yellow	Daylight reflectance at $45^0 – 0^0$ – 45% min.

Yellow color shall match Federal Test Standard Number 5958 – Color 13538 and lie within the following ranges:

X	0.485 – 0.510
Y	0.445 – 0.470

The chromaticities and luminance factors of ordinary colors of retroreflecting material shall be determined under an angle of illumination of 45 degrees; direction of view perpendicular to surface; and illumination CIE standard illuminant D65.

5. Bond Strength: After heating the thermoplastic material for four hours ± 5 minutes at 425 ± 3° F, the bond strength to Portland Cement Concrete (PCC) shall equal or exceed 275 psi (ASTM Standard Test Method for Bond Strength of Thermoplastic Traffic Marking Materials – D 4796 or ASTM C 321). Failures of type described in Section 6.1 of ASTM D 4796 bond test, must be repeated to obtain a quantifiable number. Failure of types 6.2, 6.3, and 6.4 of ASTM D 4796 bond test, must exceed the specified thermoplastic – cement brick separation.

6. Low Temperatures Cracking (Stress) Resistance for Extended Period: The material shall be tested according to AASHTO T 250 Section 7 with Section 7.2.3, modified for an extended cold temperature of 15 ± 3° F exposure period of 72 hours. Any cracking shall constitute failure of the material to qualify as a non–sealer aggressive bonding material for PCC road surfaces.

7. Impact Resistance (Gardner Falling Weight): The test specimens should be formed according to the following procedure:

Heat approximately 14.1 ounces of material in an open pint can for 4 hours at 425 ± 3˚ F. Preheat specimen draw down blade, 2-inches x 4-inches with a 1/8-inch die opening for approximately one hour at 425 ± 3˚ F. The blade is usually placed in the oven containing the sample material during the last hour of sample heating.

After heating the sample for four hours, remove the sample and the draw down blade from the oven. Place the 125–mil blade onto a PCC block. Quickly pour the sample 425 ± 3^0 F into the opening of the

draw down screed and draw down the sample for the entire length of the concrete block. Allow the drawn down test sample to condition in the open in the standard laboratory atmosphere, 73.4 ± 3^0 F and 50 ± 5% relative humidity.

Perform the testing procedure according to ASTM D 5420 Section 11. Record and report the type of failure as (a) crack or cracks on the surface, (b) cracks that penetrate the entire thickness, (c) brittle shatter (the test specimen in several pieces after impact), or (d) ductile failure (the specimen is penetrated by a blunt tear).

Both the yellow and white non–sealer materials shall have minimum impact resistance of 80 inch pounds with no visible surface cracks.

8. Impact Resistance (Notched Izod): After heating the material for four hours ± 5 minutes at 425 ± 3° F and forming test specimens according to AASHTO T 250 Section 8, both the yellow and white samples shall be a minimum notched impact resistance of 11.0 ± 0.3 inch pounds. The specimens shall be tested both at room temperature 73.4 ± 3° F and low temperature of 15 ± 3° F in accordance with ASTM D 256 test method A.

9. Oil and Grease Resistance: The thermoplastic material shall show no signs of deterioration or solubility after motor oil is rubbed vigorously into a sample for 2 minutes and allowed to penetrate for 5 minutes.

10. Set Time: When applied at a temperature range of 412.5 ± 12.5° F and thickness of 90 to 125 mil the material shall set to bear traffic in not more than 2-minutes when the air temperature is 50 ± 3° F and not more than ten minutes when the air temperature is 90 ± 3° F.

11. Flash Point: The thermoplastic material shall have a flash point of not less than 500° F when tested in accordance with ASTM D 92.

12. Storage Life: The material shall maintain the requirements of this specification for a minimum period of one year. The thermoplastic material must melt uniformly with no evidence of skins or unmelted particles for this one year time period. Any material failing to do so shall be replaced by the manufacturer at their expense.

13. Packaging and Marking: The thermoplastic material shall be packaged in suitable containers to which it will not adhere during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lbs. Each container shall designate user information, manufacturer's name and address, batch number and date of manufacture. Each batch manufactured shall have its own separate number. The label shall carry appropriate user warnings and instructions.

14. NTPEP Test Program: The material must have been applied, without surface primer, on two NTPEP

Decks (PCC) and evaluated for a period of at least one year. A minimum of 90% of the original pavement striping must be intact on the PCC decks after a one–year review period. The percent retention is calculated based on the measured test area square footage (neglecting mil thickness wear down) minus the road surface areas that are exposed due to cracking and chipping away of thermoplastic from the concrete surface caused by product bond failure to the substrate.

E. Preformed Thermoplastic Pavement Markings: This specification is for the furnishing of retroreflective preformed thermoplastic pavement marking materials that can be adhered to asphalt, concrete and Portland cement concrete pavements by means of heat fusion. The applied markings shall be very durable, oil and grease impervious and provide immediate and continuing retroreflectivity.

1. Characteristics: The preformed marking material shall consist of a resilient white and yellow polymer

thermoplastic with uniformly distributed glass beads throughout its entire cross section.

Preformed words and symbols shall conform to the applicable shapes and sizes as prescribed in the latest revision of the Manual on Uniform Traffic Control Devices (MUTCD).

The preformed markings shall be fusible to asphalt concrete and Portland cement concrete pavements by means of the normal heat of a propane type of torch. Adhesives, primers or sealers shall not be used prior to the preformed marking application on asphalt concrete and Portland cement concrete pavements.

The preformed markings shall conform to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics and be capable of fusing to itself and previously applied worn hydrocarbon and/or alkyd thermoplastic pavement markings.

The preformed markings shall be capable of application on new, dense and open graded asphalt concrete wearing courses during the paving operation in accordance with the manufacturer's instructions. After application, the markings shall be immediately ready for traffic. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

The preformed thermoplastic markings shall not be brittle and must be sufficiently cohesive and flexible at temperatures exceeding 50 degrees F for one person to carry without the danger of fracturing the material prior to application.

2. Composition: The retroreflective pliant polymer thermoplastic pavement markings shall consist of a homogeneous mixture of high quality polymeric thermoplastic binders, pigments, fillers and glass beads. The thermoplastic material must conform to AASHTO designation M 249 with the exception of the relevant differences due to the material being supplied in a preformed state.

3. Glass Beads: The markings shall contain 30% glass spheres which shall conform to AASHTO M 247 Type 1, except that glass spheres shall have a minimum of 70% true spheres on each sieve and 80% true spheres overall.

   The glass beads must be homogeneously blended throughout the material with a securely bonded protruding exposed layer of beads that provide immediate and continuous retroreflectivity; no additional glass beads shall be dropped on the material during application. Curved arrows must be available without protruding glass beads if reversibility is needed.

4. Retroreflectivity: The preformed marking shall upon application exhibit uniform adequate nighttime retroreflectivity when tested in accordance with ASTM E 1710. At 86 degree 30 feet incidence angle and 1 degree 30-feet divergence angle, the markings shall have average minimum intensities of 350 millicandelas for white and 175 millicandelas for yellow as measured with a Mirolux or LTL-2000 retroreflectometer. Follow manufacturer's instructions for use.

   Using a Taber Abraser with an H–18 wheel and a 4.4 ounce load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of bead failure. No more than 15% of the beads shall be lost due to popout and the predominant mode of failure shall be "wear down" of the beads.

5. Color Characteristics: The thermoplastic material without glass beads shall meet the following:

White	Daylight reflectance at 45^0 / 0^0 of 80% min.
Yellow	Daylight reflectance at 45^0 / 0^0 of 45% min.

The daylight reflectance shall not change significantly when the preformed thermoplastic is properly applied to the roadway surface.

For highway use, the white markings shall contain a minimum of 8% by weight of Titanium Dioxide pigment to ensure a color similar to Federal Highway White, Color No. 17886 Standard 595. Yellow color shall reasonably match color chip Number 13538 of Federal Standard 595 and be lead free.

6. Skid Resistance: The surface of the preformed thermoplastic markings shall provide a minimum skid resistance value of 45 BPN when tested according to ASTM E 303.

7. Thickness: The width of the supplied material shall have a minimum average thickness of 90 mils.

8. Flexibility: The preformed thermoplastic marking material shall have flexibility at 50° F such that no cracking occurs in the test sample when a 1-inch by 6-inches sample is bent through an arc of 900 at a uniform rate in 10 seconds (9 seconds per degree) over a one inch mandrel. The sample must be conditioned prior to testing at 50 ± 2° F for a minimum of four hours. At least two specimens tested must meet the flexibility requirements at 50° F for a passing result.

9. Environmental Resistance: The applied markings shall be resistant to deterioration due to exposure to sunlight, water, oil, diesel fuels, gasoline, pavement oil content, salt, and adverse weather conditions.

10. Effective Performance Life: When properly applied, in accordance with the manufacturer's instructions, the pavement markings shall be neat and durable. The markings shall remain retroreflective and show no fading, lifting, shrinkage, tearing, roll back or other signs of poor adhesion.

F. Cold Plastic Pavement Markings: This specification covers a white and yellow pre–formed cold plastic reflectorized pavement marking material of a type that is applied to a road surface by an inlaid, pre–coated pressure sensitive adhesive that produces an adherent reflectorized stripe of specified thickness and width and is capable of resisting deformation.

1. Characteristics: The material shall be manufactured without the use of lead–chromate pigments or other, similar, lead–containing chemicals.

   Glass beads shall be incorporated to provide immediate and continuing retroreflection. Ceramic skid particles shall be bonded to the top layer to provide a skid–resistant surface.

   Preformed word and symbol markings shall conform to the applicable shapes and sizes as outlined in the Manual on Uniform Traffic Control Devices (MUTCD).

   The preformed markings shall be capable of being adhered to pavements by an inlaid, pre–coated pressure sensitive adhesive. A surface preparation adhesive may be used to precondition the inlay pavement surface.

   The preformed marking film shall mold itself to pavement contours by the action of traffic. Following proper inlay application and tamping, the markings shall be immediately ready for traffic.

2. Composition: The retroreflective pavement marking film shall consist of a mixture of high–quality polymeric materials, pigments and glass beads distributed throughout its base cross–sectional area. A reflective layer of glass beads and a layer of skid–resistant ceramic particles shall be bonded to the top urethane wearing surface. The urethane wear surface shall have a nominal thickness of 5 mil (0.005

inches). The film shall have a pre–coated, shear–resistant, pressure sensitive adhesive.

3. Color: The daytime color of the white film shall provide a minimum initial luminance factor, Y, of 80 and shall conform to the following chromaticity requirements:

WHITE		YELLOW	
X Values	**Y Values**	**X Values**	**Y Values**
0.290	0.315	0.474	0.455
0.310	0.295	0.491	0.435
0.330	0.360	0.512	0.486
0.350	0.340	0.536	0.463

The daytime color of the yellow film shall provide an initial luminance factor, Y, in a range of 36 to 59 and shall conform to the above chromaticity requirements:

Measurements shall be made in accordance with ASTM E 1349, using illuminant "C" and 0/45 (45/0) geometry. Calculations shall be in accordance with ASTM E 308 for the 2–degree observer.

4. Reflectance: The white and yellow films shall have the following initial minimum reflectance values as measured in accordance with the testing procedures of ASTM D 4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (RL) and shall be expressed as millicandelas per square foot per foot–candle (mcd-ft–2-fc–1).

	WHITE			YELLOW		
Entrance Angle	86.0^0	86.0^0	86.5^0	86.0^0	86.0^0	86.5^0
Observation Angle	0.2^0	0.5^0	1.0^0	0.2^0	0.5^0	1.0^0
Retroreflected Luminance R_L (mcd–ft^{-2}–fc^{-1})	700	500	400	410	250	175

5. Skid Resistance: The surface of the retroreflective films shall provide an initial minimum skid resistance value of 55 BPN as measured by the British Portable Skid Tester in accordance with ASTM E 303.

The surface of the retroreflective film shall retain an average skid resistance value of 45 BPN, when tested in accordance with ASTM E 303, for a period of one year when installed in non–snow removal areas. The 45 BPN minimum value shall be an average of several readings taken in both the wheel track and non–wheel track areas.

6. Tensile Strength and Elongation: The film shall have a minimum tensile strength of 150 lbs. per square inch of cross–section when measured in the direction of the length of the roll and tested in accordance to ASTM D 638, except that a sample 6 inch x 1 inch shall be tested at a temperature between 70° F and 80° F using a jaw speed of 10 to 12 inches per minute. The sample shall have a maximum elongation of 50% at break when tested by this method.

7. Reflectivity Retention: The glass beads must be strongly bonded and not be easily removed by traffic wear. Using a Taber Abraser with an H–18 wheel and a 4.4 ounce load, the sample shall be inspected at 200 cycles, under a microscope, to observe the extent and type of bead failure. No more that 15% of the beads shall be lost due to popout and the predominant mode of failure shall be "wear down" of the beads.

8. Glass Beads: The size, quality and refractive index of the glass beads shall be such that the performance requirements for the markings shall be met. The bead adhesion shall be such that beads are not easily removed when the material surface is scratched. The film shall have glass bead retention qualities such that when a 2-inches by 6-inches sample is bent over a 1/2-inch diameter mandrel, with the 2-inch dimension perpendicular to the mandrel axis, microscopic examination of the area on the mandrel shall show no more than 10% of the beads with entrapment by the binder of less than 40%.

9. Thickness: The film, without adhesive, shall have a minimum thickness of 60 mil.

G. Lead–Free, Water–Borne Emulsion Based White and Yellow Traffic Paint: The pavement marking paint shall be rapid dry. The traffic paint shall provide optimum adhesion for glass spheres when both binder and glass spheres are applied in the recommended quantities.

1. Drying Time: When applied at a wet film thickness of 15 mils with a top dressing of 6–10 pounds of glass spheres per gallon of paint and when the pavement temperature is between 50° F and 120° F and the relative humidity doesn't exceed 80%, the binder shall dry to a no–tracking condition in a minimum of 20 seconds and a maximum of 60 seconds.

   These dry times shall not be exceeded when the paint is applied with specialized equipment so as to have the pigmented binder at a temperature of 150^0 F to 170^0 F at the spray gun.

   The no–tracking condition shall be determined by passing over the applied line in a simulated passing maneuver with a passenger car traveling 35 MPH. There shall be no visual deposition of the paint to the pavement surface when viewed from a distance of 50 feet. Furthermore, the pigmented binder, without glass spheres, shall dry to no–tracking condition in 180 seconds or less when tested in accordance with ASTM D 711.

2. Directional Reflectance: The daylight directional reflectance of white pigmented binder (without glass spheres) shall be not less than 85% relative to magnesium oxide when tested in accordance with Federal Test Method Standard No. 141d, Method 6242. If yellow, after drying shall suitably match color 13538 of Federal Standard 595.

3. The paint for the pavement markings shall contain no lead and/or chromium and shall have volatile organic content conforming to the latest Environmental Protection Agency regulations.

4. In addition, the paint and/or components shall conform to the American Society for Testing Materials

   (ASTM) as follows:

   D 93 Standard Test Methods for Flash Point by Pensky Martens Closed Tester
   D 476 Standard Specification for Titanium Dioxide Pigments, Type II Rutile
   D 562 Standard Test Method for Consistency of Paints Using Stormer Viscosimeter
   D 711 Standard Test Method for No–Pick–Up Time of Traffic Paint
   D 768 Standard Specification for Yellow Iron Oxide
   D 868 Standard Test Method for Evaluating Degree of Bleeding of Traffic Paint
   D 1152 Standard Specification for Methanol (Methyl Alcohol)
   D 1199 Standard Specification for Calcium Carbonate Pigments
   D 1210 Standard Test Method for Fineness of Dispersion of Pigment–Vehicle Systems by Hegman–Type Gage
   D 1475 Standard test Method for Density of Paint, Varnish, Lacquer, and Related Products
   D 2243 Standard Test Method for Freeze–Thaw Resistance of Waterborne Coatings
   D 2369 Standard Test Method for Volatile Content of Coatings

D 2805 Standard Test Method for Hiding Power of Paints by Reflectometry
D 3723 Standard Test Method for Pigment Content of Water Emulsion by Low Temperature Ashing
D 3960 Standard Practice for Determining Volatile Organic Content (VOC) of Paints and Related Coatings
D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by Taber Abraser
D 4366 Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
E 70 Standard Test Method for pH of Aqueous Solutions With the Glass Electrode
E 1347 Standard Test Method for Color and Color–Difference Measurement by Tristimulus (Filter) Colorimetry

The paint shall show no cracking, flaking, blistering, appreciable loss of adhesion, softening, coagulation, discoloration, and have a minimum bleeding ratio of 0.97 when tested in accordance with Federal Specification TT–P–1952B.

The paint shall be capable of dilution with water at all levels without curdling or precipitation such that the wet paint can be readily cleaned up with water only.

The minimum contrast ratio shall be 0.96 when drawing down with a 0.005 bird film applicator on a 2A Leneta Chart or equal and air–dried for 24 hours.

Contrast Ratio = Black/White.

H. Temporary Tape: This specification covers pavement marking tape of two colors, white and yellow, and of two types, Type I and Type II.

Type I Regular (This type is not required to be easily removable intact)

Type II Removable (This type is to be readily removable intact, either manually or with a roll–up device after having been in place through the construction season)

1. General: This material shall be a pavement striping tape designed to provide reflective delineation under both dry and moderate rainfall conditions. The tape shall consist of glass spheres tightly embedded to a binder; on a conformable backing pre-coated with a pressure sensitive adhesive. The striping material shall be thin, flexible, formable, and following application shall remain conformed to the texture of the pavement surface. The tape shall be furnished in the color and type designated on the Plans or in the Contract Documents. The markings shall be pre-coated with a pressure sensitive adhesive and shall be capable of being adhered to asphalt concrete or Portland cement concrete in accordance with manufacturer's instructions without the use of heat, solvents or other additional adhesive means, and shall be immediately ready for traffic after application. The adhesive shall not require a liner or release paper. The striping material shall have a uniform appearance, free from cracks and the edges shall be true, straight and unbroken. The material shall be weather resistant and show no appreciable fading, lifting or shrinkage when applied in accordance with the manufacturer's recommendations.

2. Color and Daylight Reflectance: The daylight reflectance (ASTM E 1347) of white shall be not less than 70%. The color of yellow shall be within the red and green tolerance limits of the Highway Yellow Color Tolerance Chart issued by the U.S. Department of Transportation.

3. Dimensions: The width and length shall be as shown on the Plans or in the Contract Documents. The material shall be available in rolls and there shall be no more than three splices per 50 yards of length.

4. Packaging: The material shall be packaged in accordance with accepted commercial standards and when stored under normal conditions, shall be suitable for use for a period of at least one year after

purchase.

5. Adhesion: The material shall adhere to asphalt and concrete surfaces when applied according to manufacturer's recommendations at surface temperatures above 50° F and shall be immediately ready for traffic following application.

6. Removability: Type II tape shall be removable from asphalt and Portland cement concrete intact or in large pieces, either manually or with a roll–up device, at temperatures above 40° F without use of heat, solvents, grinding or blasting.

7. Reflection: The white and yellow material shall be retroreflective, reflecting white or yellow respectively and shall be readily visible at night when viewed with automobile headlamps using high beams from a distance of at least 300 feet.

8. Durability: Type II material shall maintain adhesion, show no alligatoring, show no signs of pulling apart, and shall suffer no more than a 25% loss of beads, sand and grit when subjected to 30,000 revolutions on a small–wheel circular track as described in ASTM E 660, with the following variations or exceptions:

    a. Two opposite wheels mounted with Goodyear 3.40–5 NHS Industrial Rib tires shall be used with a total load of 51.5 pounds on each tire. Tire air pressure shall be maintained at 25 pounds. The wheels shall be mounted perpendicular to the specimens and toed out 20 to produce a slight abrading action.
    b. Specimens shall be applied to 6-inch diameter dense graded bituminous concrete surface which has been compacted at 3,000 psi for two minutes. After application, the specimens shall be allowed to cure at least 16 hours before beginning the test.

I. Epoxy: This specification is for the application of epoxy resin and glass beads as reflective pavement markings on Portland cement concrete or bituminous pavements. The epoxy resin material shall be toxic heavy metal free, two–component, 100% solids, and shall be formulated and tested to perform as a pavement marking material with glass spheres applied to the surface. The two components are an epoxy resin and an amine curing agent. The Contractor shall provide complete manufacturer's specifications and material safety data sheets to the Engineer for all material furnished.

1. Characteristics: The material shall not exude toxic fumes when heated to application temperature. The material which, when mixed in the proper ratio and applied at 0.14 mil wet film thickness at 74.8° F with the proper saturation of glass beads, has a no–tracking time of less than 40 minutes for slow curing material and less than 10 minutes for rapid curing material. The material shall be capable of fully curing under a constant surface temperature of 32° F or above.

2. Properties of Cured Material

    a. Color: Provide white which complies with Federal Standard 595 17875. Provide yellow which matches the standard shade within the red and green tolerance limits when compared with the Highway Yellow Color Tolerance chart available from the U.S. Department of Transportation, Washington, D.C. (Federal Standard 595, 13538).
    b. Abrasion Resistance: 0.0028 ounces maximum loss when tested at 30 ± 1.5 mils and a 72 hour cure and with a CS–17 wheel under a load of 2.2 lbs. for 1000 cycles.
    c. Hardness: Shore D hardness of 75 minimum.
    d. Adhesion to Concrete: When catalyzed, has such a high degree of adhesion to the specified concrete surface that there is a 100% concrete failure. Apply the material at a film thickness of 15 ± 1.5 mils to concrete with a minimum compressive strength of 4,061 psi. Allow the material to cure for 72 hours at 77° F before the test is performed.

e. Yellowness Index: White only. Value after 72 hours in QUV – 30 maximum when tested at 15 ± 1.0 mils and a 72 hour cure.
f. Field Evaluation: Field test materials at AASHTO NTPEP regional test facilities, which include both hot and cold weather conditions and are a minimum of six months in duration.

3. Glass Beads For Drop–On Application (double drop system)

a. For the first drop, furnish large beads, which are compatible with the epoxy system, and comply with AASHTO M 247 except with the following gradation (FP–96, Type 4):

Sieve Size	Percent Passing
No. 10	100
No. 12	95 – 100
No. 14	80 – 95
No. 16	10 – 40
No. 18	0 – 5
No. 20	0 – 2

b. For the second drop, furnish regular beads which are specifically manufactured to be compatible with the epoxy system, and which comply with the requirements of AASHTO M 247, Type 1.
c. Both types of beads are to be coated with a moisture resistant coating and an adhesion promoting coating which is compatible with the epoxy system.

4. Test Methods

a. Adhesion to Concrete - KDOT Standard Specifications Section 2214.2.a(2)(d) Bond Strength
b. Hardness ASTM D 2240
c. Abrasion Resistance ASTM C 501

2306.8 Method of Installation

The proposed permanent markings shall be laid out by the Contractor as shown on the Plans in advance of the marking installation. Markings shall not be applied until the layout and conditions of the surface have been approved by the Engineer. If a paint line is used for layout purposes (in lieu of a chalk line or string line) the paint line shall not be wider than 1/2-inch in width. If wider, the paint shall be removed following the application of the final permanent marking. New markings shall match existing markings as applicable in areas abutting existing road surfaces. The surface shall be dry and all dust, debris, oil, grease, dirt, temporary markings and other foreign matter shall be removed from the road surface prior to the application of the permanent marking material.

The Contractor shall be responsible for keeping traffic off freshly applied markings until they have set sufficiently to bear traffic. Traffic control is the responsibility of the Contractor and shall conform to the MUTCD. Failure to comply with traffic control guidelines will result in the pavement marking Contractor being directed to stop operations and leave the site until proper and approved traffic control has arrived and is put in place.

Temporary pavement markings shall be installed the same day that the existing pavement markings are damaged, removed or covered up prior to lane opening.

Temporary pavement markings shall be installed using the same cycle length as the permanent markings and be at least 2-feet long. Double yellow markings shall be used for temporary centerline and single white markings shall be used for temporary lane lines on four lane roadways. Single yellow markings shall be used for temporary centerline on two lane roadways as directed by the Engineer.

Half–cycle lengths with a minimum of 2-foot stripe and 10-foot gap should be used on roadways with severe curvature.

A. Glass Spheres: The drop on glass beads shall be applied at a rate of eight to ten pounds per 100 square feet.

B. Thermoplastic Pavement Markings: Thermoplastic material shall readily apply to the pavement at temperatures of 400° F to 425° F from approved equipment to produce an extruded line that shall be continuous and uniform in shape having clear and sharp dimensions. Application temperatures shall not exceed 450° F.

Thermoplastic may be used for cross walks and stop bars as specified under the conditions described herein. The thermoplastic markings shall be applied to the pavement surface in a molten state by mechanical means with surface application of glass spheres, and upon cooling to normal pavement temperature, produce an adherent retro–reflectorized stripe of specified thickness and width and capable of resisting deformation.

1. Equipment: The equipment used to install the thermoplastic shall be as follows:

    a. A self–propelled machine is required in order to fulfill the timing needs of the marking installation for longitudinal lines.
    b. If thermoplastic is used for transverse lines, i.e., crosswalks and stop lines, a push cart shall be used according to the following requirements:
        i. Only one pass with the thermoplastic pavement marking equipment shall be allowed in order to provide the required line width according to the Plans.
        ii. Multiple passes of narrower lines with overlaps to provide the required width shall not be allowed unless otherwise approved by the Engineer after review of a test strip installation.
        iii. If approved, the Contractor shall be required to heat the seam with a torch and feather the overlapped material with a putty knife. Liquid thermoplastic shall not be used for word or symbol markings.
    c. Constructed to provide mixing and agitation of the materials. Conveying parts between the main material reservoir and the shaping die shall be constructed as to prevent accumulation and clogging.
    d. Constructed so that mixing and conveying parts up to and including the shaping die will maintain the materials at a temperature between 400° F and 450° F. To assure that the material does not fall below the minimum temperature, the shaping die shall be heated by means of a gas–fired infrared heater or a heated, oil–jacketed system.
    e. Constructed as to insure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off square stripe ends and shall provide a method of applying “skip” lines. The equipment shall be constructed to be able to provide for varying die widths and to produce varying widths of traffic markings. The use of pans, aprons, or similar appliances with die overruns will not be permitted.
    f. All conditions apply as stated above for material temperatures, line definition and workmanship when a hand pushcart is used for cross walks. The Engineer will verify measurement.
    g. Equipment with a special kettle for melting and heating the material shall be provided. The kettle shall be equipped with a thermostat so that heating can be done by controlled heat transfer liquid rather than by direct flame so as to provide positive temperature control and prevent overheating of the material.
    h. Constructed for a nominal application of 90 – 125 mil thickness.
    i. The heater and applicator shall be so equipped and arranged as to meet the requirements of the National Board of Fire Underwriters of the National Fire Protection Association, of the state, and of the local authorities.
    j. Equipped with an automatic glass bead dispenser attached to the striping machine in such a

manner that the beads are dispensed almost instantaneously upon the installed line. The glass bead dispenser shall be equipped with an automatic cut–off control synchronized with the cut–off of the thermoplastic material.

k. The equipment shall be arranged as to permit preheating of the pavement immediately prior to application of the thermoplastic material, if preheating is recommended by the thermoplastic manufacturer.

l. The applicator shall be capable of containing a minimum of 1000 pounds of molten material (not applicable for hand–liner use).

m. The applicator shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

n. The Contractor's striper shall be equipped with electrical foot counters. The counters shall individually tabulate the length of line applied by each gun whether solid or dashed. The Contractor shall determine the accuracy of the foot counters and establish an adjustment factor as required to determine the pay item quantities. The foot counters shall be periodically checked to assure accurate measurements. No thermoplastic shall be applied without the accurate operation of the foot counters. The Contractor shall provide the Engineer with a certified document on these calibrations.

2. Application Over Existing Markings

a. Existing thermoplastic markings on asphalt road surfaces may be over laid with thermoplastic material providing that the existing markings (thermoplastic) are less than 30 mils thick, and are securely bonded to the substrate. If the thermoplastic is greater than 30 mils, or not securely bonded to the substrate, then it shall be ground to 30 mils, or removed completely if not securely bonded to the road.

b. Existing solvent based paint on asphalt road surfaces may be over laid with thermoplastic provided that more than 75% of the road surface is exposed, and there is no more than a single coat of paint on the remaining unexposed area. If more than one layer of paint exists, the paint is not securely anchored to the substrate, or there is less than 75% of the road surface exposed, then the paint must be thoroughly removed.

c. All existing polyester, epoxy, or other type pavement marking paints on asphalt or concrete road surfaces must be completely removed from all road surfaces prior to the installation of thermoplastic material.

3. Application Temperatures: To insure optimum adhesion, the pavement and ambient air temperature shall be 50° F and rising. The thermoplastic material shall be applied in a melted state at a temperature of 400° F to 425° F. The temperature of the material within the shaping dies shall be maintained at the manufacturer's recommendations for application temperatures, but in no case shall the temperature fall below 400° F or exceed 450° F.

The material shall not break down or deteriorate if held at the plastic temperature for a period of four (4) hours or by reason of three (3) reheatings to the plastic temperature (400^0 F to 425^0 F).

Where manufacturer's application temperatures differ from those as specified, the manufacturer's temperatures shall apply upon approval of the Engineer.

4. Line Quality: The finished lines shall have well defined edges and be free of waviness. Pavement marking lines shall be straight or of uniform curvature and shall conform with the tangents, curves, and transitions as specified in the pavement marking standards and/or as directed by the Engineer.

5. Line Thickness: The minimum thickness of the lines as viewed from a lateral cross section shall be not less than 90 mil near the edges, or less than 125 mil at the center. Drop–on glass beads shall not be included in the measurement, or if so, then appropriate allowances shall be made for the added mil

thickness. A device for gauging the installed material thickness shall be furnished to the Engineer as requested for use on the project. The gauge shall be easy to read and shall readily indicate excessive variations.

6. Clean Up: The Contractor shall be responsible for removing all pavement markings material spilled upon the roadway surface or adjoining area. The Contractor shall use methods acceptable to the Engineer for removing the spilled material.

7. Line Repair: Any pavement marking which is crossed by a vehicle and tracked shall be replaced and any subsequent marking made by the vehicle shall be removed by methods acceptable to the Engineer at no additional cost to the Owner.

C. Preformed Thermoplastic Pavement Markings: The markings shall be applied in accordance with the manufacturer's recommendations on clean and dry surfaces.

1. Asphalt: The materials shall be applied using the propane torch method recommended by the manufacturer. The material must be able to be applied at ambient and road temperatures down to 32° F without any preheating of the pavement to a specific temperature. The pavement shall be clean, dry and free of debris and oil or grease residue.

    a. At temperatures below 50° F, the preformed thermoplastic pavement markings shall be kept as warm as possible to maintain flexibility.
    b. Remove pavement surface moisture by holding a propane torch approximately 6 inches above the section of asphalt using a continuous circular motion.
    c. Heat the pavement with the torch upon placing the material to a temperature of 200° F for 90 mil, and up to 300° F for 125 mil materials.
    d. Immediately after the road surface has been properly preheated, position the material with exposed bead side up and heat.
    e. Position the torch approximately 12-inches over the marking so the flame is extended and heat is evenly applied moving the torch in a circular motion across the marking. When the correct temperature of the marking has been reached, it will turn slightly darker or pale yellow if the material is white. Over heated or burned material shall be removed.
    f. After the entire material section has been heated and bonded to the pavement, re–heat the perimeter of the marking and the road surface to bond the edges.
    g. If installing reversible arrows, which do not contain a top coating of glass beads, the glass spheres shall be hand applied on the molten material.
    h. Feather the leading edge of the pavement marking with a putty knife or bevel with the torch. Leading edges are any edge that would be susceptible to snow plow blades approaching from the direction of normal travel.
    i. After cooling, use a putty knife to attempt to remove a portion of the material. The material shall not pry off without asphalt embedded to the underside.

2. Concrete: New concrete surfaces must be sandblasted to entirely remove curing compound. The same application procedure shall be used as described for asphalt pavements. However, a compatible primer sealer may be applied before application to assure proper adhesion.

3. Chip Seal Surfaces: The same application procedure shall be used as described for asphalt pavements. However, loose aggregate should be removed where the preformed thermoplastic pavement marking is to be applied.

D. Cold Plastic Pavement Markings: The Contractor shall furnish and install white and yellow permanent retro–reflectorized cold preformed plastic pavement marking material at the location shown on the Plans, in conformance with the material specifications included herein.

The cold plastic markings shall consist of a homogeneous, extruded, prefabricated material of specified thickness and width which shall contain reflective glass spheres uniformly distributed throughout the cross–section, and shall be applied only to concrete pavement surfaces by means of an approved inlaid grinding process with pre–coated adhesive and pressure.

1. Contractor's personnel: It is important that the Contractor's personnel be completely knowledgeable of all application requirements and procedures prior to product application. It is the responsibility of the Contractor to contact the supplier of the cold plastic material if questions regarding application procedures or conditions arise.

2. Procedure: This procedure explains how to apply tape to concrete surfaces only. Apply the tape according to manufacturer's instruction in conjunction with an approved inlaid grinding method.

3. Road conditions: It is recommended that the tape be installed as soon as practical following tape manufacturer instructions.

    a. Cold plastic pavement markings shall be inlaid by an approved grooving process into concrete pavement surfaces. Cold plastic will not be allowed on asphalt pavement surfaces whether inlaid into hot asphalt or existing asphalt surfaces. Grooving the pavement surface allows preformed pavement marking tape to better adhere by creating a fresh surface. Grooving also produces a lower profile marking by embedding the tape into the pavement surface, which helps protect the tape from snowplow damage.
    b. The cutting head shall consist of diamond tipped cutting blades "gang stacked" 0.25 inches to 0.50 inches wide. The spacers between each blade must be such that there is less than a 10 mil raise in the finished groove between the blades. Water–cooling the blades may be necessary for long line grooving.
    c. The groove width shall be equal to the tape width plus 1 inch ± 1/8 inch. The depth of the groove shall be 75% of the tape thickness ± 15%. For series 420, 60 mil tapes, the groove shall be 45 mils ± 10 mils or 0.05 inch ± 0.01 inch. The bottom of the groove should have a smooth, flat surface. If a coarse tooth pattern is present, increase the number of blades and decrease the thickness of the spacers between the blades on the cutting head. If water–cooling is used, flush the groove immediately after grooving to clean the surface.
    d. Clean the surface of the road and the groove using a broom and/or high– pressure air blower. If either of these methods fail to clean the road surface, then high–pressure water wash shall be used. Road surface, including the surface of the groove must be dry and all dust, dirt, debris, oil, grease and foreign material removed before applying tape. If using water–cooling to groove, the groove must be completely dry prior to tape application.

4. Tape Application: If there is a crack in the pavement, or if the tape is to be applied over a bridge expansion joint, manhole or utility box, lay the tape over the crack joint or fitting, then cut the tape 1-inch away from the crack or joint on each side. Apply the required surface preparation adhesive and allow to dry completely (5–10 minutes at 70° F, but not over 30 minutes).

5. Tamping: Tamp the tape thoroughly with a tamping cart with a minimum 200 pound load, three times back and forth (six passes) over each part of the tape. Start in the center of the marking and work out to the edges removing any trapped air.

6. Do not twist or turn the tamper cart on the tape.

7. Make six passes (three passes back and forth) over each part of the tape (tamping is very important).

8. Make sure all edges are firmly adhered.

9. Application Conditions

    a. Air temperature 60° F and rising.
    b. Surface temperature 70° F and rising.
    c. Overnight air temperature 40° F the night before tape application.
    d. Pavement surface must be clean and dry. No rainfall should occur within 24 hours prior to application.
    e. Butt splices must be used; do not overlap tape ends.
    f. Traffic must be kept off of pavement surfaces coated with a surface preparation adhesive prior to tape application (follow manufacturer's instruction regarding the use of surface preparation adhesive).

10. Surface moisture: Cold preformed plastic tapes will not adhere if moisture is present. Therefore, road surfaces must be dry and above the minimum required temperature for application of all tapes. If rainfall occurs within 24 hours prior to application, a surface moisture test (plastic wrap or roofing paper method as approved by the Engineer) must be performed and approval obtained from the Engineer. The groove must be visibly dry for a minimum of two hours prior to application. A moisture test shall be completed after the two–hour drying time to ensure no presence of moisture.

E. Pavement Marking Paint: The Contractor shall furnish and install white and yellow retro–reflectorized pavement marking paint material at the location shown on the Plans, in conformance with the material specifications included herein.

1. The wet thickness and dry thickness of the pavement marking paint shall not be less than 15 mils and 12 mils, respectively without glass beads.

2. Glass beads shall be applied uniformly over the entire length of line at the rate of 6 to 10 lbs. per gallon of paint.

3. The gun tip shall be oriented perpendicular to the centerline to ensure that the beginning and ends of all lines are perpendicular to the centerline and not skewed.

4. The equipment shall be maintained such that the needle can be fully closed when shut as to ensure square cut lines at the beginning and ends.

F. Epoxy Pavement Marking: The Contractor shall furnish and install white and yellow epoxy markings at the location shown on the Plans, in conformance with the material specifications included herein.

1. Equipment

    a. Use equipment that is capable of spraying both yellow and white epoxy in the manufacturer's recommended proportions. Provide equipment that can place stripes on the left and right sides, and place two lines simultaneously with either line in a solid or intermittent pattern in yellow or white. All guns must be in full view of operators at all times. If words, symbols, crosswalks, cross–hatching and stop bars are to be of epoxy resin material, equip the truck with a hand spray wand for such application. Mount the equipment on a truck of sufficient size and stability, and with an adequate power source, to produce lines of uniform dimension and prevent application failure. Provide equipment with metering devices to register the accumulated volume dispensed for each material, each day. Additionally, provide individual pressure gauges, clearly visible to the operator, for each pump used.
    b. Provide equipment with two glass bead dispensers (double drop system) that uniformly distributes the glass beads to the surface of the epoxy pavement marking at a rate of at least

25 pounds per gallon. Glass beads may be applied by a pressure gun or controlled free fall.

2. Contractor's Personnel: Assure that at least one employee on the project when pavement markings are being applied holds an American Traffic Safety Services Association (ATSSA) pavement marking certification.

3. Surface Preparation

   a. On existing pavements, remove the existing pavement markings in accordance with these specifications. Remove the existing markings and prepare the surface according to the manufacturer's recommendations (for the type of markings being installed).
   b. On new Portland cement concrete pavement (PCCP), use shot blasting to remove curing compounds and laitance from the surfaces to which the pavement marking will be applied. Prepare the surfaces of new concrete bridge decks the same as new PCCP.
   c. On all pavements, thoroughly remove all dirt, grit, grease, grime, vegetable matter, residue of prior pavement marking application (including such adhesives or primers that may have been used in their application), and any other foreign matter from the roadway surface prior to the application of epoxy pavement markings.

4. Alignment: All layout required in the construction of the pavement marking is the responsibility of the Contractor. Lay out the pavement marking as detailed on the Plans. When the Plans do not provide details, submit a layout plan (conforming to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD)) for the pavement markings to the Engineer for approval. Normally locate longitudinal pavement marking stripes 2-inches from existing longitudinal joints. Provide adequate guide marks (approximately 2-inches by 6-inches at approximately 30 to 50 ft. intervals) for the application of the pavement markings.

5. Pavement Marking Application

   a. When no traffic is present, and for edge lines under any condition of traffic, a slower curing epoxy material (40 minutes) may be used. When the application is taking place under traffic, use a fast setting (10 minutes) epoxy material for center lines and skip lines.
   b. Apply the epoxy material closely behind the cleaning procedure.
   c. Provide the Engineer with a copy of the manufacturer's application instructions. Apply the epoxy pavement markings in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, apply the markings when the ambient and pavement surface temperatures are 50° F and rising. Cease pavement marking operations when the ambient or the pavement surface temperature drops to 50° F.
   d. Before mixing the components of the pavement marking material, heat the individual components to the temperature ranges recommended by the manufacturer of the material. Avoid exceeding the maximum recommended temperature at any time.
   e. Apply the epoxy pavement marking material at a thickness of 20 mils ± 0.2 mils on asphalt and PCCP. Immediately apply the glass beads to the epoxy pavement marking at the rate of 25 pounds per gallon of epoxy, equally divided between the large and regular bead gradations. Apply the large beads on the first drop and the regular beads on the second.

2306.9 Method of Removal

Temporary pavement markings on milled surfaces scheduled to be overlaid do not have to be removed prior to performing the overlay. Permanent pavement markings installed on new asphalt surfaces shall be removed without structurally damaging the pavement or scarring the surface. The method of pavement marking tape removal shall be by a high-pressure water blast method, a low-pressure water and sand blast method, a steel shot blast method, or burning method. Grinding or black paint covering shall not be allowed on new pavement surfaces.

2306.10 Performance Measures

The Contractor shall remove and replace, at the Contractor's expense, any finished markings that have the following deficiencies:

- Drag marks, gashes, gouges, pitting, foreign covering, discoloration, or areas that have failed to solidify
- Improper adhesion, length, width, or thickness
- Glass bead inadequacy
- Ragged appearance with areas that do not present sharply defined edges
- Deviation from the specified layout by an unreasonable amount based on Engineer's judgment

Drippings between markings shall be removed when instructed by the Engineer and shall not result in visible deterioration of the pavement.

SECTION 2307 FENCING

2307.1 Scope

This section governs the furnishing all labor, materials, and equipment for the for the installation and removal of fencing as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2307.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

KCMMB Kansas City Metro Materials Board Specifications

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition
Section 828 – Fencing
Section 1620 – Material for Fencing

2307.3 Materials

A. All materials used for the installation of a permanent chain link fence shall be new material conforming to:

1. Section 1620 of the Kansas Standard Specifications for State Road and Bridge Construction except concrete for posts shall be, approved KCMMB 4K mix, or approved equal.

B. All material used for the installation of permanent decorative fence shall be new material as specified or as shown on the Plans or that match the existing fence.

2307.4 Construction

A. Removal: Existing fence shall be removed as specified or as shown on the Plans or as directed by the Engineer. Removed fencing may be used for temporary fencing only with the Engineer's approval. Fences interfering with construction, and located within public right-of-way or as may be allowed for in permits or agreements, may be removed by the Contractor only if the opening is provided with a temporary gate that will be maintained in a closed position except to permit passage of equipment and vehicles unless otherwise specified. Fences within temporary construction easements may be removed by the Contractor provided that temporary fencing is installed in such a manner as to serve the purpose of the fencing removed. The Contractor shall locate and record all fence corners prior to removal. All fencing removed shall be restored by the Contractor to a condition equal to or better than that existing prior to construction unless otherwise specified. The Contractor is liable for loss and costs associated with stray animals caused by the removal or improper construction of temporary or permanent fencing.

B. Chain-Link Fence: Chain-Link Fence shall be installed at the locations shown on the Plans or as directed by the Engineer in accordance the applicable KDOT specifications for the state where the work is being performed. However, the bottom of the fabric shall be not more than 1 ½ inches above the finished ground line unless shown otherwise on the Plans. All residential fence shall have a top rail and all edges of fence fabric shall be knuckled.

C. Decorative Fence: Decorative fence shall be installed at the locations shown on the Plans or as directed by the Engineer in accordance with the manufacturer's instructions and recognized industry standards or as directed by the Engineer.

SECTION 2308 STEEL BEAM GUARDRAIL

2308.1 Scope

This section governs the furnishing all labor, materials, and equipment for the for the installation of Steel Beam Guardrail as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2308.2 Referenced Standards

ASTM
A 36 Standard Specification for Carbon Structural Steel
A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

AASHTO
M 180 Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail

2308.3 Materials

A. Steel Posts: All posts, terminal post connectors, and steel blocks for guardrail shall be formed from a structural steel meeting the requirements of ASTM A 36, and shall be galvanized in accordance with ASTM A 123.

B. Guardrail and Hardware: All guardrail and hardware shall conform to the requirements of AASHTO M 180 Class A, Type 1. Hardware shall be galvanized in accordance with ASTM A 153. Guardrail shall be galvanized with a minimum of 1.80 ounces of Zinc per sqft. All Zinc shall be “Prime Western” grade or better.

2308.4 Construction

A. Setting Posts: Posts shall be set to the depth and spaced at the intervals shown on the Plans or Standard Drawings. They shall be set vertical and true to line and grade. Steel posts may be driven by a power hammer or may be set in dug or bored holes of a size sufficient to permit thorough compacting of the backfill around the post. The backfill material shall be dry sand, placed in layers not exceeding 12 inches in thickness to a depth of 12 inches below the finished grade. After erecting and adjusting the rail to true line and grade, the sand backfill shall be compacted by flooding. The final 12 inches of backfill consisting of suitable earth material shall then be compacted in six inch lifts. Any "mushrooming" of the top of a post shall be removed and damaged spelter coating on posts shall be repaired by the zinc alloy stick method while the surface is heated to approximately 600° F. Other methods of repairing the spelter coating shall receive prior approval of the Engineer.

B. Erecting Guardrail: Bolt holes shall be shop punched. Field punching, reaming and drilling will not be permitted. Guardrail beams shall be spliced, only at posts by lapping in the direction of traffic, using the required number of splice bolts. Beams for twisted turned down terminal sections may be either field or shop twisted. Sufficient twist shall be introduced such that the beam shall retain the required shape in a relaxed condition. Beams to be erected on a radius of 150 feet or less shall be shop-curved as shown on the Plans. Each end of every installation of guardrail shall have an end, bridge anchor, or terminal section of the design and type shown on the Plans or Standard Drawings. They shall be of the same material and shall be galvanized in accordance with the requirements for the guardrail beam. Galvanized rail shall be handled in a manner to avoid damage to the galvanized coating. Any sections of rail, end sections or terminal sections on which the spelter coating has been bruised or broken shall be rejected, or may with the prior approval of the Engineer, be repaired by the method prescribed for repairing damaged spelter coating of steel posts.

END OF SECTION

TECHNICAL PROVISIONS

Section 2400

Seeding, Sodding and Overseeding

Unified Government of Wyandotte County

January 2022

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SECTION 2400 GENERAL

2400.1 Scope

This section governs all general specifications necessary for installation of seeding, sodding, native grasses, hyrdroseeding and overseeding in accordance with the Standard Drawings, the specifications and Special Provisions.

The Contractor shall furnish all plants and materials and perform all operations in connection with the preparation, fertilizing, placing, watering, weeding, firming and establishment, of sodded and seeded areas (both temporary and permanent applications). All areas of established yards shall be restored by sodding unless otherwise approved by the Owner. The Contractor shall sod and/or seed disturbed areas where shown on the Plans or by field inspection, as required by the Storm Water Pollution Prevention Plan and pursuant to all permits, applicable federal and state laws. The Contractor shall be responsible for establishment of grass.

2400.2 Referenced Standards

UG
2150 Erosion and Sediment Control

Kansas Department of Transportation
Standard Specifications for State Road and Bridge Construction, 2015 Edition
KDOT Division 2100, and Division 900

Federal and State Department of Agriculture Regulations

Applicable State Weed Laws, Missouri Revised Statutes Chapter 263, and Kansas Statutes Annotated, Chapter 2. Article 13.

American Sod Producers Association (A.S.P.A.) “Specifications for Turfgrass Sod”, and “Specifications for Topsoil Material and Application”

2400.3 Definitions

A. Rough Grading is to mean the work necessary to prepare the subgrade for topsoil application and shall be compatible with the surrounding landscape while making a smooth tradition to existing undisturbed conditions.

B. Subgrade is to mean that level of earth below the topsoil layer.

C. Compacted backfill is to mean a compaction of 90 percent standard proctor density for that material.

D. Tolerance is to mean that amount above or below a given line.

E. Certified Sod: State Certified Sod shall be turfgrass sod, grown from certified high quality seed that has been inspected by the State Certification Agency.

F. Certified Seed: A grass or legume seed named variety that has been reviewed and accepted and meets all state and federal requirements, rules and regulations. The seed shall be grown and processed in the United States or Canada and comply with the requirements of the corresponding State Seed Law. Certified Seed shall be packaged and labeled with an inspection certificate from the State Certification Agency stating

genetic identity, purity, and freedom from noxious weeks as well as excessive amounts of other crop and weedy plants at time of harvest. Cleaning and conditioning of seed must result in a product that meets or exceeds minimum standards.

G. Establishment Period: A period when planting work has been performed and initially accepted, and there is a Contract requirement to care for the planted areas in some way until the period ends.

H. Fertilizer: The grade of fertilizer will be identified according to the percent nitrogen (N), percent of available phosphoric acid (P205), and percent water soluble potassium (K20), in that order, and approval will be based on that identification.

I. Native Plant (existing): A variety of plant species occurring in its natural habitat without direct or indirect human actions.

J. Noxious Weed: All weed designated by the State Weed Board as injurious to public health, agriculture, recreation, wildlife, or all public or private property. The United States Department of Agriculture (USDA) for the corresponding state will be the authority in determination of noxious weed species.

K. Pure Live Seed (PLS): The amount of living seed in the total quantity of seed when non-viable seed or non-seed material is excluded. The following formula shall be used to determine the amount of commercial seed required to provide each kind of seed for the specified quantities of pure live seeds:

$$\text{Pounds of Commercial Seed Required} = \frac{10{,}000 \times \text{Pure Live Seed (lbs per acre)}}{\text{Purity (Percent)} \times \text{Germination (percent)}}$$

L. Riparian: Related to the bank, shore, or water-influenced areas of a watercourse or water body.

M. Sensitive Areas: Defined areas such as wetlands, natural water and riparian resources, special environmental zones, or where certain activities are restricted such as the use of chemicals.

N. Specified Weeds: All noxious weeds as defined above, and all plant species identified in the Special Provisions or on the Plans as a species to be removed.

O. Weed: A plant that is undesirable where it is growing.

2400.4 Submittals

Prior to delivery to the job site, Contractor shall submit to the Owner for approval the source and supplier of all grass seed, sod, fertilizer and mulch materials, along with the type of equipment to be used on this project and any tests completed. Manufacturer's bulletins, leaflets and other descriptive data which contain cuts, dimensions, and specifications will be acceptable for cataloged materials. Such bulletins, leaflets and other descriptive data shall be clearly marked to show which item is to be used and which paragraph of the contract specification it is to satisfy.

2400.5 Protection and Repair

The seeded/sodded area shall be kept free of traffic until accepted. If at any time before acceptance of the completed contract, any portion of the seeded surface becomes gullied or otherwise damaged, or the seeding has been damaged or destroyed, the affected portion shall be repaired to re-establish the specified condition prior to the acceptance of the work.

2400.6 Acceptance of Seeding and Sodding

A. Acceptance: Acceptance by the Owner will occur when areas seeded and/or sodded are determined to be established turf areas ready for mowing. Grass areas in excess of one (1) square foot that are dead or in poor condition regarding color and quality shall be replaced at the Contractor's expense prior to the initiation of the Maintenance Period.

B. Sod Watering: Throughout the Maintenance Period, the Contractor shall be responsible for watering the installed sod until it is established and ready for mowing. In the absence of rainfall, watering shall be performed daily during the first week and shall be sufficient to maintain moist soil to a depth of at least 4 inches. Soil on sod pads shall be kept moist at all times. Watering may be done during the heat of the day to help prevent wilting. After the second week, the Contractor shall water the sod as required to maintain adequate moisture in the upper 4 inches of topsoil necessary for the promotion of deep root growth until final acceptance as established turf areas ready for mowing.

C. Seed Watering: The Contractor shall be responsible for watering seeded areas, keeping all areas moist throughout the germination period, following the substantial germination of the seed, and during the occurrence of a dry or drought period. Continued watering will be required until final acceptance as established turf areas ready for mowing.

D. Acceptance Notification: After acceptance of the seeded or sodded area by the Owner, the Contractor shall by door hangers or other approved methods, notify all affected property owners that the maintenance of the grassed areas is now their responsibility.

2400.7 Clean-up

During the progress of this work and upon completion, thoroughly clean the project area, remove and properly dispose of all resultant dirt, debris and other waste materials.

2400.8 Guarantee

The Contractor shall guarantee all work and materials for a period of one full growing season (Spring to Fall) after the date of final acceptance of the project. During the guarantee period, all turf which dies or exhibits weed growth or undesirable grasses, free of eroded areas, bare spots, diseases and insects, shall be replaced with like material at the expense of the Contractor. Contractor to replace as originally specified areas which have failed to survive, as often as required, to establish the seeded/sodded lawn area until accepted, at no additional compensation. Contractor to repair and replace to original condition all damages to property resultant from the sodding operation and all damages as a result from the remedying of these defects, without additional compensation.

SECTION 2401 SEEDING

2401.1 Scope

This section governs furnishing all labor, materials and equipment necessary for complete installation of seeding in accordance with the Standard Drawings, the specifications and Special Provisions. The Contractor shall furnish all plants and materials and perform all operations in connection with the preparation, fertilizing, placing, watering, firming and stablishment, of seeding areas, complete and in strict accordance with these specifications and applicable Plans, and subject to the terms and conditions of the Contract. The Contractor shall seed disturbed areas where shown on the Plans or by field inspection and as required by the Storm Water Pollution Prevention Plan. The Contractor shall be responsible for establishment of grass.

2401.2 Materials

A. Seed: Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act. All seed shall be furnished in sealed standard containers unless exception is granted in writing by the Owner. Seed shall be free from noxious weeds and recleaned "Grade A" recent crop seed treated with appropriate fungicide at time of mixing. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed mix to be used will be identified prior to sowing. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

1. Seeding – Mix #1 (Turf Areas)

   Festuca arundinacea, Fineleaf Tall Fescue. Varieties- Houndog V. Rebel Jr., Rebel III, Rebel 3D, Barlexas, Millennium, Southern Choice, Tar Heel, Wolf Pack, Bonsai 2000, Shortstop II Coyote, or other pre-approved substitutes 62.5%

   Poa pratensis, Kentucky Bluegrass. Varieties- Baran, Nassau, Ram I, Nublue, Rugby II, Award, Blacksburg, Challenger, Eagleton, Limousine, Livingston, Midnight, Nuglade, Preakness, Princeton 105, Quantum Leap, 1757 or other approved substitutes 25.0%

   Lolium multiflorum – annual ryegrass 12.5%

2. Seeding – Mix #2 (Low Use Areas)

   Fescure ovina, Sheeps Fescue. Varieties- Azay, Big Horn, or other pre-approved substitutes 15.0%

   Fescura rubra subsp. Commutata, Chewings Fescue, Varieties-James town II, Victory, Tiffany, or other approved substitutes 20.0%

   Fescuca longifolia, Hard Fescue. Varieties- Spartan, Tournament, Warwick, Discovery, Waldina, Aurora, 4 AG Attila, Reliant II, Scaldis, or other pre-approved substitutes 35.0%

   Fescuca ruba subp. Ruba, Creeping Red Fescue. Varieties- Shademaster II, Jasper, Cindy, Pennlawn, or other pre-approved substitutes 30.0%

3. Seeding Rate**:** Seed mixture shall be sown at the minimum rate of 10 pounds per 1000 square feet for new seeding. See Section 2405 for overseeding rates.

B. Inorganic Fertilizer**:** Inorganic fertilizer shall be composed of a formula 12-12-12, 13-13-13 or other

approved substitute, and shall conform to the applicable State fertilizer laws. Fertilizer shall be of a type that can be uniformly distributed by the application equipment. Fertilizer may be furnished in a dry (granulated) or liquid form. When applied dry, the fertilizer shall be a granular, non-burning chemically combined product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer. Granular or pellet form shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original unopened containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted. When applied in a liquid form, fertilizer may be chemically combined or may be furnished as separate ingredients.

C. Mulch: Mulch shall be the vegetative type, or wood cellulose fiber type, whichever is specified in the Special Provisions, or as approved by the Owner.

1. Vegetative Type: The vegetative type shall be the cereal straw from stalks of oats, rye, wheat or barley and shall be free of prohibited and noxious weed seeds.

2. Wood Cellulose Fiber Mulch: Wood cellulose fiber shall contain no germination or growth inhibiting ingredients, and shall be dyed an appropriate color to aid in visual metering in its application. It shall be easily and evenly dispersed and suspended when agitated in water, and when sprayed uniformly on the soil surface, shall form a blotter-like cover, which readily absorbs the water and allows infiltration to the underlying soil. The mulch material shall be supplied in packages of not more than 100 pounds gross weight, and shall be marked by the manufacturer to show the air dry weight content (air dry weight shall contain no more than 10 percent moisture).

D. Water: Water, hose and other watering equipment required for the work shall be furnished by the Contractor.

E. Other Materials: Other materials not specifically described but required for a complete and proper planting installation, shall be as selected by the Contractor subject to the approval by the Owner.

F. Equipment: The seeding operation shall be accomplished with equipment suitable for preparing the seed bed, sowing the seed, fertilizing, spreading the vegetative type mulch, or spreading the wood cellulose fiber mulch in accordance with the applicable requirements of the following sub-section entitled "Construction".

G. Top Soil: The Contractor shall make every reasonable effort to stockpile existing top soil prior to excavation and reuse it in the same general locations. No payment will be made for topsoil furnishing and placement necessary due to excessive hauling off of existing top soil on the project site.

H. Qualifications of Workman: Provide at least one person, who shall be present at all times during the execution of this work, who is thoroughly familiar with all materials and installation procedures included in the Sodding and Seeding operations as specified herein.

I. Delivery Containers: Deliver all items to the site in their original containers with all labels intact and legible at time of Owner inspection.

J. Protection: Use all means necessary to protect all materials before, during and after installation, and to protect the installed work and materials of all other trades.

K. Replacements: In the event of damage or rejection, immediately make all repairs and replacements to the approval of the Owner and at no additional cost to the Owner.

L. Weather Conditions: All sodding and seeding shall be performed during favorable weather conditions and only during normal and acceptable planting seasons when satisfactory growing conditions exist. The

planting operations shall not be performed during times of extreme drought, when ground is frozen or during times of other unfavorable climatic conditions unless otherwise approved by Owner. The Contractor assumes full and complete responsibility for all such plantings and operations.

M. Planting Dates: Recommended dates for all seeding and planting shall be March 15 through October 15 unless otherwise approved by the Owner.

N. Pre-planting Inspection: Prior to the work of this section, the Contractor shall carefully inspect the installed work of all other trades and verify that all such work is complete to the point where installation may properly commence.

O. Discrepancies: Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

2401.3 Construction

A. All equipment used in the project and all workmanship shall meet the approval of the Owner.

B. All areas to be seeded shall be tilled or disked to a depth of 3-4 inches and raked or smoothed to remove debris, clods, surface stone, 2-inches diameter or larger and weeds. Grades on the areas to be sodded or seeded shall be maintained in true, even and compacted conditions to prevent the formations of depressions. Areas overseeded, to be seeded that have washed or eroded shall be brought to grade and compacted thoroughly by the Contractor prior to placing the seeding or overseeding. No grading shall be done when the soils are in a muddy or frozen condition.

C. Steel Edging: The finish sub-grade of areas to be planted shall be 2" below top of steel edging, if present, for grass sod and flush with top of steel edging for seeding.

D. Other Edges: The finished sub-grade next to curbs, sidewalk and drive approaches shall allow for the seed to be placed level with the improvement. The sub-grade shall be finished level with the improvement for seeding.

E. Fertilizer Application: For areas to be seeded, fertilizer shall be applied when area receives final grading and tillage.

F. Application of Fertilizer: The Contractor has the option to obtain soil tests from a recognized testing laboratory, approved by Owner, to determine soil pH, nitrogen, phosphorus and potassium requirements and organic matter content. A pH or 5.8 to 7.0 and phosphorus and potassium levels of medium or higher range for the particular test used is required. Soils falling below these test levels must be supplemented with the appropriate materials to meet such test levels. If the above soil test is not performed a 13-13-13 fertilizer shall be applied at the rate of 400 pounds per acre.

G. Acceptance of Plant Bed: Acceptance of the plant bed for seeding shall be obtained from the Owner for each section of area as indicated on the Plans. The Contractor shall be responsible for maintaining the accepted areas until the effective date for planting.

H. Sowing shall be accomplished by use of an approved mechanical seeder or drill (hand spreader can be used in small areas), making sure that successive seed strips overlap to provide uniform coverage. Seed should be drilled to a depth of 1/2 inch.

1. Seed mixed in proportions shown in Section 2401.2 may be broadcast by approved sowing

equipment. The seed shall be uniformly distributed over the designated areas. The seed shall be covered to an average depth of ½ inch by means of a brush harrow, spike-tooth harrow, chain harrow, cultipacker or other approved device.

2. Areas to be seeded shall be fertilized at rates specified in Section 2401.3.F. The seedbed shall be free of any irregularities in the surface, and shall be corrected in order to prevent formation of water pockets. All seeded areas are to be completely covered with hydromulch or with straw anchored to the soil a minimum depth of 3 inches by a disc harrow set nearly straight, to properly maintain soil moisture and to provide shade for the newly germinated chutes.

3. Promptly after mulching, wet the seedbed thoroughly, keeping all areas moist throughout the germination period. Protect all turf areas by erecting temporary fences, barriers, signs, etc. as necessary to prevent trampling and disturbance.

4. When delays in operations carry the work beyond the most favorable planting season for the grasses designated, or when conditions are such, by reason of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, the seeding operation shall be stopped and work shall be resumed only when conditions are favorable again or when approved alternative or corrective measures and procedures have been put into effect. If inspection during seeding operations or after indicate there are areas which have been skipped, the sowing of additional seed on these areas will be required.

5. The seeded areas will be inspected for acceptable grass coverage and will be acceptable when grasses designated are growing and are in good condition and no area more than ½ of one percent of the total areas shall be bare, of which no single area shall be more than one foot square in area. Any bare area larger than this will not be acceptable and shall be reseeded.

I. Compaction: Immediately following the completion of seeding operations, the entire area shall be compacted by means of a roller weighing at least 60 but not more than 90 pounds per linear foot of roller.

J. Maintenance Period: The Contractor shall be responsible for maintaining the installed grass seed and sod until all areas are complete and accepted by the Owner.

K. Mulching: Mulching shall be done within 24 hours following the seeding operation except in the case of wood cellulose fiber type mulch.

1. Vegetative Type Mulch: After compacting the surface, mulch shall be uniformly spread at the rate of 1.5 tons per acre by means of a mechanical spreader or other approved means. As soon as the mulch is spread it shall be anchored to the soil a minimum depth of 3 inches by use of a heavy disc harrow, set nearly straight, or a similar approved tool. Discs of the anchoring tool shall be set approximately 9 inches apart. Anchoring shall be accomplished by not more than two passes of the tool.

2. Wood Cellulose Fiber Type: Wood cellulose fiber mulch shall be added to the hydraulic seeder after the proportionate amounts of seed, fertilizer and water, and other approved materials are added. These ingredients shall be mixed to form a slurry which shall be applied at the rate of 1,000 pounds per acre. The mulch shall make a uniform coverage of the soil surface that will be satisfactory to the Owner.

SECTION 2402 SODDING

2402.1 Scope

This section governs the furnishing all labor, materials and equipment necessary for complete installation of sodding, in accordance with the Standard Drawings, the specifications and Special Provisions.

2402.2 Materials

A. Sod: All grass sod shall be State Certified, nursery grown native mixture of Houndog, Rebel, Pride, Cochise, Coyote or other substitute, as may be approved. Sod shall be a Tall Turf type Fescue with 10 percent Bluegrass that is free of objectionable grassy and broadleaf weeds. Sod shall be considered free of such weeds if less than 5 such plants are present per 100 square feet of area. Sod will not be acceptable if it contains any of the following weeds: Common burmudagrass,(wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, mumblewill, Canada thistle, bindweed, wild garlic, ground ivy, perennial sorral and bromegrass, or as defined by current weed laws.

1. Pad Size: The sod shall be cut to supplier's standard width and length but not less than 12 x 24 inches and not more than 24 x 72 inches or bigger sizes that are approved by the Owner. There shall not be broken pads, torn or uneven ends.

2. Strength: Root development shall be such that standard size pieces will support their own weight and retain their shape when suspended vertically from a firm grasp on the uppermost 10% of area.

3. Mowing Height: Before harvesting sod, it shall be mowed uniformly at a height of 2 - 2½ inches. The sod shall be stripped or harvested by machine at a uniform thickness of 1½ inches ± ¼ inch. Measurement of thickness shall exclude top growth and thatch.

B. Fertilizer: Fertilizer shall be inorganic 12-12-12 or 13-13-13 grade, uniform in composition, free flowing and suitable for application with approved equipment, delivered to the site in convenient containers, each fully labeled, conforming to applicable state fertilizer laws, bearing the name, trade name, or trademark and warranty of the producer.

C. Top Soil: The Contractor shall make every reasonable effort to stockpile existing top soil prior to excavation and reuse it in the same general locations. No payment will be made for topsoil furnishing and placement necessary due to excessive hauling off of existing top soil on the project site.

D. Qualifications of Workman: Provide at least one person, who shall be present at all times during the execution of this work, who is thoroughly familiar with all materials and installation procedures included in the Sodding and Seeding operations as specified herein.

E. Delivery Containers: Deliver all items to the site in their original containers with all labels intact and legible at time of Owner inspection.

F. Protection: Use all means necessary to protect all materials before, during and after installation, and to protect the installed work and materials of all other trades.

G. Replacements: In the event of damage or rejection, immediately make all repairs and replacements to the approval of the Owner and at no additional cost to the Owner.

H. Weather Conditions: All sodding and seeding shall be performed during favorable weather conditions and

only during normal and acceptable planting seasons when satisfactory growing conditions exist. The planting operations shall not be performed during times of extreme drought, when ground is frozen or during times of other unfavorable climatic conditions unless otherwise approved by Owner. The Contractor assumes full and complete responsibility for all such plantings and operations.

I. Planting Dates: Recommended dates for all seeding and planting shall be March 15 through October 15 unless otherwise approved by the Owner.

J. Pre-planting Inspection: Prior to the work of this section, the Contractor shall carefully inspect the installed work of all other trades and verify that all such work is complete to the point where installation may properly commence.

K. Discrepancies: Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

2402.3 Construction

A. Sod shall not be harvested or delivered when excessively wet or dry. Sod shall be harvested, delivered and installed within a period of 36 hours. Protect sod from sun, wind, dehydration, and rain prior to installation that cannot be placed immediately on delivery. Sod showing visible signs of heating or dehydration will be rejected.

B. Areas to be sodded shall be fertilized at the rates specified in Section 2401.3.F. The sod-bed shall be free of any irregularities in the surface resulting from fertilizing or other operations and shall be corrected in order to prevent the formation of water pockets. Freshly graded areas, which have set long enough to become dry and crusted over, shall be tilled as specified above, prior to placing the sod.

C. The first row of sod should, if possible, be laid in a straight line with subsequent rows placed parallel and tightly against one another. Lateral joints shall be staggered as in brick laying to promote more uniform growth and strength. Care shall be exercised to ensure that the sod in not stretched or overlapped and that all joints are butted tight in order to prevent voids which would otherwise cause air drying of the roots. Where new sod meets existing grassed areas, a straight, vertical edge shall be cut to allow smooth match. Sod shall be watered and firmed in accordance with Section 2400.6.B. If it is necessary to walk excessively on newly laid sod or soil, walking boards should be laid for this purpose.

D. Sod shall be laid with staggered joints and at right angles to direction of slope. Sod shall be secured by tamping or rolling. On slopes 4:1 or steeper and in drainage channels, all sod shall be anchored at minimum two-foot intervals to prevent movement under rainfall conditions.

E. The Contractor shall be responsible for having adequate water available at the site prior to and during the installation of the sod and the areas to be seeded. The sod shall be watered immediately after installation to prevent drying during progress of the work. As sodding is completed on any one section, the entire area shall be thoroughly irrigated to a one inch depth below the new sod pad. After a short drying period, the sod shall be rolled with a roller weighing not less than 60 or more than 90 pounds per linear foot to firm the sod pad and smooth minor surface irregularities. Subsequent watering should maintain sod and soil moisture to a depth of at least four inches, supplement rainfall, to promote growth, promote proper rooting to insure sod survival, and to prevent dormancy.

F. Apply second application of fertilizer at the rate of 300 pounds per acre two weeks after laying sod and prior to final acceptance.

G. The sodded areas will be inspected for the acceptable grass coverage and will be acceptable when grasses designated are growing and are in good conditions, and no area more than ½ of one percent of the total area shall be bare or dead, of which no single area shall be more than one foot square in area. Any bare or dead area larger than this will not be acceptable, and shall be resodded.

H. Maintenance Period – The Contractor shall be responsible for maintaining the installed grass seed and sod until all areas are complete and accepted by the Owner.

I. Maintenance of sodded areas shall include watering, weeding, mowing to a 2½ inch height after growth has exceeded 3 inches and prior to a 4 inch growth, replacement and installation of sod as originally specified for sodded areas failing to survive, and repair of rutting, should that occur. Clippings from mowing which mat on the grass are to be removed.

SECTION 2403 NATIVE GRASSES

2403.1 Scope

This section governs the furnishing all labor, materials and equipment necessary for complete installation of native grasses, in accordance with the Standard Drawings, the specifications and Special Provisions.

2403.2 Materials

Furnished and installed per Section 2403.3. Annual plants which sprout rapidly and survive for only one growing season are suitable only for establishing temporary vegetative cover. See Temporary Seeding, Section 2153.5.

A. The seed mix will be as follows:
Short-grass Mix
Seeding Rate: 6.42 lb/Acre (40.3 Seeds/ft2)

GRASSES:					
SCIENTIFIC NAME	**COMMON NAME**	**% of Mix**	**Seeds/ft^2**	**Rate/Acre**	
Bouteloua curtipendula	Sideoats Grama	18.69%	2.6	1.200	PLS lb
Elymus canadensis	Canada Wild Rye	9.35%	1.1	0.600	PLS lb
Koeleria cristata	June Grass	1.56%	7.3	0.100	PLS lb
Schizachyrium scoparium	Little Bluestem	34.27%	12.1	2.200	PLS lb
Sporobolus aspera	Rough Dropseed	6.23%	4.4	0.400	PLS lb
Sporobolus cryptandrus	Sand Dropseed	0.31%	2.6	0.020	PLS lb
Sporobolus heterolepsis	Prairie Dropseed	0.16%	0.1	0.010	PLS lb

WILDFLOWERS:					
SCIENTIFIC NAME	COMMON NAME	% of Mix	Seeds/ft^2	Rate/Acre	
Aster laevis	Smooth Blue Aster	0.31%	0.4	0.020	PLS lb
Astragalus canadensis	Canada Milk Vetch	1.56%	0.6	0.100	PLS lb
Chamaecrista fasciculata	Partridge Pea	6.23%	0.4	0.400	PLS lb
Dalea candidum	White Prairie Clover	0.93%	0.4	0.060	PLS lb
Dalea purpurea	Purple Prairie Clover	6.23%	2.6	0.400	PLS lb
Desmanthus illinoensis	Illinois Bundle Flower	7.79%	0.8	0.500	PLS lb
Desmodium canadense	Showy Tick Trefoil	0.93%	0.1	0.060	PLS lb
Lespedeza capitata	Round-headed Bush Clover	0.31%	0.1	0.020	PLS lb
Ratibida pinnata	Yellow Coneflower	3.12%	3.1	0.200	PLS lb
Rudbeckia hirta	Black-eyed Susan	2.02%	1.5	0.130	PLS lb

2403.3 Construction

A. Prior to planting the topsoil in the disturbed area shall be tilled to 6 inches and compacted to approximately 80% density.

B. Native grass seed shall be installed using a rangeland type grain drill seeder per the rates stated. Depths of seeding plants should be ½ inch.

C. Spread and crimp 2,000 lbs. per acre of clean straw or hay within seven days of seeding.

D. Contractor shall provide a minimum of one watering after planting to establish the cover crop.

E. Cover crop shall provide 70% cover within 21 days of seeding.

F. Contractor shall guarantee that seeded areas will have 80% cover within two full growing seasons.

G. Contractor shall allow one application of selective herbicides in the spring to control weeds.

H. Care must be taken to comply with manufacturers labels.

SECTION 2404 HYDROSEEDING

2404.1 Scope

This section governs furnishing all labor, materials and equipment necessary for complete installation of hydroseeding, in accordance with the Standard Drawings, the specifications and Special Provisions. Seed and fertilizer, mixed in proportions previously specified, may be broadcast in a hydromulch with water which forms an emulsion and covers the prepared designated areas in a uniform manner.

2404.2 Materials

Areas to be hydroseeded shall be fertilized at rates specified in Section 2401.3.F. The seed-bed shall be free of any irregularities in the surface, and shall be corrected to prevent formation of water pockets. Hydromulch used shall be a wood fiber mulch with tackifier, such as Conwit 2000, or approved equivalent. Hydromulch shall be applied at the rate of 1500 lbs. per acre.

2404.3 Construction

A. Seed and fertilizer, mixed in proportions previously specified, may be broadcast in a hydromulch with water which forms an emulsion and covers the prepared designated areas in a uniform manner.

B. Areas to be hydroseeded shall be fertilized at rates specified in Section 2405.3. The seed-bed shall be free of any irregularities in the surface, and shall be corrected to prevent formation of water pockets.

C. Hydromulch used shall be a wood fiber mulch with tackifier, such as Conwit 2000, or approved equivalent. Hydromulch shall be applied at the rate of 1500 lbs. per acre.

D. Hydroseeder filling tank should be ½ full of water before adding seed, fertilizer and hydromulch components. Begin agitation while adding remaining water so that a uniform mixture is obtained. Seed, fertilizer and hydromulch components shall not be added to water more than four (4) hours prior to application.

E. Discharge hydromulch slurry mix on prepared soil for uniform distribution.

F. Keep all areas seeded moist throughout germination period. Protect all turf areas by erecting temporary fences, barriers, signs, etc. as necessary to prevent trampling and disturbance.

G. The seeded areas will be inspected for acceptable grass coverage and will be acceptable when grasses designated are growing and are in good condition and no area more than ½ of one percent of the total areas shall be bare, of which no single area shall be more than one foot square in area. Any bare area larger than this will not be acceptable and shall be reseeded.

H. Contractor shall provide a minimum of one watering after planting to establish the cover crop.

I. Cover crop shall provide 70% cover within 21 days of seeding.

J. Contractor shall guarantee that seeded areas will have 80% cover within two full growing seasons.

K. Contractor shall allow one application of selective herbicides in the spring to control weeds.

L. Care must be taken to comply with manufacturers labels.

SECTION 2405 OVERSEEDING

2405.1 Scope

This section governs the furnishing all labor, materials and equipment necessary for complete installation of overseeding in accordance with the Standard Drawings, the specifications and Special Provisions. Overseeding is the planting of grass seed directly into the existing turf, without tearing up the turf, or the soil.

2405.2 Materials

All designated existing turf areas being overseeded shall use seed previously specified at the rate of 160 pounds per acre in a uniform manner. Areas to be overseeded shall be fertilized at rates previously specified.

2405.3 Construction

A. The seed-bed shall be free of any irregularities in the surface, and shall be corrected in order to prevent formation of water pockets.

B. Seed shall be applied with a seed drill. The seed drill shall verticut the soil to a minimum depth of ½ inch at not more than 1½ inch spacing between furrows.

C. Areas that have washed or eroded shall be brought to grade and compacted prior to overseeding.

D. The seeded areas shall be inspected for acceptable grass coverage and will be acceptable when grasses designated are growing and are in good condition. Not more than ½ of one percent of the designated turf area shall be bare, of which no single area shall be more than one foot square in area. Any area left unseeded larger than this will not be acceptable, and be reseeded.

END OF SECTION

TECHNICAL PROVISIONS

Section 2500

Sanitary Sewer

Unified Government of Wyandotte County

January 2022

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SECTION 2501 GENERAL

2501.1 Scope

This section governs the furnishing of all labor, materials and equipment for the complete installation of sewers and appurtenances as shown on the Plans and in accordance with the Standard Drawings, the specifications, and the Special Provisions.

2501.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards are referenced, the more stringent standard shall apply.

UG

Section 2100	Clearing, Grading, Excavation and Site Preparation
Section 2150	Erosion and Sediment Control
Section 2200	Paving
Section 2300	Incidental Construction
Section 2400	Seeding, Sodding and Overseeding

ASTM

A 48	Standard Specification for Gray Iron Castings
A 139	Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
A 153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 184	Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
A 307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength
A 449	Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
A 615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A 1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C 32	Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)
C 33	Standard Specification for Concrete Aggregates
C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
C 150	Standard Specification for Portland Cement
C 191	Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
C 231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C 260	Standard Specification for Air-Entraining Admixtures for Concrete
C 270	Standard Specification for Mortar for Unit Masonry
C 361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
C 443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
C 478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
C 827	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
D 450	Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing
D 698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))
D 1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
D 1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D 2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D 2235 Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
D 2240 Standard Test Method for Rubber Property—Durometer Hardness
D 2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
D 2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D 2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
D 2584 Standard Test Method for Ignition Loss of Cured Reinforced Resins
D 2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
D 2661 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
D 2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
D 3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D 3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D 3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
D 3262 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
D 3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
D 3754 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe
D 3839 Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe
D 4101 Standard Specification for Polypropylene Injection and Extrusion Materials
D 4161 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals
D 5685 Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings
D 6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
F 477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F 628 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core
F 679 Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
F 714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
F 1417 Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
F 3125 Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

ANSI/AWWA

C 104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
C 105/A21.5 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
C 110/A21.10 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In.
C 111/A21.11 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C 115/A21.15 American National Standard for Flanged Ductile-Iron Pipe with Threaded Flanges
C 150/A21.50 American National Standard for Thickness Design of Ductile-Iron Pipe
C 151/A21.51 American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
C 153/A21.53 American National Standard for Ductile-Iron Compact Fittings for Water Service

AWWA

C 302 Reinforced Concrete Pressure Pipe, Noncylinder Type
C 600 Installation of Ductile Iron Water Mains and Their Appurtenances
C 950 Fiberglass Pressure Pipe

ANSI
Z 60.1 American Standard for Nursery Stock

KCMMB Kansas City Metro Materials Board Specifications

2501.3 Cleanup

Cleanup shall follow the work progressively. The Contractor shall remove from the project site all rubbish, equipment, tools, surplus or discarded materials, and temporary construction items.

Streets to be opened to local traffic at the end of the day's operation shall be cleaned of dirt or mud. All equipment and material stockpiles shall be secured for safe passage of vehicles and pedestrians.

All work shall comply with Section 2150 "Erosion and Sediment Control".

SECTION 2502 MATERIALS

2502.1 Scope

This section governs the furnishing of all labor, materials and equipment that may be required to complete pipeline construction, exclusive of structures, as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

A. Requirements: Furnish pipe of materials, joint types, sizes, and strength classes indicated or specified. Higher strengths may be furnished at the Contractor's option at no additional cost to the Owner.

B. Manufacturer: The manufacturer shall be experienced in the design, manufacture and commercial supplying of the specific material.

C. Inspection and Testing: Inspection and testing shall be performed by the Manufacturer's quality control personnel in conformance with applicable standards. Testing may be witnessed by Owner, Engineer, or approved independent testing laboratory. The Contractor shall provide three (3) copies of certified test reports indicating the materials conform to the specifications.

D. Handling: The manufacturer and contractor shall use equipment and methods shall be adequate to protect the pipe, joint elements and prevent shock contact of adjacent units during moving or storage. Damaged sections that cause reasonable doubt as to their structural strength or water-tightness will be rejected. No pipe or fitting shall be delivered until the certified test reports are approved by the Engineer.

2502.2 Pipe, Fittings, Joints, Coatings and Linings

A. General: Furnish pipe and fittings of materials, joint types, sizes, strength classes, coatings and linings as indicated and specified.

B. Ductile-Iron Pipe and Fittings: Pipe and fittings shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C110/A21.10, and ANSI/AWWA C153/A21.53 except as otherwise specified herein.

1. General: Furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures and specials.

2. Design: All ductile iron pipe shall meet the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51 and shall be of the thickness class specified herein or shown on the drawings. The minimum thickness allowed shall be Special Class 50.

3. Joints: Mechanical and push-on joints for pipe and fittings shall conform to the requirements of ANSI/AWWA C111/A21.11. Flanged joints for ductile iron pipe and fittings shall conform to the requirements of ANSI/AWWA C115/A21.15. Gaskets shall be neoprene or other synthetic rubber material. Natural rubber gaskets will not be accepted.

4. Fittings: Fittings shall be in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have a pressure rating of not less than that specified for the pipe. Fittings used with ductile iron pipe shall be ductile iron. Fittings for pipe with mechanical joints shall have mechanical joints. Fittings for pipe with push-on joints shall have either mechanical joints or push-on joints.

5. Coatings: Pipe and fittings shall be furnished with exterior bituminous coating conforming to ANSI/AWWA C151/A21.51.

6. Linings: Pipe and fitting interior linings shall be hydrogen sulfide resistant and conform to the following:

a. Calcium aluminate-mortar lining conforming to AWWA/ANSI C104/A21.4, a 40 mil ceramic quartz filled amine cured novalac epoxy lining, a40 mil polyethylene lining in accordance with ASTM D 1248, or be PVC (polyvinyl chloride) lined.
b. Protecto 401Ceramic Epoxy or approved equal.

7. Polyethylene Encasement: Pipe and fittings shall be installed with a polyethylene tube encasement having a thickness of 0.008" (8 mils) and conforming to Section 4.1.1 of ANSI/AWWA C105/A21.5.

C. Polyvinyl chloride (PVC) Pressure Rated Plastic Pipe (SDR) and Fittings: Pipe and fittings shall conform to ASTM D 2241, except as otherwise specified herein.

1. General: Furnish maximum pipe lengths normally produced by the manufacturer, except for fittings, closures and specials. Pipe shall be used only for pressure flow systems.

2. Materials: The pipe shall be made of PVC plastic pipe having a cell classification of 12A54 B or 12A54 C as defined in ASTM D 1784.

3. Design: Pressure flow systems, i.e., force mains, shall have the wall thickness shown on the plans, with a minimum wall thickness not less than SDR 32.5 with a minimum burst pressure not less than 400 psi conforming to pipe materials designation codes PVC 1120, PVC 1220, or PVC 2120.

4. Joints: Pressure flow systems shall be joined in accordance with ASTM D 3139 with particular attention given to Section 5.3. Joints shall be push-on type only with the bell-end grooved to receive a gasket. Elastomeric seals (gaskets) shall have a basic polymer of synthetic rubber complying with ASTM F 477. Natural rubber gaskets will not be accepted.

5. Fittings: Fittings for pressure flow systems shall be ductile iron or PVC. Ductile iron fittings shall be mechanical joint conforming to Section 2502.2.B.3. PVC fittings shall have a minimum wall thickness conforming to SDR 32.5 and a minimum hydrostatic design stress of 400 psi conforming to pipe materials designation codes PVC 1120, PVC 1220, and PVC 2120.

D. Type PSM polyvinyl chloride (PVC) Sewer Pipe and Fittings: 4 through 15 inch diameter pipe and fittings shall conform to ASTM D 3034 and pipe having a diameter 18 inches through 27 inches shall conform to ASTM F 679 except as otherwise specified herein.

1. General: Furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures and specials.

2. Materials: The pipe shall be made of PVC plastic having a cell classification of 12454 B or 12454 C or 13364 B as defined in ASTM D 1784.

3. Design: Pipe shall have an integral bell and spigot joint. Wall thickness shall be SDR 26, or SDR 21 as shown on plans. If for any reason the depth of cover on SDR 26 pipe becomes greater than 15 feet, the Contractor shall immediately notify the Engineer.

4. Joints: Joint tightness shall conform to ASTM D 3212. Joints shall be push-on type only with the bell-end grooved to receive a gasket. Elastomeric seal (gasket) shall have a basic polymer of synthetic rubber conforming to ASTM F 477. Natural rubber gaskets will not be accepted.

5. Fittings: Fittings defined as tee (T) or wye (Y) connections suitable for assembly to four (4) inch orsix (6) inch building service lines shall be bell-end with a minimum wall thickness conforming to SDR 26 and shall be furnished by the pipe manufacturer. A special design is required for service connections 8

inches and larger. Saddle tees or wyes should not be used and will only be permitted in special circumstances to be determined by the County Engineer.

E. Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Wastewater Pipe (36-inch diameter and larger)

1. General: This specification designates requirements for fiberglass glass-fiber reinforced thermosetting-resin pipe (RTRP) for the conveyance of wastewater. Pipe for gravity application shall conform to ASTM D 3262 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe. Pipe for force main applications shall conform to ASTM D 3754 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe. If ASTM D 3754 pipe is selected, its actual outside diameter shall be in accordance with AWWA C 950 Fiberglass Pressure Pipe.

2. Materials: Material used in the manufacture of the pipe, fittings and specials shall conform to the following:

    a. Resin Systems: The manufacturer shall use only polyester resin system with a proven history of performance in corrosive environments found in wastewater collection systems. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product. Certification of resin compounding shall be provided by the pipe manufacturer prior to shipment to the job site. One test to verify resin compounding may be required by the Engineer. The test shall be performed by an independent testing laboratory approved by the Engineer and shall be performed upon a sample of pipe obtained from the job site. The cost of the test shall be paid for by the Contractor and shall be included with the bid price for pipe. The test shall be performed in accordance with ASTM D 2584 Standard Test Method for Ignition Loss of Cured Reinforced Resins.
    b. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of the highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
    c. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
    d. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.
    e. Elastomeric Gaskets: Gaskets shall meet ASTM F 477 and be supplied by qualified gasket manufacturers and be suitable for the service intended.

3. Stiffness: Pipe shall conform to the requirements of AWWA M45 for the size and strength. Minimum pipe stiffness at 5-percent deflection shall be 46-psi (3.2-kg/cm2) for gravity and pressure wastewater conduit as specified for all sizes when calculated in accordance with ASTM D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

4. Joints: Joint tightness shall be tested in accordance with ASTM D 4161 for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals. Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets as the sole means to maintain joint water-tightness.

5. Fittings: Fittings shall conform to ASTM D 5685 Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings or D 3840 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Non-pressure Applications.

F. High Density Polyethylene (HDPE)

1. General: Furnish maximum lengths normally produced by the manufacturer except for fittings, closures and specials.

2. Materials: All new pipe and fittings shall be solid wall high density polyethylene (HDPE) pipe, meeting the requirements of ASTM F 714 Polyethylene (PE) Plastic Pipe (SDR-PR) based on outside diameter, ASTM D 1248, ASTM D 3350. All HDPE pipe shall be marked with a green stripe to signify its use for sanitary sewer utilities.

    a. The pipe shall be manufactured from high density high molecular weight polyethylene resin which conforms to ASTM D 1248. The pipe produced from this resin shall have a minimum cell classification of 345434C under ASTM D 3350.
    b. The HDPE pipe shall have a wall thickness as shown on the Plans or Standard Drawings with a minimum wall thickness conforming to DR11 with a working pressure rating of 160 psi. HDPE pipe diameters shown on plans are iron pipe sizes which provide the nominal inside diameter necessary to exceed the flow capacity of cement lined ductile iron pipe.
    c. The pipe and fitting manufacturer shall certify that samples of his production pipe have undergone stress regression testing, evaluation, and validation in accordance with ASTM D 2837 and PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the pipe manufacturer to be 1600 psi at 73.4°F and 800 psi at 140°F.
    d. As approved by the Engineer, electrofusion fittings may be allowed in lieu of fittings designed for butt fusion.
    e. The HDPE pipe shall be provided to the project site in straight sections and shall not have been coiled at any time.
    f. All inner welds / beads shall be removed.
    g. Fittings: Lateral connections shall be made with an Inserta Tee or approved equal.

G. Polypropylene Pipe

1. General: Furnish maximum lengths normally produced by the manufacturer except for fittings, closures and specials.

2. For 12-inch to 24-inch pipe, polypropylene pipe shall have a double wall with a smooth interior and annular exterior corrugations and conform to ASTM F2764. For 30-inch and larger pipe sizes, polypropylene pipe shall have a triple wall with smooth interior and exterior surfaces with inner corrugations and conform to ASTM F 2764. The pipe shall not be perforated unless otherwise specified.

3. For 12-inch to 60-inch pipe, pipe shall be joined with a dual-gasketed integral bell and spigot joint meeting the requirements of ASTM F2764.

4. The joint shall be watertight according to the requirements of ASTM D3212 and ASTM F2764 Section 7.10. Gaskets shall meet the requirements of ASTM F477. 12- through 60-inch diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer.

H. Tees, Wyes, And Building Service Lines

1. General: All service lines are gravity. Tees, wyes, and building service lines shall be installed as shown on the Plans and Standard Drawings or specified herein. Saddles will only be allowed with the approval of the Engineer.

2. Materials: Material used in the manufacture of the pipe, fittings and specials shall conform to the following:

    a. Acrylonitrile-Butadiene-Styrene (ABS) Service Line Pipe and Fittings
        i. Pipe and fittings shall conform to ASTM F 628 Foamed Core DWV, ASTM D 2661

DWV.

ii. Joints: Joints shall be solvent-cemented. The cement shall conform to the requirements of ASTM D2235.

b. Polyvinyl Chloride (PVC) Service Line Pipe and Fittings

i. Pipe and fittings shall be made of PVC plastic pipe having a minimum cell classification of 12454 as defined in ASTM D 2241 or ASTM D 3034 for SDR26.

ii. Joints: Joints shall be of a push-on type with a bell-end grooved to receive a synthetic rubber gasket. Solvent welded joints are not allowed. The joint shall be made in accordance with ASTM D 3212.

c. High Density Polyethylene (HDPE) Service Line Pipe and Fittings

i. The pipe shall be manufactured from high density high molecular weight polyethylene resin which conforms to ASTM D 1248. The pipe produced from this resin shall have a minimum cell classification of 345434C under ASTM D 3350.

ii. As approved by the Engineer, electrofusion fittings may be allowed in lieu of fittings designed for butt fusion.

d. Ductile Iron Pipe (DIP) Service Line Pipe and Fittings: Refer to paragraph 2502.2.B of this Section for requirements for DIP service line pipe and fittings.

2502.3 Pipe Embedment Materials

A. Granular Bedding Material: All materials used for granular embedment for pipe bedding shall conform to the requirements of ASTM C 33 and shall meet the graduation identified in Section 2102.4.G.

B. Concrete for embedment and encasement:

1. Concrete shall test not less than a twenty-eight (28) day compressive strength of 3000 psi and shall otherwise conform to Section 2509.3.E.

2. Reinforcing steel when required shall be placed as shown on the Plans and shall conform to Section 2509.3.F.

2502.4 Backfill Materials

A. Granular Backfill Material: Granular backfill material shall meet the gradation requirements as outlined in Section 2102.4.

B. Flowable backfill (CLSM): Flowable backfill (CLSM) shall meet the requirements as outlined in Section 2102.2.E.

C. Select Earth Backfill Material: Select earth backfill shall be finely divided job excavated material free from debris, organic matter, rocks larger than one (1) inch and/or frozen materials.

D. Other Earth Backfill: Other backfill may be job excavated material free from debris and organic matter. No rock greater than three-inches in diameter shall be placed in any trench excavation as backfill unless approved by the Engineer.

2502.5 Tunneling, Boring and Jacking Materials

A. General: Furnish materials and necessary accessories with strengths, thicknesses, coatings, and fittings indicated, specified and/or necessary to complete the work.

B. Steel Liner Plate: Steel tunnel liner plates shall be new and with minimal oxidation. The design and shape of the

liner plates shall be such that assembly can take place entirely from within the tunnel liner. Liner plates shall be capable of withstanding the ring thrust load and transmitting this from plate to plate. The minimum outside diameter shall be four (4) feet and the minimum wall thickness shall be United States Standard Gauge 12 (0.1094 inches). Sufficient sections shall be provided with one and one-half (1½) inch or larger grouting holes located near the centers so that when plates are installed there will be one line of holes on either side of the tunnel and one at the crown; the lower line of holes on each side shall not be more than eighteen (18) inches above the invert. The holes in each line shall not be more than five (5) feet apart and unless otherwise approved, shall be staggered. Bolts and nuts shall conform to ASTM A 153, A 307, F 3125 and A 449 as applicable. Steel liner plates shall have bolted joints in both longitudinal and circumferential planes. Stagger longitudinal joints in adjacent rings when assembling.

C. Steel Casings: Steel casings for bored or jacked construction shall be steel pipe conforming to ASTM A 139 with a minimum diameter as shown on the Plans.

1. Minimum wall thickness shall be in accordance with the following table:

Diameter of Casing-Inches	Nominal Wall Thickness-Inches Under Railroads	All Other Uses
16	0.312	0.188
18	0.312	0.250
20	0.375	0.250
22	0.375	0.250
24	0.406	0.281
26	0.438	0.281
28	0.469	0.312
30	0.469	0.312
32	0.500	0.312
34	0.500	0.312
36	0.500	0.344

2. Steel shall be Grade B with a minimum yield strength of 35,000 psi under railroads and Grade A on all other uses.

3. Steel pipe shall have welded joints in accordance with AWWA C 206.

D. Reinforced Concrete Pipe: Reinforced concrete pipe used as casing shall conform to ASTM C 76.

1. Design: Provide ASTM C 76 circular pipe of the strength class required for the jacking of pipe when determined by method set forth in the latest printing of Concrete Pipe Design Manual prepared by the American Concrete Pipe Association.

2. Joints: Reinforced concrete pipe used for casing pipe shall be provided with steel end joint with a groove in the spigot end for an O-ring gasket. The O-ring gasket shall be synthetic rubber. Both joint and gasket shall otherwise conform to ASTM C 361.

3. Interior Protection: Interior protection is NOT required for reinforced concrete pipe used for casing conduit.

E. Casing Conduit Grout: Casing conduit grout shall be a pumpable grout resulting in minimum set strength of 400 psi in 28 days.

F. Sand: Sand used as fill in casing conduits shall be a clean sand and thoroughly dry. All sand fill shall conform to

the requirements under ASTM C33.

G. Pipe Supports shall conform to the following:

1. Casing Spacers: Casing spacer shall be a two-piece shell or band made from T-304 stainless steel of a minimum 14 gauge thickness. The shell/band shall have risers made of 10 gauge T-304 stainless steel and have a PVC liner. The bearing surface (skid or runner) shall be made of an ultra-high molecular weight polymer, glass reinforced polyester, or fiberglass reinforced nylon. The shell/band shall be bolted together with T-304 stainless steel bolts. The configuration of the carrier pipe in the casing pipe shall be centered. End seals shall be made by the same manufacturer as the casing spacers and shall use stainless steel bands to hold end seals to pipes.

2. Wood Skids: Wood skids shall be provided as indicated on the Plans. The wood shall be treated with a preservative as approved by the Engineer. Cut surfaces shall be given two (2) heavy brush coats of the same preservative. If PVC pipe is used as the carrier pipe, the wood skids shall be compatible with the PVC pipe.

SECTION 2503 SITE PREPARATION

2503.1 Scope

This section governs the furnishing of all labor, materials and equipment for Site Preparation as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2503.2 General

A. See Section 2101 for Site Preparation.

SECTION 2504 EXCAVATION

2504.1 Scope

This section governs the furnishing of all labor, materials and equipment for pipeline excavation for open cut, tunneling, boring, and jacking as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2504.2 General

The terms "excavation" and "trenching" shall mean the removal and subsequent handling of all material required to perform the work.

A. All pipeline excavation work shall be accomplished under supervision of a person experienced with the materials and procedures which will provide protection to existing improvements, including utilities and the proposed pipeline.

B. The alignment, depth, and pipe subgrades of all sewer trenches shall be determined by a laser beam parallel to the sewer invert.

C. When pipe is to be installed in embankment or fill, the embankment shall be constructed in accordance with section 2102.6 and shall be built up to a plane at least 18 inches above the top of the pipe prior to the excavation of the sewer trench.

D. The Contractor shall not open more trench in advance of pipe laying than is necessary. Four hundred (400) feet will be the maximum length of open trench allowed on any line under construction. All open trenches shall be adequately protected.

E. In the event hazardous wastes as defined by the Resource Conservation and Recovery Act of 1976 (PL94-580) are encountered, work shall be halted and the Engineer shall be notified. Work shall be resumed only after the Engineer notifies the Contractor. Regulation of removal, handling and disposal of hazardous wastes is the responsibility of Federal and State agencies.

2504.3 Classification of Excavated Material

No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work regardless of the type, character, composition, or condition thereof. See Section 2100 “Clearing, Grubbing, Excavation and Site Preparation”.

2504.4 Removal of Water

The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below static groundwater elevations shall be dewatered by lowering and maintaining the groundwater surface beneath such excavations a distance of not less than 12-inches below the bottom of the excavation.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

2504.5 Blasting

Blasting: When blasting is permitted by the Engineer, the Contractor shall use the utmost care to protect life and property. The Contractor shall obtain any required permits from the agency having site jurisdiction and shall comply with all laws, ordinances, and the applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property, and he shall be responsible for all damage caused by his or his subcontractor's operations.

The Contractor shall provide insurance as required by the Contract Documents before performing any blasting. The governing agency shall be notified at least 24 hours before blasting operations begin.

2504.6 No Blasting Areas

No Blasting Areas: No blasting of any kind for rock excavations or any other purpose will be allowed unless noted otherwise on the Plans or permitted by the Engineer. No blasting within 250 feet of any structures or as specified by the Fire Department.

2504.7 Open-Cut Method (Trenching)

A. General: Excavations for pipelines shall be accomplished by the open-cut method (trenching) except as specified or approved by the Engineer. Trenching shall be with a minimum inconvenience and disturbance to the general public.

The Contractor shall sort and stockpile the excavated material so the proper material is available for backfill.

B. Trench Depths: All trenches shall be excavated to depths required for proper pipe embedment. Overdepth excavation shall be required when the subgrade is unstable. Overdepth excavations shall be backfilled with granular pipe embedment material unless otherwise directed by the Engineer.

C. Trench Walls: Undercutting of trench walls is not permitted.

D. Trench Widths

1. Minimum Widths: Minimum trench widths shall be in accordance with the Plans, Standard Drawings, and manufacturers' recommendations.

2. Maximum Widths: The allowable maximum trench widths hereinafter specified apply only to that portion of the trench below the horizontal plane parallel to and six (6) inches above the top of the pipe. The allowable maximum widths may be exceeded at manholes, bore pits, tees, and in unstable earth material. Where the maximum trench width is exceeded the Contractor shall provide the appropriate strength class of pipe embedment to provide safe support strength to the pipeline.

3. When the side clearance exceeds two and one-half (2.5) times the outside pipe diameter at either side of a flexible conduit, it shall be the Contractor's responsibility at no additional cost to the Owner to provide bedding adequate to develop the required lateral support for the pipe and/or provide a pipe of sufficient strength class to accommodate the loading conditions as approved by the Engineer.

4. Trench Slope: The trench width above a horizontal plane six (6) inches above the top of the pipe may vary and side sloping is permissible unless otherwise specified.

5. Trench Shields: When trench shields are utilized by the Contractor, said shields or any part thereof shall not extend lower than twelve (12) inches above the top of the proposed pipeline nor shall the maximum allowable trench width be exceeded.

6. Sheeting and Shoring: Except where banks are cut back on a stable slope, excavation for structures and trenches shall be properly and substantially sheeted, braced, or shored as necessary to prevent caving or sliding, to provide protection for workmen and the work, and to provide protection for existing structures and facilities. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure and shall be rigid, maintaining shape and position under all circumstances.

   Trench sheeting shall not be pulled unless pipe strength is sufficient to carry trench loads based on trench width to the back of sheeting.

   Sheeting shall not be pulled after backfilling.

   Where trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed.

E. Maximum Trench Widths for Reinforced Concrete and Ductile Iron Pipe: When reinforced concrete and ductile iron pipe is utilized, the strength class and the maximum allowable trench width will be shown on the Plans.

F. Option to Trenching: Contractor may perform excavation by tunneling methods as set forth herein at no additional cost to the Owner provided prior written approval for each such location is obtained from the Engineer.

2504.8 Tunneling, Boring and Jacking

A. General: Tunneling includes all underground horizontal excavations necessary to install the pipeline. The Contractor shall submit to the Engineer, prior to actual work, a written description of his proposed tunneling operation. It shall include the types and locations of shafts, methods to provide safe support strength for the pipeline when the shafts or bore pits exceed maximum allowable trench widths and other features that would affect the pipeline.

Tunneling shall be done with a minimum inconvenience and disturbance to the general public and abutting

property owners.

B. Tunnel Cross Section: The tunnel shall be circular in cross section and of the size specified. Alternate size and shape may be submitted for consideration by the Engineer.

C. Construction

1. General: All tunnel excavation shall provide an excavation conforming to the outside diameter of the casing and/or carrier conduit. The excavation shall be to an alignment and grade which will allow the carrier conduit to be installed to proper line and grade as shown on the Plans and as established in Section 2505.4.

2. Excavation: Conduct excavation in a manner to prevent disturbing overlying and adjacent material. Perform dewatering and chemical soil stabilization or grouting if necessary, due to existing field conditions.

SECTION 2505 INSTALLATION

2505.1 Scope

This section governs the furnishing of all labor, materials and equipment for the installation of gravity and pressure pipelines and appurtenances as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2505.2 General

All pipeline installations shall conform to the following requirements:

A. Governmental Requirements: Sanitary sewer line installation shall comply with applicable State and County Health and Environment Department requirements.

The Kansas Department of Health and Environment (KDHE) has requirements for the protection of potable water systems that may affect the work covered by this Section. The most current version of these requirements can be downloaded from the KDHE website.

B. Trench Dewatering: Contractor shall maintain a dry and stable trench, obtain necessary permits, and provide for the proper method of discharging such water from the work site at all times until pipeline installation is completed to the extent that hydrostatic pressure flotation or other adverse effects will not result in damage to the pipeline.

Proper dewatering techniques are the Contractor's responsibility. All work performed by the Contractor which is adversely affected by his failure to adequately dewater trenches will be subject to rejection by the Engineer. The Contractor shall repair and/or replace the affected pipeline without additional compensation.

C. Drainage Course Crossing Encasement: Any pipeline crossing a well-defined drainage course having less than three (3) feet of cover over the pipe shall be encased in concrete. The length of encasement shall be as shown on the Plans or if not shown as specified by the Engineer.

D. Trench Shoring and Bracing: All shoring, bracing or blocking shall be furnished and installed as necessary to preserve and maintain exposed excavation faces, to protect existing improvements, to protect the proposed pipeline and to provide for safety.

Shoring or other methods for support of trench walls is the responsibility of the Contractor and shall be accomplished by methods that will not adversely affect pipeline alignment, grade and/or structural integrity.

All bracing, sheeting and/or shoring installed below a horizontal plane six (6) inches above top of proposed pipe shall not be disturbed or removed after pipe and/or pipe embedment has been installed unless otherwise specified. The bottom skids of a trench shield shall not extend lower than twelve (12) inches above top of proposed pipe.

E. Pipe Embedments: All pipe embedment shall conform to Class B First Class Modified unless otherwise specified. Installation shall be in strict conformance with instructions for the appropriate Class being utilized.

F. All Class A concrete embedments for rigid conduits shall begin and end at a pipe joint.

G. Bedding Installation

1. The trench subgrade shall be prepared to provide a uniform and continuous pipe support between pipe bells and joints.

2. Place and densify embedment material by shovel slicing or vibrating and prepare embedment material so that the pipe will be true to line and grade after installation.

3. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify by shovel slicing sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations. Place bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

4. Place pipe that is to be bedded in Class A (concrete) embedment in proper position on temporary supports consisting of wood blocks or bricks with wood wedges. When necessary, anchor or weight the pipe to prevent flotation when the concrete is placed.

5. Place concrete for Class A (concrete) embedment or encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than five (5) feet from its point of placement.

6. If unstable subgrade conditions are encountered and it is determined by the Engineer that the bedding specified will not provide suitable support for the pipe, additional excavation to the limits determined by the Engineer will be required. This additional excavation shall be backfilled with material approved by the Engineer.

7. Pipe Embedment Designations and Descriptions

    a. Class A. Embedment - Concrete Cradle. Arch or Encasement
        i. All Class A embedments require a KCMMB 4K, except as otherwise specified. After initial set of concrete, one (1) foot of backfill material should be placed over the conduit or concrete. The backfill above this point shall not be placed nor sheeting removed until at least forty-eight (48) hours after placement of the concrete. Time requirements may be adjusted by the Engineer to obtain structural integrity.
        ii. Class A embedments for all pipe shall be installed with reinforcing steel of not be less than p= 0.4%, where p is the ratio of the area of steel to the area of concrete, or as otherwise specified. Reinforcing steel shall be uniformly spaced and have a minimum lap of sixteen (16) bar diameters.
    b. Class B Embedment - The pipe shall be bedded in granular material, with a minimum thickness below the pipe as specified in Section 2103.
        i. First Class: The granular material shall be placed to the horizontal center line of the pipe. The backfill from the horizontal center line to a level not less than twelve (12) inches above the top of pipe shall be carefully placed select earth backfill compacted to eighty-five percent (85%) of maximum density at an optimum moisture + /- 2% as defined in AASHTO T 99 or ASTM D 698. The select material shall be free from debris, organic matter, frozen material and rocks larger than one (1) inch. Class IV and Class V embedment materials, as defined in ASTM D 2321, shall not be used for bedding, haunching, or initial backfill of flexible pipe.
        ii. First Class Modified: The backfill shall be the same as for First Class except all of the material used to a level not less than six (6) inches above the top of the pipe bell coupling shall be bedding aggregate.
        iii. Class C Embedment The pipe shall be bedded in granular material with a minimum thickness beneath the pipe as specified in Section 2103.

            It shall be sliced under the haunches of the pipe to a height one-sixth (1/6) of the outside diameter of the pipe. Backfill above the bedding to a point twelve (12) inches

above the top of pipe, shall be carefully placed select earth backfill compacted to eighty-five percent (85%) of maximum density as defined in AASHTO T 99 or ASTM D 698.

H. Tees, Wyes and Building Service Lines: Tees, wyes, and building service lines shall be installed as shown on the Plans or specified herein.

1. Tees, wyes and saddles shall be installed at forty-five (45) degrees with pipe springline for pipe sizes 8 through 16 inch diameter. Tees, wyes and saddles shall not be installed in pipe sizes greater than or equal to eighteen (18) inch diameter.

2. Building service lines shall be installed with a straight alignment and at a uniform grade not less than two (2) percent unless otherwise specified and shall be embedded with Class B embedment. When a building service line grade exceeds twenty (20) percent, pipeline anchors shall be installed as required under Section 2505.L, with the first anchor not more than twelve (12) nor less than seven (7) feet upstream of the tee or wye.

3. The Contractor shall maintain an accurate record for submittal to the Engineer of location, size and direction of each tee, wye, saddle and/or location, size and length of each building service line. Locations shall use the pipeline stationing as shown on the Plans or the distance from the first downstream manhole. In the event such records are not kept or are lost before final acceptance of the work, the required information shall be redetermined by the Contractor at no additional cost to the Owner.

4. Saddles will not be allowed unless approved by the Engineer.

5. Service lines shall be terminated and capped one foot on the public side of Right of Way or easement lines.

I. Gravity Sewers: All gravity sewers shall be installed to the alignment, elevation, slope, and with pipe embedment as specified and/or shown on the Plans. Maintain the following tolerances from true alignment and grade between adjacent manholes:

Alignment	6 inches
Grade	½ inch

Joint deflection shall not exceed the maximum allowable deflection per joint according to AWWA C 600. Only one correction for alignment and/or grade shall be made between adjacent manholes.

J. Pressure Sewers (Force Main): All pressure sewers shall be installed with required pipe embedment to depths shown on the Plans (not less than 42 inches) and to a continuous slope when not shown. Approved air relief valves shall be installed at all locations shown on the Plans or where required by the Engineer.

K. The Contractor shall block and anchor the pipeline to accommodate thrust and testing forces at pipe deflections, bends, tees, and plugs in accordance with the Contract Documents. All damage caused by the Contractor's failure to provide adequate thrust supports shall be corrected by the Contractor at no additional cost to the Owner.

L. Anchors: Pipelines shall be anchored in accordance with the table below:

PIPELINE ANCHORS

Center to Center

Percent of Grade	Max. Spacing (Feet)
20 – 35	36
35 – 50	24
50	16

The anchor shall be of concrete or other material approved by the Engineer. Concrete anchors shall have a minimum thickness of twelve (12) inches. The anchor shall extend not less than one (1) foot into undisturbed earth on the sides and bottom and one (1) foot above top of pipe. In incompressible material, the above dimensions may be six (6) inches each side and bottom. The anchor shall support a joint fitting.

M. Pipe Laying: All pipe shall be installed in accordance with the pipe manufacturer's recommendations, except as modified herein.

1. Pipe laying shall not proceed if the trench width as measured at the top of pipe exceeds the maximum allowable trench width. If this occurs, the Contractor shall submit to the Engineer for approval a better bedding for the pipe or a pipe that provides safe supporting strength.

2. All pipe and fittings shall be stored and handled with care to prevent damage thereto. Do not use hooks to transport or handle pipe or fittings. Do not drop pipe or fittings.

3. Rejected pipe and fittings shall be marked and removed from the Project Site at no cost to the Owner. All pipe and fittings shall be examined for soundness and specification compliance prior to placement in the trench, and rejected pipe or fittings shall not be incorporated into the pipeline. Check the class or pipe strength to be sure proper pipe is installed.

4. Clean joint contact surfaces prior to jointing. Use lubricants, primers, or adhesives as recommended by the pipe or joint manufacturer.

5. Pipe installation shall begin at the lowest point and precede uninterrupted upgrade without gaps unless otherwise approved, in writing, by the Engineer.

6. Unless otherwise required, lay all pipe straight between manholes. Excavate bell holes for each pipe joint. When jointed, the pipe shall form a true and smooth pipeline.

7. Pipe connecting to a structure shall be supported with Class A embedment, cradle or encasement to the first joint outside the structure excavation. If flexible wall connections are used, Class B embedment may be used in lieu of concrete embedment provided the height of backfill does not result in loads exceeding the pipe's safe supporting strength.

8. All pipelines shall be plugged at the end of each day's progress. Plugs or other positive methods of sealing shall be utilized at all times to protect any existing system from entrance of storm water or other foreign matter.

9. When a sanitary sewer line crosses an existing pipeline and the clearance is less than two (2) feet, special embedment may be required.

N. Connection of Pipes of Dissimilar Materials: The connection of pipes of different materials shall be made using an approved transition coupling and shall provide a permanent and watertight connection that will withstand the hydrostatic test pressure and prevent the offset of the joint within the coupling.

2505.3 Detailed Installation Requirements

All pipes shall be installed in accordance with the following standards:

A. ASTM D 2321 ADS Solid Wall, ADS Composite Wall
ASTM D 2321 PVC Solid Wall, PVC Composite Wall

B. ANSI/AWWA C 600 Ductile Iron Pipe

C. Reinforced Concrete Pipe: Installed in accordance with American Concrete Pipe Association's "Installation Manual"

D. Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Wastewater Pipe

1. Gravity Sewer: Installed in accordance with ASTM D 3839 Standard Guide for Underground Installation of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

2. Force Main: Installed in accordance with AWWA Manual M45, Fiberglass Pipe Design

E. High Density Polyethylene (HDPE) Joints: Assembled in accordance with ASTM D 2657 - Standard Practice for Heat Fusion Joining Polyolefin Pipe and Fittings

2505.4 Casing and Carrier Conduits

Casing and carrier conduits shall be installed at required locations by methods acceptable to the Engineer. Installation of the carrier conduit shall be completed prior to installation of the adjacent portions of the pipeline to allow for adjustments.

A. Casings Types

1. Steel Casing Pipe: Steel casing pipe is a flexible conduit and shall be designed to conform with one of the following design concepts (other methods may be submitted to the Engineer for approval).

   a. Method A: The steel casing conduit is considered a temporary construction means for the installation of the carrier conduit; therefore cathodic and corrosion protection is not required provided that the carrier and its joints are structurally designed to withstand all possible loadings (live, earth and superimposed) which would otherwise be supported by the casing conduit, and to withstand all pressures necessary to install the required grout. All exterior voids around the casing conduits shall be filled with casing conduit grout (see Section 2502.5.E). Interior void between the carrier and casing conduits shall be filled with sand conforming to ASTM C33. Sand shall be applied under pressure to fill all of the voids without adversely affecting the carrier conduit, joints, alignment and grade.

   b. Method B: The steel casing conduit is considered a permanent installation to protect the carrier conduit and to support all loads; therefore cathodic and corrosion protection and watertight removable end seals are required for the casing conduit. Care shall be exercised to prevent the carrier conduit from floating and receiving any load transfer from the casing conduit unless it is designed for such loading. The void between casing and carrier conduits shall be treated as shown on the Plans or Standard Drawings. Cathodic and corrosion protection for method B shall be provided by two magnesium anodes, one at each end of the casing pipe, with a lead wire connected to the encasement pipe by thermite welding.

2. Reinforced Concrete Casing Pipe: Reinforced concrete casing pipe is a rigid conduit and shall be installed in accordance with recommended procedures in the latest printing of the Concrete Pipe Design Manual prepared by American Concrete Pipe Association.

B. Casing Installation: Installation of casing shall be supervised by a foreman experienced in such work. Casing shall be installed by a combination of augering and jacking. Alignment and gradient shall be such that the carrier conduit can be installed to line and grade shown on the Plans.

Welding shall be performed by a person experienced with the type of welding necessary. All welds shall conform to AWWA C 206.

C. Liner Plate Installation: Liner plates shall be assembled immediately following the excavation. Advance liner plates or casing continuously with excavation. All voids between liner and surrounding earth shall be filled with casing conduit grout forced in under pressure. As the pumping through any hole is completed, it shall be plugged to prevent the back-flow of grout. After lining installation is complete, it shall be cleaned of all debris and all leaks sealed.

D. Carrier Conduit Installation: After completion of the installation of the casing, the carrier conduit shall be carefully pushed or pulled through the casing in a manner that will maintain proper jointing of the pipe joints and provide required gradient and alignment. Pipe skids shall be provided as indicated on the Plans. The skids shall be securely strapped to the pipe with steel strapping material at least three-quarters (3/4) inch wide.

E. Sand Fill: The annular space between lining and sewer pipe shall be filled with sand from end seal to end seal unless otherwise specified. The fill shall be placed inside the casing in a manner that will not disturb the alignment and/or grade of the sewer pipe. Sand used in casing conduits shall be as specified in ASTM C33. Sand shall be blown into the casing so that all space is filled.

F. End Seals: Construct end seals after sewer pipe bas been installed and approved. End seals shall be manufactured end seals, concrete plugs with allowances for water flow, or brick shall be in accordance with ASTM C 32, Grade SS or SM and mortar in accordance with ASTM C 270.

G. Initial Testing: Air pressure and/or exfiltration test as required shall be successfully performed on the carrier conduit prior to filling the void between casing and carrier conduits with sand or the sealing of the ends of the casing conduit.

H. Carrier Conduit Installed Without Casing: Carrier conduits installed without casing shall be assembled at the entrance to the auger hole and carefully pushed or jacked through the opening using a method designed to prevent disturbing the assembled joints. Auger holes shall be sized to accommodate the carrier conduit with a minimum of annular space around the conduit. When finally in place, carrier conduit shall be true to the line and grade required on the Plans.

SECTION 2506 BACKFILL

2506.1 Scope

This section governs the furnishing of all labor, materials and equipment to properly backfill trenches and structures as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2506.2 General

Trench backfill shall be in accordance with Section 2102.4.I except as modified herein.

2506.3 Backfilling in Street or Alley Right of Way and Under Pavement

Backfill under areas to be paved shall be in accordance with Section 2102.4.J.

2506.4 Backfill Around Structures

A. No backfill shall be placed over or around any structure until the concrete or mortar has attained a minimum strength of 2000 psi and can sufficiently support the loads imposed by the backfill without damage.

B. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature or unbalanced backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.

C. No rock larger than three (3) inches maximum dimension shall be placed within one (1) foot of the exterior surface of any structure.

D. Backfill around structures in street or alley Right of Way from the bottom of the structure to the bottom of the subgrade shall meet the requirements of Section 2102.4.J.

SECTION 2507 RESTORATION

2507.1 Scope

This section governs the furnishing of all labor, materials and equipment for the surface restoration of private and public properties that are disturbed by construction as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2507.2 General

The Contractor shall restore the project site to conditions equal to or better than those existing prior to entry unless otherwise specified.

A. Maintain adequate safety signs, barricades and lights until final restoration of work area is completed.

B. Public property shall be restored to the requirements of the Unified Government of Wyandotte County.

2507.3 Clean-Up

The Contractor, upon completion of installation and backfill operations, shall prepare the area for final grading including but not limited to the following items:

A. Clean-up shall follow the backfilling operations as closely as possible.

B. Excess material shall be removed from the site including material that has washed into the stream beds, storm water facilities, streets, etc.

C. Tools, equipment and construction material shall be removed except for in designated storage areas along the pipeline route.

D. Restore surface and sub-surface drainage and provide temporary erosion control measures in accordance with Section 2150.

2507.4 Finished Grading

The Contractor shall finish grade the area to lines and grades shown on the Plans or if not shown to those that existed prior to the area being disturbed. Special attention shall be directed to assure surface drainage. The area shall be smoothed by raking or dragging.

2507.5 Seeding

Seeding shall be in accordance with Section 2400.

2507.6 Sodding

Sodding shall be in accordance with Section 2400.

2507.7 Pavement Replacement

A. General

1. Replacement of pavement shall proceed in accordance with the traffic control plans and/or approved construction schedule.

2. Prior to pavement replacement, all edges that were previously cut but have been subsequently damaged shall be recut and all adjacent undermined and heaved pavement shall be removed.

3. Removed pavement shall be replaced in conformance with the requirements of applicable portions of Section 2200 “Paving” or Section 2300 “Incidental Construction”.

4. Non-Standard Pavement: Pavement sections not conforming to Section 2200 of these specifications shall be replaced in accordance with requirements of the Unified Government of Wyandotte County.

2507.8 Fences

See Section 2307.

2507.9 Walls

Retaining and architectural walls, if disturbed or damaged, shall be restored architecturally and structurally to conditions not less than that which existed prior to construction.

2507.10 Trees, Shrubs, and Bushes

Any tree, shrub, or bush as shown on the Plans as "replaced" shall be of the same species as the removed tree, shrub, or bush. Any tree, shrub, or bush species that is prohibited by local restrictions shall be substituted with a related species. Replacement planting shall conform to the guidelines ANSI-Z60.1-2004 "American Standard for Nursery Stock" specified by the American Nursery and Landscape Association.

SECTION 2508 TESTING

2508.1 Scope

This section governs the furnishing of all labor, materials and equipment for the performance of any and all acceptance tests as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2508.2 General

The Contractor shall furnish all labor, equipment, materials and reports for the required acceptance tests. All pipelines, including building service lines, shall undergo and pass all required tests to determine soundness and workmanship. Pipelines that do not conform to the project requirements shall be repaired and/or replaced and shall be retested until the pipeline meets the project requirements. Test results shall be recorded by the Contractor and a copy shall be submitted to the Engineer. No testing of the piping system shall be performed before backfill and compaction operations have been completed.

2508.3 Alignment and Grade

Alignment, grade and visible defects shall be checked as follows:

A. Visual Internal Inspection

1. Contractor shall clean pipe of excess mortar, joint sealant and other dirt and debris prior to inspection.

B. Television Inspection: Sewer line installations shall be inspected by closed circuit television at the Contractor's expense.

2508.4 Infiltration - Exfiltration

Hydrostatic or air pressure tests shall be conducted on sewers before acceptance by the Owner. For sewers with a diameter less than twenty-four (24) inches, the infiltration-exfiltration shall not exceed fifty (50) gallons per day per inch of nominal diameter per mile of sewer line for any section of the system. For sewers with a diameter twenty-four (24) inches or greater, infiltration-exfiltration shall not exceed three thousand six hundred (3600) gallons per day per mile of pipe.

A. Infiltration: Where sewers are laid within the ground water table, infiltration testing shall be conducted. Where evidence of infiltration is discovered by the Engineer, the Contractor shall install weirs or other suitable flow rate measuring devices adequate to determine to the satisfaction of the Engineer that the specified infiltration limit is not exceeded for that section of gravity sewer. Where the specified infiltration limit is exceeded, the Contractor shall repair or replace the defective section of pipeline at no additional cost to the Owner. Following repair of the pipeline, the Contractor shall remeasure infiltration flow rates and make additional repairs until an acceptable infiltration flow rate is achieved.

B. Exfiltration: Exfiltration tests shall be performed by the Contractor using one or a combination of methods as set forth below. Each section of gravity pipeline between manholes and/or structures shall be tested after backfill has been completed.

1. Hydrostatic Tests for Gravity Systems

   a. Test section shall be filled not less than twelve (12) hours prior to testing. Refill test section prior to performing test.

b. Perform at depths of water as measured above center line of pipe of not less than 2 feet nor more than 10 feet (consideration shall be given for water table above said center line). Maintain test as necessary to locate all leaks but not less than two hours.

2. Hydrostatic Tests for Pressure Systems

a. Conformance Procedure: Perform hydrostatic pressure and leakage tests. Conform to AWWA C 600 procedures as modified herein. Tests shall apply to all pressure sewers.

b. Sectionalizing: Test in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs. Contractor shall furnish and install test plugs at no additional cost to the Owner, including all anchors, braces, and other devices to withstand hydrostatic pressure on plugs. Contractor shall be responsible for any damage to public or private property caused by failure of plugs. Limit fill rate of line to available venting capacity.

c. Pressure Test: Conduct at 1.5 times maximum operating pressure determined by the following formula:

Ppt = (1.5) (.433) (OP-GE), in which

Ppt = test pressure in psi at gauge elevation

OP = operating pressure in feet as indicated for highest elevation of the hydraulic gradient on each section of the line

GE = elevation in feet at center line of gauge.

Perform pressure tests satisfactorily prior to determining leakage.

d. Leakage Test: Conduct at the maximum operating pressure as determined by the following formula:

Plt = 0.433 (OP-GE), in which

Plt = test pressure in psi at gauge elevation

OP and GE – as defined from pressure test formula (see above)

All joints shall be watertight and free from leaks

3. Air Testing of Gravity Systems

a. Contractor may perform air tests for all pipe (except concrete and fiberglass) for all sizes.

b. Furnish all facilities required including necessary piping connection, test pumping equipment, pressure gauges, bulkheads, regulator to avoid overpressurization, and all miscellaneous items required.

c. The pipe plug for introducing air to the sewer line shall be equipped with two taps. One tap will be used to introduce air into the line being tested through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. Additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.

d. The pressure test gauge shall meet the following minimum specifications:

Size (diameter)	4.5 inches
Pressure Range	0 -15 psi
Figure Intervals	1 psi increments
Minor Subdivisions	0.05 psi
Pressure Tube	Bourdon Tube or diaphragm
Accuracy	± 0.25% of maximum scale reading
Dial	White coated aluminum with black lettering, 270^0 arc and mirror edge
Pipe Connection	Low male 1/2 inch N.P.T.

Calibration data will be supplied with all pressure test gauges. Certification of pressure test gauge will be required from the gauge manufacturer. This certification and calibration data will be available to the Engineer whenever air tests are performed.

Gravity sewer pipe shall be air-tested in accordance with the requirements of ASTM F 1417.

e. Plug ends of line and cap or plug all connections to withstand internal pressure. One of the plugs provided must have two taps for connecting equipment. After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig. After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least two (2) minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressure is allowed to decrease to 3.5 psig. At 3.5 psig, begin timing to determine the time required for pressure to drop to 2.5 psig. If the time in seconds for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the table below, the pipe shall be presumed free of defects.

f.

Pipe Diameter (in)	Minimum Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec) L = Total Length
4	3:46	597	0.380 * L
6	5:40	398	0.854 * L
8	7:34	298	1.520 * L
10	9:26	239	2.374 * L
12	11:20	199	3.418 * L
15	14:10	159	5.342 * L
18	17:00	133	7.692 * L
21	19:50	114	10.470 * L
24	22:40	99	13.674 * L
27	25:30	88	17.306 * L
30	28:20	80	21.366 * L
33	31:10	72	25.852 * L
36	34:00	66	30.768 * L
42	39:48	57	41.883 * L
48	45:34	50	54.705 * L

If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired and backfilled. Prior to acceptance, all constructed sewer lines shall satisfactorily pass the low pressure air test.

g. If the maintenance of existing flow in a pipe is necessary and air pressure testing is not

possible, the Contractor shall perform closed circuit television inspection of the pipe at the Contractor's expense.

4. In areas where ground water is known to exist, install a one-half inch diameter capped pipe nipple approximately 10" long through manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer is installed. Immediately prior to the performance of the line acceptance test, ground water level shall be determined by removing pipe cap, blowing air through pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to pipe nipple. The hose shall be held vertically and a measurement of height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings.

2508.5 Deflection Test

A. General: Flexible pipelines shall be tested for deflection by pulling a mandrel through the entire length thereof.

1. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with nine (9) evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The rigid mandrel shall have an outside diameter (O.D.) equal to 95 percent of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, dimensions per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing. The dimensions of the mandrel for PVC pipe shall be as listed in the accompanying table. The "D" mandrel dimension shall carry a tolerance of ± 0.01 inch. Allowances for pipe wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the "D" dimension but shall be counted in as a part of the five (5) percent or lesser deflection allowance. Contact length (L) shall be measured between points of contact on the mandrel arm. The length shall not be less than as shown in the accompanying table.

2. The Engineer shall be responsible for approving the mandrel. Proving rings shall be used to verify this.

3. The mandrel shall be hand-pulled by the Contractor through all flexible sewer lines. Any sections of sewer not passing the mandrel test shall be uncovered and the Contractor, at no additional cost to the Owner, shall reround or replace the sewer to the satisfaction of the Engineer. These repaired sections shall be retested.

4. The testing shall be conducted after final trench backfill has been in place for a minimum of 30 days, unless approved otherwise by the Engineer.

D and L Dimensions For 9 Arm Mandrel			
L	D		
Nominal Diameter	ASTM D3034 SDR 35	ASTM D3034 SDR 26	ASTM D2241 SDR 21
8"	7.52"	7.37"	7.41"
10"	9.40"	9.21"	9.24"
12"	11.19"	10.96"	10.96"
15"	13.70"	13.42"	N/A
18"	16.76"	N/A	N/A
21"	19.74"	N/A	N/A
24"	22.21"	N/A	N/A
27"	25.03"	N/A	N/A

5. Mandrel outside diameters for flexible pipe types not listed in the table shall be calculated as described in paragraph 2508.5.A.1 above.

6. Mandrel outside diameters for HDPE and Fiberglass Wastewater Pipe shall be calculated as described in paragraph 2508.5.A.1 above. For Fiberglass Wastewater Pipe, the outside diameter of the mandrel shall be 97% of the inside diameter of the pipe.

2508.6 Soil Density Tests

A. General: Compaction tests shall be performed as specified in Section 2102.4.I and 2102.4.J.

SECTION 2509 MANHOLES AND SPECIAL STRUCTURES

2509.1 Scope

This section governs the furnishing of all labor, materials and equipment and the performance of all work incidental to the construction of manholes, drop manholes and special sewer structures complete with covers, steps, fittings and appurtenances as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

2509.2 General

As used herein special structures refers to manholes on large sewers, special junction structures, metering stations and similar structures constructed on the pipeline.

Manholes and special structures may be constructed of pre-cast concrete sections or cast-in-place concrete, unless otherwise noted on the Plans, Standard Drawings, or Contract Documents.

2509.3 Manhole Materials

A. Mortar and plaster coating: Mortar and plaster coatings for masonry manhole units shall conform to ASTM C 270. The mix shall consist of two (2) parts portland cement to one (1) part masonry cement to six (6) parts standard plaster sand. No mortar or plaster mixed more than thirty (30) minutes shall be incorporated in the work.

B. Non-Shrink Grout: Non-shrink grout shall be in the plastic state and show no expansion after set as tested in accordance with ASTM C 827 and shall develop compressive strength not less than three thousand (3.000) pounds per square inch with a trowelable mix within twenty-four (24) hours per ASTM C 109. The placement time shall be not less than forty-five (45) minutes based on initial set per ASTM C 191.

C. Waterproofing: Waterproofing shall be a coal-tar coating and conform to ASTM D 450. Where specified, exterior surfaces shall be coated with Tnemec "46-450 Heavy Tnemecol" or approved equal. Where specified, interior surfaces (which are exposed to raw sewage and sulfide gases) shall be coated with Tnemec "46-449 Heavy Duty Black" or approved equal. The minimum dry thickness for all waterproofing shall be 14.0 mils.

D. Precast Concrete: Precast concrete manholes shall conform to ASTM C 478 with the following modifications.

1. Wall thickness shall not be less than one-twelfth (1/12) of inside diameter plus one (1) inch or five (5) inches, whichever is greater.

2. Cement, Fine Aggregate, Coarse Aggregate and Water used in the manufacture of precast manholes shall be as specified in Section 2509.3.E.

3. Developed bases shall be used where practical. The floor of developed base manholes shall have a minimum thickness of twelve (12) inches. The bottom wall section shall be embedded a minimum of five (5) inches into the cast base. The diameter of the base pad shall be eight (8) inches greater than outside diameter of the manhole.

4. Pipe openings: The first riser (barrel) section shall be provided with circular openings with continuous, circular, resilient connectors cast into the riser wall. Horseshoe-shaped boxouts, or doghouses, shall not be allowed except when approved by the Engineer. Flexible gaskets shall be used with developed base manholes. Flexible gaskets shall be A-Lock, PSX, or approved equal.

5. The minimum distance from the invert of the downstream pipe to the top surface of the base shall be four (4) inches minimum.

6. Joints between manhole sections, adjustment rings, and below the ring and cover shall be sealed with preformed bitumastic sealants, Kent-Seal, RamNet, E-Z Stick or approved equal. The minimum bead dimension shall be one inch.

7. Exterior manhole joints shall be sealed by the following methods:

   a. Cold Applied: Joints on the manholes shall be wrapped with a Butyl Joint Wraparound Sleeve: The butyl component of the wrap shall consist of 50 percent minimum butyl rubber and shall contain 2 percent or less of volatile matter, and shall be 9" wide by 0.03" inch thick. The backing component shall be EPDM or Intra-Curing Halogenated Based Rubber that is a minimum of 0.03" thick. A release paper may be used. The butyl rubber-based wrap shall be EZ-Wrap Rubber as supplied by Press-Seal Gasket Corporation, Gator Wrap as manufactured by Sealing Systems, Inc. or approved equal.

   b. Heat Applied: Heat Shrinkable Wraparound Sleeves: The wrap system shall consist of a two-piece sleeve (backing and adhesive) with a closure system and a G-type primer. It shall consist of an irradiated cross-linked polyefin sheeting, pre-coated with a layer of anti-corrosion adhesive. The backing shall have a minimum recovery of 22 percent. The wrap shall have a mastic type adhesive, specially formulated to become fluid at temperatures achieved during installation and maintain flexibility in cold climates with installation temperatures down to –40° F. Upon cooling the adhesive shall form a tough, elastomeric protective layer. The wrap shall employ a closure seal to allow sealing of the overlap area. The overall thickness of an applied sleeve shall nominally measure 0.01 inch. The heat shrinkable wraparound sleeves shall be Wrapid Seal as manufactured by Canusa or approved equal.

8. Chimney Seals: An external flexible rubber frame seal and where necessary, extension or extensions to seal entire chimney of all sanitary sewer manholes. The seal and extensions shall seal all joints from the base flange of the frame down to the top of the cone. The seal shall be a continuous seamless band made of high quality EPDM rubber with a minimum thickness of 65 mils or a heat-shrinkable sleeve. The top section of the seal shall extend 3" attaching to the casting base/flange with the side section covering over the entire grade adjustment ring area and onto the cone section a minimum of 2". Installation of Chimney Seals shall be per the manufacturer's recommendations and these instructions shall be supplied to the inspector on each project. The seal shall be: Infi-Shield by Sealing Systems Inc., Cretex Classic External Seal or Wrapid Seal as manufactured by Canusa.

9. Both the bell and spigot ends of the manhole sections shall be primed with a liquid primer that is compatible with bitumastic sealants, Kent-Seal, RamNet, E-Z Stick or approved equal.

10. Reducing sections may be used at six (6) feet or more above the invert for special circumstances, if approved by the engineer.

11. Eccentric cone sections shall be used unless noted otherwise on the Plans.

E. Manhole and Special Concrete: Manhole and special concrete shall conform to KCMMB mix as shown on the Plans or as specified herein.

1. Standard Concrete: Standard concrete used for concrete encasements and embedments, thrust blocks, pipe anchors, pipe collars, etc. shall be KCMMB 3K unless otherwise specified.

2. Structural Concrete: Structural concrete used for aerial crossing piers, wetwell walls, manhole walls, bases, inverts, and flat slabs, etc. shall be KCMMB 4K, unless otherwise specified.

3. Concrete Materials and Admixtures

   a. For KCMMB mixes, concrete shall be an approved mix with admixtures that are approved for use in that mix design.

F. Reinforcement steel: Reinforcement steel shall conform to the following minimum requirements and as shown on the Plans or Standard Drawings.

1. Design: Reinforcing steel shall conform to one of the following.

   a. Welded Wire Fabric - ASTM A 1064.
   b. Reinforcing Bars - ASTM A 615, Grade 40, or Grade 60.
   c. Fabricated Steel Bar and Rod Mats - ASTM A 184, Grade 40, or Grade 60.

2. Fabricating Tolerances: Tolerances for concrete reinforcement shall conform to the following requirements.

   a. Sheared length = ± 1 inch.
   b. Stirrups, ties, and spiral = ± 2 inches.
   c. All other bends = ± 1 inch.

G. Iron Castings: Casting shall conform to the requirements of ASTM A 48, Class 30B. Castings shall be clean and without surface defects that will impair serviceability. Plugging or filling of holes or other defects will not be permitted. Parting fins and pouring gates shall be removed.

1. Rings and Covers: Rings and covers shall meet the following minimum requirements.

   a. Bearing surfaces between the ring and cover shall be machine finished or ground to assure interchangeability and a non-rocking fit in any position.
   b. Provision shall be made for opening, such as concealed pick hole(s).
   c. Bolt-down type manhole rings shall be anchored to the manhole walls with not less than four (4) three-fourths (3/4) inch diameter steel bolts embedded a minimum of four (4) inches, except where the entire ring is embedded in a concrete top slab.
   d. Rings and bolt-down covers shall be provided with machined surfaces, O-ring gaskets and five-eighths (5/8) inch hex head brass cover bolts. Cover bolt heads shall fit flush or below the top of the cover. The O-ring rubber gasket shall be neoprene or other synthetic, sixty (60) plus or minus five (5) hardness when measured by ASTM D 2240 type Durometer.

2. Steps

   a. Cast-Iron Steps are not allowed.
   b. Steel core, plastic coated steps: Steel core plastic coated steps shall meet the following minimum requirements.
      i. The plastic coating shall be a copolymer polypropylene meeting ASTM D 4101.
      ii. The steel core shall be a minimum of 1/2 inch in diameter and Grade 60.
      iii. The requirements of ASTM C 478 shall be met except minimum pull-out strength shall be 1,000 pounds.

2509.4 Manhole Site Preparation

Manhole site preparation shall be governed by Section 2503.

2509.5 Manhole Excavation

A. Excavation: Excavation for manholes and special structures shall be governed by this section and Section 2504. It shall be achieved in a suitable and orderly manner providing a minimum disturbance to the general public.

B. Depth of Excavation: Depth of excavation shall be to that required for proper installation of the manhole or structure. Over-depth excavation may be required by the Engineer if the subgrade is unstable. Over-depth excavation due to unstable subgrade shall be backfilled as required by the Engineer. Over-depth excavation occurring through an oversight by the Contractor shall be backfilled as required by the Engineer at no additional cost to the Owner.

C. Side Clearances: Side clearances outside the manhole and/or structures shall be no greater than to allow for forming, connection of piping, proper application of special coatings, if required, and to permit inspection. When concrete is to be placed directly against excavated faces. excavation shall be sufficiently outside of the manhole or structure to provide not less than three (3) inches of concrete cover over the steel reinforcement.

2509.6 Manhole Installation

Manhole installation shall be governed by this Section and Section 2505. It shall be performed by the Contractor on a schedule that will provide an orderly progression of the work.

A. Bases

1. Precast developed bases shall be reinforced in accordance with ASTM C 478.

2. If preferred developed bases are not used, poured concrete bases shall be used. Developed bases shall be installed on a maximum of 4 inches of crushed rock. Depths exceeding this amount shall be filled with mass concrete.

3. Poured-in-place bases shall have a minimum thickness of eight (8) inches. When poured-in-place bases are used, the invert shall be poured monolithically with the base. The bottom wall sections shall be embedded in the base section a minimum of three (3) inches. The bottom precast wall section shall not be set upon a previously poured base. Solid concrete blocks shall be used for supporting and leveling the wall section prior to pouring the base.

B. Inside Dimensions: The minimum horizontal clear distance in the barrel of the manholes shall not be less than four feet unless otherwise specified on the Plans.

C. Brick shall not be used for new manhole construction.

D. Precast

1. Delivery: Precast concrete components shall not be delivered to the job until representative concrete control cylinders have attained at least 80 percent of the specified minimum design strength.

2. Inspection: Precast concrete shall be inspected when delivered. Rejection of defective or cracked precast concrete components shall be in accordance with ASTM C 478.

3. Wall Thickness: Wall thickness shall conform to the requirements of Section 2509.3.D.

4. Construction: Precast sections shall be cleaned of all dirt, grass, and other deleterious matter. Seal each joint (including adjustment rings and castings) with a double bead of preformed bitumastic joint sealant sections shall be placed such that steps are aligned but without rotation or damage to sealant integrity. Lift holes shall be patched with non-shrink grout.

E. Cast-In-Place

1. Wall Thickness: Wall thickness shall conform to the dimensions as shown on the Plans or Standard Drawings.

2. Construction: Reinforcement steel shall be placed as shown on the Plans or Standard Drawings. Tie-holes shall be patched with non-shrink grout. Wall sleeves, where required, shall be installed as shown on the Plans or Standard Drawings. Water stops shall be installed at the wall and slab connection and shall be of the size, thickness and material as shown on the Plans or Standard Drawings.

3. Waterproofing: Interior protective coatings, where required, shall conform to the material specifications of Section 2509.3.C. Application shall conform to the manufacturer's recommendation.

F. Top Slabs: Thickness shall conform to the dimensions and reinforcement steel shall be placed as shown on the Plans or Standard Drawings.

G. Pipe Stubs: Stubs shall be installed at the locations, angles, elevations and of the materials as shown on the Plans or Standard Drawings. A water-tight removable stopper shall be installed in each pipe stub. Pipe stubs shall be installed so that a pipe joint will be two (2) feet or less from the outside manhole wall.

H. Inverts: Inverts shall be structural concrete and steel-troweled to produce a dense, smooth finish. The invert channel shall be "U" shaped in cross-section and extend upward one-half of the inside pipe diameter. Smooth transitions shall be formed for pipes of different sizes, elevation and bends. The invert bench shall be sloped to drain.

I. Steps: Steps shall be aligned vertically below the casting and spaced at sixteen (16) inch centers. The top step shall be not more than one (1) foot below the top of the cone. The lowest step shall be not more than two (2) feet above the invert bench. Field drilled step holes are not permitted in precast concrete manholes.

J. Top Elevation: The finished top elevation of manhole castings shall conform to the following unless otherwise shown on the Plans or directed by the Engineer.

1. In paved or future paved areas, the top of the casting shall conform to the slope of the pavement and be 1/8 inch below the finished pavement elevation.

2. In non-pavement areas, the top of the casting shall be not more than six (6) inches above the surrounding ground or less than the sod's upper root limit. The final elevation shall be at a point where water will not pond over the manhole cover.

K. Manhole Adjustment: All new manholes will be provided with adjustment ring(s) underneath the casting as shown on Plans. The joints shall be sealed with preformed bitumastic sealant. The maximum allowable adjustment distance between the top of the cone and the bottom of the casting shall be 12 inches. If the top of an existing manhole is required to be raised to an elevation that will exceed the maximum adjustment distance or lowered more than the adjustment rings will allow, all vertical adjustments shall be made to the barrel of the manhole.

L. Castings: Castings shall be installed with the mud ring inserted inside the manhole opening and resting on a minimum of two rows of preformed bitumastic seals. Bolt-down castings shall be held in place as shown on the Plans or Standard Drawings.

2509.7 Manhole Backfilling

Manhole backfilling shall be governed by Section 2506.

2509.8 Restoration

Restoration shall be governed by Section 2507.

2509.9 Manhole Testing

A. Scope: This section governs the furnishing of all labor, materials for the required testing of manholes and structures as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions.

B. General: All manholes shall be tested for infiltration and inflow.

C. Infiltration and Inflow Testing: All manholes shall be vacuum tested in the presence of the Engineer.

1. Each manhole shall be tested after backfilling to, at least the level of the bottom adjustment ring.

2. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or top adjustment ring.

3. All pipes entering the manhole shall be plugged at least eight inches into the sewer pipe. The plug must be inflated at a location beyond the manhole/pipe gasket.

4. All plugs shall be adequately braced to prevent the plug or pipe from being dislodged and drawn into the manhole.

5. A vacuum of at least 10.5 inches of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line. Open the vacuum line valve and adjust the vacuum to 10 inches of mercury.

6. The pressure gage shall be liquid filled having a 3.5-inch diameter face with a reading from zero to thirty inches of mercury.

7. The time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury must be equal to or greater than the following values for the manhole to be considered as passing the vacuum test:

Manhole Depth	Time (minutes)
10 feet or less	2
10.1 to 15 feet	2.5
15.1 to 25 feet	3

8. If a manhole fails the vacuum test the manhole shall be uncovered and the leak repaired by patching

the exterior of the manhole. The manhole shall then be backfilled and re-tested.

9. The vacuum testing of manholes shall be done prior to air testing the sewer lines that enter or exit the manhole.

2509.10 Lining Existing Manhole

This Section covers repair of existing manhole by placement of a cementitious lining. Topics include product and installer qualifications, manhole cleaning, manhole and invert patching, lining, and exfiltration tests.

A. Acceptable Vendors:

1. Coating materials for use in lining standard environment existing manholes shall be AP/M Permaform PERMACAST MS-10,000; Strong Systems, Inc. MS-2A; Master Builders, Inc. Emaco S88C; Standard Cement Materials, Reliner MSP; Quadex QM-1s Restore, or approved equal.

2. Coating materials for use in lining corrosive environment existing manholes shall be AP/M Permaform COR+GARD; Aquafin, Inc. Hydro-Pox 212 GL; De Neef Construction Chemicals, Inc. Denepox Sewergel; Raven Lining Systems AquataPoyx Systems or Raven 400 Series; Sauereisen, Inc. Sewergard No. 210RS, or approved equal.

B. Environmental Limits: Product shall not be placed on surfaces with below freezing temperature, or if surface may experience below freezing temperature within 24 hours after application. When air temperatures exceed 90° F, chill mix to maintain mix temperature below 85° F.

C. Component Compatibility: All equipment, materials, application methods, and installer training shall be approved for the application by the manufacturer of the lining material.

D. Submittals: Contractor shall submit for review including, but not limited to, the following:

1. Lining material product data sheet and information.
2. Manufacturer's application procedure and recommended application equipment.
3. Certification that the coating system materials furnished comply with all requirements specified herein.

E. Installer Qualifications: The firm shall be certified or licensed by the manufacturer of the lining material to have equipment and training recommended to prepare the manhole and to apply the specified coatings.

F. Products

1. Patching and Leak Control Materials: Material for patching of manholes shall be a quick setting, non-shrink, material at least as strong as the liner material and produced or recommended by the lining manufacturer. Selection of actual patch product, if any, shall be based on field conditions

2. Liner Material:

   a. Material for standard environment spray-on lining shall be a pre-blended mixture of cements, chemically active aggregates, fiber reinforcements, and other additives specifically selected for their special properties and formulated for spray application. No material (other than potable water) shall be used with or added to the approved design mix without prior approval or recommendation from the lining manufacturer and Engineer. All water used in the mixture shall be clean and potable. The density of the material at placement of the coating shall not

be less than 95 pounds per cubic feet. Approximate working time of the material after initial application shall be 30 minutes. Material shall meet the following requirements for the strength class required:

Test	Normal	Method
Compressive Strength	3000 psi, 24-hours	ASTM C109
Flexural Strength	1200 psi, 28-day	ASTM C348
Shrinkage at 90% relative humidity	0 percent	ASTM C596
Bond Strength	130 psi, 28-day	ASTM C952
Freeze-Thaw	No visible damage after 100 cycles	ASTM C666
Permeability	Shall not exceed 450 Coulombs	ASTM T277

b. Material for corrosive environment lining shall be a 100% solids, solventless two-component epoxy resin system suitable for spray or trowel application. Products shall be mixed and applied as recommended by manufacturer and approved by Engineer.

3. Installation Equipment: Application equipment shall be manufactured or licensed by the material supplier and designed specifically for the application of manhole liners. Minimum pumping pressure shall be 250 psi. High-pressure water spray for surface cleaning shall reach minimum 3500 psi.

G. Execution

1. Bypass Pumping: See Related Work in the section.

2. Manhole Preparation: Invert and service lines shall be covered to prevent waste material from entering lines. Foreign material shall be removed from wall and bench by high-pressure water spray. Loose or protruding brick, mortar, or concrete shall be chipped out. Large voids and active leaks shall be patched and plugged.

3. Invert Repair: Inverts with visible damage or infiltration shall be repaired. Contractor shall block flow and clean invert. Patch material shall be applied a minimum of 1/2-inch thick over the entire invert and shall extend onto the bench sufficiently to tie to subsequent liner placement.

4. Liner Application: Material shall be mixed and applied using the procedure and equipment approved and licensed by the lining manufacturer. Surface to receive lining shall be saturated but free of water drops. Liner shall be sprayed on following manufacturer's recommendations. Spray material to a minimum 1-inch uniform thickness to ensure that all voids and crevices are filled and a smooth surface remains after troweling. Trowel to compact material into voids and crevices and to "set" the bond on the manhole surface. Below 12 feet, minimum liner thickness shall be 1-1/2-inches.

   Top limit of the liner shall be a minimum of 1 inch up onto the casting. Bench shall receive a single coat of a minimum 1/2-inch thickness at the invert and shall increase in thickness in the direction of the wall so as to provide the required minimum slope. The entire bench shall be coated to the edge of the invert channel. The bench/wall intersection shall receive a radiused fillet.

5. Curing: The liner shall be cured a minimum of 4 hours before being exposed to flow.

6. Acceptance Testing: Liner shall be visually inspected for complete coverage and finish. When directed by Engineer, water tightness of the liner shall be tested as follows:

   a. When ground water is high or when cave-in adjacent to manhole allows dye to be introduced at the outer surface of the manhole, the liner shall be inspected visually for leaks. No leak shall be

discernible.

b. When water is not present or cannot be introduced at the outer surface of the manhole, an exfiltration test shall be conducted. Manhole shall be inundated to top and allowed to stand for 5 minutes. For depths of 6 feet or less, water drop shall be less than 1 inch. For every additional foot of depth, an additional loss of 1/8-inch shall be acceptable.

SECTION 2510 CURED-IN-PLACE PIPE

2510.1 General

A. This Section covers cured-in-place pipe for rehabilitation of existing sanitary and storm sewer mains and services. Topics include product and installer qualifications, prebid inspection, pipe preparation, lining design, cured-in-place pipe, building service restoration, point repair, and building service lining.

B. Submittals: Contractor shall submit for review including, but not limited to, product data for the following:

1. Liner tube, resin, sealant, and fittings, adapters, and specials.

2. Certificates and Affidavits (furnish prior to shipment or installation as applicable):

    a. Affidavit of compliance with applicable standards for resins and tube materials.
    b. Certification that Contractor is a licensed installer of any patented process.

3. Post Installation Video

C. Delivery and Storage: Delivery and storage of lining and other materials shall conform to requirements of the manufacturer. Furnish required storage facilities. Handle lining materials in compliance with manufacturer's recommendations. Damaged material will be unacceptable for installation.

D. Prequalifications: In order to be considered in the bid evaluation process, Contractor shall have: A minimum nation wide installation history of 250,000 feet of cured-in-place lining installations; a minimum nation wide installation history of 1,000 point repair lining installations; and a minimum nation wide installation history of 5,000 building service lining installations. All products shall have minimum 1 year installation history in MARC area counties. Applicant shall list references with contact names and phone numbers. Contractor shall provide Unified Government with prequalification information regarding cured-in-place projects at time of bid. This information shall include total linear feet of pipe installed, diameter of pipe, materials used, and contact name, address, and phone number of the owner to whom the service was provided. Unified Government may, at its discretion, adjust or waive the aforementioned prequalifications.

E. Bidder's Inspection: Bidder shall examine video tapes of lines prior to prebid meeting. Bidder shall use tape to identify service connections, obstacles, and residual load carrying capacity of the host pipe. Bidder shall make a reach by reach (manhole to manhole) determination of load carrying capacity of the host pipe before the prebid meeting. Engineer will review differing opinions regarding host pipe capacity at the prebid meeting and make a determination of the required design assumptions by addendum. Obstacles located by Bidder shall be identified at the prebid meeting. Lines so deteriorated as to risk collapse with a complete and thorough cleaning shall be identified and discussed at the prebid meeting. Bidder shall evaluate obstacles and determine appropriate repair strategy. Successful Bidder shall submit copy of the prebid video tape along with a tape log and a proposal listing obstacle locations and repair strategy. Tape log shall include obstructions and all service or other connections to the pipe.

F. Lining Design: Minimum liner thickness for each liner depth/diameter combination shall be as scheduled on the drawings. Engineer may consider Contractor proposed changes in thickness based upon use of higher flexural modulus resins. Contractor proposed changes must be supported by detailed calculations satisfactory to Engineer.

G. Post Installation Video: Contractor shall provide one copy of a videotape showing pipe after lining. Video shall be annotated to indicate all restored services.

2510.2 Materials

A. Materials shall conform to ASTM D5813, “CuredIn-Place Thermosetting Resin Sewer Pipe”.

B. Liner Tube: The tube shall consist of one or more layers of flexible needled felt or an equivalent nonwoven material capable of carrying resin and withstanding installation pressures and curing temperatures. The liner tube shall be manufactured of a resin-impregnated flexible tube cured in place using circulating hot water. The tube shall be compatible with the resin system used. The tube shall be capable of conforming to offset joints, bells, and disfigured pipe sections. The tube shall be custom fabricated to a size that, when installed, will tightly fit the internal circumference of the original conduit. Allowance shall be made for circumferential stretching during installation. Contractor shall determine the tube lengths for individual installation runs in accordance with manufacturer’s recommendations.

The cured liner tube shall conform to the following minimum structural standards:

1. Tensile strength- 3,000 psi.
2. Flexural stress- 4,500 psi.
3. Flexural modulus of elasticity- 250,000 psi.

C. Resin: The resin used shall have the following characteristics:

1. The resin used shall be high-grade corrosion resistant isophthalic polyester, vinyl ester, or epoxy that is compatible with the liner tube and installation process to be used.
2. The resin must be able to cure in the presence of water, and the initiation temperature for cure shall be less than 180° F.

D. Sealant: A sealant composed of a resin mixture compatible with the liner tube and as recommended by the liner tube manufacturer shall be used at pipe terminations and at points where the cured lining tube fails to make a tight seal.

E. Installation Equipment: Provide equipment for the installation and curing of the liner tube as recommended by the manufacturer.

2510.3 Construction

A. Installation shall be in accordance with ASTM F1216, “Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube” or ASTM F1743, “Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).”Products shall conform to ASTM D5813, “CuredIn-Place Thermosetting Resin Sewer Pipe”.

B. Precleaning: Contractor shall remove all internal debris, solids, and roots from the sewer line that will interfere with the installation or adhesion of the lining. Only fully deteriorated lines identified at the prebid meeting as subject to collapse by cleaning operations shall be exempt from a complete cleaning. Contractor shall make a post cleaning/pre-installation video to verify line is clean and obstructions are clear.

C. Spot Repairs: Line obstructions shall be repaired as follows:

1. The original pipeline shall be clear of obstructions such as solids, dropped joints, protruding service connections, crushed or collapsed pipe, and reductions in the cross sectional area of more than 20 percent that will prevent the insertion of the resin impregnated tube. Protruding service connections shall be removed to prevent dimpling of the finished liner. Maximum allowable protrusion shall be 1/2-inch. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, a spot repair excavation shall be made to uncover and remove or repair the obstruction.

2. Contractor shall perform all cured-in-place sectional and spot repairs for the sewer line segments scheduled.

3. Building service lining shall be provided where called out on plans or special conditions.

D. Bypass Pumping: See related work in this section.

E. Placement and Curing:

1. Installation by inversion is required to be in compliance with ASTM F1216 as follows:

   a. Prepare inversion tube by vacuum impregnating the liner tube with the uncured resin. Install inversion standpipe over existing manhole or other Unified Government-approved access. Attach and insert inversion tube through the standpipe with watertight seal and lubricated as recommended by the manufacturer. Invert liner to predetermined length through the existing pipe using hydrostatic pressure in the standpipe and in accordance with manufacturer's approved procedure.
   b. Maintain water at constant temperature during hydraulic leak test that shall be performed during the curing period. Provide certification of test results for each installed section.
   c. Cure installed liner using a hot water recirculation system designed to develop uniform curing temperature throughout the entire length of the lined section. The manufacturer shall approve the procedure and temperature for the resin/catalyst system employed. The resin manufacturer shall recommend duration of the cure period, and liner shall obtain proper hardness before curing is considered complete.
   d. Cool the hardened liner by introducing cool water into the recirculation system and draining the heated water. Maintain static head on cured liner until temperature throughout the liner is reduced below 100° F. Limit drainage rate to avoid creating a vacuum and damaging the freshly cured liner.
   e. Seal any annular space between the cured liner tube and the existing pipe where the cured tube fails to make a tight seal. Seals shall be a resin mixture compatible with the resins in the inversion tube.

F. Building Service Reinstatement: Prior to installation, Contractor shall record the location of service connections and lateral lines. Service reinstatements shall be made by trenchless technologies that provide continuous lining from the main through the connection and a minimum 3 feet into the service. If, after review by Engineer, it is determined a service cannot be reinstated with trenchless technology, it shall be reinstated with conventional open cut methods. Services shall be reinstated within the time limits listed in these specification, regardless of method.

G. Strength Tests: Short-term flexural properties and tensile properties tests specified in ASTM F1216 shall be performed and the results submitted to Engineer.

H. Tightness Tests: Tightness tests can be conducted by any means allowed for sanitary sewer mains. As a substitute to the tightness test, hydrostatic test conducted during curing will be allowed when equipment is set up to provide accurate measurement of makeup water. Results shall be submitted to Engineer.

END OF SECTION

TECHNICAL PROVISIONS

Section 2600

Storm Sewer



Unified Government of Wyandotte County

January 2022

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SECTION 2601 GENERAL

2601.1 Scope

This section governs the furnishing all labor, materials, and equipment necessary for the complete installation of storm sewers and appurtenances as shown on the Plans and in accordance with the Standard Drawings, the specifications and the Special Provisions. Unless otherwise noted within these specifications, the word “sewers” shall refer to pipe sewers, box culvert sewers, or open channels.

2601.2 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used. If conflicting standards exist, the more stringent standard shall apply.

UG

Section 2100	Clearing, Grading, Excavation and Site Preparation
Section 2150	Erosion and Sediment Control
Section 2200	Paving
Section 2300	Incidental Construction
Section 2400	Seeding and Sodding

ASTM

A 48	Standard Specification for Gray Iron Castings
A 139	Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
A 153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A 615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A 641	Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
A 742	Standard Specification for Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe
A 744	Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service
A 745	Standard Practice for Ultrasonic Examination of Austenitic Steel Forgings
A 760	Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
A 761	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
A 788	Standard Specification for Steel Forgings, General Requirements
A 929	Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
A 1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C 33	Standard Specification for Concrete Aggregates
C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C 361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
C 443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
C 478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
C 506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
C 507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
C 923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
C 990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
C 1628	Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets

D 1683 Standard Test Method for Failure in Sewn Seams of Woven Apparel Fabrics
D 2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
D 3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
D 3887 Standard Specification for Tolerances for Knitted Fabrics
D 5034 Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
F 593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
F 594 Standard Specification for Stainless Steel Nuts
F 2306 Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
G 152 Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

AASHTO
M 31 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
M 36 Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drain
M 55 Standard Method of Test for Steel Welded Wire Reinforcement, Plain, for Concrete
M 196 Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
M 197 Standard Specification for Aluminum Alloy Sheet for Corrugated Aluminum Pipe
M 245 Standard Specification for Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains
M 246 Standard Specification for Steel Sheet, Metallic-Coated and Polymer-Precoated, for Corrugated Steel Pipe
M 274 Standard Specification for Steel Sheet, Aluminum-Coated (Type 2), for Corrugated Steel Pipe
M 294 Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

ANSI/AWWA
C 206 Field Welding of Steel Water Pipe

ACI 301 Specifications for Structural Concrete

Federal Standard 595B

KCMMB Kansas City Metro Materials Board

Specifications Kansas Department of

Transportation

Standard Specifications for State Road and Bridge Construction, 2015 Edition

2601.3 Cleanup

Cleanup shall follow the work progressively. The Contractor shall remove from the project site all rubbish, equipment, tools, surplus or discarded materials, and temporary construction items.

Streets to be opened to local traffic at the end of the day's operation shall be cleaned of dirt or mud. All equipment and material stockpiles shall be secured for safe passage of vehicles and pedestrians. If streets are to remain open to traffic, cleaning shall be performed at a minimum of once per day at the end of the day's work or as directed by the Engineer or Owner.

Clean-up shall be considered subsidiary to other items in the Contract Documents.

SECTION 2602 PIPE SEWER CONSTRUCTION

2602.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction of pipe storm sewers and appurtenances at the location and to the lines and grades indicated on the Plans.

2602.2 Materials

A. Reinforced Concrete Pipe

1. Pipe: Reinforced concrete pipe shall conform to the following ASTM Standards and be of the minimum strength designated herein or such higher strength as may be required by the Plans:

    a. Round Pipe: ASTM C 76, Class III (minimum), Wall B (minimum)
    b. Arch Culvert Pipe: ASTM C 506, Class A-III
    c. Elliptical Pipe: ASTM C 507, Class HE-III

    Except for fittings and closure pieces, each joint of pipe shall not be less than eight feet long for pipe diameters 48 inches or less and shall not be less than six feet long for pipe diameters larger than 48 inches.

2. Reinforcement: Circumferential reinforcement shall be full-circle type. Part-circle reinforcement will not be approved. All reinforcing shall be located and spaced as recommended by the pipe manufacturer.

3. Joints

    a. Rubber Gasket Joints: Rubber gasket joints shall conform to ASTM C 443 or ASTM C 1628-06 with the following additions and exceptions.
        i. Replace ASTM C 1628-06 5.1.1 with: Circular Cross-Section or “O-Ring” Gaskets for standard use shall meet Class A requirements. Non-Circular Cross-Section or “Profile” Gaskets for standard use shall meet Class E requirements.
        ii. Replace ASTM C 1628-06 9.4 with: The manufacturer shall conduct concurrently the hydrostatic test described in 9.2 and the structural test described in 9.3. If proven watertight under these combined conditions, hairline cracks that do not leak shall not be cause for rejection. A vacuum of the American Concrete Pipe Association, may be used in lieu of the hydrostatic test referenced above.
        iii. Joint design details shall be submitted for approval together with design data and test results verifying the adequacy of the joint design.
    b. Preformed Flexible Joint Sealant: This sealant shall be either rope form or flattape form conforming to ASTM C 990. Primer, if recommended by the manufacturer, shall be applied within the manufacturers’ time requirements on all bell and spigot joint surfaces. Joint shall be thoroughly sealed and watertight.

B. Structural Plate Pipe and Pipe Arches: Structural plate and galvanizing shall conform to the requirements of ASTM A 761. Bolts, nuts, and washers for reconnecting plates shall be galvanized in accordance with ASTM A 153 and meet manufacturer’s recommendations.

C. High Density Polyethylene (HDPE) Pipe

1. Material: Pipe manufactured for this specification shall comply with and be certified to meet the requirements for test methods, dimensions and markings found in ASTM F 2306 and AASHTO M-294,

current additions. Pipe and blow molded fittings shall be made from PE compounds which conform to the requirements of cell class 435400C in the latest version of ASTM D3350.

2. Pipe Sizes: Nominal sizes for this specification include 12-60 inch diameters designated in AASHTO M294 and ASTM F 2306 as full circular cross section with an outer corrugated pipe wall and essentially smooth inner wall (waterway). Pipe corrugations shall be annular.

3. Joints: Joints shall have a gasket and may be either bell and spigot joints or made with external coupling bands. The fittings and couplings bands shall be fabricated from the same material as the pipe conforming to AASHTO M294. The coupling bands shall cover at least two full corrugations of each section of pipe and shall prevent infiltration of soil into the pipe. Gaskets shall be furnished in accordance with the Plans and Special Provisions. Coupling bands shall be reviewed and approved by the Engineer prior to installation.

4. Certification: All high-density polyethylene (HDPE) pipe used for culvert and storm sewer applications shall conform to the requirements of AASHTO M294 and ASTM F 2306, current edition. Pipe shall be provided only by manufacturers that are certified through the National Transportation Product Evaluation Program (NTPEP) Third Party Certification program.

5. Pipe Usage: High density polyethylene pipe (HDPE) may not be used for crossroad applications of collector roadways or higher unless approved by the Engineer. If approved by the engineer, HDPE in accordance with ASTM F2648, latest version, may be used in lieu of ASTM F2306 and AASHTO M294 in drainage applications that are designated as private.

D. Dual Walled Polypropylene Pipe

1. For 12-inch to 60-inch pipe, polypropylene pipe shall have a double wall with a smoot interior and annular exterior corrugations and conform to ASTM F2881 and AASHTO M330. The pipe shall not be perforated unless otherwise specified.

2. For 12-inch to 60-inch pipe, pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2881.

3. Coupling bands shall cover at least two full corrugations on each section of pipe and shall prevent the infiltration of soil into the pipe.

4. Certification: All polypropylene (PP) pipe used for culvert and storm sewer applications shall be provided only by manufacturers that are certified through the National Transportation Product Evaluation Program (NTPEP) Third Party Certification program.

E. Dual and Triple Walled Polypropylene Pipe

1. For 12-inch to 30-inch pipe, polypropylene pipe shall have a double wall with a smooth interior and annular exterior corrugations and conform to ASTM F2881 and AASHTO M330 Type S. For 36-inch and larger pipe sizes, polypropylene pipe shall have a triple wall with smooth interior and exterior surfaces with inner corrugations and conform to ASTM F 2764 and AASHTO M330 Type D. The pipe shall not be perforated unless otherwise specified.

2. For 12-inch to 30-inch pipe, pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2881. For 36-inch and larger pipe, pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2764.

3. Coupling bands shall cover at least two full corrugations on each section of pipe and shall prevent the infiltration of soil into the pipe.

4. Certification: All polypropylene (PP) pipe used for culvert and storm sewer applications shall be provided only by manufacturers that are certified through the National Transportation Product Evaluation Program (NTPEP) Third Party Certification program.

F. Granular Bedding Material: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

G. Flowable Backfill (CLSM): Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

2602.3 Construction

A. Trench Excavation: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

1. Unclassified Excavation: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

2. Rock Excavation: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

3. Earth Excavation: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

4. De-watering: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

5. Cribbing and Sheeting: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

6. Unstable Foundation: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

7. Protection of Property: The Contractor shall satisfactorily shore, support, and protect any and all structures and all pipes, sewers, drains, conduits, and other facilities, and shall be responsible for any damage resulting thereto. The Contractor shall not be entitled to any damages or extra pay on account of any postponement, interference, or delay caused by any such structures and facilities being on the line of work, whether or not they are shown on the Plans; specifically, but not limited to, damage due to delay in utility relocation.

B. Laying and Jointing

1. Handling and Protection: All pipe shall be protected during installation against shock and free fall, and be installed without cracking, chipping, breaking, bending, or damage to coating materials. Damaged pipe materials shall be replaced with new materials.

2. Grade Control: Maximum deviation from indicated alignment of any pipe after installation and backfilling shall not be greater than 0.1 foot. All pipe shall have a continuous slope free from depressions that will not drain. The Contractor shall establish such grade control devices as are necessary to maintain the above tolerances.

3. Laying: The laying of pipe in finished trenches shall commence at the lowest point, and pipe shall be installed with the bell end forward or upgrade. All pipe shall be laid with ends abutting and true to line and grade. Pipe laid shall be carefully centered to form a sewer with a uniform invert.

4. Bedding: Bedding shall be rodded, spaded, and consolidated as necessary to provide firm uniform support for the pipe, and not subject pipe to settlement or displacement.

5. Jointing: Preparatory to making filled, bonded, and watertight sealed pipe joints, all surfaces of the portions of the pipe to be jointed shall be clean and dry. Lubricants, primers, adhesives, and other substances that are used shall be compatible with the jointing material recommended or specified.

   Other than for trimming sewer pipe to be flush with the inside walls of storm sewer structures, no pipes may be trimmed unless ordered by the Engineer.

   Trenches shall be kept water-free and as dry as possible during bedding, laying, and jointing, and for as long a period as required to protect the pipe joints and concrete in structures.

   As soon as possible after the joint is made, sufficient bedding material shall be placed alongside each side of the pipe to offset conditions that might tend to move the pipe off line and grade.

   a. Concrete Pipe
      i. Plastic Joint Sealant: Plastic joint sealant shall be applied to the tongue and spigot prior to its insertion into the bell or groove. A sufficient amount of sealant shall be used to fill the annular joint space with some excess. Wipe the outside surface of the joint with additional material to assure a complete seal.
      ii. Flexible Gaskets: Flat gaskets may be cemented to the pipe tongue or spigot. O-ring gaskets shall be recessed in a groove on the pipe tongue or spigot and confined by the bell or groove after the joint is completed. Roll-on gaskets shall be placed around the tongue or spigot and rolled into position as the joint is assembled. Flat gaskets and O-ring gaskets shall be lubricated as recommended by the manufacturer.
         a) Flat gasket: Flat flexible gaskets shall conform to ASTM C 443. If there is no recess provided for the gasket, the surface of the tongue shall be cleaned and rubber adhesive applied. Using quick-drying adhesive, gaskets may be applied ahead of the laying operation or in the plant.
         b) O-ring gasket: O-ring or roll-on flexible gaskets shall conform to ASTM C 361, Section 4.10. The entire surface of the bell that comes in contact with the rubber gasket shall be well lubricated with a soap lubricant. The entire gasket shall be greased with soap. Only the soap lubricant supplied by the pipe manufacturer shall be used. Adhesive type cements shall not be used.
   b. Corrugated Metal Pipe. Corrugated metal pipe joints shall have a gasket and may be either bell and spigot joints or made with external coupling bands. The bands shall be drawn and secured on the pipe by connecting devices as furnished by the manufacturer. Pipe ends for annular corrugation shall be identical to the rest of the pipe barrel (plain ends), or in the case of helical pipe, the pipe ends at the joint shall be reformed to an annular corrugation and flange (reformed end). Gaskets shall be furnished in accordance with the Plans and Special Provisions. Coupling bands shall be reviewed and approved by the Engineer prior to installation.
   c. HDPE Pipe: HDPE pipe shall be assembled, installed, and backfilled in accordance with the manufacturer's instructions. Joints shall have a gasket and may be either bell and spigot joints or made with external coupling bands. The fittings and couplings bands shall be fabricated from the same material as the pipe conforming to AASHTO M294. The coupling bands shall cover at least two full corrugations of each section of pipe and shall prevent infiltration of soil into the pipe. Gaskets shall be furnished in accordance with the Plans and Special Provisions. Coupling bands shall be reviewed and approved by the Engineer prior to installation.

      During construction of the project in areas subjected to heavy construction equipment traffic, pipe sizes 12" - 42" shall have a minimum cover of 3 feet, and pipe sizes 48"- 120" shall have a minimum cover of 4 feet.

d. Structure Connections: Pipes connected to structures shall be cut parallel with the inside face of the structure for structures having plane walls and parallel with the spring line of the pipe for structures having curved walls. Projection of the pipe beyond the inside face shall not exceed 1 inch (measured at the springline for structures having curved walls).

C. Backfill of Trenches

1. General: Refer to Section 2100 Clearing, Grading, Excavation and Site Preparation.

SECTION 2603 BORING AND JACKING

2603.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction of steel casings, complete with bulkheads and sand fill, by boring and/or jacking at the locations and to the lines and grades indicated on the Plans, or where constructed at the Contractor's option, when approved, to bypass obstructions without open cutting.

2603.2 Materials

A. Steel Casing

1. Steel casing for bored or jacked construction shall conform to ASTM A 139.

2. Steel shall be grade B under railroads and grade A for all other uses.

3. Minimum wall thickness for steel casing shall be in accordance with the following table:

Diameter of Casing	Under Railroads	All Other Uses
24"	0.406"	0.281"
26"	0.438"	0.281"
28"	0.469"	0.312"
32"	0.500"	0.312"
34"	0.500"	0.312"
36"	0.500"	0.344"

4. Casing joints shall be welded by a certified welder in accordance with ANSI/AWWA C206.

B. End Seals: End seals shall be manufactured end seals, concrete plugs with allowances for water flow, or brick shall be in accordance with ASTM C 32, Grade SS or SM and mortar in accordance with ASTM C270.

C. Sand Fill: Sand fill shall comply with ASTM C 33, Fine Aggregate. Moisture content of the sand shall not exceed 0.5%.

2603.3 Construction Details

A. Boring and Jacking

1. Prior to starting work, complete details of the methods and the liner material to be used shall be submitted to the Engineer for approval.

2. The maximum allowable deviation from indicated alignment and grade shall be as follows except when altered by the Plans or Special Provisions:

   a. Alignment 1.0%
   b. Grade 1.0%

B. Casing Installation

1. The steel casing shall be advanced in a continuous operation without interruption. Sections of the casing pipe shall be welded together to form a continuous conduit capable of resisting all stresses including jacking stresses. The casing in its final position shall be within alignment and grade

tolerances specified in Section 2603.3.A.2. There shall be no space between the earth and the outside of the casing. Any voids which do occur shall be filled by pressure grouting.

2. Boring operations shall be performed by experienced crews using a rotary type boring machine designed especially for this purpose. Boring shall be performed in a manner to prevent disturbing the overlying and adjacent materials.

3. Jacking

   a. Jacking frame, guides, blocking, head, and reaction devices shall be arranged to apply uniform pressure about the casing circumference without damage to the casing material, and to maintain alignment within specified tolerances.
   b. Jacking reaction device shall provide adequate resistance to withstand 200 percent of the maximum jacking pressure.
   c. Provide jacks of adequate number and size for the required jacking pressure; but not less than two jacks.
   d. Maintain jacking pit and pipe installation in such condition that drainage does not accumulate. Control and disposition of surface and subsurface water at the site of jacking operations shall be the Contractor's responsibility.
   e. Excavation at the heading shall not be extended more than 1 inch outside the top and sides (upper 300-degree sector) of the casing and shall be true to grade at the invert (lower 60-degree sector).
   f. Once jacking begins, it shall proceed without interruption until installation of the entire length of the jacked casing is complete.

4. Excavation in Jacked Casings: Perform excavation within jacked casings by hand or machine methods as necessary to remove the materials encountered without disturbing the overlying material. The jacked casing shall be advanced a sufficient distance ahead of the excavation face and/or shield used as necessary to protect the workman and the work, and to prevent the uncontrolled entry of unstable materials into the casing.

5. Unstable Materials: If materials are encountered during casing installation that cannot be excavated safely or without creating voids around the exterior of the casing, the Contractor shall discontinue casing installation and stabilize such materials by dewatering, chemical soil stabilization, grouting, or other methods, and/or modify equipment and procedures as necessary to complete the casing installation.

C. Sewer Pipe Installation

1. Pipe shall be placed inside the casing to the indicated line and grade by the use of wood skids or other equivalent methods. The wood shall be pressure-treated with a preservative in accordance with ASTM D 1760. Cut surfaces shall be given 2 heavy brush coats of the same preservative. The wood skids shall be securely fastened to the sewer pipe with steel straps.

2. End seals shall be constructed after the sewer pipe is installed and approved.

3. The annular space between the casing and sewer pipe shall be filled with sand blown in so that all space is filled without disturbing the alignment and grade of the sewer pipe. Flowable Backfill (CLSM) meeting Section 2102.2.E, may be substituted in lieu of sand fill. Alternative methods may be submitted for approval by the Engineer.

SECTION 2604 STRUCTURES

2604.1 Scope

This section governs the furnishing of all labor, materials and equipment for the performance of all work necessary for construction of cast-in-place and precast concrete structures for inlets, manholes, junction boxes, box culverts, headwalls, and incidental structures.

Masonry or brick structures shall not be allowed under these Specifications.

2604.2 Materials

A. Concrete Mixes: Concrete shall be KCMMB 4K, unless otherwise specified.

B. Concrete Materials

1. For KCMMB mixes, concrete shall be an approved mix with admixtures that are approved for use in that mix design.

2. Water: Water shall be clean and free from deleterious substances. Only potable water will be acceptable without testing.

C. Reinforcing Steel: Reinforcing bars shall conform to ASTM A 615 or AASHTO M 31, Grade 60. Welded steel wire fabric shall conform to ASTM A 1064 or AASHTO M 55.

D. Precast Concrete Structures

1. Manholes: Precast manholes shall conform to ASTM C 478.

2. End Sections for Concrete Pipe: Shall be flared end sections of the pipe manufacturer's standard design and shall meet all applicable requirements of ASTM C 76 for Class II or higher classes of pipe.

3. Rectangular Structures: Shall conform to the inside dimension indicated on the Plans and be designed for the following loads:

   a. HS-20 live load for all structures in/or under pavement, shoulders, driveways, and other traffic areas.
   b. 2,000-lb wheel live load for curb opening inlets and junction boxes in non-traffic areas.
   c. 50 pcf equivalent fluid pressure for soil pressure on vertical walls.
   d. 120 pcf for unit weight of soil cover on top slabs.

4. Joints: Joints between concrete structures shall be filled with plastic joint compound or preformed plastic compound as stated herein.

   a. Barrel Sections: Minimum cross-sectional area of preformed compound between concrete barrel sections shall be 1-inch square or 1.25 inches diameter. Minimum cross-sectional area of the preformed compound between the concrete adjustment ring and cone barrel section shall be two beads of either 1-inch square or 1.25 inches in diameter.

   b. Manhole Adjustment Rings: Rings shall be constructed of concrete, HDPE, or recycled rubber.

      If HDPE adjustment rings are used, they shall be injection molded-recycled HDPE - as manufactured by LADTECH, Inc. or approved equal. They shall be bolted to the structure top

section and otherwise installed as per manufacture's recommendations.

If recycled rubber adjustment rings are used, they shall consist of no less than 80%, by weight, recycled rubber and no less than 10% by volume shredded fiber as manufactured by GNR Technologies or approved equal. They shall be installed as per manufacturer's recommendations.

The top and bottom of all adjustment rings shall be sealed using a mastic filler meeting the requirements of 2503.D.6 or an epoxy paste. The epoxy paste shall be a two component, moisture insensitive, containing no solvents, and capable of bonding with all materials it is to be used on, like Epoxytec Micor C.P.P or approved equal. Minimum cross-sectional area of preformed compound between concrete adjustment rings shall be two beads of either 1-inch square or 1.25 inches in diameter.

c. Manhole Ring and Covers: Minimum cross-sectional area of preformed compound between the concrete adjustment ring and the manhole casting shall be two beads of either 1-inch square or 1.25 inches in diameter.

d. External Manhole Chimney Frame Seal: External frame seal shall consist of a flexible rubber sleeve, interlocking adjustment extension(s), and stainless-steel compression bands. The flexible rubber sleeve and extension shall be extruded or molded from a high-grade rubber compound conforming to the applicable requirements of ASTM C 923 with a minimum tensile strength of 1500 psi and minimum elongation at break of 350%. At a minimum, the compression bands shall be 16-gauge stainless steel conforming to ASTM A 240, Type 304, with a minimum width of one inch. Screws, nuts, and bolts shall be stainless steel conforming to ASTM F 593 and 594, Type 304. The compression bands shall have the capacity to tighten with enough pressure to make a watertight seal around the rubber chimney sleeve.

E. Air Entrainment: All concrete shall be air entrained. Minimum strength requirements shall be as specified in Section 2604.2.A. Concrete Mixes.

F. Manhole Castings

1. Rings and Covers: Castings shall be gray iron conforming to ASTM A 48, Class 35B. Castings of rings and covers shall be of the shape, dimension, minimum weight, and type as indicated on Plans or Standard Drawings and be free from manufacturing defects. All curb inlet castings shall have cam locks or approved equal. If requested by special order, castings shall be cleaned and painted with one coat of tar prior to delivery. Bearing surfaces between all rings and covers for installation in all areas shall be machined to provide even seating and interchangeability of like pieces.

   All manhole rings and covers placed in paved areas shall be rated for H20 traffic. Cam lock covers or similar shall not be placed in roadway pavement unless shown on the Plans or directed by the Engineer. All covers shall have provisions for opening, such as concealed pick holes.

2. Steps: All steps shall comply with Section 2509.3.G.2.b. Cast iron steps shall not be used.

G. Toe Walls: Flared end sections for concrete and steel pipe shall be set on a concrete toe wall centered on the end of the section. Toe walls shall be 8 inches thick by 24 inches deep by the width of the end section.

2604.3 Construction

A. Concrete Structures: Concrete construction shall conform to the current ACI 301 Specifications for Structural Concrete.

1. Precast Structures: The Contractor may, at his option, construct precast concrete inlets, junction boxes, and box culverts, in lieu of the cast-in-place structures indicated on the Plans; except that all concrete base slabs for pre-cast inlets, manholes, and junction boxes may be cast-in-place. Solid concrete brick or block shall be used to block inlets and similar structures to grade during placement of base slab concrete.

   Precast concrete box culvert sections shall be installed on a 4-inch leveling course of untreated compacted aggregate conforming to Section 2200 Paving. Leveling courses shall extend 1 foot past the line of the box section and be finished to a true plane surface to provide uniform bearing for the precast section.

   Any adjustments required for precast structures to meet field conditions shall be at the cost of the Contractor.

2. Finishing: Exposed edges of all slabs, walls, and other concrete structures shall be beveled 3/4" or edged with a 1-1/4" radial tool.

   a. Formed Surfaces: Immediately following removal of the forms, fins and irregular projections shall be removed. Form tie connections, holes, honeycomb spots, and other defects shall be chipped to ensure the voided area is exposed and shall be chipped back to solid material. These areas shall be thoroughly cleaned, saturated with water, and painted with a grout approved by the Engineer. The repaired surfaces shall be cured in accordance with these specifications.
   b. Exposed Slabs: Finish for exposed slabs shall be wood float texture. Exposed edges shall be beveled or edged with a radial tool.

3. Form Removal: Forms shall remain in place until the concrete has attained sufficient strength to support loads imposed by backfilling, construction, and traffic. Within 24 hours of form removal, small holes and pockmarks of exposed walls shall be filled with Portland cement grout and rubbed smooth. Concrete voids and honeycombs shall be chipped open with a light hammer to expose weak areas for inspection. At the direction of the Engineer, expansive repair grout shall be used for partial reconstruction of otherwise sound structures.

   a. Walls: Forms shall remain in place for a minimum of 5 days or until the concrete reaches a minimum strength of 2000 psi.
   b. Slabs: Form shall remain in place for a minimum of 7 days or until the concrete reaches a minimum strength of 3000 psi.

4. Manhole Riser Adjustments: Manhole rings and covers shall be adjusted to match the slope and height, or grade, of pavements. In no case shall the surface pitch of the manhole ring and cover mismatch the pavement slope by more than 1/2 inch. The difference in height between the top of manhole cover and the top of precast cone shall not exceed 24 inches.

   In lieu of replacing concrete adjustment rings that are properly seated and structurally sound but have a small fracture, an external rubber chimney may be fitted to secure a watertight seal between the casting (manhole ring and cover) and the concrete cone barrel section.

B. Invert Channels: Form concrete invert channels in manholes, inlets, and junction boxes to make changes in

direction of flow with smooth curves of as large a radius as permitted by the inside dimension of the structure.

Grade changes and transitions shall be smooth and uniform, and all parts of the invert channel and adjacent floor shall slope to drain. Channel bottom shall be finished smooth without roughness or irregularity. Invert channels for precast concrete structures may be cast integrally with the structure base slabs at the Contractor's option.

C. Excavation and Backfill: Refer to Section 2100 "Clearing, Grubbing, Excavation and Site Preparation".

SECTION 2605 OPEN CHANNELS

2605.1 Scope

This section governs the furnishing of all labor, materials and equipment for the construction of open channel lining at the location, and to the lines, grades, and dimensions indicated on the Plans. Grading shall have been previously completed in accordance with Section 2100 Clearing, Grubbing, Excavation and Site Preparation.

2605.2 Materials

A. Concrete Materials: Concrete shall be in accordance with 2604.2.B, unless otherwise specified. Reinforcing steel shall conform to ASTM A 615 or AASHTO M 31, Grade 60. Welded steel wire fabric shall conform to ASTM A 1064 or AASHTO M 55. Concrete Lined channels are discouraged and shall only be allowed with the approval of the County Engineer.

B. Stone: Stone for riprap, and gabion linings shall consist of quarried rock and be sound, durable, and angular in shape. No more than 10 percent shall have an elongation greater than 3:1, and no stone shall have an elongation greater than 4: 1. Material shall be free from cracks, seams, or other defects. Shale and stone with shale seams are not acceptable.

1. The minimum unit weight of the stone shall be 155 pounds per cubic foot as computed by multiplying the specific gravity times 62.4 pounds per cubic foot.

2. Not more than 10 percent of the stone shall exhibit splitting, crumbling, or spalling when subject to 5 cycles of the sodium sulfate soundness test in accordance with ASTM C 88.

3. Riprap: Riprap layer shall have a minimum thickness of 15 inches, or 1.5 times as thick as the larger stones, whichever is greater.

   The gradation for RipRap (Light Stone) shall be as follows:

Weight of Stone In Lbs.	Percent Passing by Weight
250	100 (minimum)
100	50 (maximum)
75	70 (maximum)
5	10 (maximum)

   The gradation for RipRap (Heavy Stone) shall be as follows:

Weight of Stone In Lbs.	Percent Passing by Weight
1,000	100 (minimum)
500	50 (maximum)
75	10 (maximum)

   The Contractor shall provide certification that the material meets the specified gradations.

4. Gabion Fill Stone: Stone shall be of the following gradations:

U.S. Standard Square Mesh Sieve	Percent Passing by Weight

10”	100
8”	85 - 100
6”	0 - 15
4”	0- 10
3”	0

Stone shall be graded within the above limits as required to provide a unit weight in-place of 100 pounds per cubic foot or greater.

The Contractor shall provide certification that the material meets the specified gradations.

C. Filter Blanket: Filter blanket may be either of the following types at the Contractor’s option:

1. Granular Filter: Granular filter material shall consist of sound, durable rock particles conforming to the following gradation:

Sieve Size	Cumulative Percent Passing By Weight
1”	100
1/2”	70 - 100
No. 4	50 - 85
No. 10	35 - 70
No. 40	20 - 50
No. 100	15 – 40

The Contractor shall provide certification that the material meets the specified gradations.

2. Filter Fabric: Filter fabric shall consist of woven or nonwoven fabric. The synthetic fiber of either the woven or nonwoven fabric shall consist of polypropylene, nylon, or polyester filaments. The percent open area shall be not less than 4 percent nor more than 10 percent. The cloth shall provide an Equivalent Opening Size (EOS) no finer than the U.S. Standard Sieve No. 100. In addition, filter fabric shall meet the following physical requirements:

   a. Tensile Strength: Minimum grab tensile strength, both warpwise and fillingwise, shall be 200 pounds when tested in accordance with ASTM D 5034, using a 4-inch by 6-inch specimen and a jaw speed of 12 inches per minute.
   b. Elongation: Grab elongation shall be not less than 15 percent nor more than 60 percent, both warpwise and fillingwise, when tested in accordance with ASTM D 5034.
   c. Tear Strength: Minimum trapezoid tear strength shall be 100 pounds, both warpwise and fillingwise. Method of test for woven fabrics shall be in accordance with ASTM D 1117.
   d. Bursting Strength: Minimum bursting strength shall be 400 psi when tested in accordance with ASTM D 3887.
   e. Seam Strength: Woven fabric shall have a minimum seam-breaking strength of 180 pounds when tested in accordance with ASTM D 1683, using a jaw speed of 12 inchesper minute.
   f. Width: Filter fabric shall be furnished in widths of not less than 6 feet.

D. Gabion Baskets: Baskets shall be of the dimensions indicated on the drawings and be fabricated using hexagonal triple-twist wire mesh.

1. Wire: Wire shall be galvanized steel having a minimum tensile strength of 60,000 psi, and shall be zinc coated in accordance with ASTM A 641 Class 3.

2. Wire Mesh: Maximum dimension of the mesh opening shall be 4-1/2 inches or less, and the maximum

area of the mesh opening shall not exceed 12 square inches. Wire shall be 0.120-inch (minimum) diameter.

3. Selvedge Wire: Selvedge wire shall be 0.1535-inch (minimum) diameter. All perimeter edges of the mesh forming the gabion shall be securely selvedged so that joints formed by tying the selvedges have a strength equal to or greater than the body of the basket.

4. Lacing and Stay Wire: Wire shall be 0.0866-inch diameter or larger. Other connection methods, such as stainless steel clips, may be substituted with approval of the Engineer.

5. Diaphragms: Gabions shall be divided into cells not greater than 4 feet in width by wire mesh diaphragms. Diaphragms shall be factory secured to the base of the basket by continuous spiral wire.

6. PVC (Polyvinyl Chloride) Coating: Where specified in the Plans, all wire used in the fabrication of the baskets and in the wiring operations during construction shall, after zinc coating, have an extruded coating of PVC. The coating shall be gray in color ranging between series 26187 and 26293 or between series 26373 and 26375, semi-gloss, as per Federal Standard 595B. The PVC coating shall be a nominal thickness of 0.02165 inches and shall nowhere be less than 0.015 inches in thickness. The coating shall be resistant to the destructive effects of immersion in acidic, salt or polluted water, exposure to ultraviolet light, and abrasion and shall retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM G 23.

E. Sod: Sod shall conform to the requirements of Section 2400 Seeding, Sodding and Overseeding.

F. Seed: Seeding shall conform to the requirements of Section 2400 Seeding, Sodding and Overseeding.

2605.3 Construction

A. Foundation Preparation: After completion of grading in accordance with Section 2100, the area to receive channel lining shall be trimmed and dressed to conform to the cross sections indicated on the Plans within a tolerance of plus or minus 1 inch from the theoretical slope lines and grades. All deleterious materials shall be removed from the foundation area.

B. Concrete Lining

1. Concrete Lined channels are discouraged and shall only be allowed with the approval of the County Engineer.

2. Preparation: Subgrade shall be moistened by sprinkling. Forms shall be securely staked, braced, and set to line and grade. Reinforcement and tie bars shall be held in position by bar chairs, concrete brick, or other approved devices.

3. Placing and Finishing: Place, consolidate, and strike off concrete to the thickness indicated on the drawings. Concrete shall be tamped or vibrated to eliminate all voids and bring sufficient mortar to the top for finishing. Surface finish shall be a wood-float finish. Round all edges and joints with a 1/4 inch radius edging tool, except contraction joints may be sawed to a depth of 30 percent of the thickness of the concrete lining after concrete has hardened but before uncontrolled cracking occurs. Apply curing membrane as specified in Section 2200 “Paving”.

C. Filter Blanket

1. Granular Filter: Place granular filter to its full thickness in a single operation. Construction methods

shall be such that the material is placed without segregation. Compaction of granular filter material is not required.

2. Filter Fabric: Place filter fabric with its long dimension horizontal and lay free of tension, stress, folds, wrinkles, or creases.

   a. Place to provide 18 inches minimum overlap at each joint and anchor to prevent dislocation during construction of overlaying material.
   b. Fabric shall not be left exposed more than two weeks prior to placement of overlaying material. Tracked or wheeled equipment or vehicles shall not be operated on the fabric.

D. Riprap Placement: Riprap shall be placed on the prepared foundation in a manner which will provide a reasonably well-graded mass of stone with the minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in conformance with the lines, grades, and thicknesses indicated. A filter blanket of filter fabric conforming to Section 2605.2.C.2 shall be constructed under all riprap. Riprap shall be placed to full-course thickness in one operation and in such a manner as to avoid displacing the fabric. The Contractor shall place the riprap in such a way as to not tear, puncture, or shift the fabric. Riprap shall not be dropped more than 3 feet when being placed directly on the fabric. Tears or rips in the fabric shall be repaired with fabric lapped a minimum of 12 inches in all directions.

1. Placing: Placing of riprap in layers, or by dumping into chutes, or by similar methods likely to cause segregation will not be permitted.

2. Distributing: The larger stones shall be well distributed and the entire mass of stone shall conform to the specified gradation. All material shall be so placed and distributed that there will be no objectionable accumulations of either the larger or smaller sizes of stone.

3. Hand Placing: It is the intent of these specifications to produce a fairly compact riprap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the specified results.

E. Gabion Baskets

1. Assembly: Assemble each gabion unit by binding all vertical edges together with a continuous piece of connecting wire stitched around the vertical edge with coils spaced at 3 inches or less. Set empty units to line and grade and join units by stitching with connecting wire along adjoining edges. Install and securely fasten internal tie wires in each cell if necessary, to retain the shape of the cell during filling operations.

2. Filling: Fill gabion cells with stone carefully by hand or machine to provide a minimum of voids and avoid bulges and distortions of the gabion. After filling, secure the lid to the sides, ends, and diaphragm by stitching with connecting wire.

3. Filter Fabric/Gabion Unit Placement: A filter blanket of filter fabric conforming to Section 2605.2.C.2 shall be constructed under all Gabion Baskets. The Contractor shall place the gabions in such a way as to avoid tearing, puncturing, or shifting the fabric. Tears or rips in the fabric shall be repaired with fabric lapped a minimum of 12 inches in all directions.

F. Sod: Sod shall be installed as specified in Section 2400 Seeding, Sodding and Overseeding, except all sod placed in drainage channels or ditches, including both the side slopes and bottom, shall be anchored in accordance with Section 2402.3.D.

SECTION 2606 CURED-IN-PLACE PIPE

This Section covers cured-in-place pipe for rehabilitation of existing sanitary and storm sewer mains and services. Topics include product and installer qualifications, prebid inspection, pipe preparation, lining design, cured-in-place pipe, building service restoration, point repair, and building service lining. Refer to Section 2510 Cured-In-Place Pipe.

END OF SECTION

TECHNICAL PROVISIONS

Section 2700

Structures

Unified Government of Wyandotte County

January 2022

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SECTION 2701 GENERAL

2701.1 Scope

This section governs the furnishing of all labor, materials, and equipment for the construction of bridges, reinforced box culverts, retaining walls, and other miscellaneous structures as shown on the Plans and in accordance with the Standard Drawings, the specifications, and the Special Provisions.

2701.2 General

The purpose of these specifications is to provide uniformity in the Metropolitan Kansas City Area for the public works structures which are designed and constructed for the many separate municipal and county jurisdictions included therein.

SECTION 2702 SPECIFICATIONS

Procedural and administrative items covered in the Contract Documents shall supersede such items covered in the specifications referenced below unless specifically noted.

2702.1 Jurisdiction in Kansas

The current edition of the Standard Specifications for State Road and Bridge Construction, State Highway Commission of Kansas and latest version of Special Provisions shall apply. This specification is available from:

Kansas Department of Transportation
Bureau of Fiscal Services
Docking State Office Building
7th Floor
Topeka, Kansas 66612
(913) 296-3545

END OF SECTION

INSPECTION POINTS FOR TRAFFIC SIGNAL WORK BEING DONE IN WYANDOTTE COUNTY KANSAS

The following list refers to points during the construction process that will require an on-site inspection or observation before proceeding further with the construction project. The inspection will be completed by a member of the Traffic Signal Department of the Board of Public Utilities. The contractor is required to notify the Traffic Signal Department when they are performing any of the following tasks so they can inspect the process and make any necessary approvals or changes at 913-645-1449 or 913-573-9450.

1. Inspect the materials purchased and being utilized for the construction before starting the project.
2. Inspect the staked positions for the cabinets, pull boxes, and all poles.
3. Observe the boring process to make sure all splices are done properly and with the proper type of conduit or HDPE.
4. Observe the setting of pull boxes and make sure the conduit is piped into them correctly.
5. Inspect all concrete foundations for proper rebar and bolt configurations before concrete is poured.
6. Inspect the job site upon completion for any clean up or grading concerns.
7. Inspect forms before pouring concrete to ensure proper placement of conduit, the number of conduit being installed, and the size of conduits being installed.

BY	REVISIONS	DATE

TRAFFIC SIGNAL SPECIFICATIONS

SHEET 1 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

CONSTRUCTION AND MATERIAL REQUIREMENTS
FOR TRAFFIC SIGNAL INSTALLATIONS

1. GENERAL

1.1 SCOPE: These specifications govern the furnishing of all labor, materials and equipment for a complete operational traffic signal installation in accordance with the accompanying plans, the latest edition of the Unified Government Public Works Department Technical Provisions and Standard Drawings for Roads and Sewers and （when there is federal or state funding in the project） the latest edition of the KDOT Standard Specifications for State Road and Bridge Construction. In case of conflict between the other reference of documents and these specifications and accompanying plans, these specifications and Special Conditions in the Contract Documents shall govern.

1.2 SPECIAL MODIFICATIONS: These specifications may be supplemented by Special Conditions in the Contract Documents or by notes on the plans.

1.3 REVISION OF STANDARDS: When reference is made to a standard （NEC, NESC, ANSI, MUTCD, IES, IMSA, ITE, KDOT, UG etc.） the standard referred to shall be the latest revision of said standard as amended at the time of Notice to Bidders, except as otherwise noted on the plans, in a Special Provision or in these specifications.

2. MATERIALS AND EQUIPMENT

2.1 SCOPE: This section governs furnishing all equipment, materials and incidental parts as required to complete the traffic signal Installation as shown in the plans or described in these specifications or as may be modified by a special provision. All equipment, materials and incidental parts shall be new and, when possible, be of similar manufacture. All incidental parts which are not shown on the plans or described in these specifications, and which are necessary to complete the traffic signal installation, shall be furnished and installed as though such parts were shown on the plans or described in these specifications, the cost of which shall be included in the traffic signal installation lump sum bid price.

The traffic signal installation shall be complete, and the Contractor shall furnish and install all equipment necessary for the complete and satisfactory operation of all electrical apparatus and for the complete operation of the traffic signal installation whether specifically mentioned or not.

All electrical equipment shall conform to the standards of the National Electrical Manufacturer's Association （NEMA）. In addition to the requirements of these specifications, the accompanying plans and other documents listed in section 1.1, all materials shall conform to the requirements of the National Electrical Code （NEC）, the Standard of the American Society of Testing Materials （ASTM）, the American Standards Association （ASA）, the Manual on Uniform Traffic Control Devices （MUTCD）, and local ordinances. When referenced, equipment and operations shall conform to specific standards and specifications from the following agencies: IMSA, ITE, KDOT, UG.

Wherever reference is made in these specifications or in the Special Conditions provisions to the code, the safety orders, the general order, or the standards mentioned above, the reference shall be construed to mean the code, order, or standard that is in effect at the date of Notice to bidders of these specifications.

2.2 CONCRETE: All concrete supplied for the work shall be KCMMB 4k as required by the Section 4000 of the Unified Government, Public Works Department Technical Revisions & Standard Drawings for Roads and Sewers, 2008 Edition or latest edition.

2.3 REINFORCING STEEL: All reinforcing steel shall meet the requirements for reinforcing steel in ASTM A615.

2.4 TRAFFIC SIGNAL POLES: Shall conform to loading and allowable stress requirements of the Fourth Edition or latest edition and the requirements on the 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals accompanying plans.

For all non-freeway projects the Valmont KCBPU Standard Version C is pre-approved. The Poles will be designed for wind loads with basic wind velocity of 90 mph with a recurrence interval of 50 years, and a fatigue category of 2. Fatigue loads are based on the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals and the following design loads:

- Vortex Shedding: Not applicable for structures with a taper of at least 0.14"/ft, per AASHTO.
- Natural Wind Gusts: the yearly mean wind speed for natural wind gusts will be assumed to be 11.2 mph.
- Galloping: Structures are not designed to resist periodic galloping forces.
- Truck-induced gust: Structures are not designed to include truck-induced gusts.

For any project where mast arm poles are to be installed on freeways, KDOT standards for mast arm poles shall supersede the UG standard.

All traffic signal pole mast and luminaire arms shall include a 1-inch rubber grommet placed at each outlet for signal wiring and removable end caps.

Where a combination lighting/signal pole is specified on the plans, the luminaire arm shall be mounted in the same vertical plane as the signal （mast） arm （except where otherwise noted on the plans）. The vertical shaft of the combination lighting/signal pole shall be a one-placed design.

When fully loaded with all equipment as shown on the plans, all mast arms shall be between horizontal （level） to one and one-half degrees （1-1/2） above horizontal. No perceptible bending of the arm shall be observed when fully loaded, as determined by a visual inspection by the engineer.

All traffic signal poles shall be detailed on shop drawings by the manufacturer indicating pole and arm dimensions and attachment method along with signal weight, projected areas, and type of mounting that it is designed to accommodate.

2.5 ALUMINUM PEDESTALS: Shall consist of a cast aluminum square base and an aluminum shaft for mounting vertical signal heads, pedestrian signal heads, push buttons, signs, and/or a standard controller cabinet. The pedestal shall be capable of withstanding wind loadings of 90 mph.

2.5.1 Pedestal Pole Base: The cast aluminum bases should meet the requirements of ASTM B-26 or Sec. ASTM B-108. The base and post shall be joined by a threaded connection. Welded connections will not be accepted. The threaded post shall be secured to the base by means of a threaded set screw, connection of which shall be rigid and secured so as no shaft movement is perceptible, as determined by the engineer.

2.5.2 Pedestal shaft: The aluminum shaft shall be spun from one piece of seamless tubing, meeting the requirements of ASTM B429, having a minimum nominal 0.125-inch wall thickness. The shaft shall have no longitudinal welds, nor circumferential welds. The shaft shall have a uniform polish finish. Each shaft shall be tire-wrapped with a heavy water resistant paper for protection during shipment and installation.

2.6 VEHICLE SIGNAL HEADS:

2.6.1 Polycarbonate Signal Heads

Material: All vehicle signal heads shall be constructed using polycarbonate resin. The following specification describes the minimum acceptable standards for the construction or assembly of polycarbonate vehicle signal heads having nominal twelve inch lenses.

Signal Head Housing: The signal head housing shall be screw injection molded of polycarbonate resin and shall be of sectional construction to permit the installation of the number of signal head sections as specified on the standard drawings, the Special Conditions, and the plans. Signal head housing shall be yellow.

The top and bottom of each section shall include mounting holes sized to accommodate standard 1 1/2 inch signal mounting hardware. Each mounting hole shall be surrounded with molded in serrations to provide a positive lock between the individual sections of the signal and between the signal head assembly and the mounting brackety. The serrations shall provide 5 degree increments of adjustment to allow proper aiming of the signal.

Joining of Signal Head Sections: The signal head sections shall be joined together with a minimum of four bolts and locknuts located in a manner so as to distribute stress equally over the body ends. The inside surface of each body end shall be essentially smooth and flat. Any webbing or other protrusions that prevent the use of standard signal mounting hardware or obstruct the use of normal installation tools shall not be accepted.

Signal Head Doors: The signal head doors shall be screw injection molded of polycarbonate resin.

The doors shall be hinged to the body section on the left side via stainless steel hinge pins and shall be equipped with a substantial screw or wing nut type fastener of stainless steel material on the right side to provide a secure closure means. Both the hinge and closure device shall be internal to the signal body and shall not protrude from the body side in any way.

Both the hinge pins and the closing fasteners shall be held captive to the door for ease of maintenance. In the closed position, the hinge pins shall be positively locked in place to preclude their falling out due to vibration.

Each door shall be equipped with a molded lip which the visor shall fit over in such a way as to prevent any possibility of light escaping between the door and the visor.

Signal doors shall be black.

Visors: Each door shall be fitted with a tunnel type visor - which shall at its base and extending approximately 1" from the door surface - totally surround the lens to provide strength. Beyond this strengthening ring, the bottom portion of the visor shall be removed to form a "tunnel". All visors shall be of polycarbonate resin and shall be molded with four ribs extending outward from the door surface for added rigidity. Tabs shall protrude at right angles to the side of the visor to provide attachment to the signal door, and to allow their easy removal or replacement. All visor mounting hardware shall be of stainless steel. Signal head assemblies shall be supplied with all visors attached.

Visors shall be black

Terminal Blocks in signal heads: Each signal head shall be equipped with one or more terminal blocks to facilitate the electrical hookup. All terminal blocks shall be separate and removable components, which shall provide minimum #8 diameter （32 threads per inch） screws for all wiring connections. No "Fast-On" terminals shall be permitted

Signal head assemblies of three or fewer sections shall include one terminal block; four and five section signals shall include two terminal blocks.

Signal Head Wiring: All internal signal head wiring shall be color coded appropriately to indicate the function of each cable without the need to individually trace each.

Lenses: Lenses shall meet the requirements of the latest edition of the ITE Specification Vehicle Traffic Control Signal Heads. Lenses shall be in glass. Lettering shall not appear on lenses. Nominal 12-inch diameter signal lenses shall be furnished.

2.6.2 LED Ball Traffic Modules - 12 inch - Insert Type

This specification provides the minimum performance requirements for 12 inch LED traffic signal modules. This specification section refers to definitions and practices described in ITE Vehicle Traffic Control Signal Heads - Light Emitting Diode （LED） Circular Signal Supplement, Adopted June 27, 2005 , herein referred as VTCSH. The multiple LED light source should be the latest technology available on the market. The color that is produced by the individual LEDs shall match the color of the traffic signal module, whether it be Red, Amber or Green.

LED Ball Traffic Modules - 12 Inch - Insert Type

LED traffic signal modules are designed as retrofit replacements for existing signal lamps and shall not require special tools for installation. Retrofit replacement LED modules shall fit into existing traffic signal housings built to the VTCSH standard without modification to the housing.

Installation of a retrofit replacement LED signal module into an existing signal housing shall only require the removal of the following existing components: lens, lamp module, reflector and gaskets. The module shall be weather tight and fit securely in the housing and connect directly to existing electrical wiring.

LED Ball Signal Module Characteristics

- To eliminate the possibility of sun reflections or sun phantom effects, the lens shall be clear and non-tinted for all modules.
- To achieve the visual appearance similar to that of an incandescent lamp （i.e. smooth and non-pixilated）, the LED module shall use a centralized light source.
- The LED module lens shall be hard coated or otherwise made to comply with material exposure and weathering effects requirements per SAE J576.
- The LED module shall be supplied with an installed gasket.
- The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup and the LED module shall be specifically designed to reduce sun reflections or （sun phantom effects）.
- The LED module shall be supplied with an installed gasket.
- To ensure corrosion resistance, all modules shall be compliant to salt Fog ASTM B117-03 testing for 48 hours at 5% concentration with no traces of corrosion.
- The LED module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing. The power supply must fit and mount on the inside top of the LED module.
- Each LED module shall be identified on the backside with the manufacturer's name, serial number, clearly stated date of manufacture and country of origin.

All LED equipment should be suggested to field inspection of equipment, installation and acceptance by a BPU traffic signal technician. Light Emitting Diode （LED） equipment for traffic signal should meet minimum standards for material, physical and mechanical characteristics, environmental requirements and constructions as described by the most recent Vehicle Traffic Control Signal Heads （VTCSH）, LED for Circular Traffic Signal and LED for Arrow Traffic Signal and the Pedestrian Traffic Control Signal Indications （PTCSI） published by the Institute of Transportation Engineers （ITE） and corresponding Manual of Uniform Control Devices （MUTCD）.

2.6.3 LED Arrow Traffic Modules - 12 inch - Insert Type

This specification provides the minimum in-service performance requirements for 12 inch LED vehicle arrow traffic signal modules. This specification refers to definitions and practices described in ITE , Vehicle Traffic Control Signal Heads - Light Emitting Diode （LED） Vehicle Arrow Traffic Signal Supplement, Adopted July 1, 2007, , referred to in this document as VTCSH. The multiple LED light source should be the latest technology available on the market. The color that is produced by the individual LEDs shall match the color of the traffic signal module, whether it be Red, Amber or Green.

LED Arrow Traffic Modules - 12 Inch - Insert Type

LED traffic signal modules are designed, as retrofit replacements for existing signal lamps shall not require special tools for installation. Retrofit replacement LED modules shall fit into existing traffic signal housings built to the VTCSH Standard without modification to the housing.

Installation of a retrofit replacement LED signal module into an existing signal housing shall only require the removal of the following existing components: lens, lamp module, reflector and gaskets. The module shall be weather tight and fit securely in the housing and connect directly to existing electrical wiring.

LED Arrow Signal Module Characteristics

- The retrofit LED module shall be capable of replacing the optical unit.
- To eliminate the possibility of sun phantom effects, the lens shall be clear and non-tinted.
- The LED module lens shall be hard or comply with weathering effects requirements per SAE J576
- LED vehicle arrow traffic signal modules shall be manufactured to be used as omni-directional modules.
- A module shall be protected against dust and moisture intrusion, including rain and blowing rain according to MIL-STD-810F, test method 506.4, procedure 1, Rain and Blowing Rain.
- The module lens shall be made of a UV stabilized material to prevent cracking, crazing or yellowing due to UV.
- The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup and the LED module shall be specifically designed to reduce sun reflections （Sun Phantom）.
- The LED module shall be supplied with an installed gasket.
- The LED module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing. The power supply must fit and mount inside the LED module.
- The assembly and manufacturing process for the LED assembly shall be designed to ensure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- Each LED module shall be identified on the backside with the manufacturer's name, serial number and country of origin.
- The following operating characteristics shall be identified: nominal operating voltage, power consumption, and Volt-Ampere.
- Modules must be Omni-Directional and shall be clearly marked with the phrase "Suitable for mounting in any orientation."

All LED equipment should be suggested to field inspection of equipment, installation and acceptance by a BPU traffic signal technician. Light Emitting Diode （LED） equipment for traffic signal should meet minimum standards for material, physical and mechanical characteristics, environmental requirements and constructions as described by the most recent Vehicle Traffic Control Signal Heads （VTCSH）, LED for Circular Traffic Signal and LED for Arrow Traffic Signal and the Pedestrian Traffic Control Signal Indications （PTCSI） published by the Institute of Transportation Engineers （ITE） and corresponding Manual of Uniform Control Devices （MUTCD）.

2.6.4 LED Pedestrian Countdown Modules - 16 inch x 18 inch PED Countdown - Insert Type

This specification provides the minimum performance requirements for the LED "walking person" and "hand" icon pedestrian signal modules with countdown （hereafter called ped modules）. This specification is only for the nominal overall message-bearing surface of 16 inch x 18 inch. This specification is not intended to impose restrictions upon specific designs and materials that conform to the purpose and the intent of this specification. This specification refers to definitions and practices described in Pedestrian Traffic Control Signal Indications published in the Equipment and Materials Standards of the Institute of Transportation Engineers, （referred to in this document as PTCSI） and in the applicable sections of Manual on Uniform Traffic Control Devices （MUTCD） 2009 Section 4E.

LED Pedestrian Countdown Modules - 16 inch x 18 inch PED Countdown - Insert Type

Modules designed as retrofit replacements for existing pedestrian signal indication lamps shall not require special tools for installation. Retrofit replacement modules shall fit into existing pedestrian signal housings built for the PTCSI sizes stated in Section 1 of the "walking person" and "hand" icon pedestrian signal indication Standard without modification to the housing.

Installation of a retrofit replacement module into an existing pedestrian signal housing shall only require the removal of the existing optical unit components, i.e., lens, lamp module, gaskets, and reflector; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring.

LED Pedestrian Countdown Timer Characteristics

- The retrofit module shall be capable of replacing the optical component of the pedestrian indication.
- The LED module shall have a visual appearance similar to that of an incandescent lamp （ie: Smooth and non-pixilated）.
- The LED module lens shall not be a replaceable part. Screwed on lenses are not allowed. Only modules with internal mask shall be utilized. No external silk-screen shall be permit.
- The dividers inside the module that make up the icons and digits shall be black so as to eliminate sun phantom effect. When not illuminated with the sun shining into the module, the WALKING PERSON and UPRAISED HAND and COUNTDOWN DIGITS shall not be readily visible.
- The countdown digits of the pedestrian signal module shall be located adjacent to the associated UPRAISED HAND （symbolizing DON'T WALK）. When displaying a number "1" for both digits, the number "1" shall use the two segments furthest to the right. The digits shall remain on during the entire count down cycle. Flashing digits are not allowed.
- The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval. After the countdown displays zero, the display shall remain dark until the beginning of the next countdown
- The walking person, hand icons and countdown digits （16"x18" size only） shall be incandescent looking. The configurations of the walking person icon, hand icon and numbers icons are illustrated in Figures 1, 2 （per PTCSI Part 2 Specification） and Figure 3 respectively.

DATE	REVISIONS	BY
3/20/2017	UPDATED AASHTO POLE DESIGN CRITERIA	RLW

TRAFFIC SIGNAL SPECIFICATIONS

SHEET 2 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

All LED equipment should be suggested to field inspection of equipment, installation and acceptance by a BPU traffic signal technician. Light Emitting Diode（LED） equipment for traffic signal should meet minimum standards for material, physical and mechanical characteristics, environmental requirements and constructions as described by the most recent Vehicle Traffic Control Signal Heads（VTCSH），LED for Circular Traffic Signal and LED for Arrow Traffic Signal and the Pedestrian Traffic Control Signal Indications（PTCSI） published by the Institute of Transportation Engineers（ITE） and corresponding Manual of Uniform Control Devices（MUTCD）.

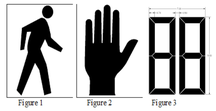


Figure 1 Figure 2 Figure 3

Dimensions for Figures 1, 2 and 3

For each nominal message bearing surface（module） size, use the corresponding minimum H（height） and W（width） measurements:

Module Size	Icon Height	Icon Width	Countdown Height	Countdown Width	Countdown Segment Width
(16 x 18 in)	11 in	7 in	9 in	7 in	0.7 in

Note: The units shall not have any accessible dip switches, toggle switches or options available that will allow the mode to be changed from counting the clearance cycle, to the full walk/don't walk cycle or any other modification to the icons or digits.

LED Pedestrian Countdown Timer Environmental Requirements

- All exposed components of a module shall be suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance. As a minimum, selected materials shall be rated for service for a period of a minimum of 60 months in a south-facing Arizona Desert installation.
- A module shall be protected against dust and moisture intrusion, including rain and blowing rain. Shall be sealed and meet MIL-STD-810F Procedure I, Rain & Blowing Rain specifications.
- The module lens shall not crack, craze or yellow due to solar UV irradiation typical for a south-facing Arizona Desert installation after a minimum of 60 months in service.
- To prevent water seepage between the back cover and the electrical wires, or between the copper and insulation of the wires, the electrical wires shall not penetrate the LED pedmodule housing. Connection shall be made by use of an over-molded connector.
- The ped module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing pedestrian signal housing. The power supply shall be designed to fit and mount inside the pedestrian signal module.
- The assembly and manufacturing process for the module shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

LED Pedestrian Countdown Timer Module Identification

- Each pedmodule shall be identified on the backside with the manufacturer's name, model, serial number and operating characteristics of each symbol. The operating characteristics identified shall include the nominal operating voltage and stabilized power consumption, in watts and Volt-Amperes.
- Modules conforming to this specification（WALKING PERSON, UPRAISED HAND only），may have the following statement on an attached label: "Manufactured in Conformance with the ITE Pedestrian Traffic Control Signal Indications - Part 2: Light Emitting Diode（LED） Pedestrian Signal Modules".

LED Pedestrian Countdown Module Functions

Cycle:

The module shall operate in one mode: Clearance Cycle Countdown Mode Only. The module shall start counting when the flashing don't walk turns on and will countdown to "0" and turn off when the steady "Don't Walk" signal turns on. The module shall not have user accessible switches or controls for the purpose of modifying the cycle, icons or digits.

Learning Cycle:

At power on, the module enters a single automatic learning cycle. During the automatic learning cycle, the countdown display shall remain dark.

Cycle Modification:

The unit shall re-program itself if it detects any increase or decrease of Pedestrian Timing. The digits shall go blank once a change is detected and then take one complete pedestrian cycle（with no counter during this cycle） to adjust its buffer timer.

Recycling:

The module shall allow for consecutive cycles without displaying the steady Hand icon（"Don't Walk"）.

Pre-Emption:

The module shall recognize preemption events and temporarily modify the crossing cycle accordingly.

☐ If the controller preempts during the walking man, the countdown shall follow the controller's directions and shall adjust from walking man to flashing hand. It shall start to count down during the flashing hand.
☐ If the controller preempts during the flashing hand, the countdown shall continue to count down without interruption.

The next cycle, following the preemption event, shall use the correct, initially programmed values. This specification is worded such that the flashing don_t walk time is not modified.

"Don't Walk" Steady:

If the controller output displays Don't Walk steady condition or if both the hand /person go dark and the unit has not arrived to zero, the unit suspends any timing and the digits shall go dark.

Power Outage:

The digits will go dark for one pedestrian cycle after loss of power of more than 2.0 seconds.

Digit Operation:

The digits shall remain continuously lit during the clearance cycle and shall not flash in conjunction with the Hand/Don't Walk icon.

2.7 MOUNTING HARDWARE:

2.7.1 Side mounted vertical bracket: Side vertical bracket mounted signal heads, as shown on the Standard Drawings, shall be supported by a one piece mounting bracket watertight assembly made entirely of a durable polycarbonate and be yellow in color. Each bracket shall either be plumb or level, symmetrically arranged and securely assembled. Each bracket shall have 72 tooth serrations to assure a positive lock with a signal head and allow positioning traffic signal heads in increments of 5 degrees. Construction shall be such that conductors are concealed within the assembly. Brackets shall be attached to the pole or the pedestal by stainless steel banding and brackets.

2.7.2 Mast arm Mounting Assemblies: Mast arm signal head assemblies shall be rigid mounted utilizing a universally adjustable bracket consisting of both top and bottom brackets with a center vertical extruded aluminum support tube attached to the mast arms by means of a clamp kit with stainless steel banding. The top and bottom brackets shall have 72 tooth serrations cast into the arm to assure a positive lock with the single housing. The vertical support tube should allow wire entry at any point and be equipped with a vinyl insert that conceals the wiring. The lower bracket arm shall be hollow for wiring entry into the single head.

2.8 SIGNAL BACKPLATES: 5-inch backplates shall be furnished and attached to the single faces to provide a dark background for the signal indications. Blackplates shall be constructed of one-piece durable black plastic capable of withstanding a 100-mile per hour wind. Backplates shall be attached to the signal as per the manufacturer's recommended practice.

2.9 ADVANCED ACCESSIBLE PEDESTRIAN SYSTEM: The Advanced Accessible Pedestrian System is required. This system shall be a web based system that is capable of managing 16 push buttons from a single control module. The push buttons shall be vibra-tactile with a raised profile arrow that points in the direction pedestrians are to travel. The push button housing shall also include the capability of mounting a 9 inch * 15 inch pedestrian sign that includes countdown timer legend（R10-3e) and has perforations over the speaker.

2.10 MULTI-CONDUCTOR SIGNAL CABLE: Multi-conductor signal cable shall conform to Section 19-1 of the latest edition of the International Municipal Signal Association, Inc.（IMSA） requirements, except all conductors supplied shall be standard copper with a size of 14 gauge. The cable shall be for operation on a 600-volt maximum and suitable use for conductor temperatures not exceeding 75 degrees Celsius. The number of conductors per cable shall be as shown on the plans.

2.11 COPPER INTERCONNECT CABLE: When copper wire is specified on the plans for interconnect cable, it shall be premium cable type phone grade interconnect cable. The cable shall be #19 A.W.G., solid copper cable having an 0.008-inch aluminum shield and shall be gel-filled for aerial and duct use. In addition, the cable shall meet the following requirements:

Conductor:	Solid, annealed copper
Conductor Insulation:	High density polyethylene or polypropylene
Core Covering:	Non-hygroscopic dielectric tape
Shield:	Copolymer-coated corrugated aluminum 0.2 mm（0.008_）
Jacket:	Virgin, black, high-molecular weight Polyethylene with surface marked measure

The cable be for operation on a 600 volt maximum and shall be filled with non-hygroscopic filled compound for moisture resistance in all applications.

2.12 OPTICAL FIBER INTERCONNECT CABLE: When optical fiber cable is specified on the plans for traffic signal interconnection or communication, the optical fiber interconnect cable along with connectors will be defined in Special Provisions for each specific project or as defined by the City Traffic Engineer.

2.13 DETECTOR LOOP WIRE: The detector loop wire shall be #14 A.W.G. stranded copper, type THHN, 1-conductor cable with PVC/nylon insulation housed in PVC tubing meeting IMSA Specifications 51-3. The PVC tubing shall be ULFR-1 rated 105 degrees C with a 0.031" wall thickness plus or minus 0.003" and 0.182" minimum to 0.198" maximum inside diameter.

2.14 LOOP WIRE SEALANT: Sealant for loop detectors shall be（3M Detector Loop Sealant. Sealant shall be gray for concrete pavement and black for asphaltic pavement. Sealant shall be prepared and installed in accordance with manufacture's instructions. The contractor shall submit the manufacturer_ s catalog information and instructions to the City Traffic Engineer for review and approval.

2.15 SPLICE SEAL: Splice seal for loop detectors shall be Tyco Electronics AMP sealing and dielectric compound patches; product #275442-1, Rev F.

2.16 DETECTOR LEAD-IN CABLE: The detector lead-in cable shall be rated for 600 volts and shall be #18 A.W.G. 4-conductor（red, green, black, white) stranded and shielded cable. The conductors shall be tin-coated, annealed copper enclosed in an aluminized shield and a high-density polyethylene jacket. All wires shall be insulated with cross-linked polypropylene or polyethylene and provided with a vinyl jacket. The interstices of the cable are not to be filled with a water blocking material. The outside diameter of the cable shall be 0.25 inches or less and shall be suitable for use in conduit, direct burial, or saw slot installation.

2.17 TRACE WIRE: Trace wire shall be red #14 A.W.G, stranded, Type THHN, 1-conductor cable with PVC/nylon insulation housed in PVC tubing meeting IMSA specification 15-5. The PVC tubing shall be ULFR-1 rated 105 degrees C with a 0.031" wall thickness plus or minus 0.003" and）.182" minimum to 0.198" maximum inside diameter.

2.18 PULL ROPE: Pull rope is for conduit for metallic cable. It shall be 3/8_ nylon and capable of pulling the required bundle of electrical cable.

2.19 MULE TAPE: Mule tape is for conduit for optical fiber. Mule tape shall be capable of pulling 72-count optical fiber at the tension rating allowable for optical fiber.

2.20 POWER CABLE: Power lead-in cable shall be of the sizes and numbers of conductors as shown on the plans.

The cable shall be for operation on a 600 volt maximum and suitable for use at conductor temperatures not exceeding 75 degrees Celsius. Material, construction, and tests shall be in accordance with the applicable requirements of the Insulated Power Cable Engineer's Association（IPCEA） Standard S-66-524 "Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Conductors shall be stranded, annealed coated copper. Copper wire, before insulating or stranding, shall meet the requirements of the latest edition of ASTM B-33（coated wire）. Stranding shall be class B, in accordance with the latest edition of ASTM B-8. Insulating shall consist of cross-linked thermosetting polyethylene, meeting the requirements of column B of IPCEA and listed by U.L. as Type USE RHW-75 DEGREES C.

2.21 POWER SERVICE ENCLOSURE: The Power Service Enclosure shall be a lockable 70-amp circuit breaker box, raintight enclosure equipped with a main breaker and a 50-amp traffic signal breaker to be operated at 120 volts AC. The unit shall be capable of receiving either 120/240 volt or 208 volt AC electrical line service. The unit shall be U.L. listed.

Ten-inch secondary extension brackets shall be used to clamp the secondary service conduit to the power pole. The brackets shall be either Joslyn #2357, McGraw Edison #DR2E2, or approved equal.

2.22 GROUNDING: Grounding on traffic signal components shall be accomplished using a #6 A.W.G. solid bare copper wire connected to ground lugs. Ground wire shall be attached by means of a ground clamp to copper-clad steel rods. Ground rods shall be ¾ inches in diameter and 10 feet long. See Section 3.3.6 for additional information on bonding and grounding（Installation of Wiring）.

2.23 CONDUIT FOR METALLIC CABLE: Unless otherwise shown on the plans, all conduits shall be Schedule 80 high-density polyethylene（HDPE) duct manufactured to ASTM D2447, ATSM D3035 and NEMA TC7 specifications. The duct shall be pre-lubricated, have smooth walls and shall be marked at regular intervals with the name of the manufacture and duct size. Couplings shall be from the same manufacturer of the duct and shall be air and watertight. HDPE conduit for traffic signal use shall be red.

HDPE conduit for street lighting use shall be gray. Schedule 80 PVC is required between service boxes and concrete foundations including conduit inside foundations. PVC conduit shall be gray.

Conduit used for service runs and service risers shall be metallic, unless otherwise directed by the Board of Public Utilities（BPU） Traffic Signal Department or the City Traffic Engineer.

2.24 CONDUIT FOR OPTICAL FIBER: Conduit for optical fiber shall be HDPE SDR 11. It shall be black with three red stripes and shall be labeled 'KCK / BPU'. Conduit shall be continuous for the length of the bore. Conduit may be fusion spliced for long runs（greater than 700 feet） between service boxes. Compression splices will not be allowed, except on bridges.

2.25 TRAFFIC SIGNAL MAIN SERVICE BOXES: Main service boxes for traffic signal systems shall be polymer-concrete composites, stackable for varying depths, rated for 20,000 lbs. loading, and with heavy duty covers meeting design loads of 22,500 lbs minimum. Boxes shall not have bottoms. All boxes will be 36-inch depth. Adjustment layers may be varying depths as called out on the plans. Nominal size will be 30-inch by 48-inch. Plans may call for a smaller or larger nominal size depending on site conditions. Main service boxes shall have the legend _ TRAFFIC_ inscribed on the lids. Lids shall be in two pieces.

2.26 TRAFFIC SIGNAL SERVICE BOXES: Service boxes shall be corrugated steel pipe, #14 gauge, meeting the requirements of AASHTO M-36. All service boxes shall have annular rings（for ease of future adjustment） and shall have either a 24-inch diameter or an 18-inch diameter with a shape as shown on the Traffic Signal Detail sheets in the accompanying plans. The frame and lid for the 24-inch service box shall be either Neenah R5900-E or approved equal and shall have the legend "TRAFFIC" inscribed on the lid. The frame and the lid for 18-inch service box shall be either Neenah R-5900-C, or approved equal and shall have the legend "TRAFFIC" inscribed in the lid. Frames for lids must be specifically manufactured for corrugated steel pipe and have the capability of being spot welded to the corrugated steel pipe.

2.27 OPTICAL FIBER SERVICE BOXES: Optical fiber service boxes for traffic signal interconnect systems shall be polymer-concrete composites, stackable for varying depths, rated for 20,000 lbs. loading, and with heavy duty covers meeting design loads of 22,500 lbs minimum. Boxes shall not have bottoms. All boxes will be 36-inch depth. Adjustment layers may be varying depths as called out on the plans. Nominal size will be 30-inch by 48-inch. Plans may call for a larger nominal size of 36-inch by 60-inch at locations where underground splice enclosures are required and where large amounts of recoverable slack will be required. These locations will be called out on the plans. Optical fiber service boxes shall have the legends 'UG TRAFFIC' and 'OPTICAL FIBER' inscribed on the lids.

2.28 CONTROLLER CABINET: This specification describes the minimum requirements for a traffic controller cabinet for use with a TS-2, Type II controller unit and incorporating selected features and functionality as defined by NEMA specifications TS-2（Latest Versions） which are incorporated herein by reference.

All load switching control shall be as defined by NEMA specification TS-2 as modified by this specification. Detection control and signal monitoring shall be as defined by NEMA specification TS-2 as modified by this specification.

The controller and all associated equipment shall be furnished completely housed in a sturdy aluminum cabinet. The cabinet shall and TS-2, Type 1 Cabinet and be of clean cut design and appearance having no sharp edges, corners or projections. It shall be a minimum "R" size having approximate dimensions of 72" H X 44" W X 25" D. A hinged door shall be provided permitting complete access to the interior of the cabinet. The cabinet is to be weather proof and dust tight. The door shall be provided with a strong lock and two sets of keys. The door hinges and pins shall be of a non-corroding material.

The cabinet shall contain four strong mounting shelves for the support of the controller and associated equipment.

A solid-state two circuit, cube type, jack mounted flasher with a rated load of 10 amps per circuit shall be supplied. Where additional load is required, more than one flasher will be provided. The flasher shall flash at the rate of 50 to 60 flashes per minute and be of the "zero switching" type to prevent radio interference.

The cabinet shall be equipped with two ventilating fans, each capable of circulating air at a rate of 100 cfm, controlled by a thermostat and shall include suitable dust filters for the capacity of the ventilating system. The filters shall be of the dry type and easily replaced. The filter shall be located behind louvers in the lower portion of the main cabinet door. The top of the cabinet shall include an exhaust air plenum with a vent screen having perforations no greater than 0.125 inches in diameter and located so as preclude the entrance of moisture into the cabinet.

BY	REVISIONS	DATE

TRAFFIC SIGNAL SPECIFICATIONS

SHEET 3 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

In addition to the main door of the controller cabinet, there shall be an auxiliary door provided in the main door with a lock and standardized police key. The panel behind the auxiliary police door shall contain two (2) switches to accomplish the following functions:

(1) Change from normal operation to flashing, and vice versa.
(2) Interrupt power to the signal heads.

The police panel shall also include a phone jack to provide for the insertion of a phone plug equipped manual control cord and switch. The phone jack and manual control plug shall be wired such that insertion of the plug shall apply a manual control enable input to the controller, and allow manual control operation as defined by NEMA specifications. The manual control switch cord shall have a minimum length of four feet. The lower front edge of the switch compartment shall be fitted with an aluminum angle to provide a storage location for the manual control assembly when not in use.

A Ground Fault Interrupter convenience outlet shall be provided in each cabinet. A second AC outlet shall also be provided, located on the left hand cabinet wall, to provide power to a video monitor. The cabinet shall be equipped with an incandescent trouble lamp rated at 25 watts, mounted on a flexible arm having a minimum length of 15 inches and located on the right hand wall of the cabinet in such a position as to be adjustable to shine light on all portions of the back panel as well as on the controller unit.

The cabinet shall contain an internal test panel which shall have switches as follows:

(1) Stop Time-Run-Normal Test switch.
(1) Manual - Auto switch
(1) Flash - Normal switch
(1) Interval advance, momentary push button
(1) Controller On - Off switch

Each cabinet shall include a terminal facility which shall incorporate four major sub sections:

- Video and loop detector terminal panel located on the cabinet left wall.
- Terminal panel for the connection of input/output circuits to the "D" connector located on the cabinet left wall.
- Main terminal panel located on the cabinet rear wall.
- Power distribution panel located on the cabinet right wall.

The video and loop detector terminal panel shall incorporate terminal blocks for the connection of all pedestrian pushbutton wiring and lightning arrestors for the incoming video coaxial cables, as well as terminal connection points for the AC supply to the video cameras and connection points for all detector loops. The camera power terminals shall be separately fused with a slow blow, 2 amp fuse installed in a fuse holder which shall also double as a disconnect switch to allow power to be removed from individual cameras for maintenance purposes. All, loop detector connections and camera power connections shall terminate on pressure style terminal blocks. Terminal block (s) for the termination of pedestrian push button connectors shall be screw type having minimum 8-32 screws. Sufficient terminal points shall be provided such that each camera power connection shall be separate. The detector terminal panel shall include a ground bus bar.

A pressure style terminal block shall be included which shall serve as a termination point for all serial communication cables used to connect to the various components of the traffic controller system. There shall also be pressure style terminal block which shall serve as a termination and distribution point for all outputs from the cabinet power supply. All terminals shall be permanently identified as to their circuit reference. All terminal blocks except the block for pedestrian push button connections shall be "dead front" type.

All wiring between the detector loop terminal blocks and the detector rack assembly described in later paragraphs shall be color coded, twisted pairs. The detector loop terminal points associated with the detector rack shall be arranged in a single vertical row of 32 terminals on the detector panel. The twisted pair connections to the detector racks shall terminate in a 37 pin "D" connector having a positive latch to ensure a reliable connection to the detector rack.

The video lightning arrestors shall be hybrid, solid state devices, one per camera, capable of safely dissipating a peak surge current of 5 kA (8 X 20 microsecond) , and shall have a response time less than 1 nanosecond. The arrestors shall be equipped with BNC connectors, and shall have a terminal point for ground wire connection.

All internal cabinet serial data shall be carried on cables specifically designed for use with RS485 circuits, and all pairs shall be twisted and color coded. Cables shall be of sufficient length to allow rearrangement of the various components within the cabinet, but shall be coiled neatly to present a workman like appearance. In addition to the serial data cables required for interconnection of the controller, malfunction management unit and detector bus interface unit (s) as required to perform the operation as defined by the project plans, one spare serial cable shall also be provided to allow for future expansion.

Each cabinet shall include a "D" connector panel having sufficient terminals for the connection of all incoming and outgoing circuits from the controller "D" harness, FSK communications as well as connection points for the incoming pre-emption detector circuits All circuits shall terminate on pressure style terminal blocks rated at not less than 30 amps per circuit. The communication circuit shall include a plug in type lighting arrestor which shall clamp any incoming surge to not more than 8 volts. To minimize signal loss, the arrestor contacts and the plug in base socket contacts shall be gold plated.

The main terminal panel shall include the following:

A: Terminal points for all input/output connections for the "A","B" and "C" connectors from the controller.

B: Wired positions for a two circuit NEMA flasher and sixteen three circuit NEMA load switches.

C: Wired positions for 6 flash transfer relays.
Flash transfer relays shall be wired such that in the normal operating mode they shall be de-energized.

D: Termination points for all field signal wiring.

All wiring to and from the NEMA "A", "B" and "C" connectors shall be routed directly to, and shall terminate on the rear of the main terminal panel by means of a soldered connection to a feed-through style terminal block such that all input/output circuitry shall be accessible from the front of the panel for test or hook up purposes. To insure the reliability of these circuits, no plugs, sockets, printed circuit boards or push on type connectors shall be inserted between the controller plugs and/or sockets and the terminal strip points at which these wires are terminated. Additionally, all load switch input circuits and conflict monitor control circuits shall terminate by means of solder connections to these same terminal strips. Thus it shall be possible to make the interconnections between the controller, load switches and conflict monitor by means of a simple system of jumpers located on the front of the main panel such that alterations may be easily accomplished.

All load switch, flash transfer relay and flasher sockets shall be wired with solder connected conductors, properly sized as to their function. Each load switch socket AC+ input shall be wired individually to the main AC signal buss with a minimum 16AWG conductor.

All field signal connections shall be terminated to a heavy duty, barrier style terminal strip having minimum 10-32 screws. All terminal connection points shall be clearly identified as to their function and referenced to the terminal facility wiring diagram by means of clear, silk screened legends located on the panel adjacent to the appropriate terminal point. All signal phases shall be equipped with provisions to allow the selection of either red or yellow flash programming. Flash programming shall be accomplished by the simple rearrangement of jumpers which shall require nothing more than simple hand tools to perform.

A power distribution panel shall be located on the right side wall of the cabinet. The assembly shall contain provisions for the connection of the incoming AC service which shall be a compression type terminal block sized to accept 6 AWG. conductors, a main cabinet circuit breaker, an auxiliary circuit breaker rated at 15 Amps to provide power to the controller, conflict monitor and detector power supply, a radio interference line filter, a lightning arrestor and a solid state buss relay having a minimum current carrying capacity of 75 Amps to control the AC power to the signal heads.

The main AC service circuit breaker shall be rated at 50 Amps

The lightning arrestor shall be of the hybrid type rated at 20,000 amps and capable of clamping such a surge to a peak of not greater than 250 volts without regard for the rise time of the surge. The arrestor shall be totally of solid state design, with no gas tube type devices of any kind and shall be a two stage unit providing separate protection for the controller and monitor unit. It shall incorporate a base or socket portion which shall permanently mount to the power distribution panel. The arrestor device itself will plug connect to that base to allow for rapid replacement in the event the arrestor is damaged by a lightning strike. A minimum 200 microhenry inductor shall be incorporated between the equipment line in and equipment line out terminals. The arrestor shall be epoxy encapsulated in a flame retardant material. The arrestor shall also include indicator lights to signify the condition of the arrestor, as well as a set of dry contacts which shall be wired to a "D" panel alarm input terminal to provide a remote notification of a failed arrestor. Lightning arrestor units shall mate with EDCO base / socket module model SHA1250-BASE.

The solid state buss relay shall have a current carrying capacity at least as great as the main circuit breaker and shall be of the normally open type wired such that under normal stop and go operation of the controller the relay shall be held energized and shall allow current flow to the load switches under that condition. De-energization of the buss relay shall disconnect power to all load switches.

Each cabinet shall be equipped with racks to accommodate the installation of card rack style video processors, SENSYS detection equipment or loop detector amplifiers. The racks shall be fabricated of aluminum and shall be in accordance with the requirements of NEMA TS-2 specifications, as well as meeting the following requirements. Each shall be wired to accept standard two or four channel devices and shall accommodate a minimum of eight, two channel, single position devices.

All cabinets shall be provided with 3 racks defined as racks 1, 2 and 3. Racks 1 and 2 will be installed on the cabinet shelf located immediately above the controller shelf. Rack 1 will be wired for video detection and shall include two extra positions wired to accommodate optical preemption devices such as OPTICOM ®. Connections to the preemption positions shall be via an inline, multi pin connector incorporating a latch.

Rack 2 shall include all wiring necessary to allow it to operate with loop detectors.

Rack 3 will be installed on a second cabinet shelf and shall be wired to operate with either video detection processors or SENSYS equipment. This same shelf will also be configured to allow the installation of a fourth detector rack if called for in the project documents. All wiring for this fourth, optional rack to allow operation of video detection or SENSYS detection equipment shall be included as a part of the standard cabinet such that in the event this additional rack is required, its installation will not involve the need for any cabinet wiring.

Except as noted above with regard to connections for optical preemption equipment, all connections to detector racks shall be via 37 pin, sub D style connectors which will include spring type latches to ensure the integrity of the connections.

Each cabinet shall include a separate, single position rack located above rack 1 to allow for the installation of a Vantage EDGE Connect video transmission module.

The cabinet shall include two cabinet power supplies meeting the requirements of NEMA specification TS2 and the following requirements. The power supply shall be completely enclosed in an aluminum housing and shall be shelf mounted. It shall provide the following voltage and current outputs:

+12 VDC +/- 1 VDC, 5.0 A
+24 VDC +/- 1 VDC, 2.0 A
12 VAC, 0.25 A

Outputs shall be fused with slow blow fuses of the ratings indicated

The AC power input shall be protected against over current with a 2 Amp slow blow fuse.

LED indicators on the front panel shall denote the presence of 12 VAC, 24 VDC and 12 VDC and the 60 Hz reference signal Test points for logic common and +24 VDC shall also be provided on the front panel.

Power supply 1 will be connected to provide power to all devices installed in racks 1 and 2. Power supply 2 shall provide operating power to all devices installed in rack 3 and optional rack 4 if used. All cabinets shall be supplied with power supply 1. Power supply 2 shall be provided only when required by the specific project plans and specifications, however each cabinet will be provided with power supply 2 wiring and connection cables so that if power supply 2 is required, no additional cabinet wiring shall be required.

All cabinet wiring shall be neat in appearance. All cables for connection to the controller and conflict monitor shall be protected by an expandable mesh sleeve and shall be routed along the rear wall of the cabinet and the top of the shelf on which the appropriate device is located.

In order to accommodate devices such as video servers, Ethernet switches or other devices requiring the use of transformer type power supplies, the cabinet shall include a power strip with a current carrying capacity of at least 15 amps. It shall include a minimum of 6 receptacle positions, spaced and oriented such that all 6 positions are available for use by plug in transformer type power supplies.

Each cabinet shall include a malfunction management unit (MMU) meeting all applicable requirements of NEMA specification TS-2 and the following requirements

The MMU shall include two high contrast, large area LCD displays to continuously show full intersection signal status and a separate LCD display to provide a graphic user interface to status, signal voltages and event logs. The event logs shall provide information as to time and date, complete intersection status, voltages, temperature, AC line events, etc. The MMU program shall include the use of help screens to assist in fault determination, which shall include trouble shooting suggestions. It shall include a 10/100Mbps Ethernet port for communication to a central office or to a lap top field computer. A software program shall be provided to allow the use of a computer to program the MMU, as well as to upload and store data logs, configuration settings etc.

The MMU shall be Eberle Design Inc. model MMU2-16LEip

If the controller is to include fiber optic communications then it shall be equipped with two fiber distribution panels to provide for the termination / interconnection of 24 fiber cables. Each of the fiber distribution panels shall be "swing out" type, low profile having a height of no more than 3 ½" and attached to the underside of the lower equipment mounting shelf. Each fiber distribution panel shall include four, six fiber bulkhead connectors. Connectors shall be ceramic insert, type ST, compatible with both single mode and multi mode fiber. Each panel shall also be provided with 3 splice trays.

The cabinet assembly shall be warranted against defect in workmanship and material for a period of one year from date of installation, not to exceed 18 months from date of shipment.

2.29 ~~EAGLE ATC M62 SERIES ACTUATED TRAFFIC SIGNAL CONTROLLER UNIT~~

This specification describes an advanced traffic signal controller meeting the latest NEMA specification, as well as providing advanced features for future requirements.

2.29 Econolite Cobalt Controller Unit

Note: Eagle ATC M62 or latest version no longer acceptable

All controller units must be capable of full functionality with the TACTICS ATMS central control firmware and the MARC OGL TranSuite firmware. TACTICS requires the latest version of SEPAC firmware to be loaded in the controller unit and requires the controllers to be capable of running the Quick-Response Traffic-Adaptive function. OGL TranSuite requires NTCIP version 4.01F firmware to be loaded in the controller unit. KCK/BPU requires both firmwares to be loaded in the controller unit with the specific version required for the deployment location activated from the factory. All controllers shall have the Ethernet port active. When required by the Special Conditions, an fsk port for twisted pair cable (3608 type of controller) shall be provided.

2.29.1 Required Standards

Traffic signal controller shall meet or exceed all requirement of the NEMA TS2-2003 specification. Equipment supplier shall provide a letter from an independent testing laboratory certifying controller compliance to the NEMA TS2-2003 specification.

2.29.2 Standard NEMA Configurations

Two Input / Output configurations shall be provided

a) NEMA TS-2 Type 1 for serial connection to cabinet Bus Interface Unit
b) NEMA TS-2 Type 2 for direct parallel connection to load switches and detectors

2.29.3 Central Processor Unit (CPU) - TS-2 (Type 2)

In addition to NEMA requirements, the CPU shall provide the following:

a) Microware OS-9 Operating System with runtime license
b) Motorola 68360 microprocessor, 25 Mhz version
c) 4 Megabytes minimum dynamic random access memory (DRAM)
d) 8 Megabytes minimum dynamic random-access memory (DRAM)
e) 512 Kilobytes minimum static random-access memory (SRAM)
f) Time of Day (TOD) clock with hours, minutes, seconds, month, year, and automatic daylight savings time adjustment. TOD may be implemented in the CPU via electronic circuitry, operating system software, or a combination.
g) During power failures, the SRAM and TOD shall be powered by STANDBY voltage from the power supply.

2.29.4 Power Supply

In addition to NEMA requirements, the Power Supply shall provide the following:

a) Line Frequency Reference signal shall be generated by a crystal oscillator, which shall synchronize to the 60-Hz VAC incoming power line at 120 and 300 degrees. A continuous square wave signal shall be +5 VDC amplitude, 8.333 ms half-cycle pulse duration, and 50 +/- 1% duty cycle. The Line Frequency Reference shall compensate for missing pulses and line noise during normal operation. The Line Frequency Reference shall continue through 500 mS power interruptions.
b) STANDBY voltage via supercapacitor for backup power during loss of service voltage shall be provided. Supercapacitor shall have a minimum of 15-farad nominal size. No batteries of any type are allowed.

2.29.5 Keyboard and Display

In addition to NEMA requirements, Keyboard and Display shall provide the following:

a) Removable by pulling off, installed by pushing on, without use of tools
b) Stowed extension cord to allow remote use of keyboard and display
c) Emulation of terminal per Joint NEMA/AASHTO/ITE ATC Standard
d) Key quantity and function per Joint NEMA/AASHTO/ITE ATC Standard
e) Liquid Crystal Display (LCD) with 8 lines of 40 characters
f) LCD contrast adjustment accomplished via the keypad, no contrast knob allowed
g) Light-emitting diode backlight for the LCD.
h) Audible electronic bell.
i) Connector compatible with C60 of Joint NEMA/AASHTO/ITE ATC Standard, with the addition of +5VDC supplied by the controller on C60, Pin 1
j) Keyboard and display may be deleted for cost savings by the Agency

BY
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TRAFFIC SIGNAL SPECIFICATIONS

SHEET 4 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	KCK	DRAWN:	B&McD
CHECKED:	B&McD	DATE:	3/20/2017
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2.29.6 Communications

In addition to NEMA requirements, the controller shall provide the following:

a) Built-in 10 Base-T Ethernet with RJ-45 connector on controller front panel
b) Built-in Internet Protocol (IP) address assigned by Institute of Electrical and Electronic Engineers (IEEE), one unique IP address for each controller.
c) Built-in Infared (IR) wireless port compatible with Microsoft Windows for Pocket PC Infrared RAW mode.
d) Built-in 1200 bps Frequency Shift Keying (FSK) modem. Modem is optional per Agency specification. Choice of 2 or 4 wire operation will be defined in the Special Conditions.
e) Built-in EIA-232 port for uploading and downloading applications software, as well as to update the operating system.
f) Built-in C60 connector for use with removable Keyboard and Display, Personal Computer COM1 or Personal Digital Assistant (PDA). C60 protocol per Joint NEMA/AASHTO/ITE ATC standard.

2.29.7 Controller Housing

In addition to NEMA requirements, the controller housing shall provide the following:

a) Seven slots with card guides for standard 3U size Versa Module Europe expansion modules. The expansion modules and mating back plane board in controller are optional, per Agency specification.
b) Two slots with card guides for standard Joint NEMA/AASHTO/ITE ATC modems. The modems and mating back plane board in the controller are optional, per Agency specification.
c) Polycarbonate construction, except back panel, rear mounting tabs and power supply mounting plate shall be aluminum for electrical grounding.
d) Built-in carrying handle
e) Two adjustable front mounting feet, used to raise the front cables and vary the display viewing-angle.

2.29.8 Traffic Control Software Functions

In addition to NEMA requirements, the controller shall provide the following:

a) 16 Vehicle Phases
b) 16 Pedestrian Phases
c) 4 Timing Rings
d) 16 Overlaps
e) 80 Detectors
f) Status: Ring Timers, Coordination Timers, Preempt Timers, Time Base, Communication, Detector Diagnostics, Intersection, Input / Output
g) Reports: Local Alarm Log, Communications Fault Log, Detector Fault Log, System Detector Log, MOE Log, Speed Log, Volume Count Log, Cycle MOE Log
h) Coordination Modes: Permissive Mode, Yield Mode, Permissive Yield Mode, Permissive Omit Mode, Sequential Omit Mode, Full Actuated Mode.
i) Adaptive Traffic Control: Adaptive Maximum Routines, Adaptive Protected/ Permissive Routines, Conditional Virtual Split Routines, Coordinated Adaptive Split Routines.
j) Preemption / Priority Routines
k) Standard Reports
l) Built-In Diagnostics
m) Time Base Control: 99 Day Programs, 10 Week Programs, 250 Events

2.29.9 Loaded Firmware

All controllers provided to the Unified Government shall have the latest revisions of both SEPAC and NTCIP versions of firmware loaded. SEPAC firmware shall be activated unless otherwise stated in the plans or special conditions.

2.30 VIDEO DETECTION SYSTEM

This specification is for the provision of a stop bar video detection system Iteris that is furnished complete with cameras, detector modules, Ethernet Interface, and all cables and connectors that are required for such operation. Video Detection System shall be compatible with VRAS video detector management software and GENETEC video management system software.

2.30.1 Modular (Multi or Single Camera) Video Detection System

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic.

2.30.1.1 System Hardware

The video detection system (VDS) shall consist of up to four video cameras, a video detection processor (VDP) capable of processing from one to four video sources, output extension modules, video surge suppressors and a pointing device. KCK/BPU requires the single channel option for the VDP. The two channel and four channel versions are prohibited by KCK/BPU.

Available System Configurations

- The VDS will be deployed at locations where site conditions and roadway geometry vary. The VDS system may also be deployed at locations where existing cabinets or equipment exist. Existing site configurations will dictate the availability of cabinet space and VDS usage.
- The proposed VDS shall be available in various configurations to allow maximum deployment flexibility. Each configuration shall have an identical user interface for system setup and configuration. The communications protocol to each configuration shall be identical and shall be hardware platform independent. The proposed VDS shall have multiple configurations available for deployment as described in Table 1.

Table 2.30.1.1 VDS Configuration

Description	No. Video Inputs	No. Video Outputs	Mounting Configuration	Power Supply Requirements
Single-Channel Rack Mounted	1	1	Rack Mount (Type 170 or NEMA TS-1, TS-2 Racks)	12 or 24 VDC Power From Rack
Dual-Channel Rack Mounted	2	1	Rack Mount (Type 170 or NEMA TS-1, TS-2 Racks)	12 or 24 VDC Power From Rack
Quad-Channel Rack Mounted	4	1	Rack Mount (Type 170 or NEMA TS-1, TS-2 Racks)	12 or 24 VDC Power From Rack

System Software

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on-board video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera view shall be available. A separate computer shall not be required to program the detection zones.

2.30.1.2 VDP Hardware

VDP System Interfaces

The following interfaces shall be provided for each of the configurations identified in Table 1.

Video Input

Each video input shall accept RS170 (NTSC) or CCIR (PAL) signals from an external video source (camera sensor, DVD or video tape player). The interface connector shall be BNC type and shall be located on the front of the video processing unit. For four-channel VDPs, an adapter cable that converts a DB15 interface to 4 individual BNC connectors shall be used. The video input shall have the capability to be terminated into 75-ohms or high impedance (Hi-Z) using dip switches or software control from the user menu.

Video Lock LED

A LED indicator shall be provided to indicate the presence of the video signal. The LED shall illuminate upon valid video synchronization and turn off when the presence of a valid video signal is removed.

Video Output

One video output shall be provided. The video output shall be RS170 or CCIR compliant and shall pass through the input video signal. For multi-channel video input configurations, a momentary push-button shall be provided on the front panel to cycle through each input video channel. In the absence of a valid video signal, the channel shall be skipped and the next valid video signal shall be switched. The real time video output shall have the capability to show text and graphical overlays to aid in system setup. The overlays shall display real-time actuation of detection zones upon vehicle detection or presence. Overlays shall be able to be turned off by the user. Control of the overlays and video switching shall also be provided through the serial communications port. The video output interface connector shall be positive locking BNC type. Friction type (e.g. RCA type) connectors shall not be allowed.

Serial Communications

A serial communications port shall be provided on the front panel. The serial port shall compliant with EIA232 electrical interfaces and shall use a DB9 type connector mounted on the front panel of the VDP. The serial communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information. The interface protocol shall be documented or interface software shall be provided. The interface protocol shall support multi-drop or point-to-multipoint communications. Each VDS shall have the capability to be addressable. The VDP shall support data rates of 1200 bps to 230,400 bps, inclusive.

Contact Closure Output

Open collector (contact closure) outputs shall be provided. Four (4) open collector outputs shall be provided for the single, dual or quad channel rack-mount configuration. Additionally, the VDP shall allow the use of extension modules to provide up to 24 open collector contact closures per camera input. Each open collector output shall be capable of sinking 30 mA at 24 VDC. Open collector outputs will be used for vehicle detection indicators as well as discrete outputs for alarm conditions. The VDP outputs shall be compatible with industry standard detector racks assignments.

Logic Inputs

Logic inputs such as delay/extend or delay inhibit shall be supported through the appropriate detector rack connector pin or front panel connector in the case of the I/O module. For VDPs and extension modules, 4 inputs shall be supported via detector rack interface. The I/O module shall accommodate eight (8) inputs through a 15-pin "D" connector.

Detection LEDs

Detection status LEDs shall be provided on the front panel. The LEDs shall illuminate when a contact closure output occurs. Rack-mounted video processors shall have a minimum of four (4) LEDs. Rack-mounted extension modules shall have two (2), four (4) or eight (8) LEDs (depending upon extension module type) to indicate detection.

Test Switches

The front panel of the VDP shall have detector test switches to allow the user to manually place calls on each VDP output channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

Mouse Port

A USB mouse port shall be provided on the front panel of the rack mount video processing unit. The mouse port shall not require special mouse software drivers. The mouse port shall be used as part of system setup and configuration. A mouse shall be provided with each video processor.

Extension Module Port

Extension modules shall be connected to the VDP by an 8-wire twisted-pair cable with modular RJ45 connectors. VDP and EM communications shall be accommodated by methods using differential signals to reject electrically coupled noise.

Extension Modules

Extension modules (EM) shall be available to eliminate the need of rewiring the detector rack, by enabling the user to plug an extension module into the appropriate slot in the detector rack to provide additional open collector outputs. The extension module shall be available in both 2 and 4 channel configurations. EM configurations shall be programmable from the VDP. A separate I/O module with 32 outputs through a 37-pin "D" connector on the front panel and 8 inputs through a 15-pin "D" connector using an external wire harness for expanded flexibility shall also be available.

The VDP and EM shall be specifically designed to mount in a standard detector rack, using the edge connector to obtain power, provide contact closure outputs and accept logic inputs (e.g. delay/extend). No adapters shall be required to mount the VDP or EM in a standard detector rack. Detector rack rewiring shall not be required.

On-board Memory

The VDP shall utilize non-volatile memory technology to store on-board firmware and operational data.

Firmware Upgrade

The VDP shall enable the loading of modified or enhanced software through the EIA232 or USB port (using a USB thumb drive) and without modifying the VDP hardware.

Input Power

The VDP and EM shall be powered by 12 or 24 volts DC. VDP and EM modules shall automatically compensate for either 12 or 24 VDC operation. VDP power consumption shall not exceed 7.5 watts. The EM power consumption shall not exceed 3 watts.

Operating Temperature

The VDP shall operate satisfactorily in a temperature range from -34 °C to +74 °C and a humidity range from 0%RH to 95%RH, non-condensing as set forth in NEMA specifications.

Video Surge Suppression

A video surge suppresser shall be provided for each video input as recommended by the manufacturer of the video detection system. The surge suppresser shall be appropriately grounded to the cabinet ground rod using 14 AWG minimum.

2.30.1.3 VDP Software

General System Functions

- Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.
- The VDP shall store up to three different detection zone patterns in non-volatile memory. The VDP can switch to any one of the three different detection patterns within 1 second of user request via menu selection with the pointing device. Each configuration shall be uniquely labeled and able to be edited by the user for identification. The currently active configuration indicator shall be displayed on the monitor.
- The VDP shall detect vehicles in real time as they travel across each detection zone.
- The VDP shall accept new detection patterns from an external computer through the EIA232 port when the external computer uses the correct communications protocol for downloading detection patterns. A Windows®-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.
- The VDP system shall have the capability to automatically switch to any one of the stored configurations based on the time of day which shall be programmable by the user.
- The VDP shall send its detection patterns to an external computer through the EIA232 port when requested when the external computer uses the appropriate communications protocol for uploading detection patterns.
- The VDP shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference or loss of the video signal.
- The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all effected detection zones in a constant call mode. A user-selected alarm output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.
- Up to 24 detection zones per camera input shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.
- The VDP shall provide up to 24 open collector output channels per camera input using one or more extension modules.
- A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single approach of traffic movement.
- Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from each video camera. No separate computer shall be required to program the detection zones.
- When a vehicle is detected within a detection zone, a visual indication of the detection shall activate on the video overlay display to confirm the detection of the vehicle for the zone.
- Detection shall be at least 98% accurate in good weather conditions, with slight degradation possible under adverse weather conditions (e.g. rain, snow, or fog) which reduce visibility. Detection accuracy is dependent upon site geometry, camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.
- The VDP shall provide dynamic zone reconfiguration (DZR). DZR enables normal operation of existing detection zones when one zone is being added or modified during the setup process. The new zone configuration shall not go into effect until the configuration is saved by the operator.
- Detection zone setup shall not require site specific information such as latitude and longitude to be entered into the system.
- The VDP shall process the video input from each camera at 30 frames per second. Multiple camera processors shall process all video inputs simultaneously.
- The VDP shall output a constant call during the background learning period of no more than 3 minutes.
- Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.
- Up to six detection zones per camera view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the EIA232 port. The zone shall also have the capability to calculate and store average speed and lane occupancy at bin intervals of 10 seconds, 20 seconds, 1 minute, 5 minutes, 15 minutes, 30 minutes and 60 minutes.
- In addition to the count type zone, the VDP shall be able to calculate average speed and lane occupancy. These values shall be stored in non-volatile memory for later retrieval.
- The VDP shall have an "advance" zone type where detection outputs to the traffic controller are compensated for angular occlusion and distance.
- The VDP shall employ color overlays on the video output.

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TRAFFIC SIGNAL SPECIFICATIONS

SHEET 5 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

- The VDP shall have the ability to show phase status (green, yellow, or red) for up to 8 phases. These indications shall also be color coded.
- The user shall have the ability to enable or disable the display of the phase information on the video output.
- For alpha numeric user inputs, the VDP shall utilize a virtual keyboard on the video overlay system to ease user input. The virtual keyboard shall use the standard QWERTY keyboard layout.
- The VDP shall aid the user in drawing additional detection zones by automatically drawing and placing zones at appropriate locations with only a single click of the mouse. The additional zone shall utilize geometric extrapolation of the parent zone when creating the child zone. The process shall also automatically accommodate lane marking angles and zone overlaps.
- When the user wishes to modify the location of a zone, the VDP shall allow the user move a single zone, multiple zones or all zones simultaneously.
- When the user wishes to modify the geometric shape of the zone, the VDP shall allow the user to change the shape by moving the zone corner or zone sides.
- On screen zone identifiers shall be modifiable by the user. The user shall be allowed to select channel output assignments, zone type, input status, zone labels or zone numbers to be the identifier.
- For multiple camera input VDPs, the user shall have the ability to enable automatic video output switching. The dwell time for each video input shall be user programmable.

2.30.1.4 VDS Camera Sensor

To accommodate deployment flexibility, the VDS camera sensor shall be compatible will all VDP platforms identified in Table 1. The VDS camera sensor shall be supplied by the VDS manufacturer.

- The advanced camera enclosure shall utilize Indium Tin Oxide (ITO) technology for the heating element of the front glass. The transparent coating shall not impact the visual acuity and shall be optically clear.
- Cable terminations at the camera for video and power shall not require crimping or special tools. The video termination shall only require a coax stripper and a screw driver. No connectors (e.g. BNC) shall be required. The power termination shall only require a standard wire stripper and screw driver.
- The camera sensor shall allow the user to set the focus and field of view either at the camera sensor or from the controller cabinet. Camera sensor control from the controller cabinet shall communicate over the coaxial cable. No additional wires shall be required.
- The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.003 lux to 10,000 lux.
- The camera electronics shall include automatic gain control (AGC) to produce a satisfactory image at night.
- The imager luminance signal to noise ratio (S/N) shall be more than 50 dB with the automatic gain control (AGC) disabled.
- The imager shall employ three dimensional dynamic noise reduction (3D-DNR) to remove unwanted image noise.
- The camera imager shall employ wide dynamic range (WDR) technology to compensate for wide dynamic outdoor lighting conditions. The dynamic range shall be greater than 100 dB.
- The camera shall be digital signal processor (DSP) based and shall use a CCD sensing element and shall output color video with resolution of not less than 540 TV lines. The color CCD imager shall have a minimum effective area of 811 (h) x 508 (v) pixels.
- The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with an auto-iris lens that operates in tandem with the electronic shutter. The electronic shutter shall operate between the range of 1/60th to 1/90,000th second.
- The camera shall utilize automatic white balance.
- The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.
- The horizontal field of view shall be adjustable from 2.4 to 58 degrees. This camera configuration may be used for the majority of detection approaches in order to minimize the setup time and spares required by the user. The lens shall be a 27x zoom lens with a focal length of 3.25mm to 88.0mm.
- The lens shall also have an auto-focus feature with a manual override to facilitate ease of setup.
- The camera shall incorporate the use of preset positioning that store zoom and focus positioning information. The camera shall have the capability to recall the previously stored preset upon application of power.
- The camera shall be housed in a weather-tight sealed enclosure. The enclosure shall be made of 6061 anodized aluminum. The housing shall allow the camera to be rotated to allow proper alignment between the camera and the traveled road surface.
- The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 18" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.
- The enclosure shall be design so that the pan, tilt and rotation of the camera assembly can be accomplished independently without affecting the other settings.
- The camera enclosure shall include a proportionally controlled Indium Tin Oxide heater design that maximizes heat transfer to the lens. The output power of the heater shall vary with temperature, to assure proper operation of the lens functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.
- The glass face on the front of the enclosure shall have an anti-reflective coating to minimize light and image reflections.
- When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH. Measurement of satisfactory video shall be based upon VDP system operation.
- The camera shall be powered by 120-240 VAC @ 50/60 Hz. Power consumption shall be 5 watts typical and 25 watts or less under worst conditions.
- Recommended camera placement height shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.
- The camera shall provide 2 options for set up, diagnostic testing, and viewing of video. A lens adjustment module (LAM) supplied by the VDP supplier, when connected directly to the camera shall allow set up, diagnostic testing, and viewing of video while the camera is installed on a mast arm or pole. The (LAM) shall also allow set up, diagnostic testing, and viewing of the video from the cabinet when connected to the coaxial cable.
- The video signal shall be fully isolated from the camera enclosure and power cabling
- Cable terminations at the camera for video and power shall not require crimping tools.
- A weather-proof protective cover shall be provided shall be provided to protect all terminations at the camera. No special tooling shall be required to remove or install the protective cap.

2.30.1.5 Installation

- The hybrid coaxial power cable to be used between the camera and the VDP in the traffic cabinet shall be per Manufacturer specifications. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. BNC plug connectors shall be used where applicable. The cable, BNC connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.
- The power cabling shall be 16 AWG three-conductor cable with a minimum outside diameter of 0.325 inch and a maximum diameter of 0.490 inch. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if necessary.
- The video detection camera shall be installed by factory-certified installers as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.

2.30.1.6 Warranty

- The supplier shall provide a limited three-year warranty on the video detection system.
- During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.
- During the warranty period, updates to VDP software shall be available from the supplier without charge.

2.30.2 Color Video Detection Camera w/o Connectors

This specification sets forth the minimum requirements for cameras that are to be used by video detection systems

2.30.2.1 Video Detection Camera

- Video detection cameras used for traffic detection shall be furnished by the video detection processor (VDP) supplier and shall be qualified by the supplier to ensure proper system operation.
- The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 1.0 lux to 10,000 lux.
- The imager luminance signal to noise ratio (S/N) shall be more than 50 dB.
- The camera shall be digital signal processor (DSP) based and shall use a ¼ inch EX view hole accumulation diode (HAD) CCD sensing element and shall output color video with resolution of not less than 530 TV lines. The CCD imager shall have a minimum effective area of 768 (h) x 494 (v) pixels.
- The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with an auto-iris lens that operates in tandem with the electronic shutter.
- The camera shall utilize automatic white balance.
- The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.
- The horizontal field of view shall be adjustable from 4.6 to 46.0 degrees. This camera configuration may be used for the majority of detection approaches in order to minimize the setup time and spares required by the user. The lens shall be a 10x zoom lens with a focal length of 4.2 mm to 42.0 mm.
- The lens shall also have an auto-focus feature with a manual override to facilitate ease of setup.
- The camera shall incorporate the use of preset positioning that store zoom and focus positioning information. The camera shall have the capability to recall the previously stored preset upon application of power.
- The camera electronics shall include automatic gain control (AGC) to produce a satisfactory image at night.
- The camera shall be housed in a weather-tight sealed enclosure. The enclosure shall be made of 6061 anodized aluminum. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.
- The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 18" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.
- The enclosure shall be design so that the pan, tilt and rotation of the camera assembly can be accomplished independently without affecting the other settings.
- The camera enclosure shall include a proportionally controlled Indium Tin Oxide heater design that maximizes heat transfer to the lens. The output power of the heater shall vary with temperature, to assure proper operation of the lens functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.
- The glass face on the front of the enclosure shall have an anti-reflective coating to minimize light and image reflections.
- When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH. Measurement of satisfactory video shall be based upon VDP system operation.
- The camera shall be powered by 120-240 VAC @ 50/60 Hz. Power consumption shall be 30 watts or less under all conditions.
- Recommended camera placement height shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.
- The camera shall provide 2 options for set up, diagnostic testing, and viewing of video. A lens adjustment module (LAM) supplied by the VDP supplier, when connected directly to the camera shall allow set up, diagnostic testing, and viewing of video while the camera is installed on a mast arm or pole. The (LAM) shall also allow set up, diagnostic testing, and viewing of the video from the cabinet when connected to the coaxial cable.
- The video signal shall be fully isolated from the camera enclosure and power cabling
- Cable terminations at the camera for video and power shall not require crimping tools.
- No BNC or other connector shall be used for the coaxial video cable termination at the camera.
- The power connection at the camera shall use connector terminations that only require the use of wire strippers and a standard screwdriver. No special crimping tools or other types of terminations shall be used.
- A weather-proof protective cover shall be provided shall be provided to protect all terminations at the camera. No special tooling shall be required to remove or install the protective cap.

2.30.2.2 Installation

- The hybrid coaxial power cable to be used between the camera and the VDP in the traffic cabinet shall be per Manufacturer specifications. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. A BNC plug connector shall be used at the cabinet end. The coaxial video cable shall be stripped and terminated at the camera and cabinet per manufacturers' instructions (no BNC or other connector shall be used at the camera). The coaxial cable, BNC connector used at the cabinet termination, and crimping tool shall be approved by the supplier of the video detection system. The manufacturer's instructions must be followed to ensure proper connection.
- The power cabling shall be 16 AWG three conductor cable with a minimum outside diameter of 0.325 inch and a maximum diameter of 0.490 inch. The power cable shall be terminated at the camera per manufacturers' instructions and shall only require standard wire strippers and a screw driver for installation (no special connectors or crimping tools shall be used for installation). The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if necessary.
- The video detection camera shall be installed by factory-certified installers as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.

2.30.2.3 Limited Warranty

- The supplier shall provide a limited three-year warranty on the video detection camera. See suppliers standard warranty included in the Terms and Conditions of Sale documentation.
- During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

2.30.3 Rack Mounted Video Detection Single Point Interface Ethernet Device with MPEG/H.264 Video Streaming

This specification sets forth the minimum requirements for a module that provides a single point interface to multiple rack-mounted video detection units. This module shall also have the capability to stream up to 4 simultaneous video streams over an Ethernet interface.

2.30.3.1 Functional Capabilities

- The interface device shall provide capabilities to enable multiple rack-mounted video detection processors to be locally and remotely accessed from a single point via one set of user interface devices. User interface devices are defined as a pointing device (mouse or track-ball) and video monitor.
- Up to four video detection processor chains (video detection processor and extension modules) shall be accommodated.
- The device shall allow the operator to switch video output display for any of the attached rack-mounted video detection processors by pressing a momentary switch or by using the remote access software.
- Local user access to video detection programming shall be limited to the detection processor unit that is currently being displayed on the monitor.
- All local programming and setup parameters for the video detection processor shall be user accessible through the interface unit without requiring the user to swap user interface cables between video detection processors.
- Remote access to the device shall be through the built-in Ethernet port or EIA-232 port via access software running on a Microsoft Windows based personal computer.
- An internet browser-based remote access firmware shall also be available for remote setup and diagnostics of the interface unit.
- The interface unit shall support streaming video technology using MPEG4 and H.264 standards to allow the user to monitor video detection imagery over the Ethernet interface. Motion JPEG streaming video shall not be allowed.
- The user shall be able to select which video input to be displayed on the output video monitor by repeatedly depressing the menu button.
- The user shall be able to select a quad view of all of the four cameras simultaneously on the output video monitor by depressing the menu button.
- The interface unit shall allow four independent streams, one from each video detection processor, to be transported via Ethernet to four independent streaming video players simultaneously in CIF resolution.
- The interface unit shall also have a browser interface that allows the user to configure the module.
- The browser interface shall also allow the user to view the streaming video on the browser interface.
- The browser interface shall allow the user to select the resolution of the displayed streamed video.
- The interface unit shall support the streaming and display of D1, CIF, QCIF, VGA and QVGA video resolutions in a single stream or four concurrent streams in CIF resolution.
- The interface unit shall allow the user to select a quad-view of all four input video signals to be shown on the browser interface.
- The interface unit shall allow the user to manage the unit's Ethernet bandwidth usage by allowing the user to select the maximum bandwidth limit between 256 kbps and 7.0 Mbps.
- The browser interface shall allow the user to change the unit's Ethernet network settings of IP address, subnet mask and default gateway.
- The interface unit shall allow the user to upload new application firmware through the use of the browser interface.
- Access to the interface unit shall be under password control and the browser interface shall allow the user to change the password.
- The interface unit shall have the capability to perform IP port redirecting between the remote management software and each attached video detection processor. A unique IP port number shall be assigned for each video detection interface. The port number shall not be identical to the web browser interface of 80.

BY	REVISIONS	DATE

TRAFFIC SIGNAL SPECIFICATIONS

SHEET 6 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

2.30.3.2 Interface Device Hardware

. The interface device shall be specifically designed to mount in a standard TS-1, TS-2, and 170 type detector rack, using the edge connector to obtain power. No adapters shall be required to mount the interface device in a standard detector rack.
. The interface device shall occupy no more than two slots in the detector rack and shall provide a loop-type handle for easy installation and removal.
. The interface device shall be powered by 12 or 24 volts DC and shall not consume more than 6.25 watts. The unit shall automatically compensate for the different input voltages and shall be hot-swappable.
. The interface device shall operate in a temperature range from -35°C to +74°C and a humidity range from 0% RH to 95% RH, non-condensing.
. Video Ports - The interface unit shall accommodate a maximum of four composite video inputs and one video output.

. Video inputs and video output shall be made via BNC connectors to ensure secure connections. RCA or other straight friction plug-in type connections shall not be allowed. Video inputs shall use a vendor supplied "octopus" cable to accommodate the four video inputs. Provisions shall be made to accommodate the mating cable to utilize jack screws for securing the octopus cable.
. The interface unit shall accommodate either monochrome or color video signals conforming to NTSC or PAL video standards.
. The interface unit shall automatically sense the video input signal and configure the video output port to either NTSC or PAL standards. Each video input signal shall be separately sensed to allow mixed video signals.

. The interface unit shall interface with up to four video detection processors using RJ-45 interface connectors.
. The interface unit shall support the use of USB pointing devices. The unit shall support either a USB mouse or trackball. Pointing devices shall not require vendor specific pointing device software drivers.
. An EIA-232 communications port shall be provided for local and remote access. The connector for this port shall be a 9-pin "D" subminiature connector on the front of the interface unit. Provisions shall be made to accommodate mating cables to utilize jack screws for securing cables.
. Hi-intensity LED status lights shall be provided to facilitate system monitoring. Indicators shall be provided to show the status of the internal processor, video lock and indication of which video input is being monitored.
. An Ethernet port shall be integrated within the interface unit. The Ethernet port shall conform to 802.3 Ethernet specifications and shall auto-sense between 10 and 100 Mbps data rates. Industry standard TCP/IP (UDP and TCP packets) protocol shall be supported. The Ethernet connection shall be made through a RJ-45 connector.

2.30.3.3 Limited Warranty
. The supplier shall provide a limited three-year warranty on the video detection system. See suppliers standard warranty included in the Terms and Conditions of Sale documentation.
. During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

2.31 LOOP DETECTOR SYSTEM

Inductive loops are rarely used in current projects for the UG unless they are currently in use at a location and there are insufficient resources to upgrade to less intrusive detection methods. A typical rare occurrence for inductive loops may require recutting loops for existing detectors or provision of detector cards for existing loops that are to be reused. Since these are maintenance scenarios and there is a need to minimize inventory brands, BPU has standardized on two detector units. The LMD622 detector is used for standard presence operation. The LMD622t detector is used where extend and delay functionality is required. The specific detector card that may be required for a particular project will be defined on the plans. The cabinet wiring specifications above, indicate that TS-2 card rack installations are utilized.

2.32 WIRELESS BATTERY MAGNETOMETER VEHICLE DETECTION SYSTEM

This specification sets forth the minimum specifications for a system that detects vehicles on a roadway using battery powered magnetometers utilizing wireless communications to transmit detection information to the controller. The Wireless Battery Powered Magnetometer Vehicle Detection System (VDS) shall consist of one or more Vehicle Sensor Nodes (VSN) per lane, wireless repeaters (RP) mounted on the side of the roadway, one or more Access Points (AP) mounted on the side of the roadway, and Contact Closure (CC) and Extension (EX) Interface Card. Communications between the VSN and the AP shall be wireless.

2.32.1 Functional Capabilities
. The VSN shall detect a vehicle by measuring a change in the earth's magnetic field near the VSN caused by the vehicle (i.e. magnetometer type detection).
. The VSN shall transmit detection information within 125ms of a detected event.
. The VSN shall automatically recalibrate in the event of a detector lock.
. Each VDS system shall consist of one or more VSN's per lane located as identified on the intersection plans.
. Communications between the VSN and the AP shall be wireless.
. The RF link among the AP, RP, and VSN shall conform to the following:
. The RF link shall utilize an IEEE approved wireless communications protocol.
. Communications is allowed only in an unlicensed band.
. The VSN and RP shall be reconfigurable by a user over the wireless interface to avoid interference from other users of the communications band. A minimum of 16 channels shall be provided for this purpose.
. The RF link budget shall be 93dB or greater.
. The AP to VSN (or RP to VSN) RF range shall be at least 150 feet for an AP/RP installed at 24 feet above the roadway and at least 100 feet at 18 feet above the roadway.
. The RP to AP RF range shall be at least 750 feet when both units are installed 18 feet above the roadway.
. Each VSN shall transmit a unique identifying code.
. The VSN shall respond within 100 seconds when the AP is powered on.
. When no AP is present or is powered off, the VSN is not required to detect vehicles.
. The AP shall have the capability to transmit detection information to a 170, 2070, or NEMA traffic controller to provide real time detection information via a standard contact-closure based input shelf.
. The VSN, RP and AP shall be capable of accepting software and firmware upgrades.

2.32.2 VSN Hardware
. The VSN shall consist of a 3 Axis magnetometer, a microprocessor, a wireless transmitter and receiver, and a battery.
. The VSN components shall be contained within a single housing.
. The VSN housing shall NEMA 6P and IP68 standards.
. The VSN components shall be fully encapsulated within the housing to prevent moisture from degrading the components.
. The VSN shall be able to operate at temperatures from -37°F to +176°F.
. The VSN housing shall be capable of being installed in a 4" diameter 2-1/4" deep cored hole.
. The VSN shall be designed to operate from its battery for a period of 9 or ten years of life under normal traffic conditions after it is put into operation.
. As an option, the VSN shall be able to transmit the complete X-Y-Z magnetic signature of a vehicle, sampled at a minimum of 128 samples per second. In this mode, the VSN shall be designed to operate from its battery for a minimum of 1 year.

2.32.3 AP Hardware
. The AP shall be the communication hub of the sensor network.
. The AP shall be able to communicate to up to 24 VSN's.
. The AP shall be powered via 48V DC, 3W or via non-isolated external 10 to 15V DC, 2W power. Power shall be provided by the CC Contact Closure Card.
. The AP shall have at least one powering option that provides 1500V isolation and5KV surge protection.
. The AP shall operate in the -37°F to +176°F temperature range.
. The AP shall meet NEMA 4X and IP67 standards
. The AP shall weigh no more than 3 lbs.
. The AP shall communicate to the controller via the CC and optional EX Contact Closure Board(s).

2.32.4 Repeater Hardware
. If required, a RP shall be provided.
. The RP shall extend the effective communication range of the sensor to the AP an additional 750'.
. The RP shall be battery powered.
. The RP battery shall be field replaceable.
. The RP shall operate in the -37°F to +176°F temperature range.
. The RP shall meet NEMA 4X and IP67 standards
. The RP shall weigh no more than 3 lbs.

2.32.5 CC and EX Contact Closure Cards
. The CC and EX cards shall provide detector outputs to the controller.
. The CC shall communicate with the AP via an Ethernet cable.
. The CC and EX shall directly plug in to standard 170/2070 Input Files and NEMA detector racks.
. Each CC and EX cards shall provide up to 4 channels of detection.
. The CC and EX shall be able to provide pulse or presence detection outputs.
. The CC and EX card shall provide for up to 31 seconds of delay
. The CC and EX card shall provide up to 7.5 seconds of extension.
. The front panel of the CC and EX cards shall provide:
. Status LED's displaying
. Detection Channel Status
. Line Quality
. Fault Monitor
. Ten Configuration DIP switches to enable
. Presence or Pulse mode
. Delay
. Extension
. Rotary Switch to program time functions for delay and extension functions
. Two Ethernet style RJ45 connectors
. The CC and EX cards shall be powered by 11 to 26 VDC
. The CC card shall provide power to the AP over the Ethernet cable.
. The CC and EX cards shall be surge protected to GR-1089 standards
. The CC and EX cards shall operate -37°F to +176°F temperature range.
. The CC and EX cards shall operate in up to 95% humidity (non-condensing)
. The Access Box shall provide a communication link between the AP and CC.
. The Access Box shall provide the ability for remote communications.
. The Access Box shall have 3 Ethernet style RJ45 connectors.
. The Access Box shall not exceed 2-3/8" x 1-1/2" x 7/8" in size.

2.32.6 Configuration Software
. The VDS shall include the software necessary to configure the VSN.
. The VDS shall include the software necessary to configure the RP.
. The VDS shall include the software necessary to configure the AP.
. The VDS shall include the software necessary to store and retrieve detection data.

2.32.6 Configuration Software
. The VDS shall include the software necessary to configure the VSN.
. The VDS shall include the software necessary to configure the RP.
. The VDS shall include the software necessary to configure the AP.
. The VDS shall include the software necessary to store and retrieve detection data.

2.32.7 Limited Warranty
. The supplier shall provide a limited two-year warranty on the detection system.
. During the warranty period, technical support shall be available from the supplier via telephone within 24 hours of the time a call is made by a user, and this support shall be available from factory-authorized personnel or factory-authorized installers.
. During the warranty period, standard updates to the software shall be available from the supplier without charge.

2.33 2 WIRE ACCESSIBLE PEDESTRIAN SIGNAL (APS)

The Audible-Tactile Pedestrian Signal System shall consist of all electronic control equipment, mounting hardware, push buttons and signs, which are designed to provide both a push button with a raised vibrating tactile arrow on the button, along with a variety of audible sounds for different pedestrian signal functions.

The System shall be manufactured by an ISO 9001:2008 registered company. The System shall meet the requirements of Made in America and/or The Buy American Act.

2.33.1 Design Compliance
Substantiating documentation for meeting ISO, NEMA, IEC, and FCC requirements must be supplied from an outside Testing Services Laboratory.

. The System shall meet the functionality requirements of MUTCD 2009 4E.
. The System shall meet NEMA TS 2 Section 2.1 Temperature & Humidity requirements.
. The System shall meet NEMA TS 2 Section 2.1 Transient Voltage Protection requirements.
. The System shall meet NEMA TS 2 Section 2.1 Mechanical Shock and Vibration requirements.
. The System shall meet IEC 61000-4-4, IEC 61000-4-5 Transient Suppression requirements.
. The System shall meet FCC Title 47, Part 15, Class A Electronic Noise requirements.
. The Push Button Station (PBS) Enclosure shall meet NEMA 250 Type 4X Enclosure requirements.
. The Central Control Unit (CCU) & Ped Station Monitor (PSM) Enclosures shall meet NEMA 250 Type 1 requirements.
. The System shall meet NEMA TS 4 Electrical Reliability requirements (applicable portions of Section 8).

2.33.2 Specifications - Accessible Pedestrian Signal Units
Ensure APS complies with US Access Board's "Draft Guidelines for Accessible Public Rights of Way (PROWAG) Section R306. In addition, ensure that the APS complies with and provides operation consistent with requirements of Sections 4E.09 through 4E.13 of the 2009 Edition of the Federal Highway Administration publication Manual on Uniform Traffic Control Devices.

Supply an APS (pushbutton station) that includes a pedestrian sign, a pushbutton, vibrotactile arrow, an ambient noise sensing microphone, and an audible speaker contained in one unit and with the following features:

. Vibrating tactile arrow with high visual contrast, located on the actual push button, not separate on the push button unit.
. PUSH BUTTON: ADA compliant with raised arrow on the button plunger. The arrow on the PBS shall be able to be changed to one of four directions.
. PUSH BUTTON: Uses Piezo switch technology rated to greater than 20 million operations.
. All audible sounds shall emanate from the PBS.
. Pushbutton locator tone with duration of 0.15 seconds or less, repeating at 1-second intervals. The pushbutton locator tones must deactivate when the traffic control signal is operating in a flashing mode. The locator tones must be intensity responsive to ambient sound and be audible (a maximum of 5 dBA louder than ambient sound) up to 6 to12 feet from the pushbutton or to the building line whichever is less.
. Optional Speech walk message for the WALKING PERSON (symbolizing WALK) indication.
. Optional Speech pushbutton information message.
. Audible tone walk indications consisting of ticks repeating at 8 to 10 times per second at multiple frequencies with a dominant component at 880 Hz ±20%. It must provide an audible walk indication during the walk interval only.
. The System shall provide two language capabilities, selectable by user (as a custom feature).
. The System shall provide Emergency preemption message in conjunction with a preemption system (selectable feature).
. LOCATE tone and "Walk", "Pedestrian Clearance" audible feature must have independent settable minimum and maximum volume limits.
. The System shall be able to be set to vibrate a tactile arrow button during the WALK interval following a button push and/or every time the walk comes up.
. The System shall have the field-selectable function known as "Locating Tone". This means that during the FLASHING DON'T WALK and the DON'T WALK intervals, the system shall provide a locating tone that emanates from the Pedestrian Push Button Station. The system shall provide at least three different sounds to choose from.
. The System shall have the field selectable function known as "Extended Push Activation". This means that the audible WALK message will only be activated and sound during the WALK interval if the button is depressed for a field selectable minimum period of time (from 0 to 6 seconds). Also, for the following walk phase, the volumes have a separately settable minimum and maximum volume level.
. The System shall have the field selectable function known as "Informational Message". This means that a custom message giving the location of the street to cross and the intersection (or other information) will be vocalized only when the button is depressed for a minimum field selectable time.
. The System shall provide a "Wait" message that plays once the button is activated until the walk cycle goes into effect. This message must have the field selectable option of OFF or playing every 4, 6, 8 or 10 seconds.
. The System shall have standard "Travel Direction" options that can be selected at the time of installation.
. The System shall have at least five field selectable walk sound options including a cuckoo, a chirp, a rapid tick or custom voice message.
. The System shall provide 3 Ped-clearance sound choices including audible countdown (field selectable). The audible countdown shall represent the time remaining during the pedestrian clearance interval. Timing is automatically adjusted to CLEARANCE INTERVAL timing.
. All sounds for all PBS s must be synchronized.
. The system shall have an ambient sensing microphone located in the pedestrian station in a non-visible, environmentally protected housing.
. Automatic volume adjustment in response to ambient traffic sound level provided up to a maximum volume of 100 dBA.
. The pushbutton must be ADA compliant and activate both the walk interval and accessible pedestrian signal.
. Actuation indicator-tone and light.
. Pushbutton station and Central Control Unit shall be rated for the following temperature range: -34C to +74C (-29F to +165F).
. CONFLICT WALK MONITOR: Circuitry shall have a separate microcontroller that independently monitors the main microcontroller outputs and Walk Mode for conflict condition, the PBS is reset in case of a conflict detection.
. Unless specified otherwise in the plans, supply a central control unit (CCU) for the pushbutton stations that resides in the Traffic Signal Controller Cabinet. Provide a CCU capable of controlling up to 4 pedestrian phases and 16 Pushbutton stations. Ensure that all inputs and outputs on the CCU have Transient Voltage Protection. Shall be provided with an interface connection board. Shall have Ethernet access to PBS s through the CCU to be able to change the settings of PBS as well as monitor the self-test Events of the PBS s and report back to the Central Control Station. Shall have internal memory to store a few hundred events with a date-time stamp for each event. Shall have an internal real-time clock capable of updating and synchronizing its time with an NTP server. Shall provide user settable information to the user including location, contact information and system name via SNMP protocol. Shall have the ability to send system Trap messages for any event logged in the system health log to up to three separate IP addresses using SNMP protocol. Shall provide a user settable calendar function allowing four separate configuration profiles to be configured to become active at different times of the day on a daily, weekly, or holiday basis.

2.33.3 Optional Desirable Features
. The firmware and voice messages shall be upgradeable via a PC standard USB port at the PBS. There shall be no requirement for the IC chips or module hardware to be removed or exchanged in order to complete a firmware update.
. Use of field replaceable fuses is unacceptable. All fuses and overload protection circuits shall be solid state, and self-resetting in the event of overload.
. All field selectable options shall be set and adjusted using a vendor supplied infrared remote programmer or Laptop USB port, without use of potentiometer or hardware adjustments. All USB adjustments shall include a Windows XP/7/Vista PC-based program with password security.
. The system shall work with the vendor Windows XP/7/Vista PC-based program to allow time of day (TOD), week, month & holiday programming, with a minimum of 4 TOD alternate programs.
. The system shall have an event tracking log, accessible via the vendor's Windows XP/7/Vista PC-based program, to allow downloading of the time stamped event data.

2.34 FIBER OPTIC HUB CABINET

Fiber optic hub cabinets shall be provided in two different configurations defined as "Single Wide" and "Double Wide" as specified by the plan documents.

All cabinets shall be of welded construction, fabricated of 0.12" natural aluminum with no sharp edges or burrs and shall offer a clean, workmanlike appearance.

Single wide cabinets shall be provided with front and rear doors which shall occupy almost all of the front and rear of the cabinet to allow unrestricted access to the cabinet interior. Cabinets shall have approximate overall dimensions of 64" H X 24¼" W X 20¼" D. The rear door shall include louvers and an air filter to allow for ventilation.

BY | REVISIONS | DATE

TRAFFIC SIGNAL SPECIFICATIONS

SHEET 7 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

Double wide cabinets shall be provided with four doors occupying almost all of the front and rear portions of the cabinet. The cabinet shall have approximate overall dimensions of 66" H X 44½" W X 26" D. One door on both the front and rear of the cabinet shall be equipped with louvers and air filters for ventilation.

All doors shall be equipped with stainless steel hinges, three point latching mechanisms, stainless steel latch operator handles having means to allow the use of an external padlock and shall be fitted with "standard" traffic signal cabinet, Corbin style tumbler locks operated by standard 1R6380 traffic signal cabinet keys.

The roofs of both type cabinets shall include vent openings designed to preclude the entrance of water.

The interior of the cabinets shall be fitted with standard 19" EIA equipment racks. Single wide cabinets shall include one equipment rack. Double wide cabinets shall include two equipment racks. Racks shall provide equipment mounting facility for essentially the entire height of the cabinet.

All cabinets shall include thermostatically controlled vent fan (s) ; one in the case of single wide cabinets, two for double wide cabinets. Fan (s) shall be mounted to removable panels located under the previously described roof vents. Fans shall be ball bearing type rated at 100 CFM.

The tops of each type cabinet shall be fitted with front and rear fluorescent lights controlled by door operated refrigerator switches. All doors shall be equipped with these switches which shall provide power to the front or rear light as appropriate.

All cabinets shall include a power distribution panel mounted between the front and rear rails at the bottom of the equipment rack. The power distribution panel shall include a heavy duty, three position, pressure type terminal strip for the connection of incoming AC power; a safety ground connection, a lightning arrestor, a 30 amp main circuit breaker, a GFI duplex service power receptacle and two duplex equipment receptacles. A 15amp circuit breaker shall control power to the GFI service receptacle only; a second 15 amp circuit breaker shall control power to the equipment receptacles, cabinet lights and fan (s) .

The lightning arrestor shall be of the hybrid type rated at 20,000 amps and capable of clamping such a surge to a peak of not greater than 250 volts without regard for the rise time of the surge. The arrestor shall be totally of solid state design, with no gas tube type devices of any kind and shall be a two stage unit providing separate protection for the controller and monitor unit. It shall incorporate a base or socket portion which shall permanently mount to the power distribution panel. The arrestor device itself will plug connect to that base to allow for rapid replacement in the event the arrestor is damaged by a lightning strike. A minimum 200 microhenry inductor shall be incorporated between the equipment line in and equipment line out terminals. The arrestor shall be epoxy encapsulated in a flame retardant material. The arrestor shall also include indicator lights to signify the condition of the arrestor, as well as a set of dry contacts which shall be wired to a "D" panel alarm input terminal to provide a remote notification of a failed arrestor. Lightning arrestor units shall mate with EDCO base / socket module model SHA1250-BASE.

All cabinets shall include a pull out type plan drawer providing approximately 1½" of storage space mounted to the equipment rack as high as practical. All cabinets shall include a rack mounted power bar assembly having a minimum of eight outlets spaced and oriented such that all outlets will be available for use with "cube" style equipment power supplies.

Equipment racks shall be fitted with fiber optic distribution / termination housing and splice housings.

The following complement of fiber optic components, listed from top to bottom, shall be provided in each rack:
CCH-04U, CSH-03U, CCH-04U, CSH-03U, CCH-04U, CSH-03U
All components shall be spaced to allow unrestricted access to all pull out trays, drop down doors etc.

Each CSH-04U shall include a full complement of twelve, CCH-CP06-19T six position bulkhead connector panels having ceramic ST type connectors suitable for use with both single mode and multi- mode fiber optic conductors.

Each CSH-03U shall include a full complement of eight M-67-048 splice trays.

All cabinets shall include anchor bolts.

2.35 ETHERNET NETWORK SYSTEM COMPONENTS

Ethernet Network System Components including Ethernet switches and other related materials and equipment are not defined in these general specifications. When required, these items will be defined in special conditions for each specific project. For projects that do require expansion or modification of the Ethernet Network, a qualified System Integrator with qualified personnel will be required to program such devices and activate them on the network. This work must be in coordination with BPU Electrical Engineering Department and the UG's Department of Technology Services.

2.36 ADVANCED TRAFFIC MANAGEMENT SYSTEM (ATMS) and INTELLIGENT TRANSPORTATION SYSTEM (ITS)

ATMS and ITS items such as Pan/Tilt/Zoom cameras, messaging systems, traffic responsive systems and traffic adaptive systems are not defined in these general specifications. When required, these items will be defined in special conditions for each specific project. Such systems will require the use of a qualified System Integrator who has knowledge of the existing ATMS / ITS system and how to integrate new deployments into the existing systems.

2.37 SPAN WIRE ASSEMBLIES: All messenger cable, tether cable, guy wire, down guy anchors and cable clamps shall conform to the requirements of the Standard Drawings or as may be listed on the accompanying plans or in a Special Provision. All wood span wire poles shall be as noted in the accompanying plans.

2.38 SIGNS: All permanent traffic signing and traffic control signing shall conform to the requirements of the Manual on Uniform Traffic Control Devices. All signs shall be fabricated from standard aluminum blanks utilizing super engineer grade or high intensity grade reflective sheeting as called for the accompanying plans.

2.39 OVERHEAD STREET NAME SIGNS: Overhead street name signs shall be provided and installed on all mast arm poles. These signs shall be constructed of 0.125-inch aluminum sheeting of the size and indicated on the plans. All sign faces shall be diamond grade VIP reflective sheeting. ~~All sign legends shall be 8 inch uppercase series C letters or numbers and shall be white in color.~~ All signs shall have a white 0.75-inch wide border and shall have green back-grounds. All signs shall have the legends centered on the face. Letter spacing shall be 100 percent and the lateral spacing to the vertical borders and spacing between words shall be 100 percent of the spacing in the outlined in the Federal Highway Administrations publications Standard Alphabets For Highway Signs. Actual sign drawings of the proposed signs shall be field located and drilled. Signs shall be mounted to the mast arms using stainless steel banding and clams using a bolt with a fiber washer. During final tightening of the bolt, the fiber washer shall be held in place so that it does not turn with the bolt. Improper tightening of the bolt will result in sign face damage.

2.40 SHOP DRAWINGS: Before commencing the installation of the Traffic signal Installation, three (3) complete sets of schedule of materials and equipment proposed for installation shall be submitted for the approval of the engineer. This schedule shall include catalog cuts, diagrams, drawings, and the engineer may require other such descriptive data as may be required by the engineer. All submittals shall include the manufacturer brand name and part number where applicable. Where more than one item is present on a submittal sheet, the appropriate item or items shall be highlighted. All submittals shall be organized as much as practical in order with the summary of quantities sheet in the plans. Three submittal packages shall be provided with one complete submittal set in each packet. In the event any items of material or equipment contained in the schedule fail to comply with specifications requirements or items are not highlighted, or submittals are not packaged, such items may be rejected. New submittals on rejected items shall be supplied to the engineer for approval. The UG and/or BPU will review all shop drawings for approval prior to submittal to KDOT. When it is required by these specifications that a test be made of the materials to be used on the work, the contractor shall furnish the Engineer a certified copy as such material. When any reference is made in these specifications to any specifications such as ASTM, IPCEA, IMSA, AIEA, AIEE, etc., or a related specification referred to by reference therein, or revision thereof which states that a certain test, or tests are to be made at the Contractors expense and three certified copies of the same be furnished as above mentioned.

2.41 Maintenance and Support

- The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.
- The supplier shall maintain an ongoing program of technical support for the interface unit and video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on-site technical support services.
- Installation or training support shall be provided by a factory authorized representative.
- All product documentation shall be written in the English language.

3. CONSTRUCTION REQUIREMENTSOF TRAFFIC SIGNAL SYSTEMS

3.1 SCOPE:
This section governs the installation and construction of the traffic signal installation. The Contractor shall be responsible for all facets of construction whether specially mentioned or not to complete the traffic signal installation in accordance with the plans and specifications. Construction shall include but not to be limited any excavation, forming, trenching, sawing, equipment installation, material placement, traffic control and project area restoration. All work shall conform to line, elevation and grades as shown on the plans or as directed by the engineer. In so much as possible, all construction shall conform to the latest accepted industry standards utilizing equipment that is appropriate for the construction task.

Whenever any parts of the plans shall be in conflict with any part or parts of the plans, or any parts of the specifications or any of the items proposed to be constructed shall appear to be impracticable, or impossible to construct, then the matter shall be immediately brought to attention of the Traffic Engineer. Her decision in the matter shall be final and the contractor shall follow her directions to avoid any such conflict in the plans or specifications.

Where the term " Traffic Engineer" is used in this section, it shall mean the Engineer in charge of construction or her duly authorized representative.

3.2 ORDER OF WORK:

3.2.1 Within twenty days following execution of a contract, the Contractor shall submit to the engineer for approval the shop drawings as required in Section 2.35 of this specification.

3.2.2 A preconstruction conference shall be held with the Contractor and the Engineer as directed by the engineer.

3.2.3 At the earliest possible time all electrical conduit, service boxes and junction boxes shall be installed at the correct grade.

3.2.4 At the earliest possible time, all pole foundations shall be installed at the correct grade.

3.2.5 The signal assembly, including signal heads, shall be erected no more than ten working days before the traffic signal installation in fully operable to perform the signal displays as set forth in this project. Traffic signal heads shall remain covered with ORANGE bags during construction until the entire installation is placed in operation. Black bags shall not be used to cover the new signal heads during construction. Traffic signal heads shall remain covered during construction until the entire installation is placed in operation. Signal heads are to be covered to convey to drivers that they are not operational, as approved by the engineer.

3.2.6 The induction loops may be installed at any time, provided they have been in place for at least three weeks prior to final contract acceptance.

3.2.7 The contractor is hereby advised that the work to be done shall be completed with full knowledge of the schedule made available to the engineer. The Traffic Engineer may, at her option, cause work completed without his knowledge or inspection, to be dismantled and inspected.

3.2.8 Any requested the engineer or her representatives must approve deviation from the "Order of Work" established herein must be approved by the engineer or his representatives.

3.2.9 Locating of Utilities

In addition to the above and prior to any construction, The contractor shall be responsible for locating all utilities whether above, on, or below the ground and to protect the city against any and all damages arising from the contractors failure to have utilities located and exercise due care when working near utilities. The contractor is notified that all existing utility information, including any existing traffic signal equipment locations, were obtained from existing office record and that prior to any excavation, the Contractor shall have all locations verified in the field by the respective utility companies.

No new fixture shall be constructed as part of this contract which is in contact with any existing utility facility, or the code required thereby, unless approved by the engineer.

3.2.10 Notification of Property Owners

The contractor shall notify each property owner at least one day in advance of construction activity being started in front of the respective property.

3.2.11 Contractor Requirements

The contractor shall have a copy of the plans and specifications at the job location at all times. All traffic signal installation work shall be done by, or in the presence of and under responsible charge of an employee of the Contractor who holds a Level II Traffic Signal Electrician or Level II Traffic Signal Technician certification which has been granted by International Municipal Signal Association.

3.2.12 Traffic Control

Traffic Control for this work shall confirm with the requirements of Section 1300 of the Technical Provisions & Standard Drawings, with the Manual on Uniform Traffic Control Devices (MUTCD) and with the requirements of the Plans. No deviation from these standards is allowed without written permission of the Engineer.

3.3 CONSTRUCTION REQUIREMENTS

3.3.1 Service Boxes:

Service boxes shall be installed as shown on the plans and on the Standard Detail sheets and at such additional points at the Contractor, at his own expense and with the approval of the Traffic Engineer, may desire to facilitate work. Unless otherwise directed by the Traffic Engineer, all service boxes shall be installed level to 1 inch above the finish grade.

3.3.1.1 CMP Service Boxes:

CMP service boxes shall be installed at the location shown on the plans and as shown on the Traffic Signal Detail sheets and as such point as the Contractor, at his own expense, may desire to facilitate the work. An 8-inch layer of aggregate shall be provided under all service and junction boxes for drainage as shown on the Traffic Signal Detail sheets in the plans. Unless otherwise directed by the Traffic Engineer, all service and junction boxes shall be installed level to 1 inch above the finish grade. After conduits are inserted into the service boxes, the extra space around the conduits is to be filled with spray foam to prohibit infiltration of water or soil.

3.3.1.2 Polymer Concrete Composite Service Boxes:

Polymer Concrete Composite service boxes shall be installed at the location show on the plans and as shown on the Traffic Signal Detail sheets. An 8-inch layer of aggregate shall be provided under all service boxes for drainage as shown on the Traffic Signal Detail sheets in the plans. Due to the size of these boxes and the need to make them ADA compatible, the contractor shall stake all four corners of the boxes. Boxes shall not be installed until the profile and pitch of these boxes is approved by the Traffic Engineer.

Polymer Concrete Composite Service Boxes shall be installer prior to installation of conduits. Slotting of these boxes for the purpose of accommodating conduit is prohibited in order to maintain the structural integrity of the boxes and to keep soil from infiltrating the box. Holes for conduits shall be core drilled into the sides of the boxes as approved by the engineer.

Holes for conduits for mainline optical fiber are to be aligned in such a manner as to allow the conduit to be installed through the box and 20 feet beyond as shown on the standard drawings. The conduit inside the service box will not be removed until fiber is ready to be installed. When long-line conduit is installed, the through-box conduit will be placed such that it can be fusion coupled to the long-line conduit. Mainline optical fiber conduit shall enter service boxes 18-inches below the top of the box.

After conduits are inserted into the service boxes, the extra space around the conduits is to be filled with spray foam to prohibit infiltration of water or soil.

3.3.1 Conduit:

Conduit shall be installed as shown in the plans and Traffic Signal Detail sheets and in conformance with appropriate articles of the National Electric Code.
The size of the conduit shall be as shown on the plans. It shall be the privilege of the Contractor, at his own expense, to use larger size conduit if desired; and where larger size conduit is used. It shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted.

Conduit for optical fiber shall be bored at a depth of 48 inches below final grade of the ground, street, driveway, or sidewalk it is placed under. This conduit shall maintain a constant 48-inch depth. This will be proved by installing and toning a trace wire. This conduit is intended for long run backhaul fiber that will be used by BPU and the UG. BPU will be installing high count fiber in this conduit at a later date.

Conduits shall be kept clean during the installation process. In the event the contractor allows soil or boring sludge to contaminate the inside of the conduit, the Engineer will determine whether the conduit will be completely cleaned or replaced. Conduit must maintain the lubricated condition it was provided in for the purpose of installing fabric inner-duct and/or multiple optical fiber runs that will be installed independently over time.

Subsidiary to conduit installation and conditional for payment for conduit work is the installation of nylon pull rope in conduits for metallic cable and mule tape along with trace wire in conduits intended for optical fiber cable. Even if the project includes installation of cable the pull rope, mule tape, and trace wire must be installed and approved prior to cable installation. Contractor shall demonstrate to the Engineer the ability of pull rope and mule tape to move readily. Trace wire must have continuity and will be used to prove the depth of installation of conduit for optical fiber.

3.3.2 Excavations

The Contractor shall perform all excavations for installation underground conduits, cable, boxes, and pole based in whatever substances encountered, to the depths indicated on the drawings or as otherwise approved. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the excavation to avoid slides. Excavated materials shall be kept off sidewalks and out of the street where possible. Excavated material that is piled on sidewalks or in streets shall be removed by the end of the same working day. The Contractor shall pile excavated materials such that drivers visibility will not be obstructed. All excavated materials not required or unsuitable for backfill shall be removed and wasted on a site obtained by the Contractor. Excavations and trenches shall not be larger or wider than necessary for the proper installation of foundations or electrical appliance. Excavation shall not be performed until immediately before the installation of conduit, bases, or other appliances. All excess excavated material shall be removed at the earliest possible time or as directed by the Engineer.

3.3.2 Backfill & Compaction

All areas excavated shall be backfilled and compacted in accordance with these Specifications. Backfill shall be deposited in not over 6" layers and tamped to 95 percent density +/- 3 percent of optimum moisture. The top 6 inches of backfill shall be select soil suitable for sodding. All areas excavated shall be backfilled at the earliest possible time or as directed by the Engineer. After backfilling, all disturbed area shall be kept well filled and maintained in a smooth and well drained condition until permanent repairs are made. Where trenches are excavated in established sod areas, the area shall be backfilled the same day excavation occurs by a method approved by the Engineer. Approved methods are intended to reduce damage to the established sod area.

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TRAFFIC SIGNAL SPECIFICATIONS

SHEET 8 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	KCK	DRAWN:	B&McD
CHECKED:	B&McD	DATE:	3/20/2017
SCALE:	N/A	SHEET NO.:	

3.3.3 Pavement Restoration

Pavement restoration for conduit placement across streets and driveways and within parkways shall be done in compliance with Section 2100 - Trenching & Tunneling, Section 2250 - Utility Patch Requirements, Section 3300 - Asphalt Repairs, Section 4000 Concrete Materials and Methods, and Section 4100 - Concrete Pavement and Flatwork of the Unified Government Engineering Department Technical Provisions and Standard Drawings. Trenching of pavements will not be allowed without prior approval from the Public Works ROW Manager. The approval process includes submittal of detailed plans for cutting and restoration and also requires issuance of a permit. When pavement must be cut, the subgrade, base pavement, and surface pavement will all be benched separately in accordance with UG Engineering Department Standards.

3.3.4 Pole Foundations

The bottom of the concrete foundations shall rest on firm ground; foundations shall be poured monolithic except the top 6" pole cap. The exposed portions shall be formed to present a neat appearance. Forms shall be true to line and grade. The top of concrete foundations, except special foundations, shall be finished to either sidewalk grade or 1 inch above grade, as directed by the Traffic Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position, to proper heights, and held in place by means of a template until the concrete sets. Each anchor bolt shall be provided with 2 hex head nuts, 2 flat washers, and 1 lock washer. Both forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete. All conduits shall be secure covered prior to pouring concrete. All threaded portions of anchor bolts shall be taped during the concrete pour. Any concrete splashed on poles when pouring the pole cap shall be immediately cleaned off.

Anchor bolts shall be placed in templates such that the bottoms of the leveling nuts will be 2 inches above the top of the finish grade for the concrete foundation cap. Foundation cap shall be edged with an edging tool or shall be formed with chamfer except for the side adjacent to sidewalk when the foundation cap is to be flush with the sidewalk for ADA purposes.

3.3.5 Cabinet Foundations

The bottom of the cabinet foundations shall rest on firm ground. Foundations shall be poured monolithically. The exposed portions shall be formed to present a neat appearance. Forms shall be true to line and grade. The top of cabinet foundations shall be finished to the elevation show on the plans or as directed by the Traffic Engineer. Forms shall be rigid and securely braced in place. Conduit ends shall be placed in proper position, to proper heights, and held securely in place until the concrete sets. Both forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete. All conduits shall be secure covered prior to pouring concrete.

Cabinet foundation tops are generally 18-inches maximum above sidewalk or curb grade. The top edges are to be formed with chamfer strips. Foundation tops shall be finished smooth. Any honeycombing shall be filled. Any rough edges or corners shall be rubbed smooth with carborundum stones.

Sidewalk steps for cabinet foundations shall be edged with an edging tool or shall be formed with chamfer strips except for the side adjacent to sidewalk when it is to be flush with the sidewalk for ADA purposes.

3.3.5.1 Controller Cabinets
For controller cabinets, conduits shall be bundled together in the center of the concrete base. They shall be configured in such a way as to not interfere with proper connections of cables to the back-panel of the cabinet.

3.3.5.2 Double-wide Optical Fiber Termination Cabinets
For double-wide optical fiber termination cabinets, there is a divider wall running down the center of the cabinet. The concrete base is to be visualized in two cells. The conduits that are designated for each cell are to be bundled in the center of that cell - as shown on the standard drawings.

3.3.6 Installation of Wiring

Installation of wiring shall be in accordance with the plans and specifications and appropriate articles of the National Electric Code, and the recommendations of IMSA. In addition, allowable pulling tensions on wiring in conduits shall be as per the cable manufacturer s recommendations. Approved pulling lubricants shall be used when pulling wiring in conduits. No splicing of cables will be allowed, except where loop cables are spliced to home-run cables. Cover the entire splice area with water tight connections. Connection must be inspected and approved by a BPU traffic signal technician.

A minimum of one (1) turn of each cable shall be left in every service box for slack. In addition, slack shall be left in all poles and the controller cabinet. All slack cable shall be neatly dressed using nylon cable ties.

Bonding jumpers shall be No. 6 AWG bare copper wire or equally connected by approved clamps. Grounding of neutral at service point shall be accomplished as required by the National Electric Safety; Code, except bonding jumpers shall be No. 6 AWG or equal. Ground electrodes shall be provided at each signal pole and pedestal and at the controller as detailed on the plans. The control requires an equipment ground as indicated on the Standard Detail sheets in the plans.

3.3.7 Installation of poles and pedestals

All poles and pedestals are to be installed as shown in the plans and the Standard detail sheets. All attachments are to be located in the field and all wire entrances shall be drilled or punched in the field. All drilled or punched surfaces shall be carefully reamed and/or deburred or threaded as appropriate before an application of one field coat of cold galvanizing. The Engineer shall confirm the location and mounting heights of all pole and pedestal attachments located in the field.

Should field adjustments of any attachment be necessary after the Engineer confirms the locations, the Contractor shall be responsible for plugging any holes caused by the initial installation. Hole plugging methods shall be approved by the Engineer.

Mast arms on mast arm poles shall be installed after the mast arm poles are erected.

3.3.8 Installation of Signal Heads

Signal heads shall be installed as shown on the plans and the Standard detail sheets. The Traffic Engineer shall approve the location, mounting, and mounting height of all signal heads. Signal heads shall not be installed at any intersection until all other signal equipment, including the controller cabinet, is in place and ready for operation at the intersection, except that the signal heads may be mounted if the faces are not directed towards traffic
(refer to the beginning of 'ORDER OF WORK')

The signal heads shall be adjusted in the field such that a person standing on the pavement, a distance of four times the speed liming (mph) in feet (0.8 times the speed from the stop bar,) shall see the brightest image of the red section. All heads shall be plumbed as viewed from the direction in which the face.

3.3.9 Installation of Loop Detectors

3.3.9.1 Loop detector installation shall conform to the details and notes shown on the plans and the Standard Detail sheets. All loop conductors shall be wound in the same direction with the start and end clearly marked on the conductors at the service box. Conductors of all loops shall run continuous to and from the nearest service box.

3.3.9.2 When construction of a loop is started, it shall be completed the same construction day. Should the Contractor start a loop installation and fail to satisfactorily completed, the entire loop may be subject to replacement at the discretion of the Engineer. Construction of loop shall only be started when the ambient air temperature is 40 degrees F. and rising.

3.3.9.3 Saw cuts for loop wires shall be made with a self-propelled saw with a water-cooled blade. The water is used to cool and lubricate the blade and eliminate blowing saw dust. Water shall be provided by the Contractor. All jagged edges or sharp corners and protrusions shall be removed using a small chisel and hammer. The saw cut shall be cleaned to remove cutting dust, grit, oil, and other contaminates. The saw cut and entire loop area shall be flushed clean with water and dried with compressed dry air immediately after cutting. Care shall be taken during the cutting and cleaning operation to avoid blowing debris at passing pedestrians and vehicles or onto private property. All corners of loops will be drilled with 1.5 inch to 2 inch hole-drill to the depth of saw cut.

3.3.9.4 Installation shall conform to the details and notes as shown on the plans. Detector loop wire shall be one continuous wire with each partial loop to be in the configuration detailed on the plans. All loop conductors shall be wound in the same direction with the start and end clearly marked on the conductors at the junction or service box. Conductors of all loops to be operated shall be run continuous to the nearest junction or service box. The conductor wire between the edge of pavement and the junction box shall be twisted a minimum of 2 times per foot or per the manufacturer's recommendation to reduce signal interference. The loop conductors for each loop shall be spliced in the junction box or service box to the existing detector lead-in cable running from the box to a sensor unit mounted in the controller cabinet.

3.3.9.5 Wire shall be installed so as to minimize stress at corner locations. Wire shall be kept dry when installing in the saw slot and shall be inserted by use of a blunt, preferably nonmetallic, flat paddle. Backer rod shall be used to keep loop wire above slot bottom and to allow sealant to surround the loop wire. 1" lengths of closed cell polyethylene backer rod shall be installed every 2 feet to keep the wire properly positioned in the saw slot.

3.3.9.6 After conductors are installed in the slots cut in the pavement, the slots shall be filled with the approved sealant to within 1/8 inch of the pavement surface. The sealant shall be prepared and installed in accordance with the manufacturer's recommendations, as approved by the Traffic Engineer. The sealant shall be between 1-1/2 inches and 2-1/4 inches thick above the top conductor in the saw cut as determined by the saw cut depth and as indicated in the plans. Before setting, surplus sealant shall be removed from the adjacent road surfaces without the use of solvents.

3.3.9.7 The Contractor shall allow time to let the sealant set before opening the lane (s) to traffic. Approved absorbent material shall be spread over the sealant if traffic is allowed over the loop before the sealant is completely set, as determined by the Traffic Engineer.

3.3.9.8 Splices between loop wire and home-run cable:

The splice shall be made by the following method to be environmentally protected and watertight.
- Remove lead-in cable coverings and expose 4 inches of insulated wire.
- Remove insulation from each conductor of detector lead-in cable and scrape both copper conductors with knife until bright.
- Remove the plastic tubing from the loop wires for 1 1/2 inches.
- Remove the insulation from the loop wires and scrape both copper conductors with knife until bright.
- Wash the exposed copper conductors with turpentine spirits to clean the conductors.
- Connect conductors by a soldered "Western Union" type splice using either a butane torch with a soldering tip or an electric soldering iron.
- Seal with heat shrink tubing over individual wire splices and also over the entire splice with larger heat shrink tubing. Heat shrink tubing needs to be placed on the wires prior to soldering.
- Cover the entire splice area with sealing compound patch per manufacturer's instructions.

3.3.9.9 Testing of loop wire as required for acceptance
Each detector loop shall be tested as a condition of acceptance. Successful testing at the junction box and controller cabinet must be completed before installing sealant. Operation of the loop shall be confirmed by checking the signal at the controller box. If the loop detector is not properly signaling the controller box when triggered, the Contractor shall provide corrective measures to fix the problem to result in a fully functioning loop detector. The Contractor shall test the following parameters for each loop and provide copies of test results to the Traffic Engineer.

- Loop Resistance: Tested with an ohmmeter to approximately the calculated value determined by wire gauge and length of wire.
- Induced Voltage: Acceptable if there is no deflection of the pointer on a voltmeter.
- Inductance: Tested at the junction box with a direct read inductance meter, the inductance in microhenries (uH) shall be approximately the calculated values determined by wire gauge and wire length.
- Leakage to Ground: Grounding with a 500ZV DC megger to confirm insulation resistance to ground is more than 100 megohms.

3.3.10 Video Detection Systems

3.3.10.1 The video detection system shall be installed according to the manufacturer's requirements and the Contract Documents. The Traffic Engineer shall be provided with three (3) copies of the manufacturer's written requirements. The video detection system configuration consists of the number of cameras and video detection systems shown in the Contract documents. The actual quantity and proposed location of the equipment to be furnished, installed, and made fully-functional as a complete video detection system by the Contractor is shown in the Plans. The supplier of the video detection system shall supervise the installation and testing of the video and computer equipment. A factory-certified representative from the supplier must be on-site during installation. In the event that the filed-setup computer is provided by the owner, the installation and testing shall be done at the time that training is conducted.

3.3.10.2 A two-year s manufacturer's warranty covering the entire Video Detection System shall be provided. The warranty period will begin upon acceptance of the video detection system by the Traffic Engineer. The warranty shall cover ongoing software support by the supplier to include updates of the video detection system processor unit, modular cabinet interface unit and supervisor software (if a field setup compute is required for setup.) These updates must be provided free of charge during the warranty period. The update of the video detection system software shall be compliant with NEMA TS2.

3.3.10.3 The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be made available to the owner in the form of a separate agreement for continuing support.

3.3.11 Pavement Sensor Systems

3.3.11.1 General Requirements:
All components of pavement sensor systems shall be installed in accordance with manufacturer's recommendations. Failure to follow manufacturer's recommendations will make components fail early or never function properly. The contractor is required to provide a 2 year warranty for materials and labor from the time of acceptance. Acceptance is determined by demonstration of the sensors ability to function as vehicle detectors, counting detectors, or system detectors within the TACTICS ATMS system.

It is a subsidiary requirement of pavement sensor systems to have the manufacturer, supplier, and/or a properly trained system integrator to program and tune the devices individually and collectively within TACTICS ATMS. If the sensors are only to function only as loop detectors, that functionality must be demonstrated through the TACTICS ATMS.

If the sensors are to function as counting detectors and/or system detectors, that functionality must be programmed into TACTICS and demonstrated to work through TACTICS including the printed report functionality. This includes the requirement to have optical fiber completely installed and network interface devices (including Ethernet switches) fully functional so that the TACTICS ATMS functionality and reporting can be fully implemented and demonstrated.

3.3.11.2 Repeaters and Access Points
Repeaters and Access Points must be installed precisely to manufacturer s specifications to assure they will function properly and for the intended life of the device. Improper connection of Cat 5e cable to the access points will cause water infiltration and voiding of the manufacturer's warranty. The Contractor will not be excused from his 2 year warranty if connectors are improperly installed.

Aiming of these devices is critical in order for the pavement sensors to be detected. The Contractor is required to work with the manufacturer and the supplier to make sure they are installed at proper locations and aimed properly.

3.3.11.3 Pavement Sensors
Pavement Sensors shall be installed in accordance with manufacturer s recommendations and the requirements of the standard drawings. The holes for the sensors shall be cut to precise dimensions in order to allow the epoxy to properly encapsulate the sensors. Holes shall not be overfilled with epoxy as overfilling will allow snow plow damage or the early demise of sensors in a rotomill and resurface scenario.

3.3.12 Signal Turn-on, Clean-up, & Acceptance

3.3.12.1 The signal turn-on shall be performed by BPU personnel and the Traffic Engineer. The Contractor shall be present for signal turn-on and be prepared to respond to any technical difficulties that may be encountered due to construction of the traffic signal.

The signal turn-on shall not occur on Fridays, holidays, or weekends and shall be completed between the hours of 9:00 am and 3:00 pm unless otherwise noted in the plans or directed by the Engineer. At locations without previous traffic signal control, or under all-way STOP control for any period of time, the new traffic signal shall flash for a period of two to three business days prior to full signal system turn-on. New signal turn-on shall not occur on Fridays, weekends, holidays, or the day before a holiday.

3.3.12.2 All traffic signal installation elements shall function properly as a complete system for a minimum period of fifteen (15) calendar days before acceptance by the City.

3.3.12.3 The fifteen (15) calendar day test period shall be continuous without malfunctions. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction and the text period shall not resume until all components are satisfactorily operating.

3.3.12.4 The Contractor shall be present to assist and participate in inspections of the traffic signal installation prior to final acceptance. Although BPU personnel may be present during inspections, determination of deficient items is solely the determination of the Engineer and the Contractor is responsible to the Traffic Engineer and NOT BPU for determination of what items must be corrected.

3.3.12.5 The work included in this project may involved modification of existing traffic signal equipment at locations which are presently controlled by operating traffic signals. If portions of the existing traffic installations are to be incorporated in the proposed signal installations, the following policies are to be observed during the installation of the proposed modifications and improvements:

3.3.12.6 The existing signal controls shall be kept in operation during installation of the proposed signal modifications and improvements, except for shutdowns to allow for alterations as required for installation of the proposed improvements. Any such disruption shall be requested in writing by the Contractor along with such supporting documentation as revised traffic control plans.

3.3.12.7 Some periods of disruption to existing signal operations can be tolerated during installation of the proposed improvements. However, the Contractor shall coordinate planned disruptions of signal operations with the Engineer a reasonable time in advance of such disruption of operations. Reasonable is defined as a minimum of 24 hours ahead of the required disruption. The Contractor shall be responsible for maintaining adequate traffic control during any period of disruption to the existing signal. During such times, the Contractor is required to hire off-duty KCK Police Officers to direct traffic during the signal outage.

3.3.12.8 Planned disruptions of signal operations shall be restricted during off-peak time periods as directed by the Engineer. The signal controls shall be operable during all other periods.

3.3.12.9 All existing wiring within existing controller cabinets shall be identified by the Contractor and each conductor properly labeled prior to de-energizing the existing controller to install the proposed modifications and improvements.

3.3.12.10 All existing salvageable equipment, as determined by the Engineer, (i.e. signal heads, lunimaires, poles, arms, controllers, and cabinets) that is in excess of the requirements of this project shall be completely removed from the project. The Contractor shall deliver same equipment to the Board of Public Utilities Traffic Signal Shop located at 6742 Riverview Avenue. The Contractor shall be responsible for any damage or loss of salvageable equipment. All new equipment purchased as spare parts under the requirements of this project shall be delivered new and undamaged to the Board of Public Utilities Traffic Signal Shop located at 6742 Riverview Avenue, and stockpiled as per the instructions of the Traffic Signal Supervisor. The Contractor shall exercise care in the removal and delivery of any existing or new equipment to be delivered to the City. All non-salvaged items of existing equipment shall become the property of the Contractor.

3.3.12.11 All concrete bases removed on this project shall be broken up and removed to a depth of twenty-four (24) inches below grade. Holes resulting from this operation shall be filled to the proper grade with suitable material approved by the Traffic Engineer.

3.4 METHOD OF MEASUREMENT:

"Traffic Signal Installation" as indicated on the plans, complete-in-place and accepted, will be measured as a unit lump sum quantity for all work necessary.

3.5 BASIS OF PAYMENT:

"Traffic Signal Installation", measured as provided above, will be paid for at the contract lump sum price bid, which price shall be full compensation for furnishing all equipment, materials, and all other work necessary or incidental to the construction of the complete traffic signal installation and for all equipment, tools, labor, and incidentals necessary to complete the work.

BY	REVISIONS	DATE

TRAFFIC SIGNAL SPECIFICATIONS

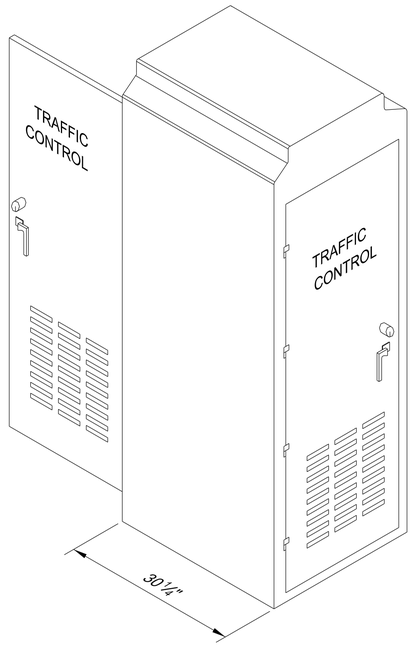
SHEET 9 OF 9

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

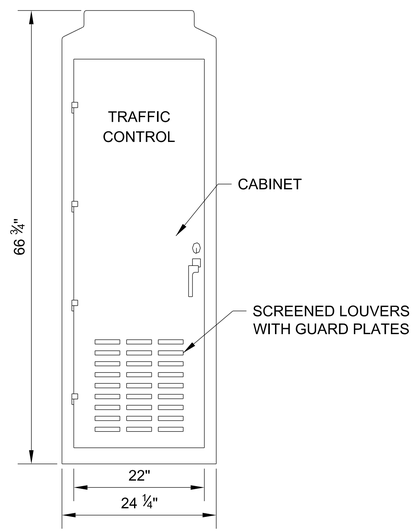
DESIGNED: KCK	DRAWN: B&McD
CHECKED: B&McD	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:

TYPE 170 CABINET DETAILS

(TYPE 332)

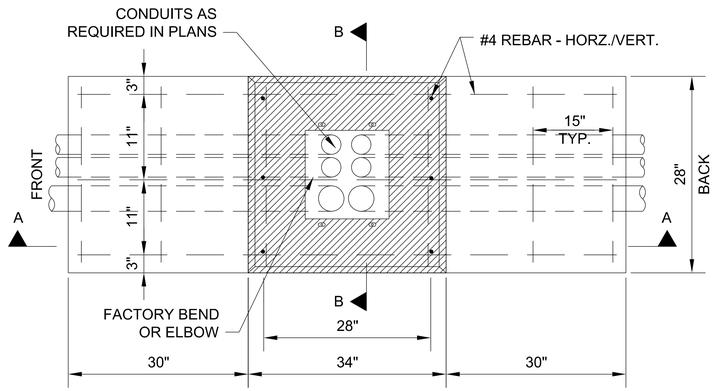


ISOMETRIC

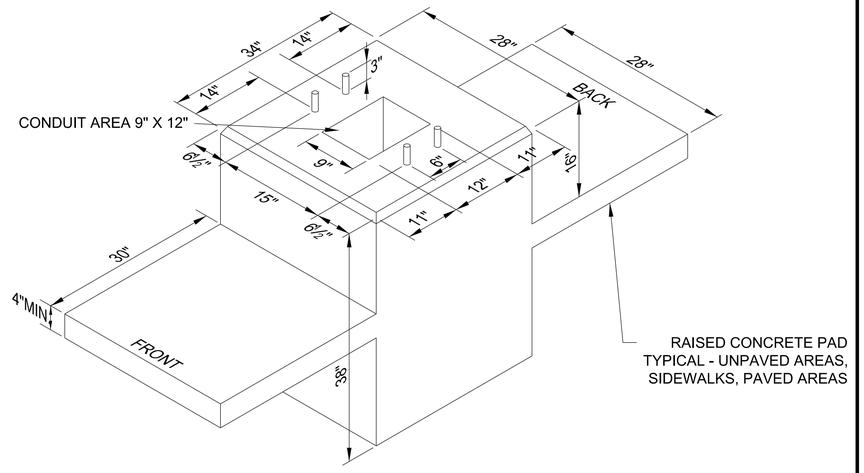


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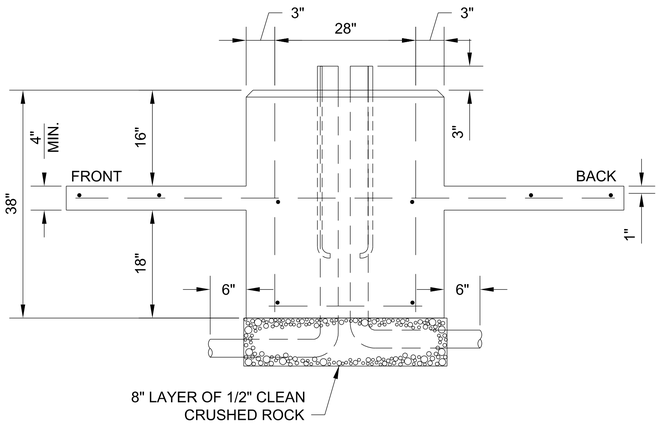
TYPE 170 SINGLE CABINET PAD BASE



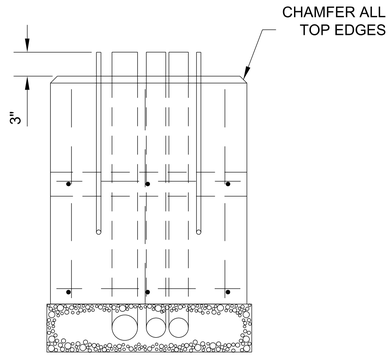
PLAN



ISOMETRIC



ELEVATION A-A



SECTION B-B

ITS CABINET PAD NOTES:

1. ALL CONDUITS SHALL BE RIGIDLY INSTALLED BEFORE CONCRETE IS PLACED.
2. TOP OF PAD TO BE SLOPED TO DRAIN.
3. A 1-c#6 SOLID COPPER SYSTEM GROUND CABLE SHALL BE INSTALLED THROUGH ONE OF THE PVC CONDUITS BETWEEN THE CONTROLLER AND CLOSEST SERVICE BOX.
4. DUCT SEAL SHALL BE APPLIED AT ALL CONDUIT ENTRANCES AFTER CABLE INSTALLATION.
5. A WATERTIGHT SEAL SHALL BE APPLIED ALONG THE INSIDE AND OUTSIDE EDGES OF THE CABINET WHERE IT ABUTS TO THE CONCRETE PAD.

DATE	REVISIONS	BY
4/27/2016	GENERAL DRAWING UPDATE	BAMcD

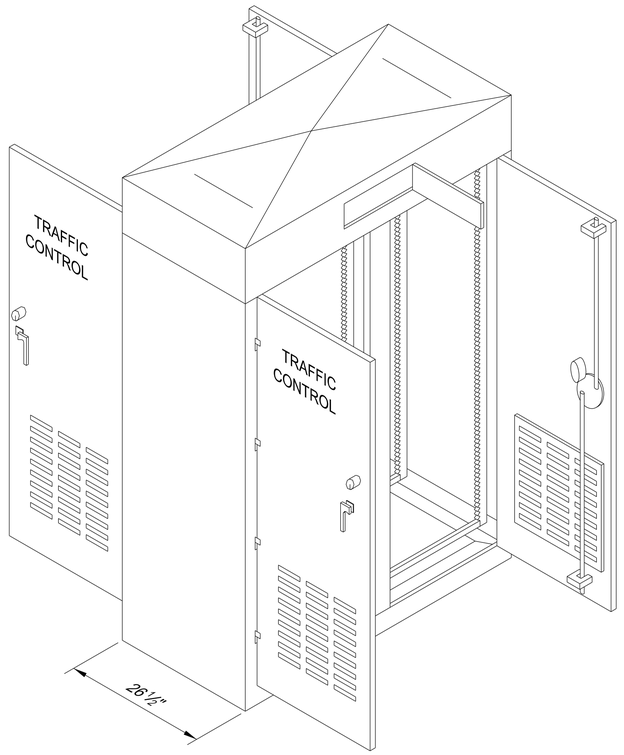
ITS SYSTEM DETAILS 1 OF 5

TYPE 170 CABINET AND SINGLE CABINET BASE DETAILS

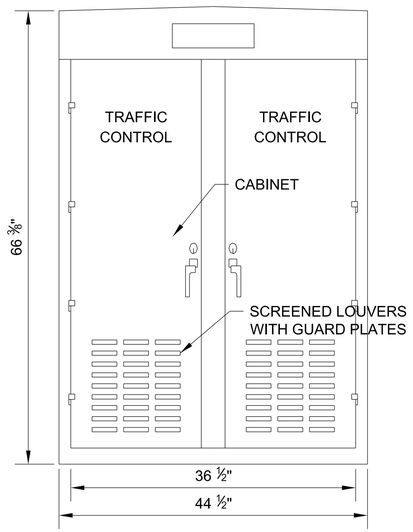
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 5/22/08
SCALE: N/A	SHEET NO.:

TYPE 170 DOUBLE WIDE CABINET

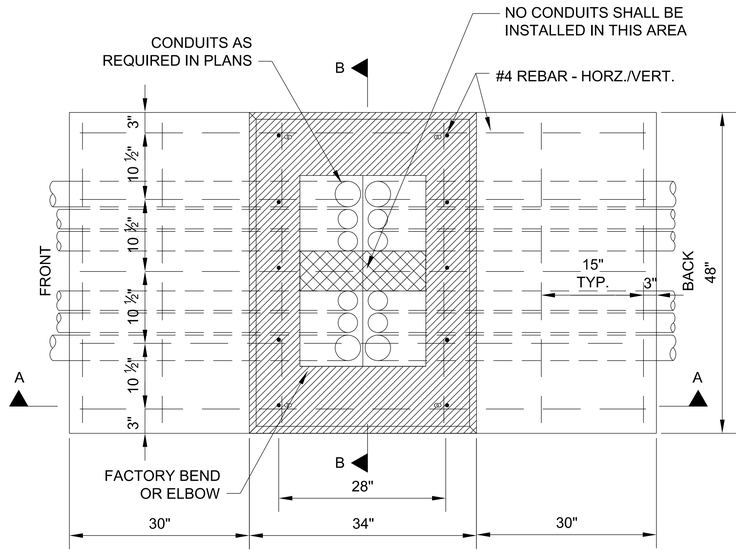


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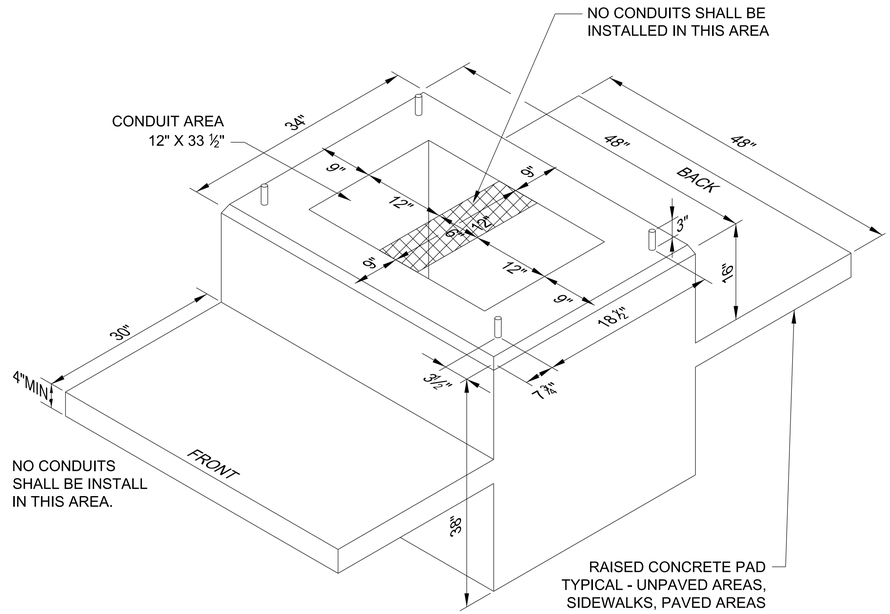


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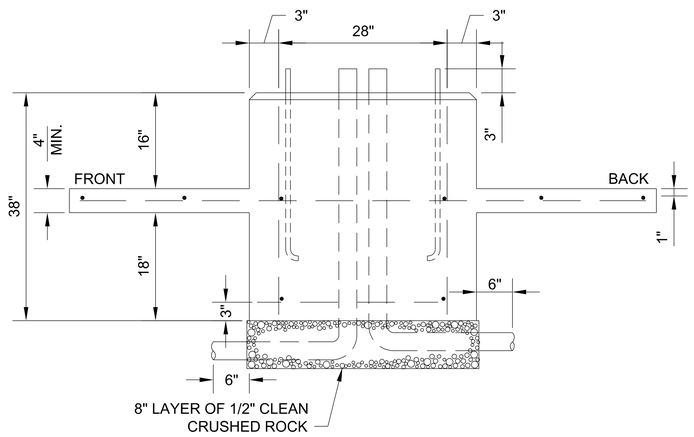
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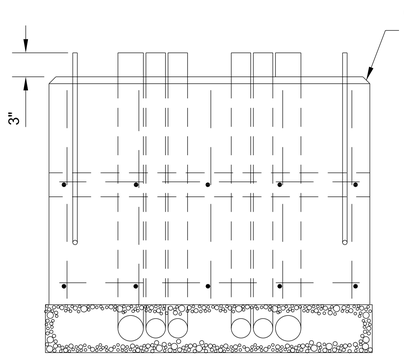
PLAN



ISOMETRIC



ELEVATION A-A



SECTION B-B

ITS CABINET PAD NOTES:

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REVISIONS	BY
GENERAL DRAWING UPDATE	BAMcD
DATE	
4/27/2018	

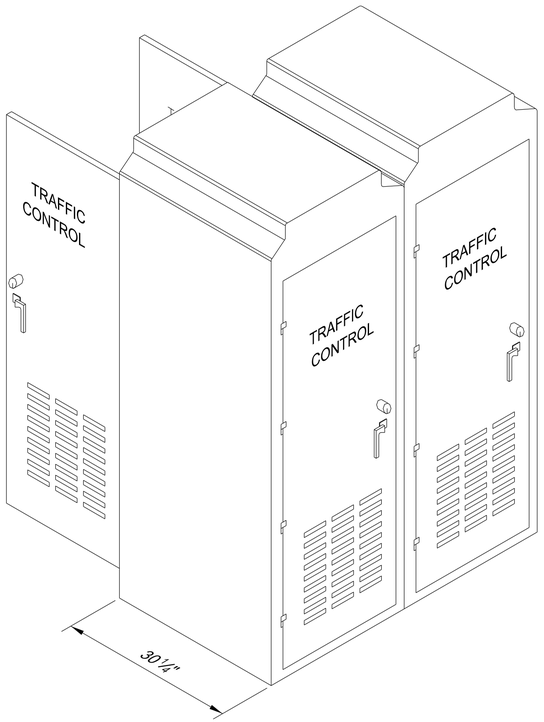
ITS SYSTEM DETAILS 2 OF 5

TYPE 170 DOUBLE WIDE CABINET AND BASE DETAILS

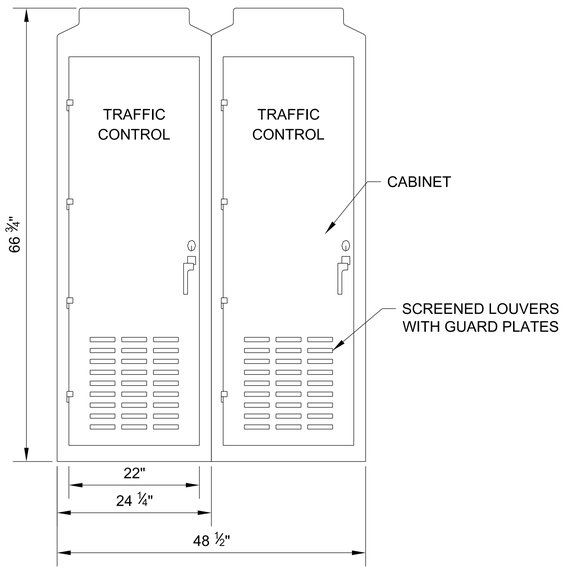
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	5/22/08
SCALE:	N/A	SHEET NO.:	

COMMUNICATIONS + 1 CABINET



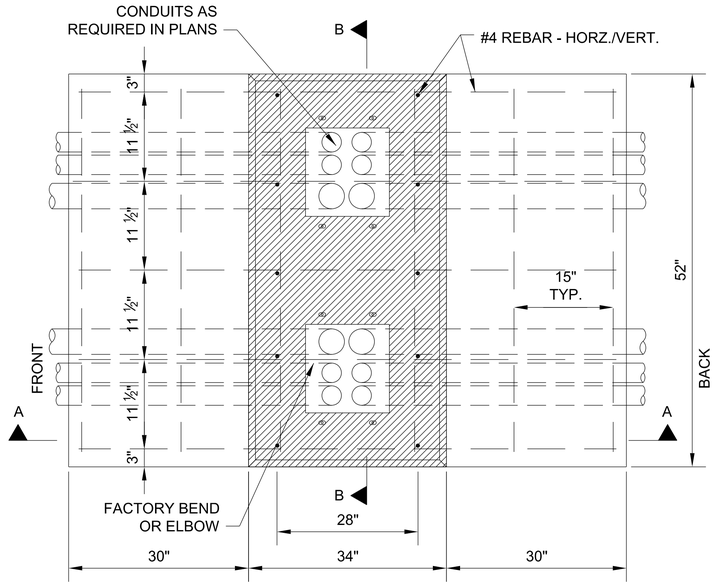
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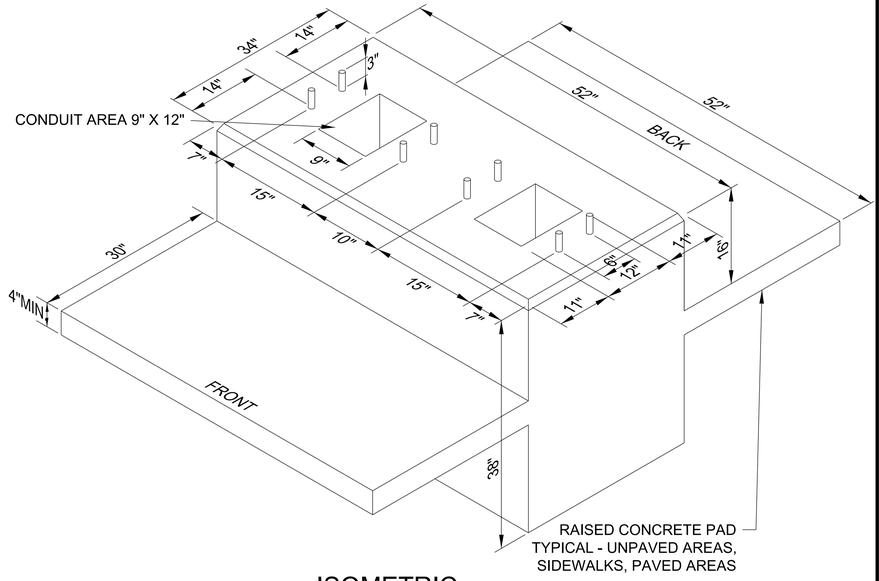
ELEVATION

* THIS DETAIL IS FOR TWO DISTINCT CABINETS. EACH SHALL HAVE SEPARATE GROUNDING PROVIDED THROUGH ITS PVC CONDUIT TO ITS NEAREST SERVICE BOX.

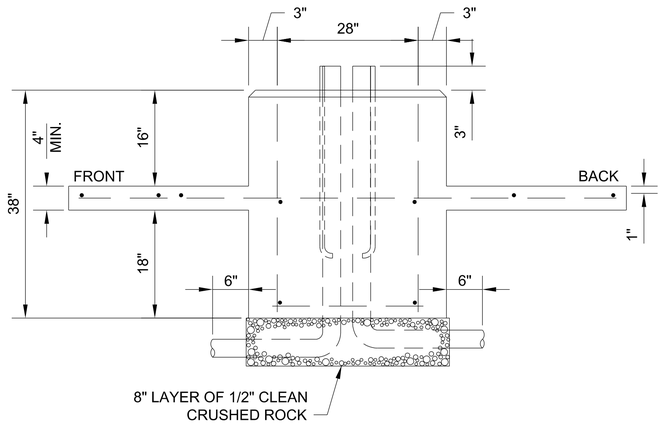
COMMUNICATIONS + 1 CABINET PAD BASE



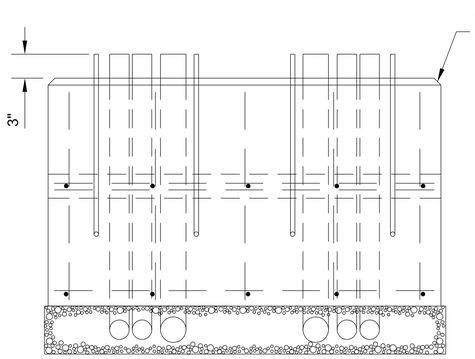
PLAN



ISOMETRIC



ELEVATION A-A



SECTION B-B

ITS CABINET PAD NOTES:

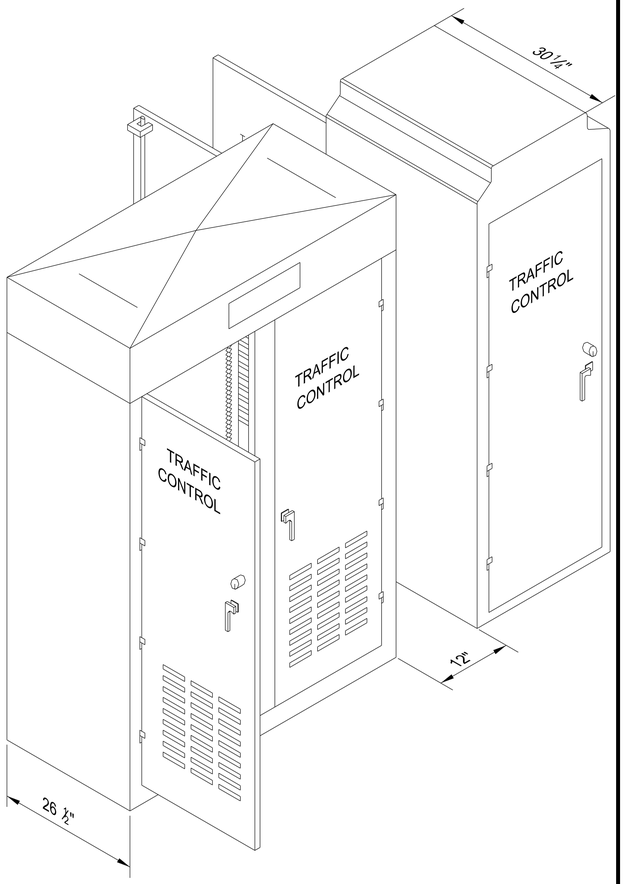
1. ALL CONDUITS SHALL BE RIGIDLY INSTALLED BEFORE CONCRETE IS PLACED.
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BY	REVISIONS	DATE
BMcD	GENERAL DRAWING UPDATE	4/27/2018

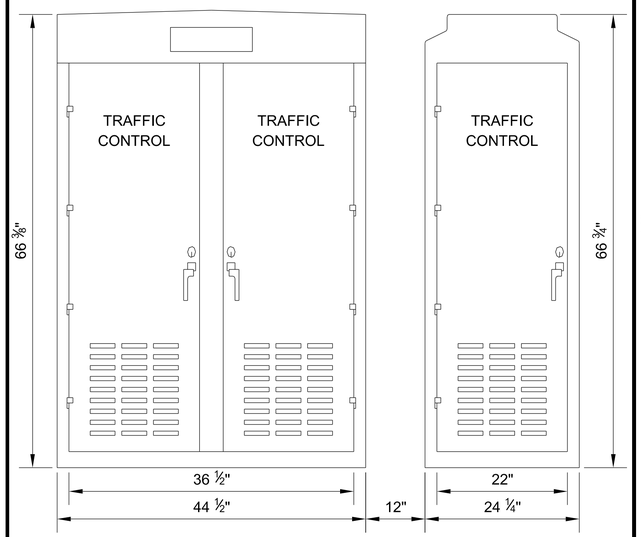
ITS SYSTEM DETAILS 3 OF 5
COMMUNICATIONS + 1 CABINET AND BASE DETAILS
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	5/22/08
SCALE:	N/A	SHEET NO.:	

TYPE 170 DOUBLE WIDE +1 CABINET



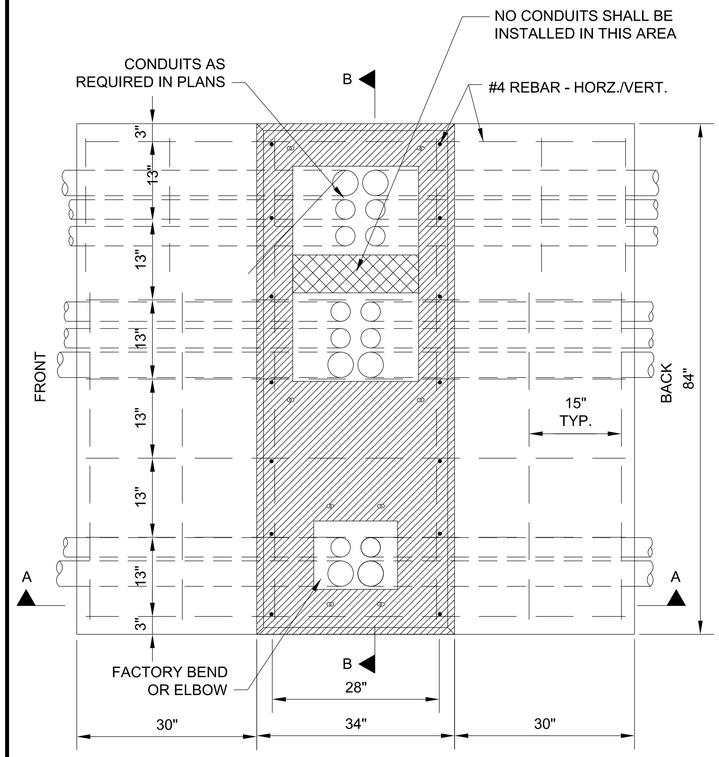
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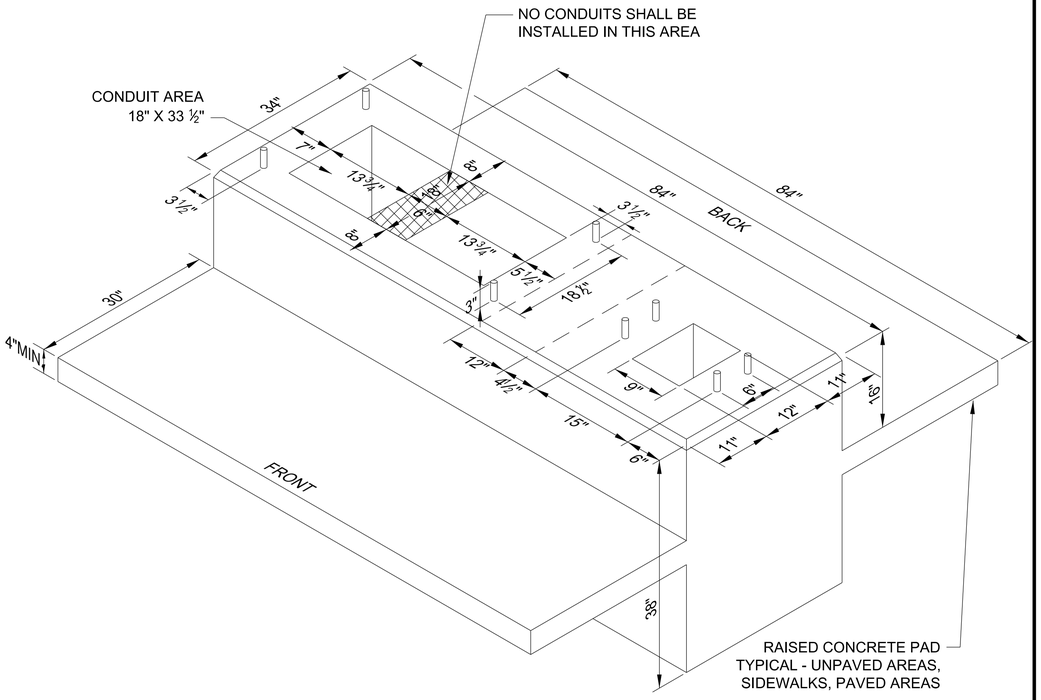
ELEVATION

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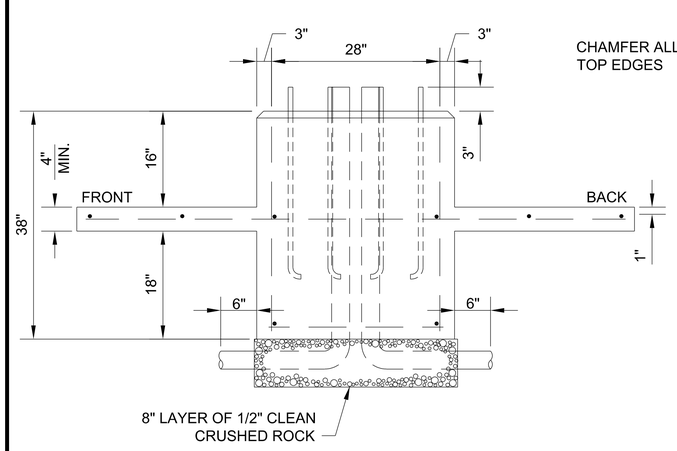
TYPE 170 DOUBLE WIDE +1 CABINET BASE



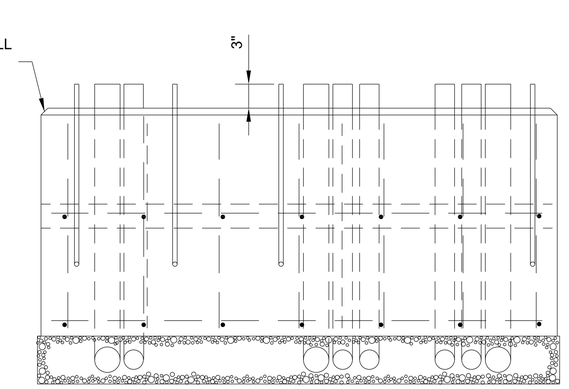
PLAN



ISOMETRIC



ELEVATION A-A



SECTION B-B

ITS CABINET PAD NOTES:

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BY	REVISIONS	DATE
BAMcD	GENERAL DRAWING UPDATE	4/27/2018

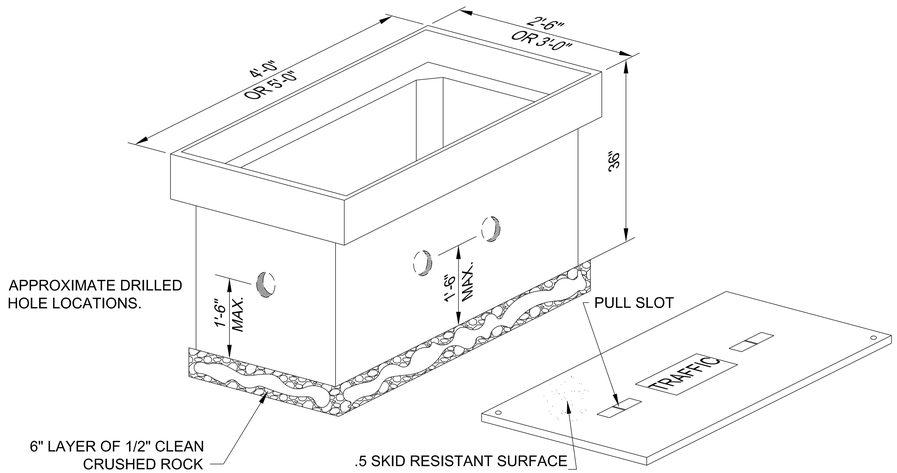
ITS SYSTEM DETAILS 4 OF 5

TYPE 170 DOUBLE WIDE + 1 CABINET AND BASE DETAILS

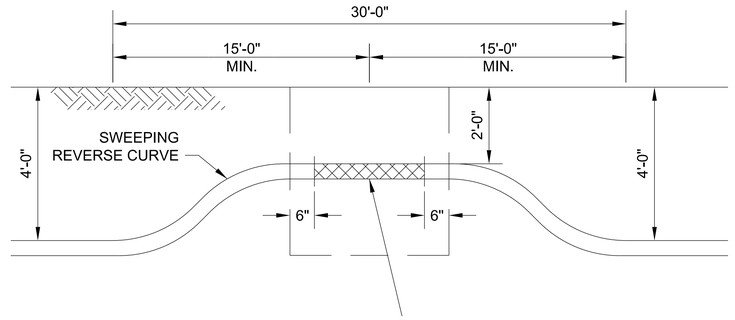
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 5/22/08
SCALE: N/A	SHEET NO.:

ITS SERVICE BOX DETAIL



ISOMETRIC



SECTION

NOTES:
1. ITS SERVICE BOXES SHALL BE ARMORCAST BRAND 30" X 48" OR 36" X 60" POLYMER COMPOSITES, STACKABLE FOR VARYING DEPTHS, RATED FOR 20,000 LBS. LOADING, AND WITH HEAVY DUTY COVERS MEETING DESIGN LOADS OF 22,500 LBS. MINIMUM. BOXES SHALL NOT HAVE BOTTOMS.

2. BOXES ARE NOT TO BE SLOTTED FOR PLACEMENT OVER EXISTING CONDUITS.

3. CONDUITS SHALL NOT BE ELBOWED UP FOR ENTRY THROUGH BOX BOTTOM.

4. ALL INTERCONNECT CONDUITS SHALL BE HDPE SDR 11, BLACK WITH THREE RED STRIPES.

5. AN 6 INCH THICK LAYER OF 1/2 INCH AGGREGATE SHALL BE PROVIDED UNDER ALL SERVICE BOXES

CONSTRUCTION PROCEDURE FOR OPTICAL FIBER SERVICE BOXES:
1. BOX SHALL BE SET TO LINE AND GRADE.

2. 20 FT LONG PIECES OF CONDUIT SHALL BE INSERTED THROUGH DRILLED HOLES TO FACILITATE FIBER PULLING. CENTER OF CONDUIT PIECES SHALL BE IN CENTER OF BOX.

3. CUT CONDUIT AT CENTER OF BOX AND PULL CONDUIT BACK OR REMOVE MIDDLE PORTION LEAVING 6" OF CONDUIT REMAINING IN THE BOX FOR BOTH ENDS OF CONDUIT. CONDUIT FROM BOX SHALL BE FUSION SPLICED TO MAIN LINE CONDUIT.

4. FIBER CONDUIT SHALL BE 24" DEEP AT THE BOX. FIBER OPTIC CONDUIT SHALL BE 48" DEEP BETWEEN BOXES.

5. FIBER CONDUIT MAY BE FUSION SPLICED TO MAIN LINE FIBER OPTIC CONDUIT, WHERE REQUIRED, A MINIMUM OF 10 FEET AWAY FROM CENTER OF BOX.

6. FIBER CONDUIT HOLES SHALL BE SEALED ON INSIDE AND OUTSIDE OF BOX.

DATE	REVISIONS	BY
4/27/2015	GENERAL DRAWING UPDATE	BMMD

ITS SYSTEM DETAILS 5 OF 5

SERVICE BOX DETAILS

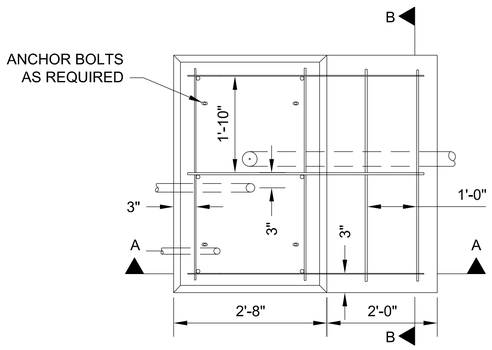
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 5/22/08
SCALE: N/A	SHEET NO.:

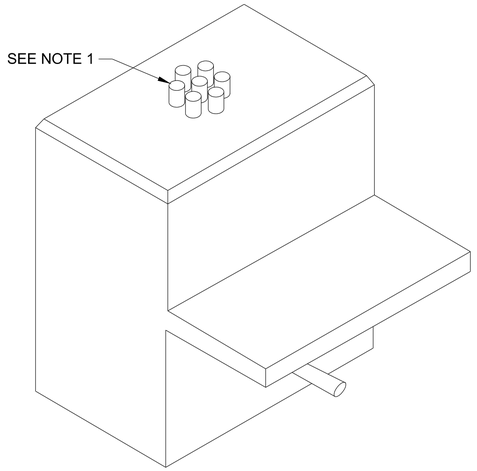
CONTROLLER PAD TYPE "P" OR "R" DETAILS

NOTES:
1) TYPICAL CABINET PAD INSTALLATIONS WILL HAVE 2-4", 2-3", 2-2", AND 1-1" SCH. 80 PVC CONDUITS RUNNING TO CABINET SERVICE BOX.

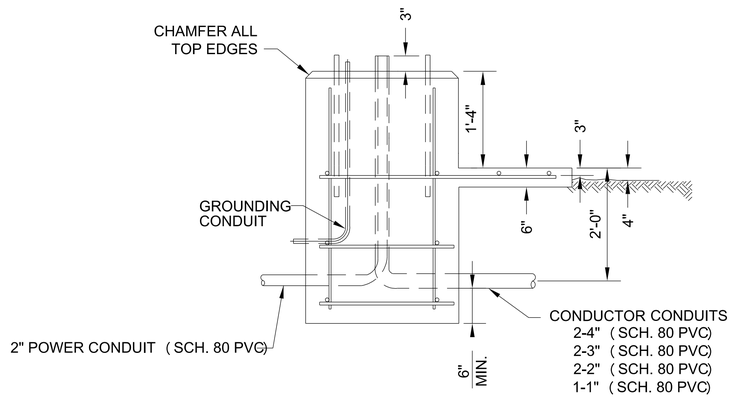
2) CONCRETE FOR PAD SHALL BE COMMERCIAL GRADE.



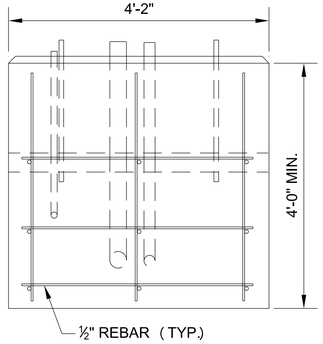
PLAN



ISOMETRIC

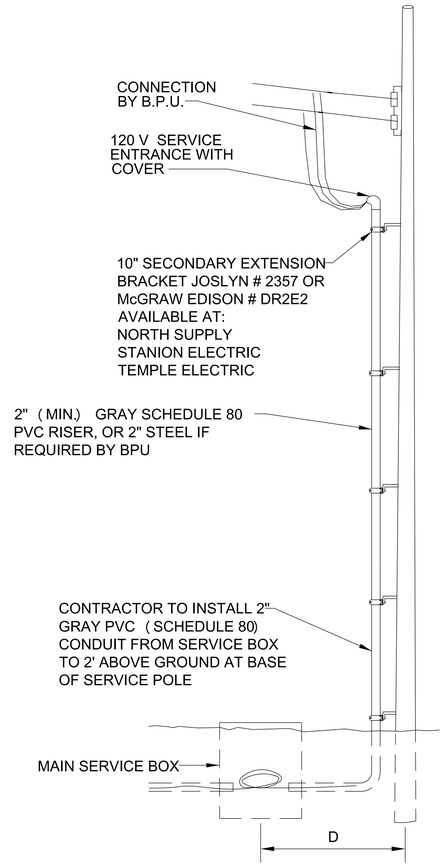


ELEVATION A/A



ELEVATION B/B

SECONDARY SERVICE DETAIL



2 URD DUPLEX OR TRIPLEX CABLE WILL BE INSTALLED FROM TRANSFORMER TO MAIN SERVICE BOX. CONTRACTOR IS RESPONSIBLE FOR INSTALLING POWER SERVICE CONDUIT AND CABLE FROM MAIN SERVICE BOX TO AND UP POLE INCLUDING RISER, STANDOFFS, ENTRANCE HEAD, AND ELECTRICAL ENCLOSURE (IF APPLICABLE) . CONTRACTOR TO LEAVE POWER CABLE UNCONNECTED AT ENTRANCE HEAD, BPU WILL COMPLETE CABLE HOOK-UP. CONTRACTOR TO COORDINATE RISER HEIGHT AND QUANTITY OF EXCESS CABLE AT ENTRANCE HEAD WITH BPU.

BY | REVISIONS | DATE

TRAFFIC SIGNAL DETAILS 1 OF 12

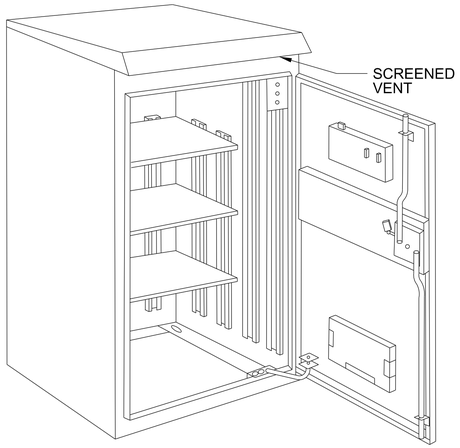
NEMA TYPE P AND R CONTROLLER BASE AND POWER DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

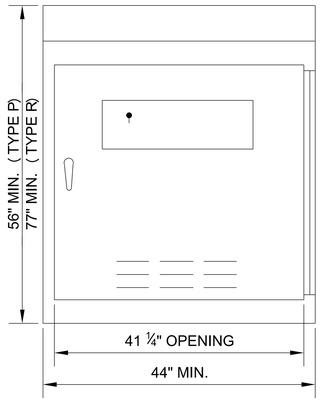
DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 3/20/2017
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CONTROLLER CABINET, TYPES "P" AND "R"

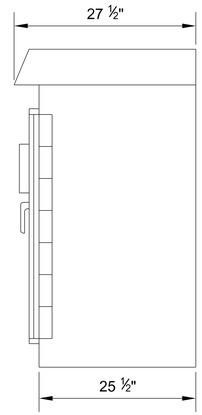
(TYPE P CABINET TO BE SUPPLIED WITH 3 SHELVES,
TYPE R CABINET TO BE SUPPLIED WITH 4 SHELVES)



ISOMETRIC



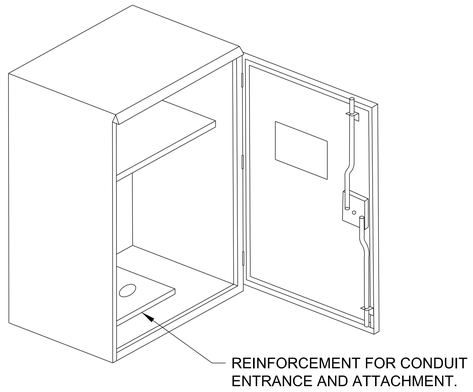
ELEVATION



SECTION

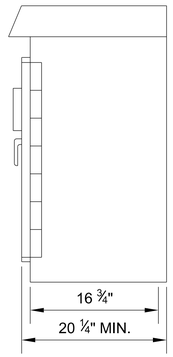
CONTROLLER CABINET, TYPES "G" AND "H"

(POLE MOUNTED)



ISOMETRIC

ELEVATION



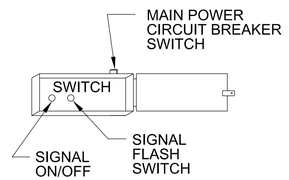
SECTION



OPTIONAL SHELF MOUNT



STANDARD SHELF MOUNT



NOTES:

1. THE CONTROLLER CABINET FINISH SHALL BE NATURAL ALUMINUM.
2. THE MATERIAL SHALL BE 0.125" THICK ALUMINUM.
3. POLE ATTACHMENT HARDWARE FOR TWO-POINT ATTACHMENT SHALL BE PROVIDED FOR CONTROLLER CABINET TYPES G AND H.
4. HYBRID CABINETS SHALL NOT BE ACCEPTED.

BY

REVISIONS

DATE

TRAFFIC SIGNAL DETAILS 2 OF 12

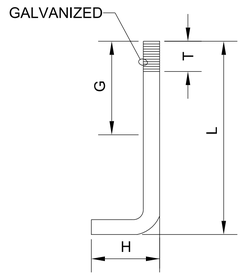
CONTROLLER CABINET DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	3/20/2017
SCALE:	N/A	SHEET NO.:	

MAST ARM LENGTH	BOLT SIZE	L	H	T	G
20' OR LESS	1½" X 60"	54"	6"	8"	12"
22' - 26'	1½" X 60"	54"	6"	8"	12"
28' - 36'	1¾" X 90"	84"	6"	8"	12"
38' - 48'	1¾" X 90"	84"	6"	8"	12"
50' - 55'	1¾" X 90"	84"	6"	8"	12"
60' - 65'	1¾" X 90"	84"	6"	8"	12"

MAST ARM POLE ANCHOR BOLT SCHEDULE



BOLT SIZE	L	H	T	G
¾" X 18"	15"	3"	6"	12"

PEDESTAL POLE ANCHOR BOLT SCHEDULE

MAST ARM LENGTH	FOOTING DIAMETER	DEPTH	"V" BARS	"S" BARS	BOLT CIRCLE (Y)
20' OR LESS	36"	9'-6"	7-#8 BARS X 9'-0"	10-#5 BARS @ 12" MAX.	16"
22' - 26'	36"	11'-0"	7-#8 BARS X 10'-6"	12-#5 BARS @ 12" MAX.	16½"
28' - 36'	36"	12'-6"	7-#8 BARS X 12'-0"	13-#5 BARS @ 12" MAX.	17½"
38' - 48'	36"	13'-0"	8-#8 BARS X 12'-6"	14-#5 BARS @ 12" MAX.	18"
50' - 55'	36"	15'-0"	8-#8 BARS X 14'-6"	16-#5 BARS @ 12" MAX.	20"
60' - 65'	36"	15'-0"	8-#8 BARS X 14'-6"	16-#5 BARS @ 12" MAX.	21"
#					

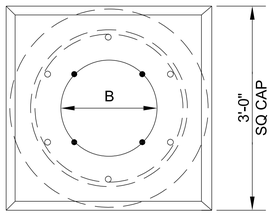
A structural analysis shall done for mast arms lengths exceeding 65'.

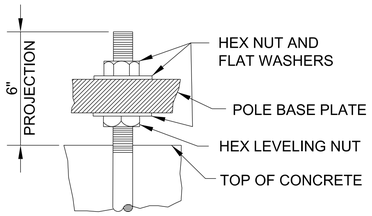
MAST ARM POLE AND BASE SCHEDULE

POST	FOOTING DIAMETER	DEPTH	"V" BARS	"S" BARS	BOLT CIRCLE (B)
4 ½"	24"	3'-6"	6-#4 BARS X 3'-0"	2-#4 BARS @ 12" MAX.	12¾"

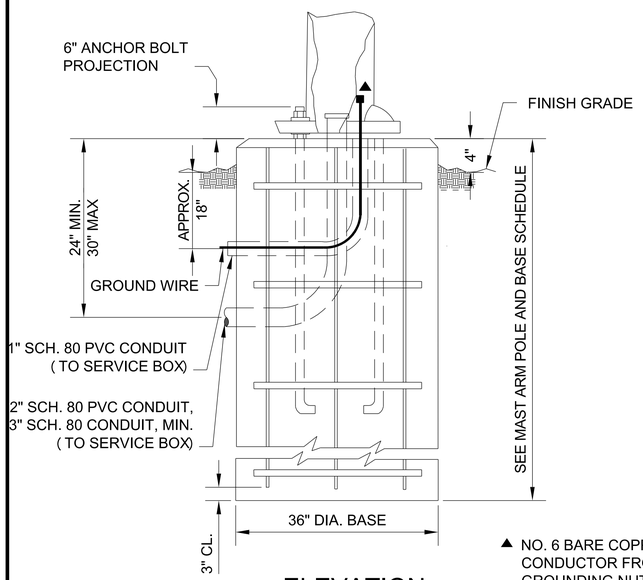
PEDESTAL POLE BASE SCHEDULE

MAST ARM POLE BASE





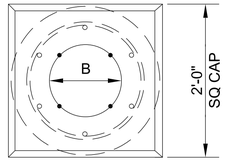
PLAN



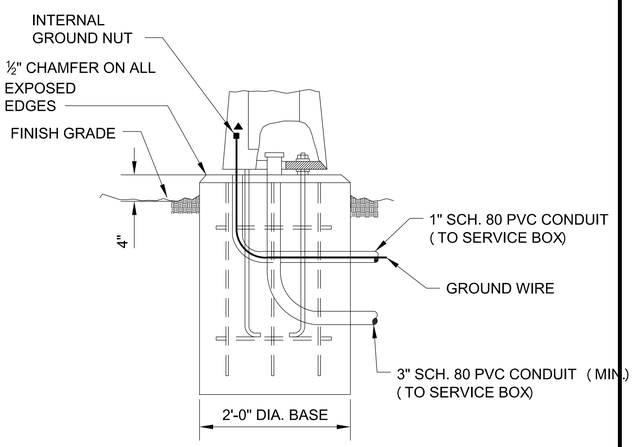
ELEVATION

▲ NO. 6 BARE COPPER GROUND CONDUCTOR FROM INTERNAL GROUNDING NUT TO CLAMP ON GROUND ROD.

PEDESTAL BASE

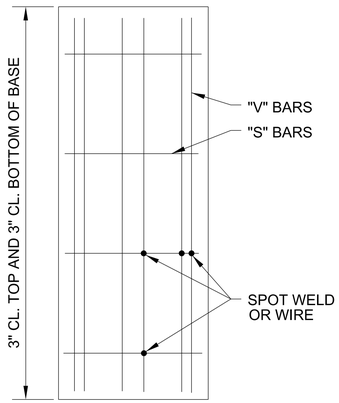


PLAN

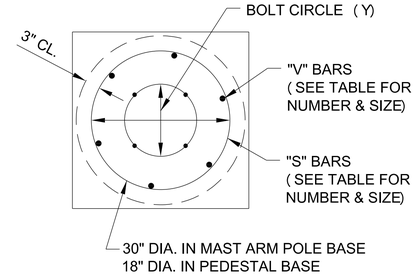


ELEVATION

REBAR CAGE DETAILS



ELEVATION



PLAN

NOTE:
CONCRETE FOR BASES SHALL BE COMMERCIAL GRADE.

BY
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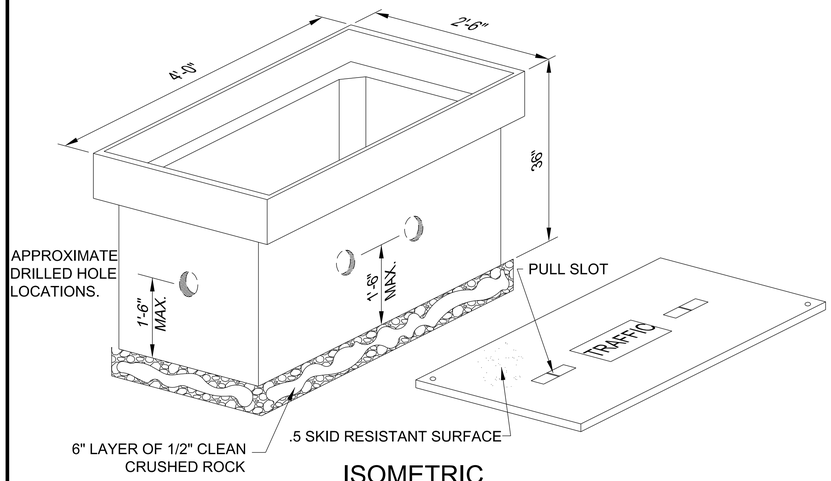
TRAFFIC SIGNAL DETAILS 3 OF 12

CONCRETE FOOTING DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: GBA	DRAWN: GBA
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CABINET SERVICE BOX AND OPTICAL FIBER BOX DETAIL



ISOMETRIC

NOTES:

1. CABINET SERVICE BOXES AND INTERCONNECT SERVICE BOXES SHALL BE ARMORCAST BRAND 30" X 48" POLYMER COMPOSITES, STACKABLE FOR VARYING DEPTHS, RATED FOR 20,000 LBS. LOADING, AND WITH HEAVY DUTY COVERS MEETING DESIGN LOADS OF 22,500 LBS. MINIMUM. BOXES SHALL NOT HAVE BOTTOMS.

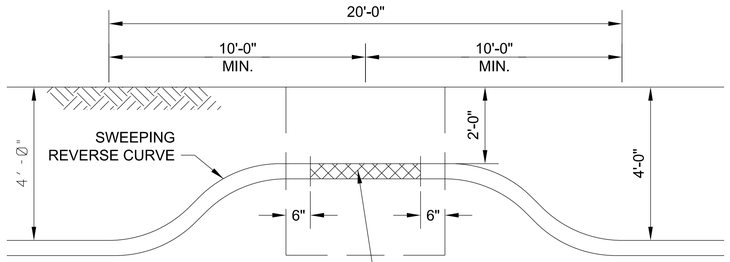
2. BOXES ARE NOT TO BE SLOTTED FOR PLACEMENT OVER EXISTING CONDUITS.

3. CONDUITS SHALL NOT BE ELBOWED UP FOR ENTRY THROUGH BOX BOTTOM.

4. ALL INTERCONNECT CONDUITS SHALL BE HDPE SDR 11, BLACK WITH THREE RED STRIPES.

5. AN 6 INCH THICK LAYER OF 1/2 INCH AGGREGATE SHALL BE PROVIDED UNDER ALL PULL BOXES

6. CONDUIT FROM SERVICE BOX AND CABINET SHALL BE SCHEDULE 80 PVC. ALL OTHER CONDUIT SHALL BE SCH. 80 PVC OR HDPE.



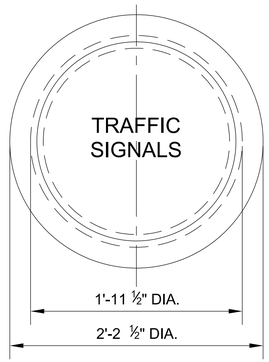
SECTION

PRIOR TO PULLING FIBER CUT CONDUIT AND REMOVE MIDDLE PORTION OR PULL CONDUITS BACK OUT LEAVING 6" REMAINING IN THE BOX

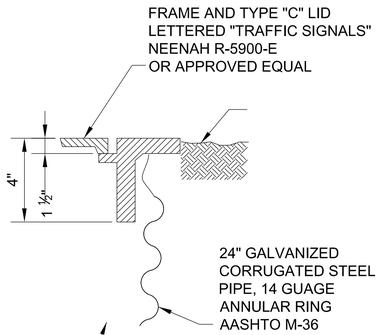
CONSTRUCTION PROCEDURE FOR OPTICAL FIBER SERVICE BOXES:

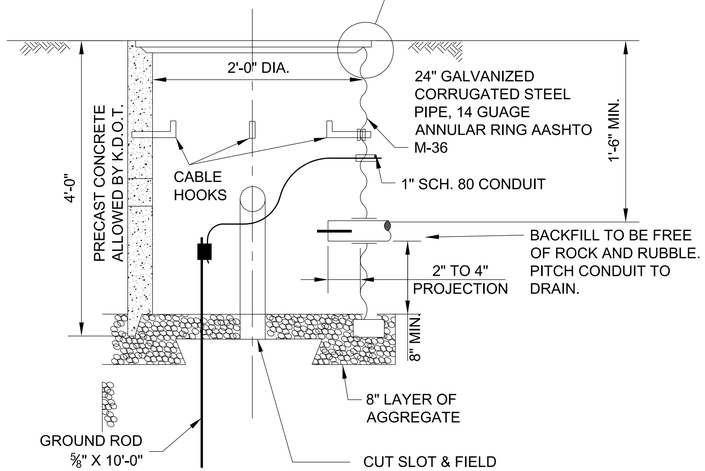
1. BOX SHALL BE SET TO LINE AND GRADE.
2. 20 FT LONG PIECES OF CONDUIT SHALL BE INSERTED THROUGH DRILLED HOLES TO FACILITATE FIBER PULLING. CENTER OF CONDUIT PIECES SHALL BE IN CENTER OF BOX.
3. CUT CONDUIT AT CENTER OF BOX AND PULL CONDUIT BACK OR REMOVE MIDDLE PORTION LEAVING 6" OF CONDUIT REMAINING IN THE BOX FOR BOTH ENDS OF CONDUIT. CONDUIT FROM BOX SHALL BE FUSION SPLICED TO MAIN LINE CONDUIT.
4. FIBER CONDUIT SHALL BE 24" DEEP AT THE BOX. FIBER OPTIC CONDUIT SHALL BE 48" DEEP BETWEEN BOXES.
5. FIBER CONDUIT MAY BE FUSION SPLICED TO MAIN LINE FIBER OPTIC CONDUIT, WHERE REQUIRED, A MINIMUM OF 10 FEET AWAY FROM CENTER OF BOX.
6. FIBER CONDUIT HOLES SHALL BE SEALED ON INSIDE AND OUTSIDE OF BOX.

24" SERVICE BOX

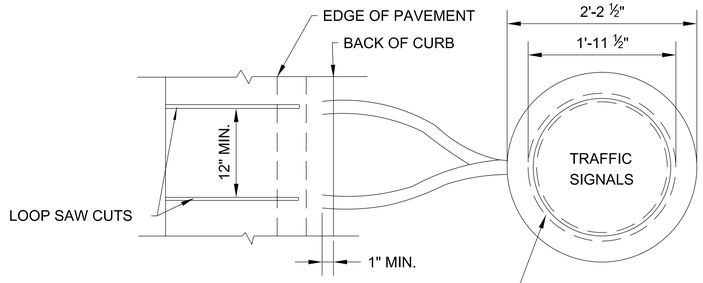


PLAN

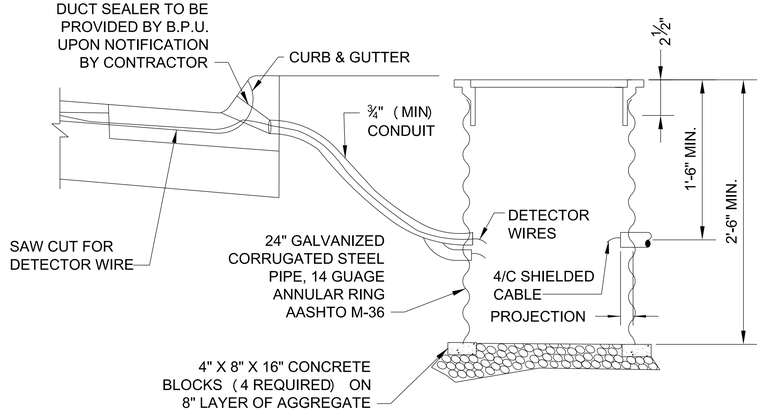




SECTION



PLAN



SECTION

NOTE:
ALL CONDUITS CONTAINING TRAFFIC SIGNAL CABLES SHALL BE OF THE FOLLOWING TYPE:

- ELBOWS AND CONDUIT ENCASED IN FOOTINGS SHALL BE SCHEDULE 80 PVC.
- ALL CONDUIT UNDER ROADWAY PAVEMENT SHALL BE RED SCHEDULE 80 HDPE.
- ALL CONDUIT SHALL BE SCHEDULE 80 PVC.

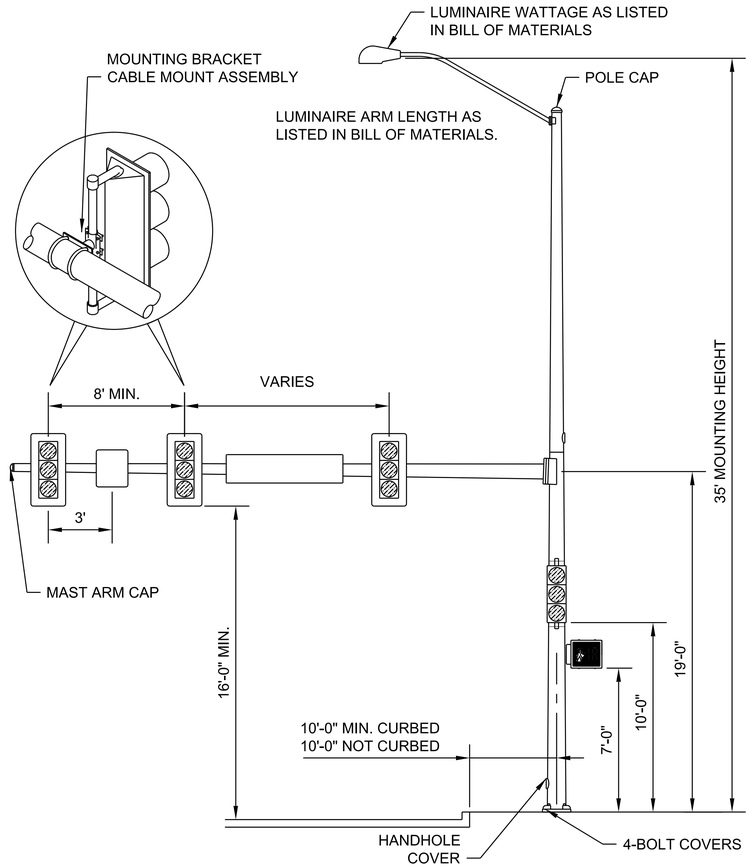
BY | REVISIONS | DATE

TRAFFIC SIGNAL DETAILS 4 OF 12

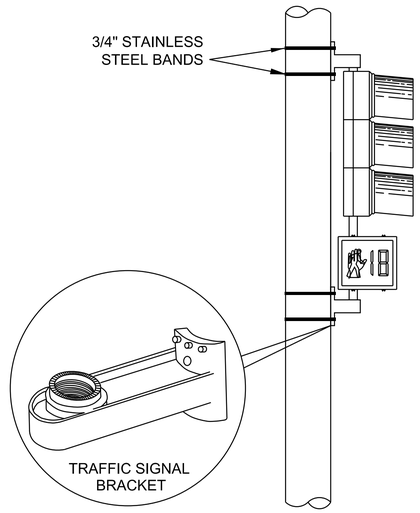
JUNCTION BOX AND SERVICE BOX DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

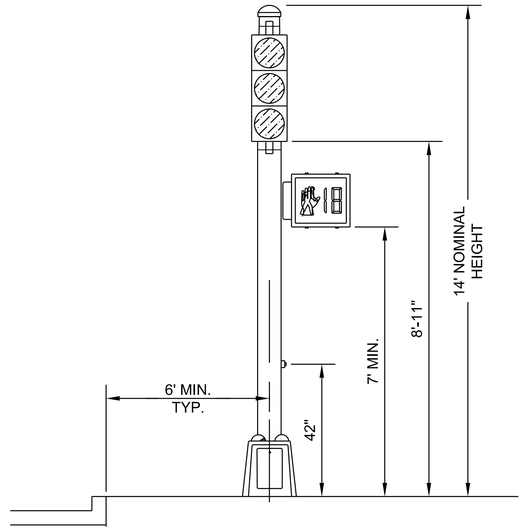
DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:



STEEL COMBINATION STREET LIGHTING & SIGNAL POLE

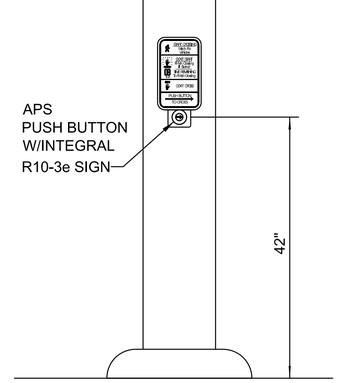


POLE BAND AND CLAMP MOUNTING DETAIL

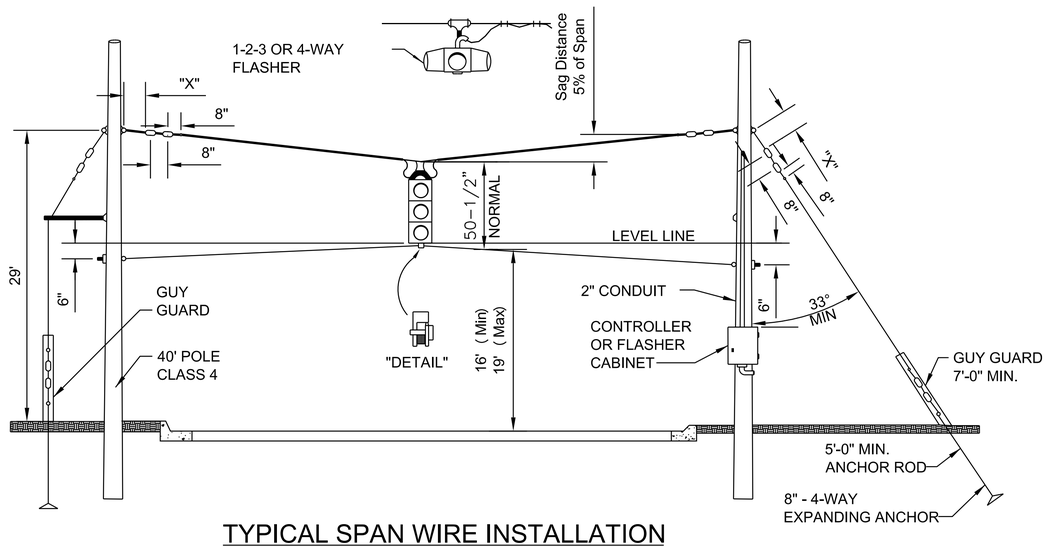


ALUMINUM SIGNAL PEDESTAL POLE

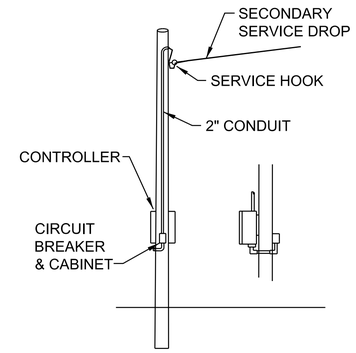
NOTES:
1) PEDESTRIAN PUSH BUTTON SHALL BE PARALLEL TO THE CROSSWALK AND FACING THE INTERSECTION.
2) COUNT DOWN TIMER SHALL FACE THE CROSSWALK.



PEDESTRIAN PUSH BUTTON



TYPICAL SPAN WIRE INSTALLATION



SECONDARY SERVICE DETAIL FOR SPAN WIRE INSTALLATION

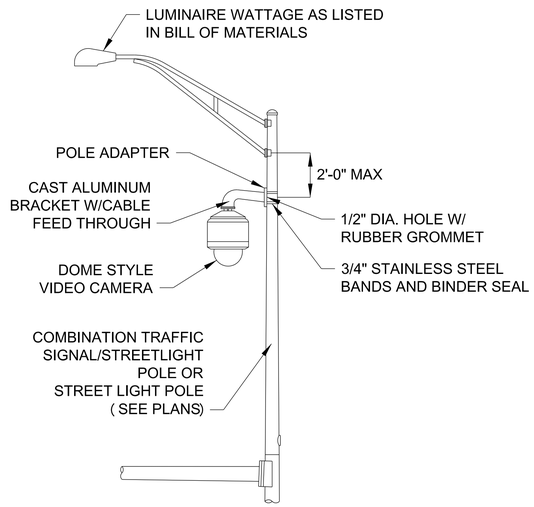
BY
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DATE

TRAFFIC SIGNAL DETAILS 5 OF 12
SIGNAL POLE AND SPAN WIRE DETAILS
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	3/20/2017
SCALE:	N/A	SHEET NO.:	

VIDEO DETECTION CAMERA MOUNTING DETAILS

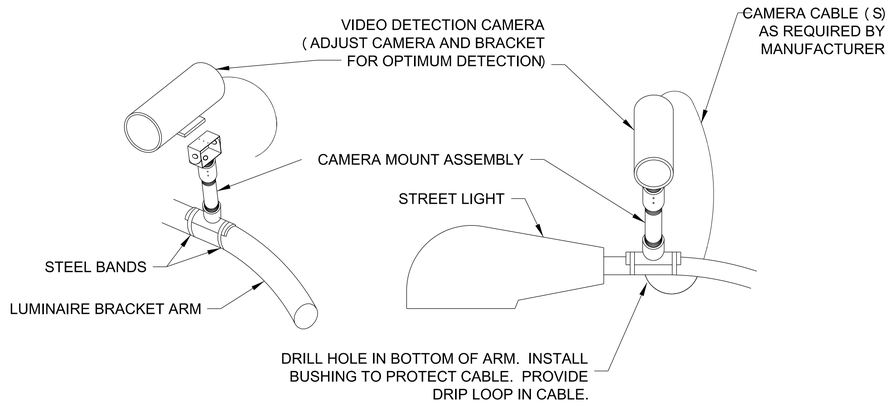
CCTV CAMERA MOUNTING DETAIL



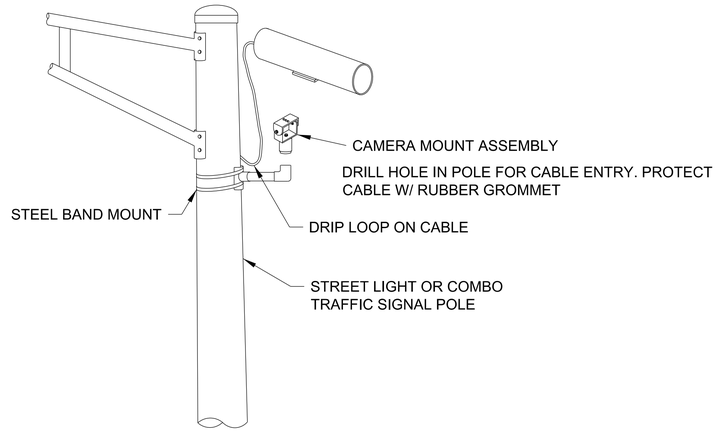
NOTE:
1. ALL CONDUITS CONTAINING PTZ CABLES SHALL BE RED HDPE SCHEDULE 80 OR SCHEDULE 80 PVC UNLESS OTHERWISE NOTED.

2. PTZ CAMERA SHALL BE MOUNTED AND ORIENTATED SO THAT THE POLE ARM DOES NOT OBSCURE VIEW OF CAMERA.

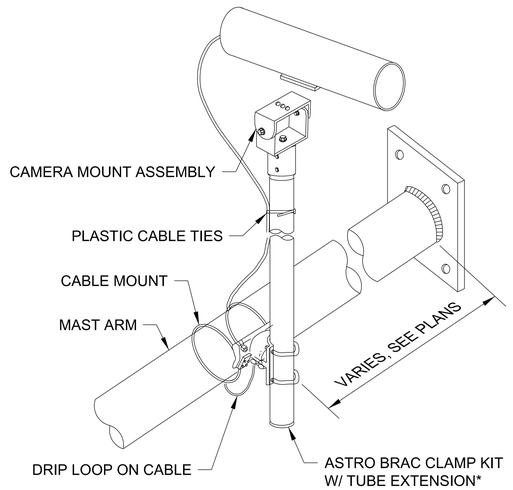
3. MOUNTING BRACKET SHALL BE SKYBRACKET CABLE CLAMP KIT (#SS-SBC120-SCK) .



LUMINAIRE BRACKET MOUNT



POLE-SIDE MOUNT



NOTE:
DRILL HOLE IN BOTTOM OF MAST ARM FOR CABLE ENTRY. PROTECT CABLE W/ RUBBER GROMMET.

* TUBE EXTENSION SHALL BE 73" UNLESS OTHERWISE NOTED.

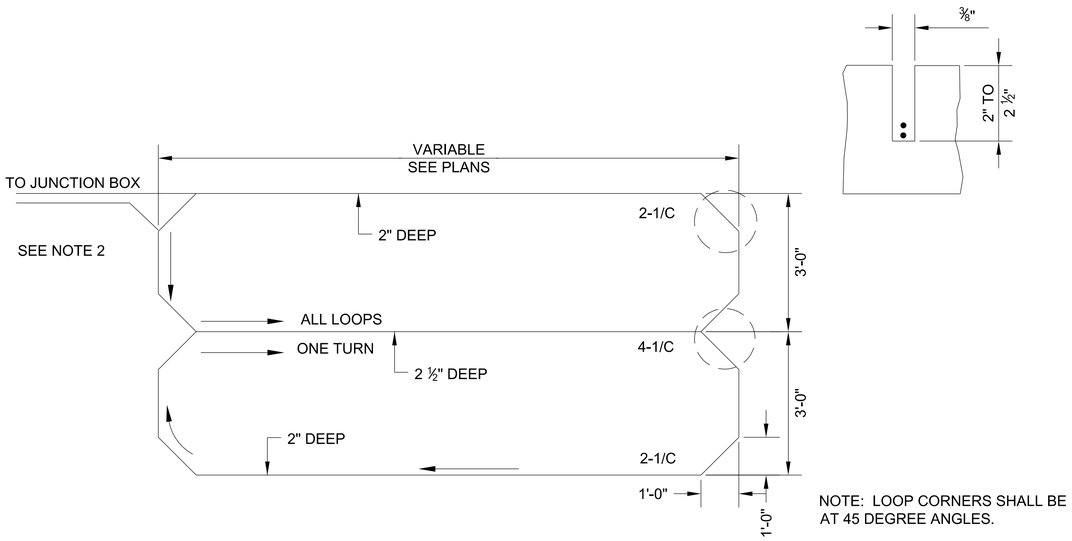
MAST ARM MOUNT

BY | REVISIONS | DATE

TRAFFIC SIGNAL DETAILS 6 OF 12
VIDEO DETECTION CAMERA MOUNTING DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: GBA	DRAWN: GBA
CHECKED: KCK	DATE: 3/20/2017
SCALE: N/A	SHEET NO.:



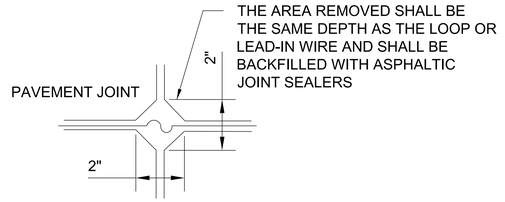
NOTE: LOOP CORNERS SHALL BE AT 45 DEGREE ANGLES.

NOTES:
1. FILL SLOTS WITH A HOT APPLIED, RUBBERIZED ASPHALT SEALANT TO WITHIN 1/8 " OF PAVEMENT SURFACE.

2. DETECTOR LEAD IN CABLE AND LOOP WIRE SHALL BE CONTINUOUS RUNS WITHOUT SPLICES. TWIST LOOP WIRES 2 TURNS PER FOOT BETWEEN THE DETECTOR LEAD IN CABLE AND LOOP.

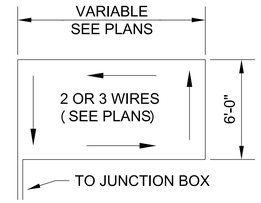
3. LOOP SLOTS CUT IN THE BASE MAY BE REDUCED IN DEPTH BY THE SURFACE COURSE TO BE APPLIED.

QUADRAPOLE LOOP DETECTOR DETAIL



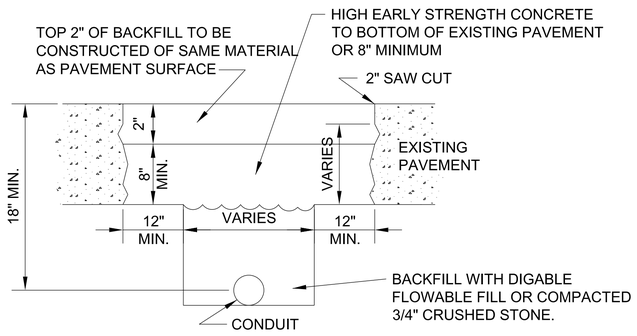
ALTERNATE METHOD

NOTE: 6' x 6' LOOP SLOTS SHALL BE 2" DEEP.

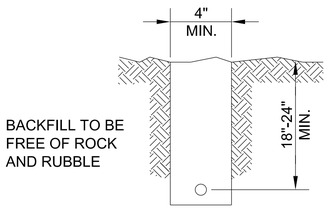


MULTIPLE TURN LOOP DETECTOR DETAIL

TRENCHING



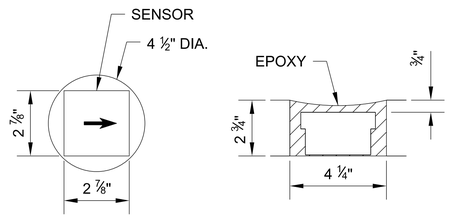
PAVED AREAS



UNPAVED AREAS

VEHICLE SENSOR NODE

NODE INSTALLATION



PLAN ELEVATION

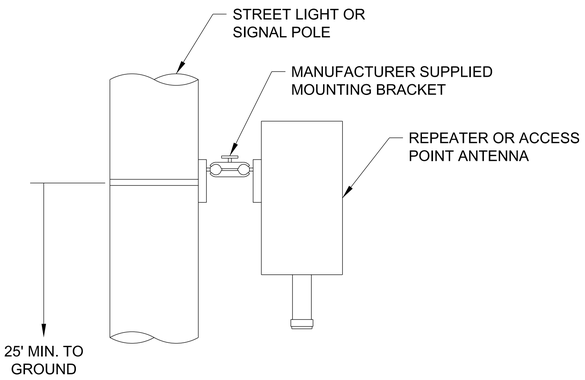
NODE INSTALLATION NOTES:
1. PRIOR TO INSTALLATION, NOTE SENSOR'S ID, LANE NUMBER, AND LOCATION IN LANE.

2. UNLESS OTHERWISE SPECIFIED, INSTALL THE SENSOR IN THE MIDDLE OF THE LANE.

3. CORE A HOLE AT LEAST 2 ¾" DEEP, SO THAT SENSOR WILL BE A MINIMUM OF ¾" BELOW SURFACE.

4. INSTALL SENSOR FLAT IN THE CORED HOLE WITH ARROW PAINTED IN DIRECTION OF TRAVEL

5. IF MULTIPLE SENSORS PER LANE ARE INSTALLED, THEY SHOULD BE 20' APART, UNLESS OTHERWISE NOTED.



VEHICLE SENSOR NETWORK POLE MOUNT DETAIL

BY
REVISIONS
DATE

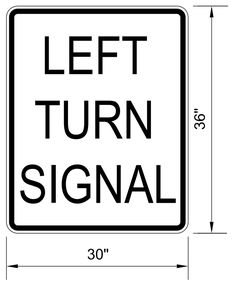
TRAFFIC SIGNAL DETAILS 7 OF 12
TRENCHING
AND DETECTION DETAILS

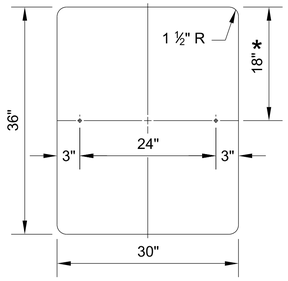
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	3/20/2017
SCALE:	N/A	SHEET NO.:	

SIGN FACE DETAILS

R10-10L





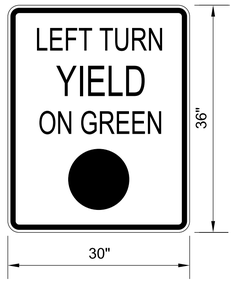
* DRILL ONE HOLE AT STATED DIMENSIONS.
LEVEL SIGN AND DRILL THE SECOND HOLE.

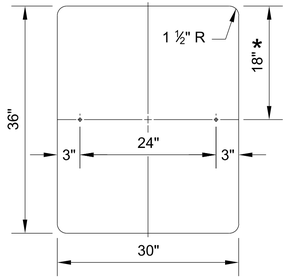
COLORS
LEGEND - BLACK (NON-REFLECTIVE)
BACKGROUND - WHITE (REFLECTIVE)

BORDER
INDENT - ⅜"
WIDTH - ⅝"

LETTERING
SERIES C - 5" UPPER CASE

R10-12





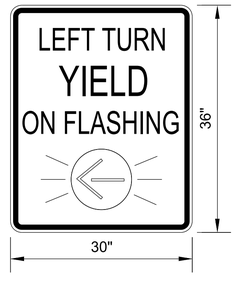
* DRILL ONE HOLE AT STATED DIMENSIONS.
LEVEL SIGN AND DRILL THE SECOND HOLE.

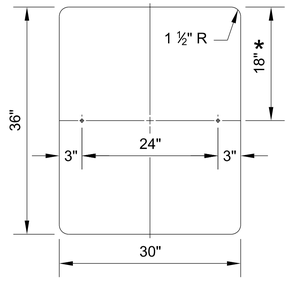
COLORS
LEGEND - BLACK (NON-REFLECTIVE)
BACKGROUND - WHITE (REFLECTIVE)
SYMBOL - GREEN (REFLECTIVE)

BORDER
INDENT - ⅜"
WIDTH - ⅝"

LETTERING
SERIES C - 3" & 4" UPPER CASE

R10-SPECIAL





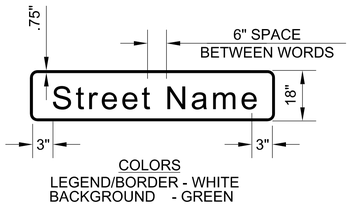
* DRILL ONE HOLE AT STATED DIMENSIONS.
LEVEL SIGN AND DRILL THE SECOND HOLE.

COLORS
LEGEND - BLACK (NON-REFLECTIVE)
BACKGROUND - WHITE (REFLECTIVE)
SYMBOL - YELLOW (REFLECTIVE)

BORDER
INDENT - ⅜"
WIDTH - ⅝"

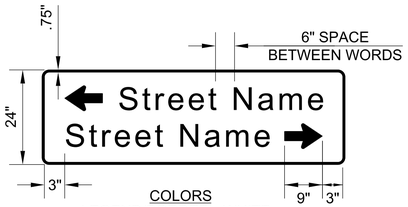
LETTERING
SERIES C - 3" & 4" UPPER CASE

STREET NAME



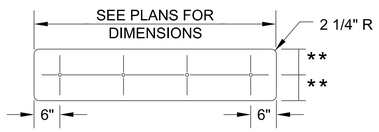
COLORS
LEGEND/BORDER - WHITE
BACKGROUND - GREEN

LETTERING
SERIES D - 12" UPPER CASE
SERIES D - 9" LOWER CASE



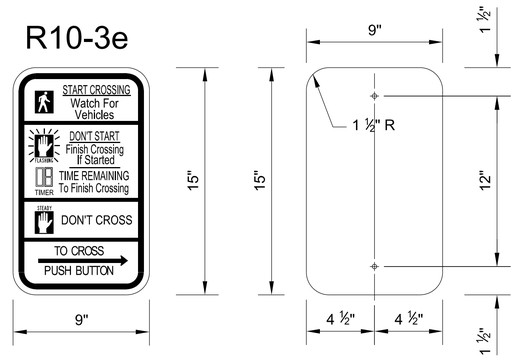
COLORS
LEGEND/BORDER - WHITE
BACKGROUND - GREEN

LETTERING
SERIES D - 8" UPPER CASE
SERIES D - 6" LOWER CASE



MATERIAL - 0.125" THICK ALUMINUM
** TO BE DETERMINED IN FIELD

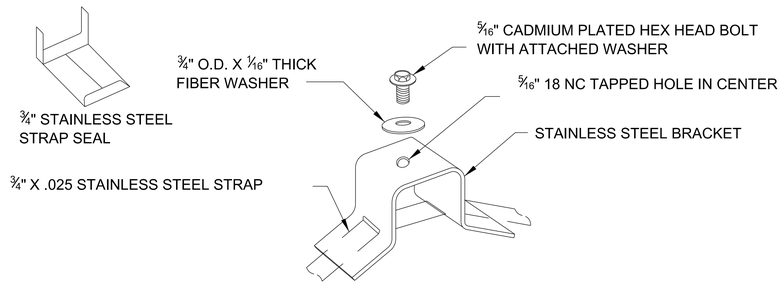
R10-3e



COLORS
LEGEND/BORDER - BLACK
BACKGROUND - WHITE (RETROREFLECTIVE)
UPRAISED HAND SYMBOL, TIMER - ORANGE (RETROREFLECTIVE) ON BLACK
PEDESTRIAN SYMBOL - WHITE (RETROREFLECTIVE) ON BLACK
SIGN SHALL INCLUDE BRAILLE TEXT DESCRIBING THE STREET BEING CROSSED.

BORDER
INDENT - ⅜"
WIDTH - ⅜"

SIGN BRACKET DETAIL



BOLT HOLES SHALL BE FIELD DRILLED. INSTALLATION SEQUENCE SHALL BE TO LOOSELY BOLT SIGN TO BRACKETS. BAND THE BRACKETS ON MAST ARM AND TIGHTEN THE BOLTS. DURING FINAL TIGHTENING OF BOLT, THE FIBER WASHER SHALL BE HELD IN PLACE SO THAT IT DOES NOT TURN WITH THE BOLT. IMPROPER TIGHTENING OF BOLT WILL RESULT IN SIGN FACE DAMAGE.

NOTES:

1. OVERHEAD STREET NAME AND REGULATORY SIGNS SHALL BE SUBSIDIARY TO "TRAFFIC SIGNAL INSTALLATION."
2. ALL OVERHEAD STREET NAME SIGN FACE SHEETING SHALL BE VIP SHEETING.
3. ALL OVERHEAD STREET NAME SIGNS SHALL HAVE LEGENDS CENTERED ON THE FACE. THE LETTER SPACING SHALL BE 150% THE SPACING IN FHWA'S STANDARD ALPHABETS FOR HIGHWAY SIGNS.
4. ACTUAL SIZE DRAWINGS OF THE PROPOSED SIGNS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
5. REGULATORY SIGN BLANKS SHALL BE 0.080-INCH ALUMINUM. MOUNTING BRACKET AND BANDING SHOWN IN THE SIGN BRACKET DETAIL SHALL BE USED.

BY
REVISIONS
DATE

TRAFFIC SIGNAL DETAILS 8 OF 12

SIGN DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	3/20/2017
SCALE:	N/A	SHEET NO.:	

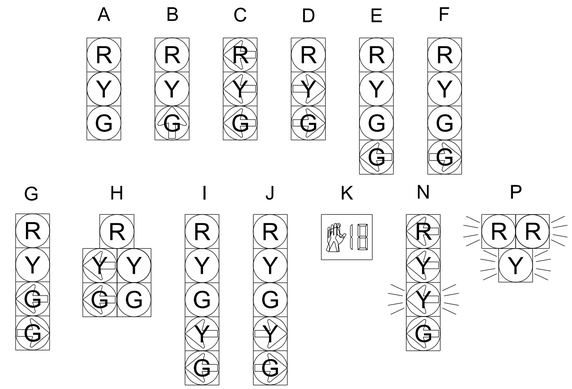
CADconform Certify This File

CADconform Certify This File

BILL OF MATERIALS

ITEM	QUANTITY	UNIT	REMARKS
NEMA CONTROLLER UNIT - SEE NOTE 1		EACH	Econolite Cobalt Controller Unit
MALFUNCTION MANAGEMENT UNIT - SEE NOTE 3		EACH	
SURGE PROTECTOR		EACH	
LOAD SWITCH		EACH	
FLASHER		EACH	
FLASH TRANSFER RELAY		EACH	
DETECTOR, 2-CHANNEL		EACH	
DETECTOR, 4-CHANNEL		EACH	
POLE MOUNTED CABINET		EACH	TYPE__
PAD MOUNTED CABINET (FULL TS-2)		EACH	TYPE__
BUS INTERFACE UNIT (BIU)		EACH	
TRAFFIC SIGNAL HEAD	CHART A	EACH	
SIGNAL HEAD MOUNTING BRACKET	CHART A	EACH	
BACK PLATE	CHART A	EACH	
L.E.D. LENS		EACH	
PEDESTRIAN PUSHBUTTON w/APS & R10-3e SIGN (SEE NOTE 4)		EACH	
MAST ARM POLE	CHART B	EACH	
TRAFFIC SIGNAL PEDESTAL ALUMINUM		EACH	
8 POSITION TERMINAL BLOCK		EACH	
SERVICE BOX, 24" DIA.		EACH	
CABINET SERVICE BOX, 30" X 48"		EACH	
JUNCTION BOX, 24" DIA.		EACH	
LUMINAIRE		EACH	SEE LIGHTING PLNS
LUMINAIRE LAMP_____ WATT, 120 VOLTS		EACH	SEE LIGHTING PLNS
PHOTOCELL		EACH	
UNFUSED STREET LIGHT CONNECTOR KIT		EACH	
FUSED STREET LIGHT CONNECTOR KIT		EACH	
OVERHEAD STREET NAME SIGN	CHART C	EACH	
R10-10L SIGN (30" X 36")		EACH	
R10-12 SIGN (30" X 36")		EACH	
R10-23 (24" X 30")		EACH	
FLASHING YELLOW ARROW SIGN (30" X 36")		EACH	
CIRCUIT BREAKER, TRAFFIC SIGNAL, 15 AMP.		EACH	
GROUND ROD & CLAMP		EACH	
SERVICE WIRE NO. 2 AWG URD TRIPLEX		LIN FT	
LIGHTING DISTRIBUTION WIRE NO. 10 AWG 1c		LIN FT	
POLE & BRACKET WIRE NO. 10 AWG 1c		LIN FT	
GROUND WIRE NO. 6 AWG 1c		LIN FT	
MULTI-CONDUCTOR CABLE NO. 14 AWG 2c		LIN FT	
MULTI-CONDUCTOR CABLE NO. 14 AWG 5c		LIN FT	
MULTI-CONDUCTOR CABLE NO. 14 AWG 9c		LIN FT	
VIDEO DETECTION CABLE		LIN FT	
VIDEO DETECTION CAMERA (SEE NOTE 2)		EACH	
VIDEO DETECTION PROCESSOR (SEE NOTE 2)		EACH	
LOOP SEALANT	AS REQ'D		
PRE-FORMED LOOP		EACH	
CONDUIT, 1" & FITTINGS, RED HDPE (SCHEDULE 80)		LIN FT	
CONDUIT, 2" & FITTINGS, RED HDPE (SCHEDULE 80)		LIN FT	
CONDUIT, 3" & FITTINGS, RED HDPE (SCHEDULE 80)		LIN FT	
CONDUIT, 4" & FITTINGS, RED HDPE (SCHEDULE 80)		LIN FT	
CONDUIT, 1" & FITTINGS, PVC (SCHEDULE 80)		LIN FT	
CONDUIT, 2" & FITTINGS, PVC (SCHEDULE 80)		LIN FT	
CONDUIT, 3" & FITTINGS, PVC (SCHEDULE 80)		LIN FT	
CONDUIT, 4" & FITTINGS, PVC (SCHEDULE 80)		LIN FT	
ACCESS POINTS		EACH	
REPEATERS		EACH	
PAVEMENT SENSORS		EACH	
MOUNTING BRACKETS FOR ACCESS POINTS & REPEATERS		EACH	
CAT 5E OUTDOOR CABLE		LIN FT	

SIGNAL FACES



NOTES: ALL LENSES ARE L.E.D. UNLESS OTHERWISE NOTED

FLASHING YELLOW INDICATION

FLASHING RED INDICATION

K SIGNAL FACE: DIALIGHT MODEL 430-6479-001X OR APPROVED EQUAL

CHART A SIGNAL SUMMARY

SIGNAL FACE ARRANGEMENT	NO. SECTIONS (PER FACE)	SIGNAL MOUNTING TYPE	QUANTITY
A	3	MAST ARM W/BACKPLATE	
J	5	MAST ARM W/BACKPLATE	
N	4	MAST ARM W/BACKPLATE	
P	3	MAST ARM W/BACKPLATE	
A	3	SIDE-OF-POLE	
K	1	SIDE-OF-POLE	
P	3	SIDE-OF-POLE	

CHART B MAST ARM POLES

POLE NUMBER	POLE HEIGHT	SIGNAL ARM LENGTH	SIGNAL ARM MOUNTING HEIGHT	NO. OF SIGNALS ON ARM	SIGNAL SPACING	LUMINAIRE ARM LENGTH	LUMINAIRE MOUNTING HEIGHT	QUANT.

CHART C OVERHEAD STREET NAME SIGNS

SIGN	LEGEND	LENGTH	QUANTITY

BID ITEM

ITEM	UNIT	QUANTITY
TRAFFIC SIGNAL INSTALLATION	L.S.	LUMP SUM
VIDEO DETECTION SYSTEM	L.S.	LUMP SUM

NOTE:

1.) THE TRAFFIC SIGNAL SYSTEM SHALL BE COMPLETE AND THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT AND MATERIALS NECESSARY FOR THE SATISFACTORY OPERATION OF ELECTRICAL APPARATUS AND FOR COMPLETE OPERATION OF THE TRAFFIC SIGNAL SYSTEM WHETHER SPECIFICALLY MENTIONED OR NOT, UNLESS OTHERWISE NOTED.

2.) THE TRAFFIC SIGNAL SHALL UTILIZE ITERIS VIDEO DETECTION EQUIPMENT WITH EDGECONNECT NETWORK INTERFACE CARDS.

3.) THE TRAFFIC SIGNAL CONTROLLER SHALL BE EAGLE ATC M62 WITH A EBERLY MALFUNCTION MANAGEMENT UNIT (MMU2-16LE (ip)) .

4.) THE PUSH BUTTON SHALL BE EZCOMMUNICATOR 2-WIRE NAVIGATOR APS SYSTEM WITH ETHERNET CAPABILITY.

-QUANTITIES FOR INFORMATION ONLY-

BY	REVISIONS	DATE
BMcD	General Drawing Revisions	10/5/2015

TRAFFIC SIGNAL DETAILS 9 OF 12

XX STREET & XX STREET (STA. XX+XX)

BILL OF MATERIALS

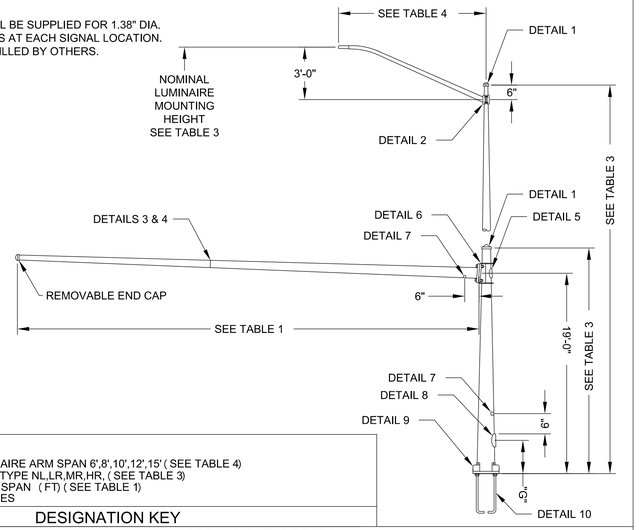
CITY OF KANSAS CITY, KANSAS

PUBLIC WORKS DEPARTMENT

TRAFFIC DIVISION

DESIGNED:	GBA	DRAWN:	GBA
CHECKED:	KCK	DATE:	5/22/08
SCALE:	N/A	SHEET NO.:	

NOTE:
1.1" I.D. GROMMETS WILL BE SUPPLIED FOR 1.38" DIA. WIRE ENTRANCE HOLES AT EACH SIGNAL LOCATION. HOLES TO BE FIELD DRILLED BY OTHERS.



KCBPU-36-HR-15
- LUMINAIRE ARM SPAN 6',8',10',12',15' (SEE TABLE 4)
- UPRIGHT TYPE NL,LR,MR,HR, (SEE TABLE 3)
- SIGNAL ARM SPAN (FT) (SEE TABLE 1)
- KCBPU POLE SERIES

DESIGNATION KEY

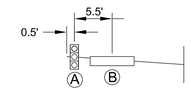
KCBPU POLE SERIES

DESIGN CRITERIA:
THE MAST ARM TRAFFIC STRUCTURES SHOWN ON THIS DRAWING HAVE BEEN DESIGNED IN ACCORDANCE WITH THE LOADING AND THE ALLOWABLE STRESS REQUIREMENTS OF THE 2013 AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", SIXTH EDITION, LTS-6. THE WIND LOADS WERE CALCULATED FROM A BASIC WIND VELOCITY OF 90 MPH WITH A RECURRENCE INTERVAL OF 50 YEARS, AND A FATIGUE CATEGORY OF 2. THE FATIGUE LOADS WERE CALCULATED ON THE REQUIREMENTS OF SECTION 11 OF THE CODE, AND THE FOLLOWING CONDITIONS:

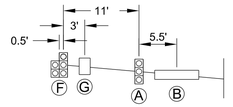
- STRUCTURES ARE DESIGNED TO RESIST NATURAL WIND GUSTS BASED ON THE YEARLY MEAN WIND VELOCITY OF 11.2 MPH.
- STRUCTURES ARE NOT DESIGNED TO RESIST GALLOPING-INDUCED CYCLIC LOADS.
- TRUCK-INDUCED GUST LOADS ARE EXCLUDED PER THE REQUIREMENTS OF THE CODE.
- STRUCTURES ARE DESIGNED TO INCLUDE AASHTO ICE LOADS

**NOTE:
UPON INITIAL FIELD ASSEMBLY OF THE MAST-ARM'S FIRST SECTION'S BUTT PLATE TO THE MAST-ARM VERTICAL POLE'S BUTT PLATE, IF THE END USER DETERMINES THAT THERE IS A SUFFICIENT GAP AT A BOLT HOLE SUCH THAT THERE WILL NOT BE FACE-TO-FACE CONTACT BETWEEN THE TWO BUTT PLATES, THEN A WASHER SHALL BE INSERTED TO PROVIDE FACE-TO-FACE CONTACT BETWEEN THE TWO BUTT PLATES IN ACCORDANCE WITH SECTION 5.16 "BOLTED CONNECTIONS" OF THE 2013 EDITION OF AASHTO.

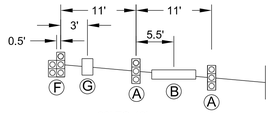
AASHTO 2013 SPECIFICATIONS



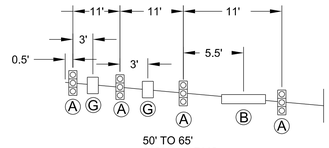
14' TO 20' SIGNAL ARMS



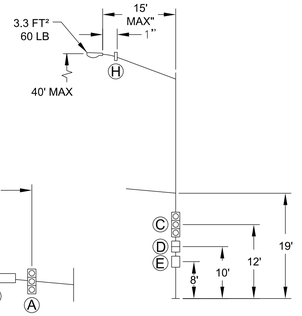
22' TO 26' SIGNAL ARMS



28' TO 48' SIGNAL ARMS



50' TO 65' SIGNAL ARMS



TYPICAL POST LOADING

MAXIMUM LOADING INFORMATION

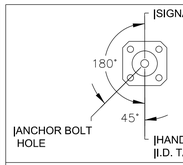
DEVICE	DESCRIPTION	PROJ. AREA (FT²)	WEIGHT (LBS)
A	12"-3 SEC. SIGNAL WITH BACK PLATES	8.67	30
B	18" X 72" STREET NAME SIGN	9.00	20
C	12"-3 SEC. SIGNAL WITH NO BACK PLATES	4.08	30
D	DUAL-2 SEC. PEDESTRIAN SIGNAL	8.00	40
E	30" X 30" POLE MOUNTED SIGN	6.25	13
F	12"-5 SEC. SIGNAL WITH BACK PLATES	12.36	45
G	30" X 36" MAST ARM MOUNTED SIGN	7.50	15
H	WIRELESS ANTENNA ROUTER	0.80	17

TABLE 1: POLE AND SIGNAL ARM DATA

DESIGNATION KEY				POLE DATA			POLE BASE					ANCHOR BOLT DATA				SIGNAL ARM DATA			
POLE SERIES	SIGNAL ARM SPAN (FT)	LUMINAIRE ARM (IF ANY) TYPE	LUMINAIRE ARM (IF ANY) SPAN (FT)	BASE DIA. (IN)	LENGTH (FT)	GAUGE OR THK. (IN)	SQUARE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	CENTER HOLE "P" (IN)	HOLE DIA. "Z" (IN)	DIA. "K" (IN)	LENGTH "J" (IN)	HOOK "H" (IN)	THREAD LENGTH "U" (IN)	FIXED END DIA. (IN)	FREE END DIA. (IN)	GAUGE OR THK. (IN)	LENGTH (FT)
KCBPU	14.00	NL,LR, MR,HR	(6) THRU (15)	12.00	SEE TABLE 3	7	17.00	16.00	2.00	10.64	1.75	1.50	54.00	6.00	8.00	9.00	7.04	7	14.00
	16.00															9.00	6.76	7	16.00
	18.00															9.00	6.48	7	18.00
	20.00															9.00	6.20	7	20.00
KCBPU	22.00	NL,LR, MR,HR	(6) THRU (15)	13.00		7	17.50	16.50	2.00	11.50	1.75	1.50	54.00	6.00	8.00	9.00	5.92	7	22.00
	24.00															9.00	5.64	7	24.00
	26.00															9.00	5.36	7	26.00
KCBPU	28.00	NL,LR, MR,HR	(6) THRU (15)	13.00		5	18.50	17.50	2.00	11.50	2.00	1.75	84.00	6.00	8.00	9.00	5.08	7	28.00
	30.00															9.00	4.80	7	30.00
	32.00															9.00	4.52	7	32.00
	34.00															10.00	5.24	7	34.00
	36.00															10.00	4.96	7	36.00
KCBPU	38.00	NL,LR, MR,HR	(6) THRU (15)	14.00		0.219	18.00	18.00	2.00	12.50	2.00	1.75	84.00	6.00	8.00	11.00	5.68	7	38.00
	40.00															11.00	5.40	7	40.00
	42.00															11.50	5.62	7	42.00
	44.00															11.50	5.34	7	44.00
	46.00															11.50	5.06	7	46.00
	48.00															11.50	4.78	7	48.00
KCBPU	50.00	NL,LR, MR,HR	(6) THRU (15)	15.00		0.219	20.00	20.00	2.00	13.00	2.00	1.75	84.00	6.00	8.00	13.00	6.00	7	50.00
	52.00															13.00	6.08	DET.3	52.00
	55.00															13.00	5.66	DET.3	55.00
KCBPU	60.00	NL,LR, MR,HR	(6) THRU (15)	16.00		0.250	21.00	21.00	2.00	14.25	2.00	1.75	84.00	6.00	8.00	14.00	5.96	DET.3	60.00
	65.00															14.50	5.76	DET.3	65.00

TABLE 2: MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (KSI)
ALL TAPERED TUBES	A595 GR.A OR A572	55
BASE PLATE	A36	36
SIMPLEX PLATE	A36	36
ANCHOR BOLTS	F1554 GR.55	55
CONNECTING BOLTS	A449	--
GALVANIZING-HARDWARE	HOT DIP ZINC	--



ALL ANGLES MEASURED CLOCKWISE FROM LOWER HANDHOLE AS VIEWED FROM SMALL END OF POLE

RADIAL INDEX

FINISH DATA

STANDARD FINISH	OPTIONAL FINISH
SYSTEM: GALVANIZED (GV)	SYSTEM: FINISH PAINT/GALVANIZED (FPGV)
BASE COAT: HOT-DIP GALVANIZED TO ASTM A123	BASE COAT: HOT-DIP GALVANIZED TO ASTM A123
PRIME COAT: NONE	PRIME COAT: NONE
FINISH COAT:NONE	FINISH COAT:TGIC OR URETHANE POLYESTER POWDER
COLOR: NONE	COLOR: ????
SPEC: F-1	SPEC: F-283????

TABLE 3: ELEVATIONS

ELEVATIONS	TYPE			
	NO LUMINAIRE (NL)	LOW RISE (LR)	MEDIUM RISE (MR)	HIGH RISE (HR)
LUM. MOUNTING HEIGHT	---	30'-0"	35'-0"	40'-0"
POLE LENGTH	20'-6"	27'-6"	32'-6"	37'-6"

TABLE 4: LUMINAIRE ARM DATA

SPAN (FT)	FIXED END DIAMETER (IN)	FREE END DIAMETER (IN)	GAUGE
6.00	3.40	2.38	11
8.00	3.63	2.38	11
10.00	3.89	2.38	11
12.00	4.16	2.38	11
15.00	4.57	2.38	11

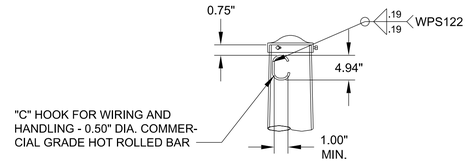
DB01173 REVISION A

REVISIONS	DATE	BY
Updated Mast Arm Standards	11/29/2016	BAM-D

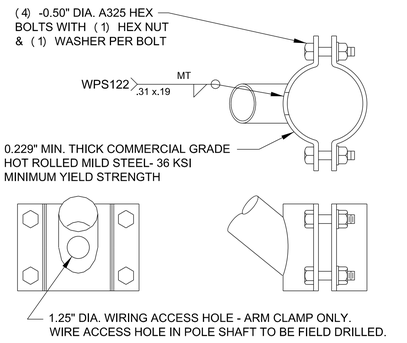
TRAFFIC SIGNAL DETAILS 10 OF 12

TRAFFIC SIGNAL
MAST ARM STRUCTURES
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

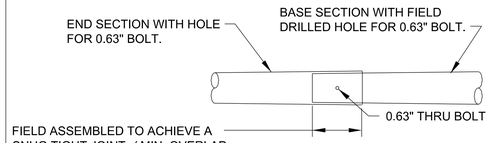
DESIGNED: Valmont	DRAWN: Valmont
CHECKED: Valmont	DATE: 9/30/2016
SCALE: N/A	SHEET NO.:



DETAIL 1 | POLE TOP



DETAIL 2 | LUMINAIRE ARM ATTACHMENT

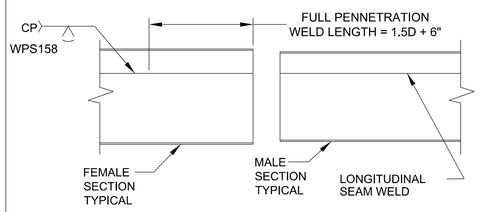


ARM SECTION DATA

SPAN (FT)	BASE SECTION		END SECTION		
	LENGTH (FT)	GAUGE OR THK. (IN)	BASE DIA. (IN)	LENGTH (FT)	GAUGE OR THK. (IN)
52.00	50.00	7	6.62	3.90	7
55.00	50.00	7	6.62	6.90	7
60.00	19.42	0.250	12.00	43.15	7
65.00	22.99	0.250	12.00	44.58	7

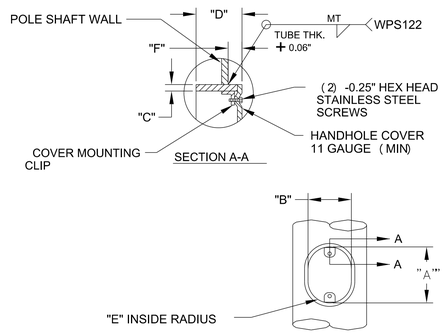
DETAIL 3 | SIGNAL ARM SLIP JOINT

("D"= INSIDE DIAMETER OF OUTER TUBE)



52',55'60',65' MAST ARM
WELD REINFORCEMENT

DETAIL 4 | MAST ARM WELD REINFORCEMENT



SPAN (FT)	"A" I.D. (IN)	"B" I.D. (IN)	"C" THK (IN)	"D" DEPTH (IN)	"E" RADIUS (IN)	"F" PROJ (IN)
14.00	5.50	3.50	0.375	2.00	1.50	0.50
16.00						
18.00						
20.00						
22.00	6.75	4.00	0.375	3.00	2.00	0.50
24.00						
26.00						
28.00	6.75	4.00	0.375	3.00	2.00	0.50
30.00						
32.00						
34.00						
36.00						
38.00	6.75	4.00	0.375	3.00	2.00	0.50
40.00						
42.00						
44.00						
46.00						
48.00						
50.00	6.75	4.00	0.375	3.00	2.00	0.50
52.00						
55.00						
60.00	6.75	4.00	0.375	3.00	2.00	0.50
65.00						

DETAIL 5 | UPPER HANDHOLE

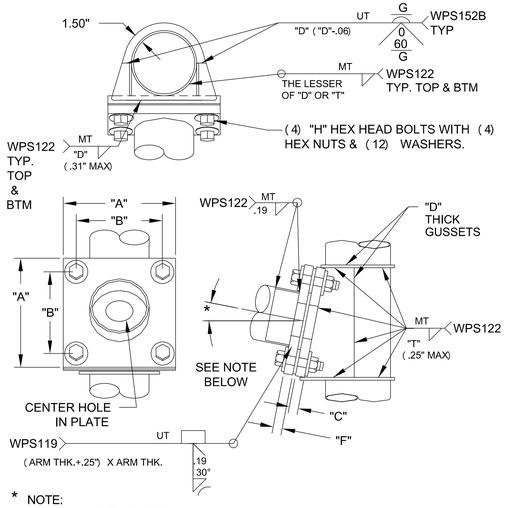
ALL WELDS SHALL HAVE 100% VISUAL TESTING PERFORMED, WITH COMPLETE JOINT PENETRATION WELDS TO HAVE 100% UT TESTING, AND ALL OTHER WELDS TO HAVE 25% MT TESTING.

WELDING & TESTING

ALTHOUGH RARE, VIBRATIONS SEVERE ENOUGH TO CAUSE DAMAGE CAN OCCASIONALLY OCCUR IN STRUCTURES OF ALL TYPES. BECAUSE THEY ARE INFLUENCED BY MANY INTERACTING VARIABLES, VIBRATIONS ARE GENERALLY UNPREDICTABLE. THE USER'S MAINTENANCE PROGRAM SHOULD INCLUDE OBSERVATION FOR EXCESSIVE VIBRATION AND EXAMINATION FOR ANY STRUCTURAL DAMAGE OR BOLT LOOSENING. THE VALMONT WARRANTY SPECIFICALLY EXCLUDES FATIGUE FAILURE OR SIMILAR PHENOMENA RESULTING FROM INDUCED VIBRATION, HARMONIC OSCILLATION OR RESONANCE ASSOCIATED WITH MOVEMENT OF AIR CURRENTS AROUND THE PRODUCT.

VIBRATION DISCLAIMER

("T"= SHAFT WALL THICKNESS)

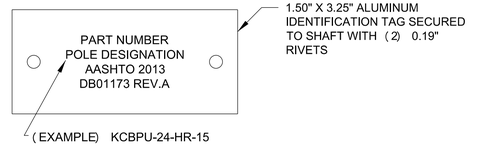


* NOTE:
RISE IN SIMPLEX PLATES VARIES PER POLE BASE DIA. AND LOADS ON MAST ARMS.

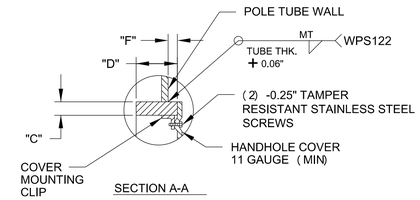
SIGNAL ARM ATTACHMENT DATA

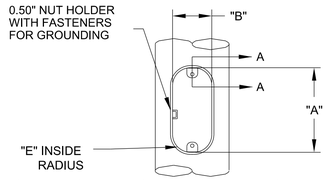
ARM SPAN (FT)	"A" (IN)	"B" (IN)	POLE PLATE "C" (IN)	ARM PLATE "F" (IN)	"D" (IN)	CENTER HOLE DIA. (IN)	"H" (IN)
14.00	16.75	13.50	2.00	2.00	0.375	7.64	1.25 X 6.25
16.00							
18.00							
20.00							
22.00	17.75	14.50	2.00	2.00	0.375	7.64	1.25 X 6.25
24.00							
26.00							
28.00	17.75	14.50	2.00	2.00	0.375	7.64	1.25 X 6.25
30.00							
32.00							
34.00	17.75	14.50	2.00	2.00	0.375	8.50	1.25 X 6.25
36.00							
38.00	18.75	15.50	2.00	2.25	0.375	9.50	1.25 X 6.50
40.00							
42.00	18.75	15.50	2.00	2.25	0.375	7.00	1.25 X 6.50
44.00							
46.00							
48.00							
50.00	20.25	17.00	2.00	2.25	0.375	7.00	1.25 X 6.50
52.00							
55.00							
60.00	22.25	18.50	2.00	2.00	0.375	7.25	1.50 X 6.50
65.00	22.25	18.50	2.00	2.00	0.375	7.50	1.50 X 6.50

DETAIL 6 | SIGNAL ARM ATTACHMENT



DETAIL 7 | I.D. TAG





SPAN (FT)	"A" I.D. (IN)	"B" I.D. (IN)	"C" THK (IN)	"D" DEPTH (IN)	"E" RADIUS (IN)	"F" PROJ (IN)	"G" MTG. HEIGHT (FT)
14.00	10.00	4.50	0.500	2.00	2.25	0.50	1.54
16.00							
18.00							
20.00							
22.00	10.00	4.50	0.500	2.00	2.25	0.50	1.54
24.00							
26.00							
28.00	10.00	4.50	0.500	2.00	2.25	0.50	1.54
30.00							
32.00							
34.00							
36.00							
38.00	10.00	4.50	0.500	2.00	2.25	0.50	1.67
40.00							
42.00							
44.00							
46.00							
48.00							
50.00	10.00	4.50	0.500	2.00	2.25	0.50	1.71
52.00							
55.00							
60.00	10.00	4.50	0.500	2.00	2.25	0.50	1.79
65.00							

DETAIL 8 | LOWER HANDHOLE

DB01173 REVISION A

BY	REVISIONS	DATE
BAMcD	Updated Mast Arm Standards	11/29/2016

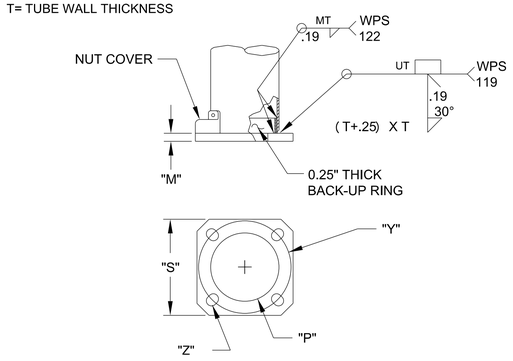
TRAFFIC SIGNAL DETAILS 11 OF 12

TRAFFIC SIGNAL
MAST ARM STRUCTURES

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

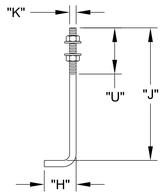
DESIGNED: Valmont	DRAWN: Valmont
CHECKED: Valmont	DATE: 9/30/2016
SCALE: N/A	SHEET NO.:

T= TUBE WALL THICKNESS



DETAIL 9	POLE BASE

(4) -ANCHOR BOLTS WITH
(2) HEX NUTS AND (2) WASHERS
PER BOLT WITH THREADED
END GALVANIZED AT LEAST 12".



DETAIL 10	ANCHOR BOLT

DB01173 REVISION A

DATE	REVISIONS	BY
11/29/2016	Updated Mast Arm Standards	BAM-D

TRAFFIC SIGNAL DETAILS 12 OF 12

TRAFFIC SIGNAL
MAST ARM STRUCTURES

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
TRAFFIC DIVISION

DESIGNED: Valmont	DRAWN: Valmont
CHECKED: Valmont	DATE: 9/30/2016
SCALE: N/A	SHEET NO.:

UNIFIED GOVERNMENT OF KANSAS CITY, KANSAS AND WYANDOTTE COUNTY

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

&

KANSAS CITY BOARD OF PUBLIC UTILITIES

STREET LIGHTING DESIGN GUIDE

January 2019

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STREET LIGHTING DESIGN REQUIREMENTS

PART 1 – GENERAL

1.01 APPLICABILITY: The criteria outlined in this document shall be adhered to for the design of all publicly and/or privately financed street lighting systems to be installed in the public street right-of-way or on other public property under the jurisdiction of the Unified Government, the City of Kansas City, Kansas (UG/KCK), and the Board of Public Utilities (BPU).

1.02 LIGHTING SYSTEM SCOPE: The Design Engineer shall be responsible for establishing the scope of a street lighting system and the phasing of construction. The Design Engineer shall clearly communicate the scope, critical design elements, and phasing of the lighting system with the City Traffic Engineer/BPU Engineering and receive approval prior to commencement of design. Refer to the Design Engineer's Checklist in Part 6 of this document.

1.03 SYSTEM CONFIGURATION: Street lighting systems shall be composed of all electrical equipment required to provide a complete, operable system. This shall include, but is not limited to power supplies, luminaires, poles, distribution cables, conduit, foundations and related appurtenances.

1.04 DESIGN CRITERIA AMENDMENTS: It is the intention of these criteria to provide consistent procedures, methodologies, and standards for the design engineer to conform to while preparing improvement plans for projects for the UG/KCK. These criteria, however, are not intended to hinder design innovations that may be beneficial for the project budget, public safety, and/or character of the lighting environment. Only with prior authorization of the City Traffic Engineer/BPU Engineering may these criteria be amended.

1.05 DESIGN REFERENCE STANDARDS: For new roadway designs, the Design Engineer shall utilize the current edition of American National Standard Practice Manual for Roadway Lighting by the Illumination Engineering Society, *ANSI/IES RP-8-14*. For lighting designs that are part of a phased, on-going project and/or were designed by previous criteria, the criteria outlined in *ANSI/IES RP-8 -00 (R2005)* may be utilized to design a comparable lighting environment and uniform corridor. When designing for a roundabout controlled intersection, the Design Engineer should reference the *ANSI/IES DG-19-08 Design Guide for Roundabout Lighting*.

The Design Engineer shall provide a lighting system design that conforms to the guidance outlined in the National Electrical Code (NEC, NFPA 70) and National Electric Safety Code (NESC, ANSI C2). Additionally, all lighting designs shall follow the electrical guidelines and policies required by BPU.

PART 2 – DESIGN CRITERIA

2.01 GENERAL: The criteria outlined below shall be followed when specifying the type and placement of equipment for a street lighting system. Generally it is the anticipation of the UG/KCK and BPU that L.E.D. luminaires will be utilized for designs, however, high intensity discharge (H.I.D.) luminaires may be required for design in certain cases/areas. The design engineer shall confirm the luminaire

type with the City Traffic Engineer/BPU Engineering prior to commencement of design. The standard plans, details, and material specifications for street lighting are available through the Engineering Division of the Public Works Department or at the UG/KCK's website: http://www.wycokck.org/.

2.02 LIGHTING DESIGN METHODOLOGY: Street lighting design for continuous lighting systems shall be based upon the criteria proposed by the Project Design Engineer and approved by the City Traffic Engineer/BPU Engineering. If a project is determined that it should use the criteria outlined in the *ANSI/IES RP-8-00 (R2005)*, it shall therefore be based on the ILLUMINANCE design methodology. Alternatively, if a project is determined that it should utilize the criteria outlined in the *ANSI/IES RP-8-14*, it shall therefore be based on the LUMINANCE design methodology. Each design methodology shall take into account the photometric output of the luminaires chosen for the specific project and approved by UG/KCK and BPU.

2.03 LIGHTING DESIGN CRITERIA: The Design Engineer should reference the appropriate *ANSI/IES RP-8* publications as established above as a basis for design. The street lighting design elements and values for both the illuminance and luminance methodologies are outlined below. UG/KCK may require that the Design Engineer submit photometric evaluation drawings and calculations to illustrate conformance with the design criteria.

A. ***FACILITY LIGHTING DESIGN TYPES*:** Every street lighting project presents unique challenges that require the Design Engineer to consider the most optimum design type for a particular facility. Street lighting design types should be chosen based on road user safety and economic value given the overall project improvements and potential utility conflicts. Lighting design types consists of the following: Single-sided, double-sided, staggered, and median. Some projects may require the Design Engineer to incorporate more than one design type to accomplish the lighting criteria set forth within this document. The UG/KCK prefers that a median design type not be used where the median width may create maintenance and/or safety impacts due to vehicle collisions. Median mounted street lighting design will require preapproval by the City Traffic Engineer/BPU Engineering to be evaluated on a case-by-case basis.

B. ***ILLUMINANCE & LUMINANCE DESIGN VALUES*:** The following information is intended to provide the Design Engineer with guidance for determining the design values for illuminance and luminance values as set forth in the *ANSI/IES RP-8* publications. The Design Engineer shall coordinate with the City Traffic Engineer/BPU Engineering to determine the street and pedestrian conflict area(s) of a given project prior to commencement of design. City adopted Code of Ordinances, Chapter 27, Article VII, Division 2, Section 27-288 outlines criteria for street classifications as a basis for design. Additionally, pavement classification shall be determined based upon the proposed pavement design of new or reconstruction projects or of the existing pavement for street lighting retrofit projects. The tables below should be used to assist in the determination of the proper design criteria for each project.

Illuminance Methodology Criteria (*Source ANSI/IES RP-8-00 (R2005)*)					
Street & Pedestrian Conflict Area Classification		**Pavement Classification (Minimum Maintained Average Values)**			**Max. Uniformity Ratio E_{ave}/E_{min}**
Street Classification	**Pedestrian Conflict Area**	**R1 (fc)**	**R2 & R3 (fc)**	**R4 (fc)**	
Expressway	High	1.0	1.4	1.3	3.0
	Medium	0.8	1.2	1.0	3.0
	Low	0.6	0.9	0.8	3.0
Major (Arterial)	High	1.2	1.7	1.5	3.0
	Medium	0.9	1.3	1.1	3.0
	Low	0.6	0.9	0.8	3.0
Collector	High	0.8	1.2	1.0	4.0
	Medium	0.6	0.9	0.8	4.0
	Low	0.4	0.6	0.5	4.0
Local	High	0.6	0.9	0.8	6.0
	Medium	0.5	0.7	0.6	6.0
	Low	0.3	0.4	0.4	6.0

Luminance Methodology Criteria (*Source ANSI/IES RP-8-14)*					
Street & Pedestrian Classification		**Avg. Luminance L_{avg} (cd/m^2)**	**Avg. Uniformity Ratio L_{avg}/L_{min}**	**Max. Uniformity Ratio L_{avg}/L_{min}**	**Max. Uniformity Ratio E_{ave}/E_{min}**
Street Classification	**Pedestrian Classification**				
Expressway	N/A	1.0	3.0	5.0	0.3
Major (Arterial)	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

Street Surface Classifications (*Source ANSI/IES RP-8-00 (R2005)*)			
Class	**Q_o***	**Description**	**Mode of Reflectance**
R1	0.10	PCC street surface. Asphalt street surface with a minimum of 12% of the aggregates composed of artificial brightener (e.g., Synopal) aggregates (e.g., labradorite, quartzite).	Mostly diffuse
R2	0.07	Asphalt street surface with an aggregate composed of minimum 60% gravel [size greater than 1 cm (0.4 in.)]. Asphalt street surface with 10% to 15% artificial brightener in aggregate mix. (Not normally used in North America).	Mixed (diffuse & specular)
R3	0.07	Asphalt street surface (regular and carpet seal) with dark aggregates (e.g., trap rock, blast furnace slag); rough texture after some months of use (typical highways)	Slightly specular
R4	0.08	Asphalt street surface with very smooth texture.	Mostly specular
* Q_o = representative mean luminance coefficient			

Pedestrian Conflict Area Classifications (*Source ANSI/IES RP-8-14*)		
Pedestrian Conflict Area Classification	**Number of Pedestrians (Peds/hour)**	**Description**
High	>100	An area where a significant number of pedestrians are expected. E.g. downtown, retail areas, stadiums, etc.
Medium	1 - 100	An area where fewer pedestrians are expected at night. E.g. office areas, apartments, parks, etc.
Low	<10	An area where very low pedestrian volumes are expected. E.g. residential dwellings, rural and semi-rural regions.

C. ***LIGHT LOSS FACTOR*:** The light loss factor (LLF) that shall be used for design of L.E.D. street lighting facilities is 0.90. The LLF for the design of any H.I.D. luminaires shall be 0.69. The UG/KCK reserves the right to modify this factor as determined by actual field performance of the luminaires installed on previous projects. Any desired deviation from the LLF will be communicated to the Design Engineer prior to commencement of design.

D. ***OPTICAL DISTRIBUTION TYPE*****:** The UG/KCK & BPU prefer that Type III optical distribution be used as the basis for design on most roadway projects. Other distribution types may be utilized for projects in which the Design Engineer determines that a Type III distribution is not the optimal spread, or if it creates excess light trespass. The Design Engineer should avoid designing a lighting system that may negatively impact adjacent residential property owners with excess light trespass. Optical distributions outside of the typical Type III shall be approved by the City Traffic Engineer/BPU Engineering.

E. ***CORRELATED COLOR TEMPERATURE (CCT)*****:** The Design Engineer should design L.E.D. lighting systems using a standard color temperature to maintain uniformity of light source appearance with adjoining L.E.D. lighting systems. A 4000K CCT should be used for design while conducting photometric analysis of the system and be labeled as such on the plans.

F. ***VOLTAGE DROP CALCULATIONS*****:** The Design Engineer shall design the electrical lighting system such that the inefficient voltage losses to the system loads are prevented. Voltage drops for distribution systems, or branch circuits, are allowed up to a maximum of 5% voltage drop. Service feeder voltage drops, however, are allowed up to a maximum of 3% voltage drop. Refer to Part 4 - Street Lighting Electrical System Design Guidance for information regarding service, distribution, and pole & bracket cable size and type as a basis for voltage drop calculations. Note that the resistance of service and distribution cables should reflect the properties of aluminum (not copper) URD triplex cable. The UG/KCK and/or BPU may require that voltage drop calculations be submitted for review on any given project.

PART 3 – STREET LIGHTING EQUIPMENT DESIGN GUIDANCE

3.01 GENERAL: The Design Engineer should factor the standard materials into the design of a street lighting system. The standard materials have some flexibilities and limitations that should be acknowledged in order to accurately and efficiently design the system. Additionally, the Design Engineer should be mindful of the customary placement and setbacks of electrical street lighting equipment

3.02 STREET LIGHT POLES: Street light pole height for a given project should be selected based upon the type of facility and needs of that facility to perform as required above. There are 2 standard mounting heights allowed to achieve the proper lighting design: 30 feet and 35 feet. The pole features, dimensions, and mounting heights are illustrated in the Standard Details.

The City Traffic Engineer/BPU Engineering may require that some projects utilize decorative street lighting poles for lighting projects that occur within environments designated for greater character. Environments which would warrant decorative poles include, but are not limited to, the Legends, Village West, Rosedale, Downtown, and Central Business Districts (CBD). In this case, the Design Engineer should consult with the City Traffic Engineer/BPU Engineering to establish which decorative pole to specify and refer to the Standard Drawings for design of the decorative H.I.D. and L.E.D. luminaires.

3.03 BRACKET ARMS: Bracket arm lengths should be selected such that the luminaires are positioned in a straight line when looking down the roadway. The bracket arms should be oriented 90 degrees, or perpendicular, to the traveled way. The standard lengths for bracket arms consist of a 6 foot and 12 foot arm. The bracket arm features and dimensions are shown in the Standard Details.

3.04 L.E.D. LUMINAIRES: Luminaires of the light emitting diode type shall be selected to meet the lighting criteria outlined above. The luminaire should be capable of multi-tap voltage selection ranging from 120–277V. Dimmable drivers and 7-pin photocells that meet *ANSI C136.41-2013* standards for dimming receptacles should be specified for all projects with federal funding requiring 'as equal' options. The following L.E.D. cobrahead style luminaires may be specified 'as equals': GE's Evolve, Cooper's Navion, AEL's Autobahn, and LED2's Alpha. The following L.E.D. decorative post top style luminaires may be specified 'as equals': Eaton's Generation, Holophane's GranVille II, and GE's Avery StreetDreams. Refer to the Pre-Approved Luminaire Product List for more information on qualified L.E.D. luminaire models.

For street lighting projects in which a 30 foot mounting height pole is suitable, the Design Engineer can typically expect to utilize a 150W - 250W equivalent L.E.D. luminaire. In contrast, when a 35 foot mounting height pole is best suited for a project, the Design Engineer can typically expect to utilize a 250W - 400W equivalent L.E.D. luminaire. Pole spacing shall be determined by photometric analysis based on roadway classification, geometric characteristics, and other lighting environment considerations.

Note that for projects utilizing federal funds and requiring a minimum of 3 'as equal' luminaires to be specified on the plans, the designer should perform a photometric check on each of 3 approved luminaires to determine which yields the shortest (conservative) spacing design. Although the approved product list outlines "equivalent" luminaires, their individual photometric performance will vary to some degree. The lighting design should be representative of the most conservative luminaire (of the 3 provided by the designer in the plans) with the intent that if a contractor selects it for construction, the minimum lighting design criteria will still be met.

3.05 H.I.D. LUMINAIRES: High intensity discharge type luminaires, where approved by UG/KCK & BPU, shall be specified to meet the lighting criteria outlined above. The luminaire should be capable of multi-tap voltage selection ranging from 120-277V. High Pressure Sodium (H.P.S.) luminaires shall be 250W for the general roadway design. Decorative poles include both H.P.S. luminaires and metal halide (M.H.) lamps. Refer to the decorative pole standard drawings for details. The following H.P.S. luminaires may be specified 'as equals': Cooper OVZ and American Electric's Roadway Series 115. Refer to the Pre-Approved Product List for more information on approved H.I.D. luminaire models.

Pole spacing for 250W H.P.S. luminaires, whether it be a 30' or 35' mounting height, shall be determined by photometric analysis. Similarly, pole spacing for decorative poles with H.I.D. luminaires shall be based off the photometric analysis that factors the lighting environment needs and characteristics.

3.06 POLE BASES: Pole bases will consist of a screw-in anchor base and/or concrete bases, as required by project subsurface conditions. Wherever possible, the preferred street lighting pole base is a screw-in anchor base. Should rock be encountered and a screw-in anchor base cannot be conventionally screwed into the ground, a predrilled hole with flowable fill may be used to install a screw-in anchor base, or a concrete base may be used. Concrete bases should be installed in areas of fill (embankment) or areas of otherwise disturbed soils where soil settlement may occur. Both screw-in and concrete anchor bases require a ground rod to be installed as indicated on the standard drawings.

3.07 EQUIPMENT PLACEMENT: Lighting equipment, with the exception of the service feed, shall be installed only within a public street right-of-way or on other public property. Typically such equipment, excluding conduits under street pavement, shall be positioned in a shoulder area. Lighting equipment, including street lights, junction/pull boxes, and power supplies, are at higher risk of being damaged when positioned within the curb return of a roadway intersection. Lighting equipment should therefore be positioned beyond the curb return of an intersection, or adjacent to a property line at other mid-block locations. The Design Engineer should avoid placing electrical equipment directly in front of residential properties unless the City Traffic Engineer/BPU Engineering deems that no other practical alternative exists.

At roundabout controlled intersections where residential or collector roadways meet, a minimum of two (2) street lights should be located diagonally across the circular intersection from one another. Where arterial roadways intersect, a minimum of four (4) street lights should be placed around the outside of the circular intersections. The poles at roundabouts should be equally spaced and in a manner that provides uniform lighting in accordance with guidance of the *IES DG-19-08 Design Guide for Roundabout Lighting.*

Street lights should be strategically placed and noted on the plans to maintain a minimum clearance of ten feet (10') from all overhead utilities. Where no high voltage overhead lines exist, the Design Engineer may seek approval from BPU to maintain a minimum clearance of six feet (6').

3.08 EQUIPMENT SETBACKS: Generally, street lighting equipment should be positioned at a consistent setback as outlined below:

A. ***STREET LIGHT POLES***: On a curbed roadway, the pole setback should typically be thirty inches (30") measured from the back of curb to the center of the pole base. The City Traffic Engineer/BPU Engineering may authorize a greater setback on heavily traveled streets. For non-curbed roadways, the setback should not be less than six feet (6') measured from the edge-of-pavement to the center of the pole base. At locations where a different setback is required to avoid an underground utility or other obstruction, the Design Engineer shall specify a mast arm of appropriate length to place the luminaire at or near the curb, pavement edge, and/or consistent with other adjacent luminaires.

Where median mounted street lights are preapproved, street lights should be positioned a minimum of 15' behind the nose of the median and along the median centerline.

B. ***DISTRUBTION SYSTEM***: Typically the distribution system setback from a curbed roadway shall be the same as that specified for the street light poles, or thirty inches from the back of curb to center of the conduit, except where a different setback is required to avoid a utility or other obstruction. Non-curbed roadways shall also be the same as that specified for the street light poles, or not less than six feet (6') from the edge-of-pavement to the center of the conduit.

C. ***JUNCTION/PULL BOX***: Typically the setback of a junction/pull box from a curbed roadway shall be the same as that specified for the distribution system, or thirty inches from the back of curb to center of the box. Non-curbed roadways shall also be the same as that specified for the distribution system, or not less than six feet (6') from the edge-of-pavement to the center of the box.

D. ***POWER SUPPLY***: Setbacks for power supplies along all roadways shall be a minimum of six feet (6') measured from the back of curb to the center of the pedestal. Power supplies should remain within the right-of-way boundary, and in most cases near the limits of the right-of-way to maintain a safe distance from vehicular traffic. Power supplies located near intersections should be positioned outside of curb returns and such that intersection sight distance is not hindered.

PART 4 – STREET LIGHTING ELECTRICAL SYSTEM DESIGN GUIDANCE

4.01 GENERAL: The street lighting electrical system shall comply with the NEC (NFPA 70), NESC (ANSI C2), and the service standards of BPU. The Design Engineer shall also ensure that the street lighting electrical system complies with the street lighting electrical system component requirements as outlined below. Any deviation from these system component requirements must be justified by the designer and approved by BPU.

4.02 POWER SUPPLY VOLTAGE, AMPERAGE, PHASE, & CIRCUITS: Power supplies shall be pre-approved by BPU and capable of operating at 120/240VAC and 100 amperes and 5,000 ampere short circuit current rating (SCCR). Single phase power shall energize all power supplies and corresponding branch circuits. BPU prefers that 120VAC be used to design branch circuits, however, 240VAC may be utilized to energize circuits requiring lengthy spans.

4.03 SERVICE FEED (LEAD-IN CABLE): The Design Engineer shall coordinate with BPU to determine a service point location and ensure availability of 120/240VAC service to the power supply. Service feed cables shall be #2 AWG URD aluminum triplex cable. The service feed cable quantity should be determined by accounting for all center-to-center horizontal and vertical distances, including eight feet (8') of slack, to connect the power supply to the service point. The contractor shall be required to coordinate connection of the service feed cable with BPU.

4.04 DISTRIBUTION CABLE (SECONDARY CABLE): Distribution cables for branch circuits shall consist of #2, #4, #6, or #8 AWG URD aluminum triplex cable. The distribution cables shall be sized by the Design Engineer such that the voltage drop does not exceed 5%. Breakaway fused and non-fused connectors shall be utilized to connect the distribution cable to the pole and bracket cable within the pole bases. Two (2) fused connectors shall be utilized for the hot leads, and one (1) non-fused connector shall be used for the ground as illustrated in the standard drawings. Compression in-line splice kits shall be used to connect distribution cables within junction/pull boxes as illustrated in the standard drawings.

4.05 POLE & BRACKET CABLE: Pole wiring from the distribution cables to each luminaire shall be two conductor copper #10 AWG (2c#10 AWG) for H.I.D. luminaires or #12 AWG (2c#12 AWG) for L.E.D. luminaires, both rated as THHN/THWN-2. For L.E.D. luminaires, a copper #12 AWG ground cable is required from the luminaire to the pole grounding lug. The length of the pole and bracket cable is calculated by adding the nominal pole height, the length of bracket arm, and five feet (5') of slack. This quantity would be doubled for poles with dual luminaires.

4.06 DISTRIBUTION SYSTEM: Electrical conduit shall be underground in two inch (2") or three inch (3") diameter polyvinyl chloride (PVC) conduit or high density polyethylene (HDPE) conduit. A three inch (3") Schedule 80 conduit shall be used from the power supply to the service point, including up the utility pole to the transformer. Two inch (2") schedule 80 PVC shall be used under roadways and commercial driveways, or as otherwise needed to meet conduit fill. All other underground distribution runs, including branch circuits, shall be installed in two inch (2") schedule 40 PVC or HDPE conduit.

Galvanized rigid steel (GRS) conduit shall also be incorporated in the distribution system where required to traverse structures such as bridges or retaining walls. Galvanized conduit hangar supports and stainless steel hardware shall be used to attach the GRS to the structure.

Conduit can be trenched or plowed in unpaved areas. Where conduits are required to cross under sidewalks, driveways, or streets, it shall be directionally bored. Borings under roadways shall be perpendicular to the roadway, or the shortest possible crossing distance.

The Design Engineer should calculate the length of conduit by adding the center-to-center distances between equipment. All of the center-to-center distances should be subtotaled and multiplied by 102% to allow for bending of conduit to avoid obstructions.

PART 5 – STREET LIGHTING PLAN REQUIREMENTS

5.01 GENERAL: The street lighting improvement plans should include all pertinent information required to build and check the design of the system. The plans should be arranged as outlined below, or as required by the City Traffic Engineer/BPU Engineering. The Design Engineer responsible for preparing the plans should be a Kansas registered professional engineer and is required to sign and

seal the title page. Plans should be submitted to the City Traffic Engineer/BPU Engineering for review and approval prior to construction.

5.02 SHEET SIZE: The suggested sheet size for street lighting improvement plans is twenty-four inches by thirty-six inches (24"x36"), although sheets twenty-two inches by thirty-four inches (22"x34") may be used. If the street lighting plans are submitted as part of a roadway improvement project, the sheet size should match the roadway improvement plan sheets.

5.03 SHEET TYPES: A complete set of improvement plans shall consist of the following sheets and elements:

A. ***TITLE SHEET***

a. Scaled project location vicinity map with north arrow
b. Signed & sealed signature block
c. Approval block for signature and date by the County Engineer

B. ***STREET LIGHTING PLAN SHEETS***

a. North arrow, legend, and minimum 1"=50' bar scale
b. General Notes on 1st plan sheet (see Section 5.04)
c. Plan view of street lighting improvements relative to roadway
d. Schedule of poles, boxes, power supplies, etc
e. Station and offset of street lighting equipment
f. All existing and proposed utilities (underground & overhead)
g. Street Light Pole # ID's by power supply #, circuit #, and pole # (ie. 2-1-6)
h. Bid Items and quantities on last page of plan sheets (see Section 5.05)

C. ***WIRING DIAGRAM SHEETS***

a. Schematic wiring diagram with distribution system for each power supply
b. Size and center-to-center distance of service distribution cables
c. Summary table illustrating the distribution cable size, circuit raceway length, input amperage, percent voltage drop, and circuit breaker trip rating for each circuit

D. ***STANDARD STREET LIGHTING DRAWINGS***

a. Drawings are available for download via http://www.wycokck.org/
b. Revisions forbidden unless approved by City Traffic Engineer/BPU Engineering for special applications.

5.04 GENERAL NOTES: The following is the minimum list of general notes to the contractor that should be included on the first page of the street lighting plan sheets. These notes are not meant to be all-inclusive; project specific notes may be required by the Design Engineer.

GENERAL NOTES:

1. THE UG/KCK TECHNICAL SPECIFICATIONS, DESIGN CRITERIA, AND STANDARD DRAWINGS FOR L.E.D. STREET LIGHTING SHALL GOVERN THE CONSTRUCTION OF ALL LIGHTING IMPROVEMENTS FOR THIS PROJECT.
2. THE CONTRACTOR SHALL HAVE ONE (1) SIGNED COPY OF THE IMPROVEMENT PLANS, APPROVED BY UG/KCK & BPU, AT THE PROJECT SITE AT ALL TIMES.
3. THE CONSTRUCTION OF THE IMPROVEMENTS SHOWN OR IMPLIED BY THESE PLANS SHALL NOT BE INITIATED, OR ANY PART THEREOF UNDERTAKEN, UNTIL THE CITY TRAFFIC ENGINEER IS NOTIFIED OF SUCH INTENT, AND ALL REQUIRED PERMITS AND FEES, PROPERLY EXECUTED BONDS, AND CONTRACT AGREEMENTS ARE RECEIVED AND APPROVED BY THE CITY TRAFFIC ENGINEER.
4. THE CONTRACTOR SHALL CONTACT THE ENGINEERING INSPECTOR AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE TO SCHEDULE A REQUIRED INSPECTION.
5. THE CONTRACTOR SHALL NOT WORK ON SUNDAYS OR HOLIDAYS. WORK ON SATURDAYS IS ALLOWED WHEN REQUESTED AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE AND WHEN APPROVED BY THE CITY TRAFFIC ENGINEER/BPU ENGINEERING.
6. ALL WORK SHALL BE CONFINED WITHIN THE RIGHT-OF-WAY OR DEFINED CONSTRUCTION LIMITS. WORK OUTSIDE OF THESE BOUNDARIES SHALL REQUIRE APPROVAL BY THE CITY TRAFFIC ENGINEER/BPU ENGINEERING.
7. THE CONTRACTOR SHALL STAKE THE LOCATIONS FOR ALL POLES, CONDUITS, POWER SUPPLIES, PULL BOXES, AND JUNCTION BOXES TO BE INSTALLED. THE STATIONS AND OFFSETS PROVIDED ARE TO THE CENTER OF THE STREET LIGHTING EQUIPMENT. THE CONTRACTOR SHALL PROVIDE ELEVATIONS. IF OBSTRUCTIONS ARE ENCOUNTERED DURING INSTALLATION, THE CONTRACTOR WILL RE-STAKE THOSE LOCATIONS AFFECTED BY THE OBSTRUCTION. THE CONTRACTOR SHALL CONTACT THE ENGINEERING INSPECTOR TO INSPECT THE STAKING PRIOR TO COMMENCING ANY EXCAVATION OR CONSTRUCTION WORK.
8. THE PLACEMENT OF CONDUIT SHALL BE COORDINATED WITH ALL PAVING OPERATIONS WITHIN THE PROJECT LIMITS. CONDUIT INSTALLATION AND CONDUIT CONNECTIONS SHALL BE INSPECTED AND APPROVED BY THE ENGINEERING INSPECTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXTRA COSTS OF INSTALLING CONDUITS BY ALTERNATE CONSTRUCTION METHODS AFTER THE STREET PAVEMENT HAS BEEN PLACED AND FOR ANY DAMAGE TO THE PAVEMENT THAT MAY OCCUR DURING CONDUIT INSTALLATION.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING EXISTING EQUIPMENT AS NOTED AND DELIVERING ALL SALVAGEABLE EQUIPMENT TO THE BPU OPERATIONS CENTER. THE CONTRACTOR SHALL CONTACT THE CITY TRAFFIC ENGINEER/BPU ENGINEERING AT LEAST TWENTY-FOUR (24) HOURS IN ADVANCE TO COORDINATE THE DELIVERY. ALL EQUIPMENT SHALL BE DISASSEMBLED PER THE INSTRUCTIONS OF THE CITY TRAFFIC ENGINEER/BPU ENGINEERING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE OR LOSS OF SALVAGEABLE EQUIPMENT.
10. ALL EXISTING UTILITIES SHOWN ON THESE IMPROVEMENT PLANS ARE ACCORDING TO THE BEST INFORMATION AVAILABLE TO THE DESIGN ENGINEER; HOWEVER, ALL UTILITIES ACTUALLY EXISTING ON-SITE MAY NOT BE SHOWN. UTILITIES DAMAGED THROUGH THE NEGLIGENCE OF

THE CONTRACTOR TO OBTAIN THE LOCATION OF SAME SHALL BE REPAIRED OR REPLACED AT THE EXPENSE OF THE CONTRACTOR.

11. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO MINIMIZE THE DOWNTIME OF AN EXISTING STREET LIGHTING SYSTEM TO BE MODIFIED. ALL EXISTING EQUIPMENT DAMAGED THROUGH THE NEGLIGENCE OF THE CONTRACTOR DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED, AS DIRECTED BY THE CITY ENGINEER, AT THE EXPENSE OF THE CONTRACTOR.
12. ALL EXISTING DRIVEWAYS, PARKING LOTS, SIDEWALKS, FENCES AND UNDERGROUND SPRINKLER SYSTEMS DAMAGED THROUGH THE NEGLIGENCE OF THE CONTRACTOR DURING CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL OPERATING CONDITION AT THE EXPENSE OF THE CONTRACTOR. ALL AFFECTED SURFACES, FENCES, PIPES AND FITTINGS SHALL BE REPLACED WITH NEW MATERIALS AT THE ORIGINAL LOCATION. ALL RESTORATION WORK SHALL BE ACCEPTABLE TO THE ENGINEER INSPECTOR AND THE PROPERTY OWNER.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COST AND COORDINATION WITH BPU TO SUPPLY POWER HOOK-UP TO POWER SUPPLIES.
14. MINOR RELOCATION OF STREET LIGHT POLES, JUNCTION/PULL BOXES, AND POWER SUPPLIES TO AVOID CONFLICTS WITH EXISTING UTILITIES AND FEATURES MAY BE ALLOWED UPON APPROVAL OF THE ENGINEERING INSPECTOR.

5.05 BID ITEMS & QUANTITIES: Standard quantity items that specifically apply to the project in the following table should be illustrated on the last page of the street lighting plan sheets to callout quantities for the contractor's reference. These quantities will roll up to a lump sum price for the "LIGHTING SYSTEM" in the overall summary of project quantities.

SUMMARY OF STREET LIGHTING MATERIALS & QUANTITIES *		
ITEM	**UNIT**	**QUANTITY**
DISTRIBUTION CABLE, #2 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #4 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #6 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #8 AWG ALUM. TRIPLEX	L.F.	
SERVICE CABLE, #2 AWG ALUM. TRIPLEX	L.F.	
POLE & BRACKET CABLE, 2c#10 AWG COPPER	L.F.	
POLE & BRACKET CABLE, 1c#10 AWG COPPER GND.	L.F.	
POLE & BRACKET CABLE, 2c#12 AWG COPPER	L.F.	
POLE & BRACKET CABLE, 2c#12 AWG COPPER GND.	L.F.	
2” H.D.P.E. CONDUIT, SDR 11	L.F.	
2" P.V.C. CONDUIT, SCHEDULE 40	L.F.	
2" P.V.C. CONDUIT, SCHEDULE 80	L.F.	
3" P.V.C. CONDUIT, SCHEDULE 80	L.F.	
JUNCTION/PULL BOX	EA.	
SCREW-IN ANCHOR FOUNDATION	EA.	
TRANSFORMER BASES	EA.	
CONCRETE FOUNDATION	EA.	
STREET LIGHT POLE, 30' M.H.	EA.	
STREET LIGHT POLE, 35' M.H.	EA.	
STREET LIGHT POLE, DECORATIVE	EA.	
BRACKET ARM, 6'	EA.	
BRACKET ARM, 12'	EA.	
COBRAHEAD LUMINAIRE, H.I.D. 250W	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 150W EQUIV.	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 250W EQUIV.	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 400W EQUIV.	EA.	
POST TOP LUMINAIRE, H.I.D. DECORATIVE	EA.	
POWER SUPPLY, 4-CIRCUIT 120/240VAC	EA.	
POWER SUPPLY, FOUNDATION	EA.	
BREAKAWAY CONNECTOR, FUSED	EA.	
BREAKAWAY CONNECTOR, NON-FUSED	EA.	
REMOVE & RELOCATE EXISTING EQUIPMENT	L.S.	
RIGHT-OF-WAY RESTORATION	L.S.	

*These quantities are approximate and were prepared solely for the Contractors convenience and are not guaranteed to be a complete list of materials required for the project.

PART 6 –DESIGN ENGINEERS CHECKLIST

GENERAL: The design engineer shall review the checklist below and confirm that each of the items have been satisfied. It is highly encouraged that the designer refer to this checklist at the onset of the project to ensure that all parties are on the same page and avoid unnecessary redesign/delays.

Lighting Design Engineers Checklist

- ☐ Confirm lighting design criteria (luminance, illuminance, street class, ped conflict area) with City Traffic Engineer/BPU Engineering.
- ☐ Refer to Pre-Approved Luminaire Product List for design and analysis; utilize most conservative 'As Equal Luminaire' spacing design.
- ☐ Establish optimal pole height and spacing design (single, double, staggered) and lateral offset for poles in the right-of-way.
- ☐ Perform photometric analysis and calculations to satisfy the design criteria. Designer to provide evidence of analysis, if requested.
- ☐ Coordinate with BPU to determine where/if underground and/or overhead utilities will conflict and if proper clearance exist.
- ☐ Coordinate with BPU to determine power supply locations, capacity of existing transformers, and/or installation of new transformers.
- ☐ Perform voltage drop calculations for each circuit and 200A power supply. Designer to provide evidence of calculations, if requested.
- ☐ Submit plans, quantities, and estimates in accordance with the Street Lighting Design Guide and Lighting Specifications.

UNIFIED GOVERNMENT OF KANSAS CITY, KANSAS AND WYANDOTTE COUNTY

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

&

KANSAS CITY BOARD OF PUBLIC UTILITIES

STREET LIGHTING EQUIPMENT & MATERIAL SPECIFICATIONS

January 2019

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STREET LIGHTING MATERIAL SPECIFICATIONS INTRODUCTION

PART 1 – GENERAL

1.01 SCOPE: The specifications outlined in this document covers the furnishing of all materials, equipment, and labor for the installation and testing of the street lighting systems to be installed in the public street right-of-way or on other public property under the jurisdiction of the Unified Government and the City of Kansas City, Kansas (UG/KCK), and the Board of Public Utilities (BPU). The materials and equipment specifications outlined herein shall be strictly adhered to, or as otherwise directed by the plans or City Traffic Engineer/BPU Engineering.

1.02 CODES AND STANDARDS: All materials and work shall conform to the requirements of the National Electric Code (NEC, NFPA 70), the National Electrical Safety Code (NESC), the standards of the American Society for Testing Materials (ASTM) and the American Standards Association (ASA), as well as local ordinances and the Board of Public Utility (BPU) policies. Electrical equipment shall conform to the standards of the National Manufacturers Association (NEMA).

1.03 PERMITS & INPECTIONS: Contractors are responsible for obtaining a right-of-way permit from the UG/KCK's Public Works Department before any work within the City's right-of-way is conducted.

The City Traffic Engineer/BPU Engineering will assign an address for the power supply, which the Contractor shall use when requesting electrical service inspection through BPU. After an approved power supply inspection, Contractors shall coordinate with BPU to energize the system. The Contractor is responsible for all costs associated with the connection of power from the service point to the power supply.

Contractors shall contact the City Traffic Engineer/BPU Engineering once project work begins and to request final inspection. Contractor shall keep the City Traffic Engineer/BPU Engineering apprised of the project progress and the Contractor's proposed schedule. The City Traffic Engineer/BPU Engineering or Engineering Inspector reserves the right to require any work completed without their knowledge to be halted and dismantled, if necessary, to properly inspect the work.

1.04 REFERENCES: In addition to the specifications outlined herein, the following specifications should be referenced by the Contractor where required by the plans and/or contract documents:

- KDOT Standard Specification, Section 814 – Electrical Lighting Systems and Traffic Signals
- KDOT Standard Specification, Section 1703 – Electrical Lighting and Traffic Signal Equipment

1.05 SUBMITTALS: Prior to the start of construction, the Contractor shall submit two (2) copies of complete shop drawings for all manufactured equipment and materials to the City Traffic Engineer/BPU Engineering for approval. Manufacturer cut sheets, drawings, dimensions and other pertinent data required to confirm standard equipment should be submitted. The Contractor shall

clearly indicate specifically which item the contractor intends to use on the project on each cut sheet, drawing, or specification submitted. Items submitted that fail to comply with the specifications herein may be rejected by the City Traffic Engineer/BPU Engineering. The City Traffic Engineer/BPU Engineering may also require additional documentation for non-cataloged equipment or materials. The Contractor should not place orders for any project related equipment or materials until in receipt of written approval from the City Traffic Engineer/BPU Engineering.

If shop drawings are required to be resubmitted as a result of a proposed field modification of a structure, a registered professional engineer shall seal those shop drawings prior to submittal.

PART 2 – MATERIALS & EQUIPMENT

2.01 GENERAL: All materials used in the fabrication or assembly of the items below shall comply with this specification and any applicable sections of the KDOT Standard Specifications as required by the plans and as referenced above. All lighting equipment is required to be new and consisting of a material grade that meets or exceeds these specifications.

2.02 ALUMINUM STANDARDS: The mounting height of street lighting poles and length of associated bracket arms shall be as specified in the plans and/or contract documents. The manufacturer, supplier, and Contractor shall guarantee that shafts and bracket arms provided on this project shall remain without defect for a period of five (5) years.

A. ***POLE SHAFTS*****:** Aluminum lighting pole shaft (30' & 35' mounting heights) assemblies shall be spun from one piece of seamless tubing and after fabrication, it shall have a mechanical strength of not less than T6 temper. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper without longitudinal or circumferential welds, except at the lower end joining the shaft to the base. The top of the pole shaft shall be equipped with a cast aluminum removable top held securely in place by means of set screws. Pole shafts shall be tire wrapped with a non-staining paper for protection during shipping.

Pole dimensions shall be as specified on the standard drawings. It is the responsibility of the fabricator to verify and attest that the material sizes proposed are structurally adequate and in full compliance with this specification and the standard drawing.

B. ***SHOE BASE*****:** The four-bolt shoe base shall be a permanent mold casting made of aluminum alloy 356.0 T6. The base shall be free of cracks, pits, and blow holes and of sufficient size and strength to withstand full design loads. The base shall telescope the shaft; and the one weld shall be on the inside of the base at the end of the shaft, while the other weld shall be on the outside at the top of the base. The shoe base and the two (2) welds shall develop the full strength of the pole assembly. The shoe base flange shall have four slotted holes for anchorage. Four bolts, four nuts, four removable bolt covers, and eight washers shall be provided with each pole. The bolt covers shall attach to the upright portion of the body of the base. The bolt circle is provided in Table 1 of the pole detail sheet.

C. ***BRACKET ARMS*****:** The truss type member arm assembly shall be a one piece welded assembly consisting of an upper arm and lower arm (brace) securely joined by a vertical strut and a connector or weld at the outboard end of the arm assembly. The upper arm shall be a tapered-elliptical aluminum tubing by cold working from round tubing. After tapering, the upper arm shall then be flattened to produce an elliptical cross-section with the major diameter in the horizontal plane, parallel to the wind. The outboard end of the upper arm shall remain round with a two-inch (2") slipfitter for mounting the luminaire. The lower arm (brace) shall be 1.5" Schedule 40 pipe and the outboard end shall be covered by an end cap. The vertical strut shall be an arm connector and shall conform to aluminum alloy 6063-T4 extruded.

D. ***BREAKAWAY TRANSFORMER BASE*****:** Breakaway transformer bases (T-bases) shall be fabricated from aluminum alloy 356-T6. Breakaway T-bases shall also be approved by the Federal Highway Administration (FHWA) as satisfying up to the LTS-6 edition of the American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.* An access door shall be provided along with stainless steel and galvanized steel hardware, per the Standard Drawings. Breakaway T-bases shall be supplied as shown on the plans and Standard Drawings.

E. ***FOUNDATIONS***: Foundations shall be screw-in or concrete and installed per the plans. Screw-in foundations are the preferred type of pole base and shall be of the size and type required by the plans and standard drawings.

Screw-in anchors shall be hot dip galvanized per ASTM-A153 with a baseplate that is perpendicular to the shaft axis (+/- 1 degree) and a hole centerline concentric to the shaft axis (+/- 0.188). Anchors shall also have two flame cut slots in the shaft perpendicular to the baseplate to allow for conduit access in and out of the foundation. The baseplate shall meet the latest edition of ASTM A36 structural steel. Shafts shall meet the latest edition of ASTM A252, grade 2 steel pipe piles. Helix shall meet the latest edition of ASTM A635 for 3/8 inch thick hot rolled steel plate or coil. The pilot point shall be the latest edition of ASTM A575 for 1-1/4 inch diameter hot rolled steel BA.

The anchors shall be screwed into the ground within the maximum and minimum torque ratings per the manufacturer's recommendations. Pre-drilling of holes for the anchor is prohibited unless otherwise approved by the City Traffic Engineer/BPU Engineering for areas where rock is encountered. The foundation shall be screwed straight into the ground and the baseplate shall be plumbed with a level and flush with the finish grade. Minor leveling adjustments may be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 0.25" (6.35 mm) thick. Only one shim or washer will be allowed at any one anchor bolt with a maximum of two on any pole.

Where street light foundations are to be installed in areas of fill (embankment), resulting from roadway grading improvements or otherwise, a concrete foundation shall be installed. If screw-in foundations cannot be used for any reason, concrete foundations shall be installed at the contractor's expense.

2.03 ILLUMINATION EQUIPMENT: Luminaires shall be light emitting diode (L.E.D.) or high intensity discharge (H.I.D.) as specified on the plans and as pre-approved by KCK/BPU. Refer to the Pre-Approved Luminaire Product List for luminaires that are qualified to meet these specification requirements. Cobrahead luminaires shall contain a die cast aluminum housing and a corrosion resistant powder coated gray finish. A power door assembly with a removable trigger latch, or equivalent easy maintenance access door, shall be included with the luminaire. The luminaire shall be equipped with a slipfitter mounting design. Luminaires shall be prewired, requiring only connection of service wires to the terminal board. Terminal boards shall be capable of multi-tap voltage selection ranging from 120-277V. Optics for cobrahead luminaires shall be full cutoff with Type III distribution. Decorative post top luminaires housing and ribs shall made of cast aluminum with a black polyester powder coat paint finish. Mounting base casting should slipfit over a standard 3" outer diameter tenon with set screws. An internal terminal block shall be provided to support 120-277V operation. The optics shall include refractive and reflective prisms for efficiency of a Type III distribution.

For all L.E.D. luminaires, a driver adept for dimmable lighting shall be factory installed with a 7-pin receptacle (with shorting cap) that meets or exceeds ANSI C136.41-2013 standards for dimming. The operating frequency of the L.E.D. lamps shall range between 50-60 Hz with a Total Harmonic Distortion (THD) less than 20%. Surge protection rated for at least 6kV/3kA shall be integrated with the luminaire housing unit. The luminaire correlated color temperature (CCT) shall be 4000k unless otherwise approved by the City Traffic Engineer and indicated on the construction plans.

2.04 ELECTRICAL CONDUCTOR MATERIAL: The types and lengths of service feed, distribution, and pole & bracket cables shall be supplied as shown on the plans, Standard Drawings, or as specified in the Project Special Provisions. Cables shall meet the requirements outlined below:

A. ***SERVICE FEED (LEAD-IN CABLE)*****:** Aluminum triplex #2 AWG URD rated, capable of operating at 600 volts phase-to-phase. Service feed cable should meet or exceed all applicable requirements for ANSI/ICEA S-76-474. Additionally, it should at least meet ASTM specifications B-230, B-231, B-232, B-399, and B-901.

B. ***DISTRIBUTION CABLE (SECONDARY CABLE)*****:** Aluminum triplex #2, #4, #6, or #8 AWG URD rated, capable of operating at 600 volts phase-to-phase. Distribution cables should meet or exceed all applicable requirements for ANSI/ICEA S-76-474. Additionally, it should at least meet ASTM specifications B-230, B-231, B-232, B-399, and B-901.

C. ***POLE & BRACKET CABLES*****:** Two (2) stranded annealed copper #10 AWG conductors, type THHN or THWN-2, capable of operating at 600 volts and meets applicable ASTM specifications. Additionally, UL Standards 83, 758, and 1063 shall be met. Along with the two (2) conductor leads (2 hot leads for 240V, 1 hot & 1 neutral lead for 120V), a #10 AWG copper grounding conductor shall be run from each luminaire to the grounding lug inside the pole. A solid copper ground conductor that meets or exceeds the size of the distribution cable shown on the plans for each particular circuit shall be bonded to a 5/8" x 10' ground rod at each pole.

2.05 POWER SUPPLY: Power supplies shall be an underground service type, rated for 100 amperes, 120/240VAC, unless otherwise noted and capable of operating fourbranch circuits. Branch circuits shall be configured for 120VAC operation unless otherwise indicated to be 240VAC on the construction plans. The pedestal shall be 0.125 aluminum #5052, rain-tight NEMA 3R construction with individual panel, contactor, and rear service pull "compartments." Meter and panel/contactor compartments shall have piano hinged doors with padlocking provisions. The panel and contactor compartments shall have an inside panel door. The outer front and inside panel doors shall be equipped with an approved doorstop. Meters are not required by BPU for street lighting power supplies, however, BPU reserves the right to demand meters for future monitoring purposes. Panelboard shall have silver plated copper buss and shall accept 12 - 1 inch plug-in breakers. Panelboard compartment shall contain a 7-pin photocell, convenience receptacle, and test switch. All factory installed wire shall be copper. Power supply shall be U.L. listed and bonded to a 5/8" x 10' ground rod.

2.06 CONDUIT: The type, size and length of conduit and fittings shall be supplied as shown on the Plans or Standard Drawings, or as specified in the Special Provisions. The contractor shall furnish and install high density polyethylene (HDPE) conduit and Schedule 40 and/or Schedule 80 polyvinyl chloride (PVC) for the distribution system. Galvanized Rigid Steel (GRS) conduit shall be used where conduit is to be installed on a structure.

A. ***POLYVINYL CHLORIDE (PVC)*****:** Rigid nonmetallic conduit shall be two-inch (2") or three-inch (3") Schedule 40 or Schedule 80 PVC conduit as indicated on the plans and standard drawings. The conduit shall bear an Underwriters' Laboratories label and shall conform to Federal Specification WC-1094A (latest version). Fittings shall be fabricated from PVC and have the same chemical and physical property as the conduit with which it is being used.

Two-inch (2") Schedule 80 PVC conduit is required under all road and commercial driveway crossings, or as otherwise shown on the plans. Three-inch (3") Schedule 80 PVC shall be used between the power supply and service point, including up the pole to the transformer.

B. ***GALVANIZED RIGID STEEL (GRS)*****:** Galvanized rigid steel conduit shall be in accordance with ANSI C80.1. GRS conduit shall be galvanized on both the inside and the outside surfaces. The weight (mass) of zinc coating shall be no less than 0.5 ounce per square foot of coated surface, as determined in accordance with AASHTO T 65. The interior or exterior surface, or both, may

be given a coating of suitable material to facilitate installation of wires and cables and to permit the conduit to be readily distinguished from pipe used for purposes other than electrical. All metal conduit ends shall be provided with a bushing to protect the cable from abrasion. Fittings shall be in accordance with ANSI C80.4. A sufficient number of conduit hangars shall be supplied to attach the GRS conduit to the structure, as recommended by the manufacturer. One (1) No. 6 AWG, bare copper ground wire shall be attached to each end of the GRS conduit with a grounding busing. The ground wire shall be connected to a ground rod at each end of a GRS conduit run, or extended to an adjacent GRS conduit or ground rod.

GRS conduit shall be installed where the distribution system is traversing structures such as bridges or retaining walls. Expansion fittings shall be installed at expansion joints on the structures.

C. ***HIGH DENSITY POLYETHYLENE (HDPE)*****:** Flexible non-metallic conduit shall be high-density polyethylene conduit (HDPE). The conduit shall be smooth walled inside and out, and gray in color. The conduit shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The conduit shall be manufactured to NEMA Standard TC-7 and ASTM D 3035 SDR11 specifications. The conduit shall be clearly and durably marked at least every 10 feet with the material designation, nominal duct size, and the name and/or trademark of the manufacturer. Fittings for the HDPE conduit shall be in accordance with ASTM D 2683. Epoxy used for the fittings shall be in accordance with the conduit manufacturer's recommendations.

An approved factory coupling shall be used for connection of the HDPE conduit to a 90° factory PVC elbow or between two lengths of HDPE conduit. The coupling shall be of high density polyethylene material. The coupling shall provide an airtight and watertight lock connection.

2.07 SERVICE/JUNCTION BOXES: The type and size of service or junction boxes shall be supplied as shown on the Plans. All boxes shall meet a design load rating capable of withstanding operations and maintenance truck weight or an errant vehicle at a minimum of 22,500 lbs. The Contractor shall install an approved junction/pull box.

PART 3 – CONSTRUCTION EXECUTION

3.01 GENERAL: The Contractor shall conduct all construction activities in compliance with the Occupational Safety and Health Act (OSHA) rules and regulations. Only well trained, qualified laborers shall be allowed to perform construction activities related to street lighting and they shall be familiar with the applicable sections of the NEC. Prior to construction, the Contractor shall contact the City Traffic Engineer/BPU Engineering to set up a pre-construction meeting.

3.02 INSTALLATION: The following equipment shall be installed by the Contractor as described herein, or as directed by the Plans, City Traffic Engineer/BPU Engineering or Engineering Inspector.

A. ***POLE AND LUMINAIRE INSTALLATION*****:** Poles and luminaires shall be of the size and type required by the standard details for the pole(s) specified on the plans.

a. **Pole Wiring:** Luminaire pole & bracket cables shall be connected to the secondary cables through in-line, waterproof, breakaway fuseholders. All secondary cable connections inside pole bases shall be made with approved multiple tap connectors. The Contractor shall install in-line waterproof breakaway fused and non-fused disconnects in each pole base. Two (2) fused disconnects shall be utilized for each "hot" and/or neutral lead and one (1) non-fused disconnect shall be used for the ground. The multiple tap connectors and fuseholders shall be installed convenient to the transformer base access door. One (1) foot of surplus cable shall be coiled at the line side of the multiple tap connector, between the connector and the fused disconnect, and on the load side of the fused disconnect.

The incoming distribution ground wire and ground rod grounding wire shall be fastened to the factory-installed grounding lug in the base of the pole. The ground rod grounding wire shall match the size of the incoming distribution wire. Additionally, a single conductor #10 AWG ground wire shall be run from each luminaire head to the ground lug.

The pole wiring shall be color coded (black = hot, white = neutral, green = ground) and without splices from the fuseholder to the connection at the luminaire.

b. **Pole and Luminaire Erection On Screw-In Anchor Foundations:** The 30' or 35' pole shall be fastened to the foundation with a breakaway transformer base using pole manufacturer recommended bolts and nuts. The nut shall be on top. A washer shall be installed under the bolt head and another under the nut. The pole shall be checked for plumb, minor corrections made using galvanized or cadmium plated steel shim stock, the nuts tightened and the anchor bolt covers installed. Transformer bases access doors shall be situated so that they are on the house side, or opposite side from the adjacent traffic. For poles installed in a median, the transformer doors should be oriented away from one direction of oncoming traffic, facing North or East.

c. **Pole and Luminaire Erection On Concrete Foundations:** No sooner than five (5) days after construction of the foundation, a nut and washer shall be installed on each anchor bolt. The 30' or 35' pole will be mounted to a breakaway transformer base using nuts, bolts, and washers as recommended by the pole manufacturer. Using the lower nuts, the pole shall be brought into vertical alignment (plumb), the top nuts tightened, and the anchor bolt covers installed. The opening between the pole base and the foundation shall be taped and grouted. Transformer bases access doors shall be situated so that they are on the house side, or opposite side from the adjacent traffic. For poles installed

in a median, the transformer doors should be oriented away from one direction of oncoming traffic, facing North or East.

d. **Luminaire On Bracket Arms**: The luminaire slipfitter shall be installed on the davit supplied with the bracket arm. The luminaire and davit shall project from the street side of the pole and be perpendicular to the curb line, unless otherwise directed in the plans.

e. **Luminaire Adjustment**: The luminaire shall be adjusted and leveled in accordance with the manufacturer's instructions. The nadir shall be placed directly below the light source center. Luminaire should typically be installed such that the frontal view of the luminaire is parallel to the road surface, while in the side view the luminaire should be horizontal.

f. **Storage, Protection, & Clean Up:** Poles and mast arms shall be kept dry and out of the weather until time for erection. The manufacturer's protective paper wrapper may be removed for inspection upon receipt from the manufacturer. Poles and luminaires shall be cleaned of dirt, grease, etc. Scratches, abrasions or other surface damage shall be repaired to like new condition.

B. ***FOUNDATIONS:*** Foundation anchors and reinforcing steel shall be of the size and type required by the standard details for the pole(s) specified on the plans.

a. **Screw-In Foundations:** The anchors shall be screwed into the ground. Pre-drilling of holes for the anchor is not allowed. During installation the foundation shall be plumbed with a level. The foundation shall be screwed straight into the ground and the base plate shall be level. Minor leveling adjustments may be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 1/4 inch thick. Only one shim or washer will be allowed at any one anchor bolt with a maximum of two on any pole. If screw-in foundation anchors are not able to be used for any reason, concrete foundations shall be installed at the contractor's expense.

b. **Concrete Foundations:** The bottom of the concrete foundations shall rest on firm ground; foundations shall be poured monolithic. Forms shall be true to line and grade. Top of footing for standards, except special foundations, shall be finished to curb, or sidewalk grade or as directed by the City Traffic Engineer/BPU Engineering. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position, to proper heights, and held in place by means of a template until the concrete sets. Anchor bolts shall be provided with hex head nut, flat washer and lock washer. Both forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete.

Pole base and power supply foundations shall be KCMMB4K, air entrained, 28-day compressive strength Portland Cement Concrete. Aggregate shall be Kansas Class 1 or Class 6.

Reinforcing steel for concrete bases shall be accurately cut and bent to the dimensions and shapes shown on the standard details. Cutting and bending tolerances for reinforcing steel shall be in accordance with the latest edition of the Concrete Reinforcing Steel Institute's *Manual of Standard Practice*. Flame cutting of uncoated reinforcing steel may be permitted. Reinforcing steel shall be protected from damage at all times. When placed in the work and before concrete is placed, reinforcing steel shall be free from dirt, oil paint, grease, loose mill scale, thick rust, any dried mortar and other foreign substances. A thin layer of powdery rust may remain. Reinforcing bars shall be positively secured against displacement. The bars shall be firmly tied at alternate crossings or closer. The steel shall be spot welded or tied in the correct position with proper clearance maintained between the forms and reinforcement. Splicing of bars shall not be allowed. Concrete shall not be placed until forms and reinforcing steel have been checked and approved by the Engineering Inspector.

Concrete pole bases shall be consolidated by an internal type vibrator. The vibrator shall operate at frequencies of vibration not less than 4,500 cycles per minute under load. The amplitude of vibration shall be adequate to consolidate concrete properly. The concrete shall be cured with an approved moisture barrier such as wet burlap, polyethylene, etc., for a period of seventy-two (72) hours. Cold weather curing shall be such that the concrete temperature shall be maintained above freezing for the entire curing period. Forms shall not be removed until the concrete is thoroughly set.

The exposed portions of the foundation shall be finished to present a neat appearance. Finishing should be done with the positioning jig in place. If the jig must be removed for finishing, it shall be re-installed immediately after finishing and left in place throughout the cure period. A safety device (traffic cone, Type I barricade, etc.) shall be installed and secured firmly in place over each foundation immediately after finishing and remain in place until the pole or pedestal is installed. Prior to installing the pole or pedestal, the positioning jig shall be removed, loose concrete cleaned from around the anchor bolts and conduits, and the conduits trimmed to provide proper clearance for the pole or pedestal

C. ***WIRING:*** The roadway lighting conductor system shall be installed in 2"-3" HDPE and/or SCH 40 or 80 PVC conduit, or as otherwise sized in the plans, wired and installed as a 120 or 240 volt system as required and shown on the plans. Wiring shall conform to the appropriate articles of the National Electric Code. Wiring shall be continuous from street lighting appurtenance to street lighting appurtenance. No splices of cable will be permitted in conduit or outside of pull boxes, junction boxes, or pole bases. Conductors for service and branch circuits shall be Triplex

URD rated, sized in accordance with the plans by the Design Engineer. Conductors for all pole and bracket cables shall be copper 2c-#10 THHN/THWN-2 rated.

Powdered soapstone, talc or other approved lubricant shall be used when inserting conductors in conduit. All cable to be installed in one conduit shall be pulled by the Contractor in one operation, and all ends shall be taped to exclude moisture and shall be so kept until the splices are made or terminal appliances attached. Ends of spare conductors shall be taped.

All splices in junction boxes and pull boxes shall be made with appropriate in-line splice connectors. Such splices shall be carefully wrapped with three successive layers of Scotch (3M) No. 130C, "Linerless Rubber Splicing Tape" and then wrapped with three layers of Scotch (3M) No. 33+ "Electrical Tape". The total diameter of the taped splice shall be approximately 1 ½ times the diameter of the spliced conductor covering. 3M Scotchkote electrical coating shall be "Painted" over the splice. Two feet of slack shall be left at all power supplies, junction boxes and pull boxes for splicing and connecting wires. Wiring within boxes shall be neatly arranged and laced up. Wires shall be color-coded (black = hot, white = neutral, green = ground) and circuits permanently identified in accordance with designations used on the plans.

All distribution cable connections inside the base of the light pole shall be made with approved waterproof, breakaway fused and non-fused disconnects. Two disconnects for each hot lead (fused) and one disconnect for the ground ("dummy fuse") shall be installed. Two additional disconnects for the hot leads shall be provided for twin luminaire poles (ground disconnect is shared). Fuses shall be high interrupting, 8-amp and as approved by BPU. The breakaway disconnect fuseholders shall be installed convenient to the handhole at the base of the pole.

One (1) foot of surplus cable shall be coiled at the line side of the breakaway connector, between the connector and the fused disconnect, and on the load side of the fused disconnect. The connectors for the ground shall be installed with the male end of the connector on the line side. The ground wire shall be fastened to the factory installed ground lug in the base of the light pole. All poles shall be bonded to form a continuous system. At each pole and multiple service point, a ground rod shall be installed. The electrode shall be a copper rod not less than five-eighths (5/8) inch in diameter and ten (10) feet in length, unless otherwise noted on the plans, driven to a depth so the top is six (6) inches below the surface of the ground. The service equipment shall be bonded to the driven ground rod by a copper wire of equal size to the distribution cable on the plans, and enclosed in a one (1) inch diameter conduit.

D. ***POWER SUPPLY PEDESTAL AND FOUNDATION:*** The power supply assembly, including the pedestal, circuit breakers, fuses, contactors, photoelectric control, control wiring, meter socket, service feed, and foundation, shall be constructed and installed as shown on the Plans and Standard Drawings, and as specified in the Special Provisions or as directed by the Engineer. The Contractor shall coordinate his activities with BPU to insure delivery of power to the power supply when and where required by the plans. The power supply pedestal shall be cleaned of

wrapping, shipping material, dirt, grease, etc. Scratches, abrasions or other surface damage shall be repaired to like new condition. The photo cell shall be directed north unless southbound traffic may impact photo cell operation. Power supply foundations shall have two to four (2-4) 2 inch conduits for exiting cables (one per circuit), one (1) one inch conduit for grounding rod and cable, and one (1) 3 inch conduit for service cable. Grounding cable for the power supply shall be a bare copper #6 AWG. The direction of the existing conduit and the orientation of the power supply shall be approved by the Engineering Inspector.

E. ***CONDUIT:*** All labor, materials, and equipment shall be furnished with all distribution system work. All conductors shall be run in conduit between all lighting equipment locations. Conduit shall be installed as shown on the Plans and Standard Drawings, and as specified in the Special Provisions or as directed by the City Traffic Engineer/BPU Engineering to avoid underground obstructions. The size of the conduit used shall be as shown on the Plans, and as specified in the Special Provisions. Schedule 80 PVC conduits shall be used under existing/proposed street pavement, commercial driveways, PVC conduit bending locations, or any above ground conduit runs. HDPE SDR 11 or Schedule 40/80 PVC conduit may be used at all other locations.

a. **Installation:** The conduit installed under all roadway surfaces shall be placed a minimum of forty-eight (48) inches below the top of curb elevation; under drives and within shoulders at a minimum depth of twenty-four (24) and a maximum of forty-eight (48) inches below finished grade. Street lighting conduit may be installed in the same trench with traffic signal or fiber optic conduit as long as the minimum depth requirements are met and a minimum of twelve (12) inches of vertical separation between the top of one conduit and the bottom of the other is maintained. Conduit set in standard bases shall extend approximately three (3) inches above the foundation vertically. Conduit entering through the bottom of a junction/pull box shall be located near the ends to leave the major portion of the box clear. Conduit entering junction/pull boxes shall terminate two (2) inches inside the box wall and shall be sloped to facilitate pulling of cable. At all outlets, conduit shall enter from the direction of the run.

   The ends of all conduits shall be well-reamed to remove burrs and rough edges. Field cuts shall be made square and true so that the ends will butt or come together for the full diameter thereof. Conduit bends, except factory bends, shall have a radius of not less than six times (6x) the inside diameter of the conduit. Where factory bends are not used, conduit bends shall be made without crimping or flattening, using the longest radius practical and utilizing an appropriate conduit bending tool.

   Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

b. **Trenching:** A trench crossing a proposed street shall be backfilled with clean one-half inch (½") crushed rock (CA-5) to two feet (2') behind the future curb. If the bottom of

the trench is in rock or rocky soil, the conduit shall be placed on a six-inch (6") protective layer of clean, tamped backfill material. Backfill within six inches (6”) of the conduit shall be free of rock or other solid material likely to cause damage. All backfill material shall be compacted to a density at least ninety percent (90%) of the maximum density for the material used as determined by ASTM D-698. The six inches (6”) of backfill nearest the conduit shall not be machine compacted.

c. **Boring:** Conduit for a power service cable to be placed under an existing developed area outside a street right-of-way shall be installed using approved boring methods. Also, where a conduit is to be placed under an existing paved surface, it shall be installed using approved boring methods. No existing developed property outside a street right-of-way or existing paved surface shall be cut or otherwise disturbed without the written permission of the Engineer and then only in the event insurmountable obstructions are encountered. The conduit shall be bored at a depth of between twenty-four inches (24”) and thirty-six inches (36”) below the final grade. Boring pits shall be kept two feet (2’) clear of the edge of any type of pavement wherever possible. Excessive use of water, such that the paved surface might be undermined or the subgrade softened, will not be permitted. Boring may be used instead of trenching at all other locations.

F. ***BOXES:*** Junction boxes and/or pull boxes shall be installed at the locations shown on the plans. However, boxes should not be located in sidewalks and driveways. A box shall also be installed at each end of a conduit run that crosses the road, unless intercepting a street light pole. The Contractor may install, at his own expense, additional boxes as may be desired to facilitate the work upon approval of the Engineer. Junction and pull boxes shall be installed on crushed rock (CA-5) at the designated depths shown on the standard details or as directed by the Engineer. Cinders, broken concrete, broken rock, or other hard or undesirable material shall not be used for backfilling. Unless otherwise directed by the Engineer, boxes shall be installed level to 1 inch (25 mm) above the finish grade.

G. ***INSTALLATION LOCATIONS:*** Unless otherwise noted on the plans, or obstructions exist, equipment shall be installed at the following locations:

a. **Conduit:** One (1) foot behind the back of curb.
b. **Street Light Poles:** Three (3) feet behind the back of curb to center of pole and on property lines. Transformer base access doors shall be situated such that they are on the house side, or on the opposite side of adjacent traffic.
c. **Junction/Pull Boxes:** Two (2) feet behind the back of curb to center of box and no closer than two (2) feet to any street light pole.
d. **Power Supplies:** Located within the right-of-way and in accordance with BPU requirements and City ordinances.

H. ***SYSTEM TESTING:*** The Contractor is responsible for testing the completed street lighting system. Prior to acceptance, the Contractor shall notify the Engineering Inspector for an inspection as soon as the system(s) is (are) ready. All street lighting system elements shall function properly as a complete system for a minimum period of ten (10) days before acceptance will be granted. The ten (10) day period shall be continuous and initiated by the Engineering Inspector. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction. A period shall start when the malfunction has been repaired to the satisfaction of the inspector. After the burn test is completed, the street light system(s) must remain in operation if the street is open to vehicle traffic.

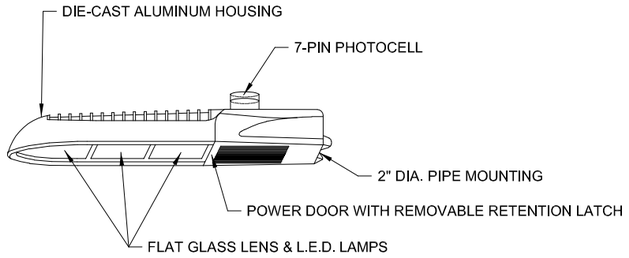
I. ***MAINTENANCE WORK:*** The Contractor is responsible for making all repairs and replacements, including downed poles, damaged or cut cables, and burnt out lamps, to the street lighting system, regardless of the cause or responsible party, until the entire system is completed, inspected and accepted.

J. ***REPLACMENT OF DAMAGED PROPERTY:*** The Contractor shall be held responsible for replacing or reconstructing in kind, any damaged property that result from construction activities including, but not limited to, sidewalks, curbs, gutters, Portland Cement concrete and asphaltic concrete pavement, grass, drainage structures and irrigation systems. The new work shall be restored to its original and serviceable condition satisfactory to the City Traffic Engineer/BPU Engineering. Whenever a part of a square or slab of existing concrete sidewalk, driveway or pavement is broken or damaged, the entire square or slab shall be removed and reconstructed at the expense of the Contractor.

PART 4 – MEASUREMENT & PAYMENT

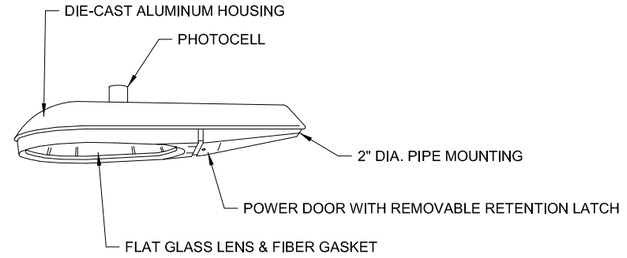
4.01 METHODS OF MEASUREMENT: The street light installation as indicated on the plans, complete-in-place and accepted, will be measured as a unit lump sum quantity for all work necessary.

4.02 BASIS OF PAYMENT: The street light installation measured as provided above will be paid for at the contract lump sum bid price for the “LIGHTING SYSTEM”.



L.E.D. LUMINAIRE

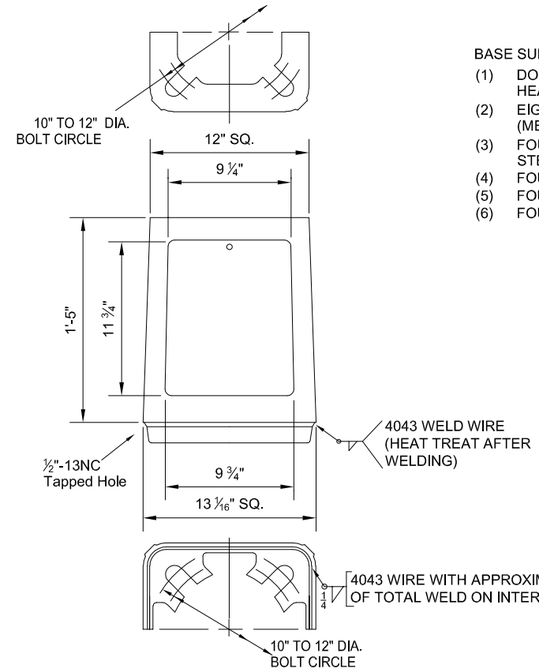
(150 WATT, 250 WATT, & 400 WATT HPS EQUIVALENT)
*L.E.D. SHOWN IS SCHEMATIC ONLY, ACTUAL APPEARANCE MAY VARY



H.P.S. LUMINAIRE

(250 WATT)

NOTES:
1. LUMINAIRES SHALL POSSESS THESE GENERAL CHARACTERISTICS AND BE PROVIDED AS SPECIFIED ON THE PLANS.
2. H.P.S. LUMINAIRES SHALL ONLY BE USED WHERE PRE-APPROVED BY UG/KCK & BPU.
3. FOR DECORATIVE H.P.S. LUMINAIRES AND POLE DETAILS, REFER TO THE STANDARD DRAWING DETAILS FOR DECORATIVE LIGHT POLES.
4. REFER TO THE APPROVED PRODUCT LIST FOR L.E.D. AND H.I.D. LUMINAIRES
5. ALL L.E.D.'S SHALL HAVE A 4000K C.C.T.



BASE SUPPLIED WITH:
(1) DOOR AND ¼"-20NC STAINLESS STEEL HEX HEAD SCREW
(2) EIGHT 1" WASHERS ½" THICK X 2¾" O.D. (MECHANICAL GALV. PER ASTM B454)
(3) FOUR 1"-8NC X 3¾" LONG GALVANIZED STEEL HEX HEAD BOLTS
(4) FOUR 1"-8NC GALVANIZED STEEL HEX NUTS
(5) FOUR 1" GALVANIZED STEEL LOCKWASHERS
(6) FOUR 1" GALVANIZED STEEL FLATWASHERS

AKRON FOUNDRY TB2-AF 1012-17 I.W.
(TB2-17")

MATERIAL: ALUM. ALLOY 356-T6

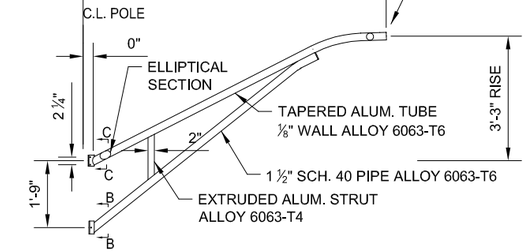
TRANSFORMER BASE

(HAPCO DRAWING A70512)

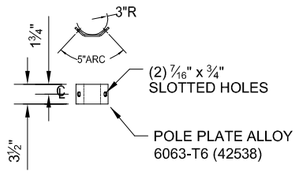
QTY	ITEM NO.	A	B	C
	75406-001	25'-9"	23'-9"	.156"
	75406-002	30'-9"	28'-9"	.219"

STREET LIGHT POLE

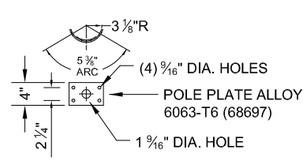
(HAPCO DRAWING B75406)



QTY	ITEM NO.	A	TUBE SIZE	ELLIPTICAL SECTION
	75407-001	6'	3" O.D.	2 ⅜" x 3 ½"
	75407-002	12'	3 ½" O.D.	2 ⅜" x 4 ⅜"



VIEW B-B



VIEW C-C

FURNISH THE FOLLOWING STAINLESS STEEL HARDWARE WITH EACH BRACKET:
(4) ½"-13NC X 1½" LONG HEX. HEAD BOLTS
(4) ½" SPRING LOCKWASHERS
(2) ⅜"-16NC X 1½" LONG HEX. HEAD BOLTS
(2) ⅜" SPRING LOCKWASHERS

STREET LIGHT BRACKET ARM

(HAPCO DRAWING B75407)

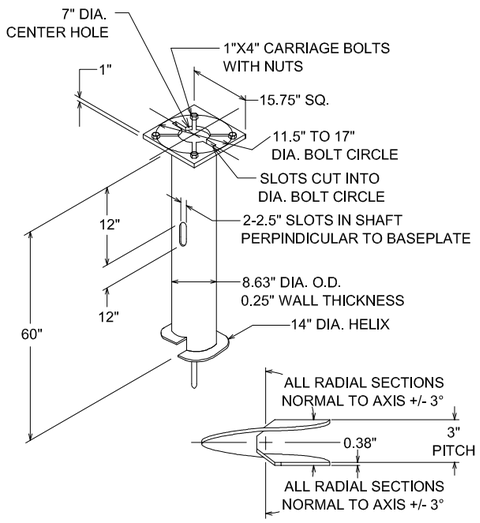
REVISIONS | DATE

STREET LIGHTING DETAILS 1 OF 4
POLE, BRACKET ARM, LUMINAIRE, AND TRANSFORMER BASE DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

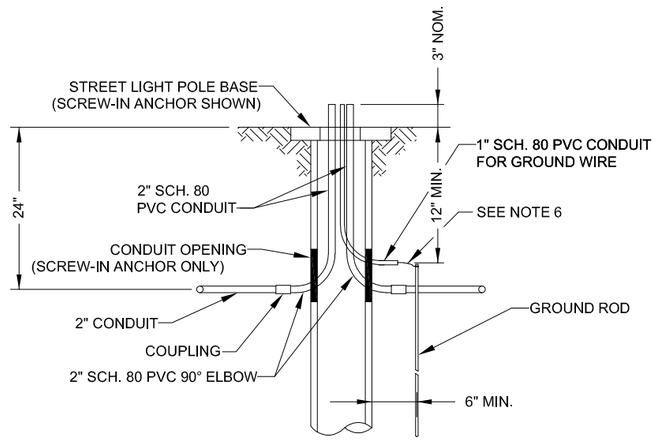
KANSAS CITY BPU THE POWER OF COMMUNITY

DESIGNED:	-	DRAWN:	-
CHECKED:	KCK	DATE:	10/16/18
SCALE:	N/A	SHEET NO.:	

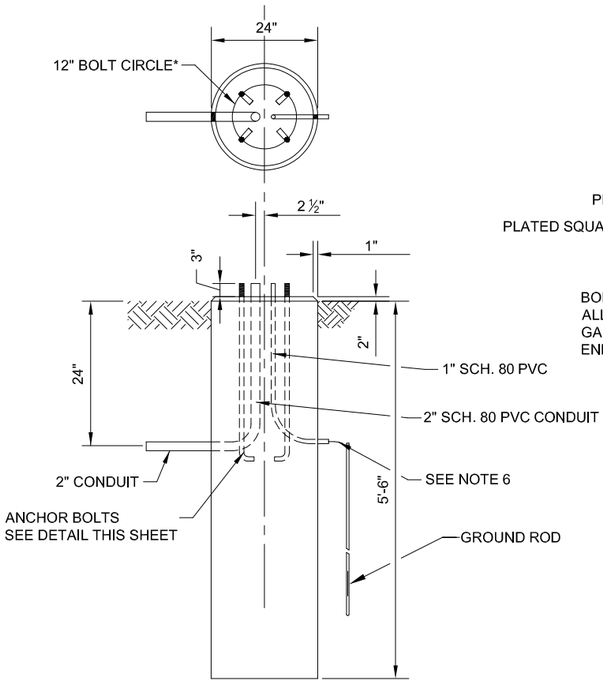


HELIX MUST BE FORMED BY MATCHINGH METAL DIE
(SIDE VIEW OF TRUE HELICAL FORM)

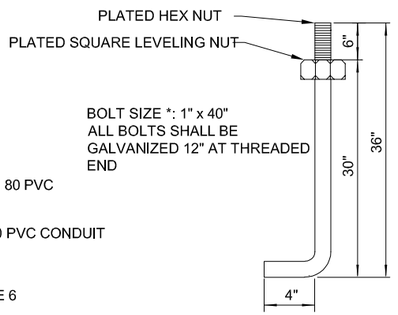
SCREW-IN FOUNDATION



CONDUIT ENTRANCE AND GROUNDING



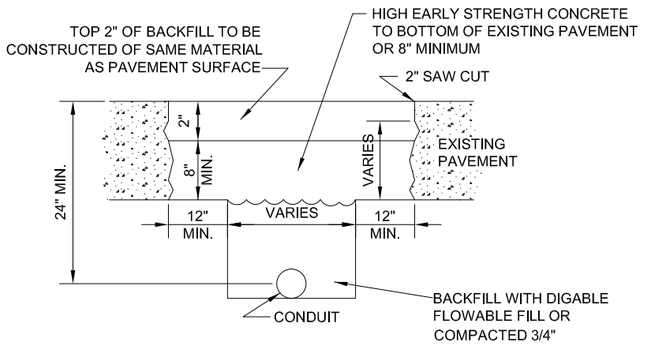
CONCRETE FOUNDATION



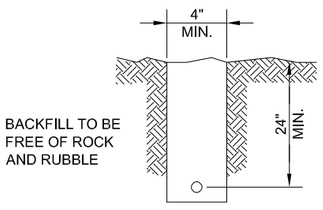
ANCHOR BOLT

(4 EA PER FOOTING)

* FOR DECORATIVE FIXTURES,
SEE LIGHTING DETAIL SHEET 5.

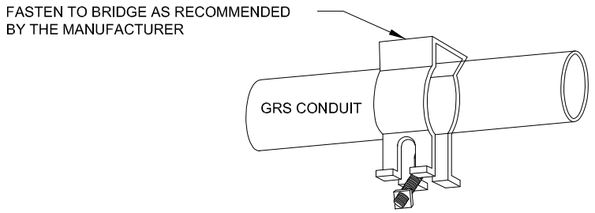


PAVED AREAS

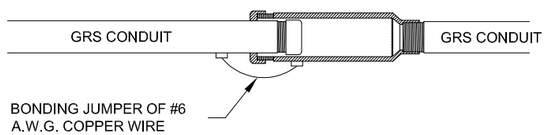


UNPAVED AREAS

TRENCHING



CONDUIT HANGER



EXPANSION FITTING

GRS CONDUIT DETAILS

NOTES:
1. ALL CONDUITS INSTALLED ABOVE GROUND SHALL BE GRS.
2. CONDUIT ATTACHED TO BRIDGES SHALL HAVE EXPANSION FITTINGS INSTALLED AT EACH END OF THE BRIDGE AND AT EACH EXPANSION JOINT ON THE BRIDGE.
3. ALL GRS CONDUITS SHALL BE ELECTRICALLY BONDED BY GROUNDING BUSHING AND GROUND WIRE AS DETAILED.
4. INSTALL THE CONDUIT AND CONNECTOR ASSEMBLY TO PERMIT A 1/2" MINIMUM LONGITUDINAL TRAVEL IN EITHER DIRECTION.
5. ALL CONDUIT & FOUNDATION ELEMENTS ON THE DESIGN PLANS SHOULD FOLLOW BPU/UG SPECIFICATIONS & DESIGN GUIDE
6. INSTALL BARE COPPER GROUND CONDUCTOR SIZED EQUIVALENT TO THE DISTRIBUTION CABLE OF THE CORRESPONDING CIRCUIT AT EACH POLE.

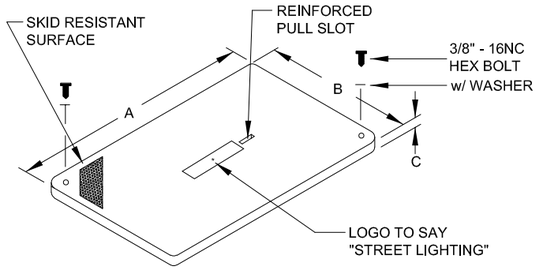
BY | REVISIONS | DATE

STREET LIGHTING DETAILS 2 OF 4
POLE FOUNDATIONS
AND CONDUIT DETAILS

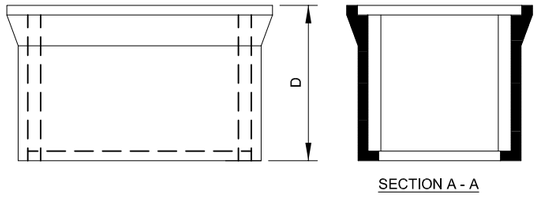
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

KANSAS CITY BPU — THE POWER OF COMMUNITY

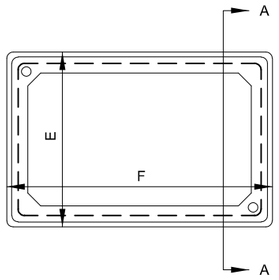
DESIGNED: -	DRAWN: -
CHECKED: KCK	DATE: 10/16/18
SCALE: N/A	SHEET NO.:



COVER



SECTION A - A



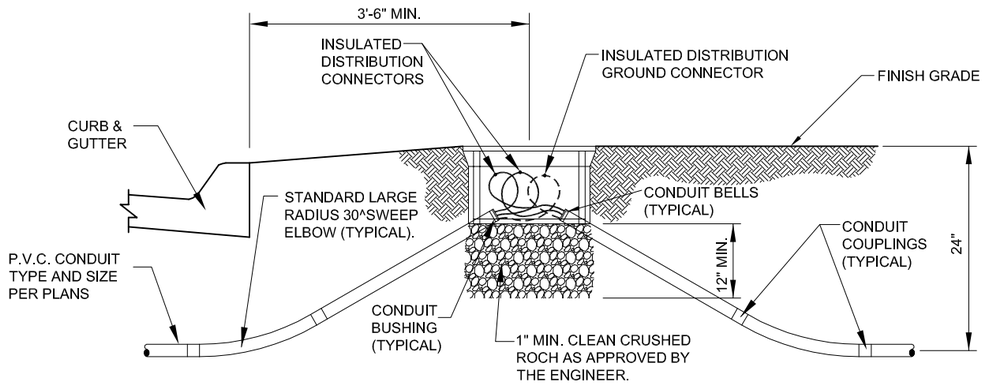
NOTES:
1. BOXES SHALL BE STACKABLE FOR EXTRA DEPTH.

2. BOXES AND COVERS SHALL HAVE A DESIGN LOAD RATING OF 22,500 LBS. MIN.

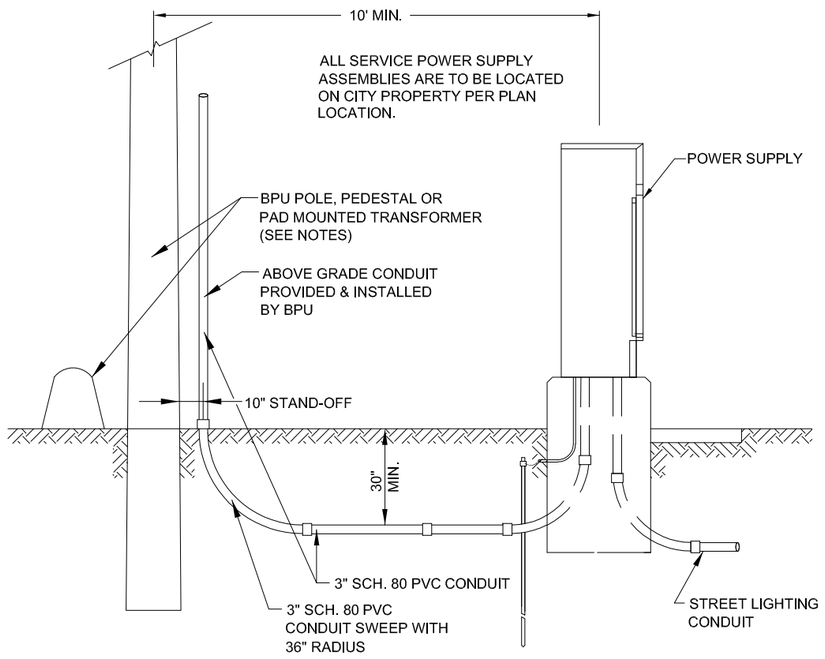
BOX

DIMESIONS (IN.)					
A	B	C	D	E	F
30 ½"	17 ½"	2"	24"	19 ⅞"	32 ⅞"

FIBERGLASS REINFORCED POLYMER CONCRETE JUNCTION/PULL BOXES



JUNCTION/PULL BOX WIRING DETAIL

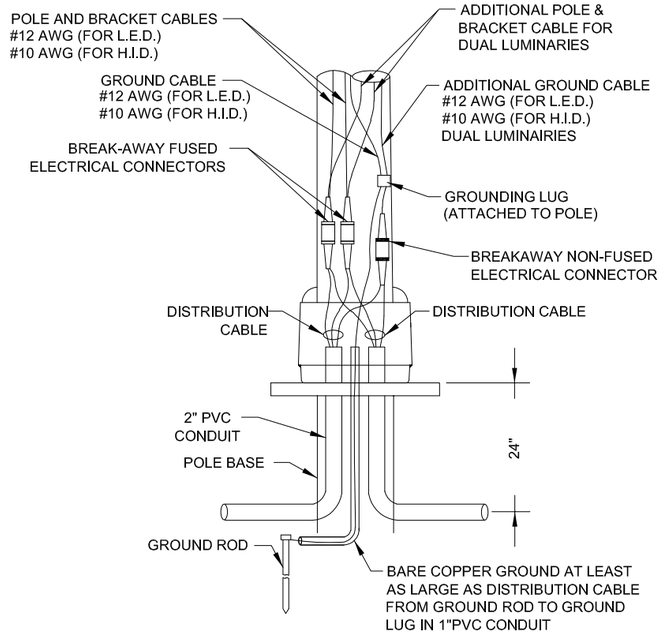


SECONDARY SERVICE CONNECTION

NOTES:
1. FOR POLE MOUNTED TRANSFORMERS, CONTRACTOR SHALL INSTALL A 3" SCHEDULE 80 PVC CONDUIT SWEEP TO JUST ABOVE GRADE AND AT A 10" STAND-OFF FROM THE UTILITY POLE. THE CONDUIT SHOULD BE POSITIONED AT THE BASE OF THE POLE SUCH THAT A CONDUIT (BY BPU) WILL RUN DIRECTLY UP THE POLE WITHOUT CONFLICTING WITH UTILITIES.

2. FOR GROUND MOUNTED PEDESTALS, CONTRACTOR SHALL INSTALL 3" SCHEDULE 80 PVC CONDUIT IN A TRENCH TO WITHIN 24" OF THE PEDESTAL OR PAD MOUNTED TRANSFORMER. AN ACCESS HOLE 36" x 36" x 36" IN SIZE SHALL BE PROVIDED. CONTRACTOR SHALL KEEP THE OPEN TRENCH COVERED AND PROMPTLY BACKFILL ACCESS HOLE WHEN SERVICE CONNECTION IS COMPLETE.

NOTE:
ALL LIGHTING EQUIPMENT SHALL BE 120V OR 240V, DEPENDING ON DESIGN SHOWN IN PLANS.



POLE WIRING DETAIL

BY
REVISIONS
DATE

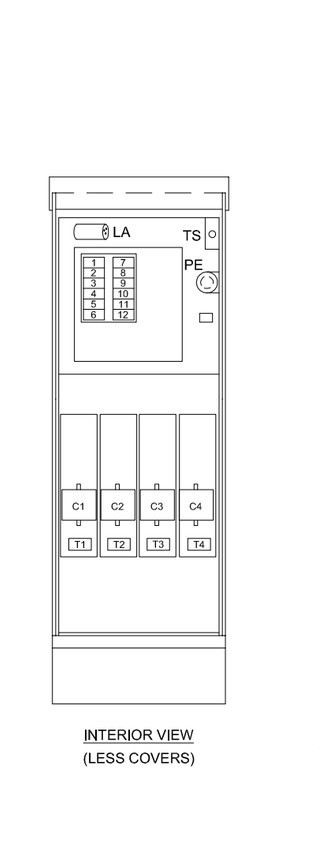
STREET LIGHTING DETAILS 3 OF 4
LIGHT POLE WIRING, JUNCTION BOXES, AND SERVICE CONNECTION DETAILS

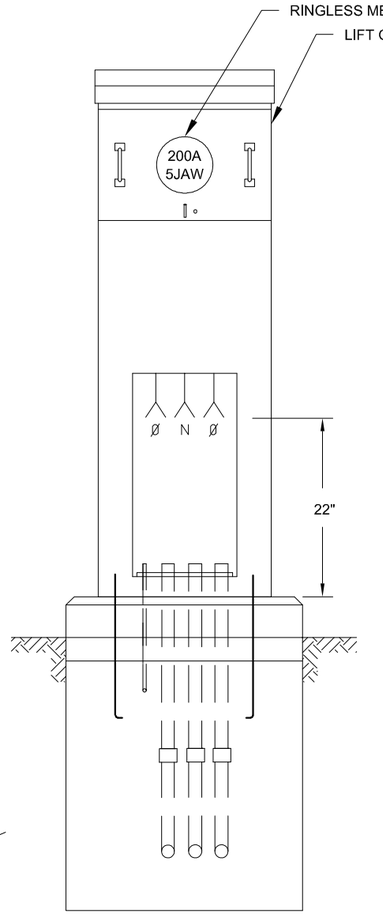
CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

KANSAS CITY BPU THE POWER OF COMMUNITY

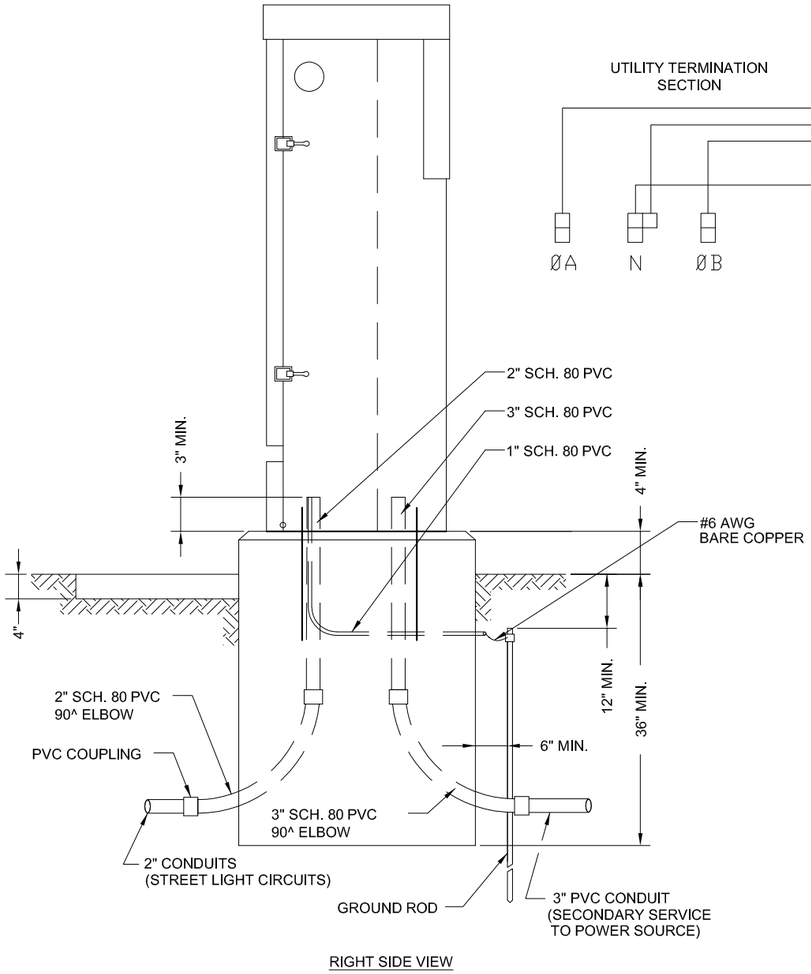
DESIGNED: -	DRAWN: -
CHECKED: KCK	DATE: 10/16/18
SCALE: N/A	SHEET NO.:

INTERIOR VIEW
(LESS COVERS)

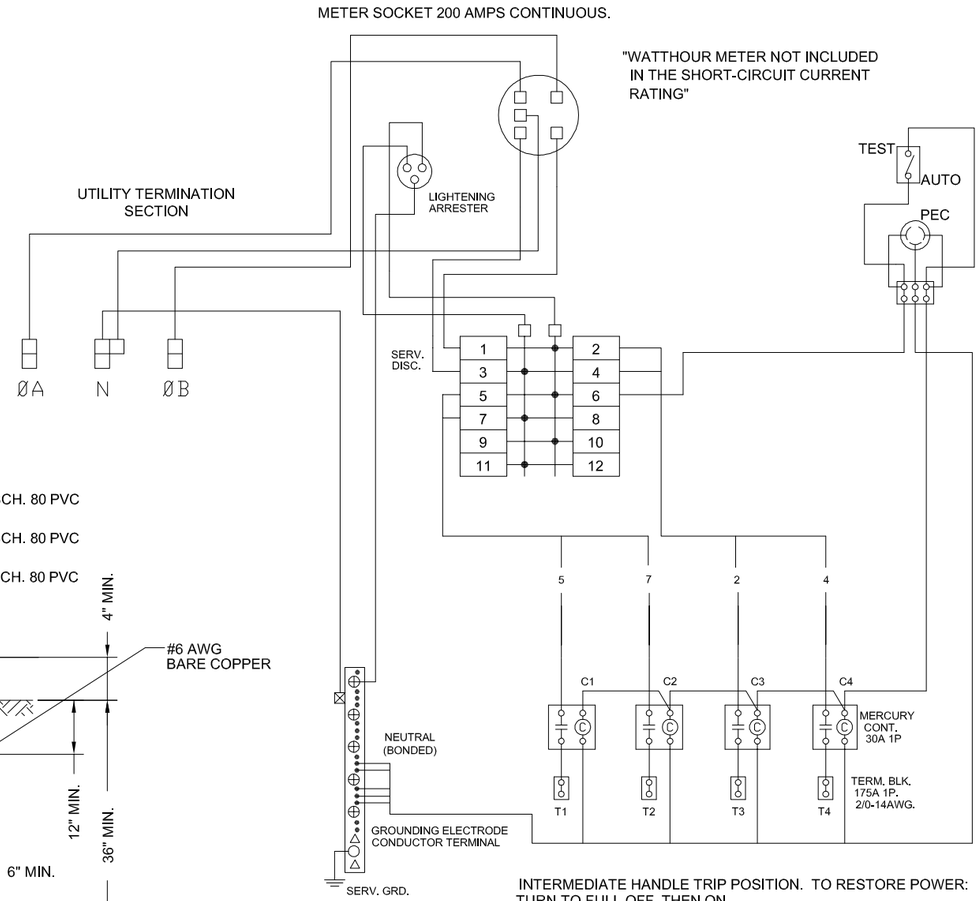




REAR VIEW
(LANDING DETAIL, COVER REMOVED)



RIGHT SIDE VIEW



INTERMEDIATE HANDLE TRIP POSITION. TO RESTORE POWER:
TURN TO FULL OFF, THEN ON.

NOTES:
1. PHOTOELECTRIC CELL SHOULD BE ORIENTED TO THE NORTH OR EAST.
2. SEAL AROUND JOINT BETWEEN CABINET AND BASE WITH LIFETIME SILICONE CAULK.
3. ALL EXPOSED EDGES OF THE BASE SHOULD HAVE A 1"CHAMFER.
4. IF BASE IS ADJACENT TO A TRAFFIC SIGNAL CONTROLLER, RAISED PORTION OF BASE (ABOVE FINISHED GRADE) SHOULD BE CONSTRUCTED TO THE SAME HEIGHT AS THE SIGNAL CONTROLLER BASE.
5. THE STREET ADDRESS WITH THE POWER SUPPLY NUMBER BELOW IT SHOULD BE LABELED ON THE UPPER PORTION OF THE CABINET FACING THE STREET. BPU WILL SUPPLY STICKERS FOR THE CONTRACTOR TO INSTALL.

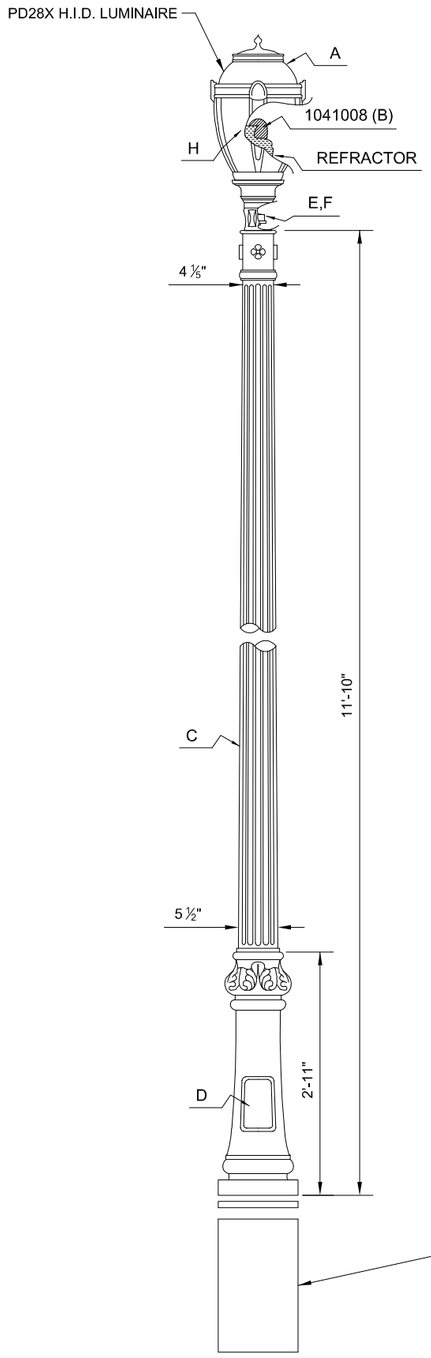
BY
REVISIONS
DATE

STREET LIGHTING DETAILS 4 OF 4
4-CIRCUIT POWER SUPPLY & FOUNDATION DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

KANSAS CITY BPU
THE POWER OF COMMUNITY

DESIGNED: -	DRAWN: -
CHECKED: KCK	DATE: 10/16/18
SCALE: N/A	SHEET NO.:



H.I.D. MAINTENANCE PARTS ONLY

ITEM	QTY.	STOCK NO.	DESCRIPTION
A	1	1040991	LUMINAIRE (FIXTURE W/ REFRACTOR, PHOTOCELL, & PHOTOCELL RECEPTACLE
B	1	1041008	LAMP - ANTIQUE STREET LIGHTING #C150S55/ALTO
C	1	1040981	POLE - ANTIQUE STREET LAMP 12' CAST ALUMINUM
D	0	1041025	ACCESS DOOR- ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
E	0	1041033	PHOTOCELL RECEPTACLE - ANTIQUE STREET LIGHTS (FOR REPAIRS ONLY)
F	0	1041019	PHOTOCELL - ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
G	0	1041034	BALLAST KIT - ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
H	0	1041018	GLOBE ANTIQUE STREET LIGHTING

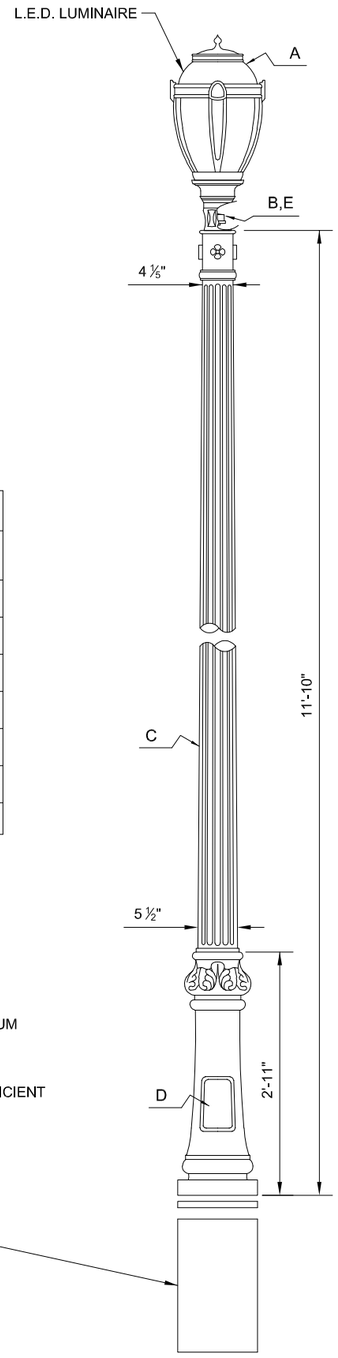
DECORATIVE POLE FOUNDATION NOTES:

1. FOUNDATION MUST BE AS LARGE AS BASE.
2. FOUNDATION SURFACE MUST BE FLAT AND LEVEL.
3. A ¼" THICK GROUT BED OR AN APPROVED ⅜" MINIMUM THICKNESS STEEL BASE PLATE MAY BE USED AS REQUIRED FOR LEVELING.
4. CONTRACTOR MUST ENSURE FOUNDATION IS SUFFICIENT FOR INTENDED INSTALLATION.

REFER TO POLE FOUNDATION DETAILS

DECORATIVE H.I.D. STREET LIGHT POLE

POST PA DW12 12 ANBK

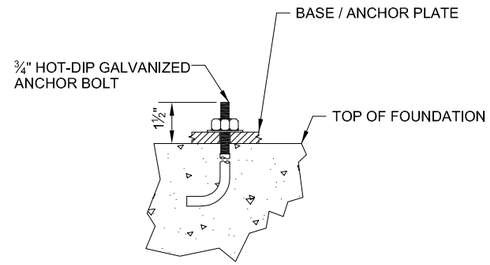


L.E.D. MAINTENANCE PARTS ONLY

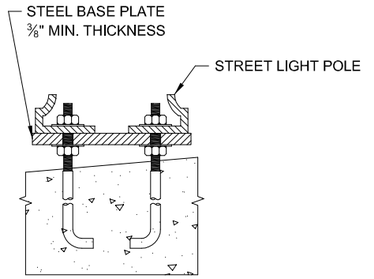
ITEM	QTY.	STOCK NO.	DESCRIPTION
A	1	-	SEE APPROVED PRODUCT LIST FOR DECORATIVE L.E.D. LUMINAIRIES
B	1	-	PHOTOCELL RECEPTACLE - ANTIQUE STREET LIGHTS (FOR REPAIR ONLY)
C	1	1040981	POLE - ANTIQUE STREET LAMP 12' CAST ALUMINUM
D	1	1041025	ACCESS DOOR- ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
E	1	-	PHOTOCELL - ANTIQUE STREET LIGHTING (FOR REPAIR ONLY)

DECORATIVE L.E.D. STREET LIGHT POLE

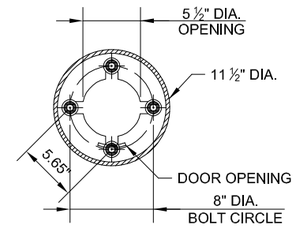
POST PA DW12 12 ANBK



ANCHORAGE DETAIL



ANCHORAGE DETAIL NON-LEVEL APPLICATIONS



ANCHORAGE GUIDE

BY | REVISIONS | DATE

STREET LIGHTING DETAILS 1 OF 1

DECORATIVE LIGHT POLE, LUMINAIRES, AND ANCHORAGE DETAILS

CITY OF KANSAS CITY, KANSAS
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

KANSAS CITY BPU — THE POWER OF COMMUNITY

DESIGNED: -	DRAWN: -
CHECKED: KCK	DATE: 10/16/18
SCALE: N/A	SHEET NO.: