



**TECHNICAL SPECIFICATIONS
FOR PUBLIC IMPROVEMENTS
PROJECTS**

Revised July 2018



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GENERAL PROVISIONS

The provisions in this section shall be considered as applicable to all parts of these specifications including all revisions or supplements.

A. DEFINITIONS. Whenever the following words, phrases, or abbreviations appear in these specifications, they shall have the following meanings:

1. City shall mean the City of Spring Hill, Kansas, a municipal corporation, acting by and through its duly elected governing body and its duly appointed officials.
2. Engineer shall mean the City Engineer of the City of Spring Hill or his authorized representatives acting on behalf of the City.
3. Design Engineer shall mean a licensed engineer under contract to the developer or the City of Spring Hill for the purpose of preparing and sealing engineering design drawings for a specific public improvement project.
4. Inspector shall mean an authorized representative of the City Engineer who has been assigned to assure conformance to the requirements of these specifications by the contractor.
5. Contractor shall mean a person, partnership, or corporation duly licensed and bonded to the City of Spring Hill performing construction operations within the City of Spring Hill.
6. Bond shall mean performance and maintenance bonds and other instruments of security furnished by the contractor and his surety in accordance with these specifications.
7. Day shall mean a calendar day of twenty-four (24) hours measured from midnight to the next midnight.
8. Whenever the words "as directed", "as required", "as permitted", or words of like meaning are utilized it shall be understood that the directions, requirements, or permission of the City Engineer is intended. Similarly, the words "approved", "acceptable", and "satisfactory" shall refer to approval of the City Engineer.

- B. REFERENCED STANDARDS.** Whenever references are made to standard specifications, methods of testing, materials codes, practices, and requirements, it shall be understood that the latest revision of said references shall govern unless a specific revision is stated. Wherever any of the following abbreviations appear they shall have the following meaning:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
ASA	American Standards Association
ISO	Insurance Services Office
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
ANSI	American National Standards Institute, Inc.
KHS	Standard Specification for State Road and Bridge Construction, Kansas Department of Transportation, latest edition

Where the words "these specifications" appear or where words of similar connotation are used it shall be understood that such reference refers to the Technical Specifications and Design Criteria for Public Improvement Projects of the City of Spring Hill.

- C. PERMIT FOR CONSTRUCTION.** No construction of any private street or public improvement project shall be undertaken until the following criteria and requirements have been fully met.
1. Contract plans and specifications have been submitted to and approved by the City Engineer and Director of Public Works. Along with approved contract drawings and specifications, the City shall have received all copies of permit applications required by the project. These permits include but are not limited to Kansas Department of Health and Environment (KDHE) sanitary sewer extension permit, Notice of Intent to Discharge Stormwater (NOI), Kansas Department of Transportation (KDOT) permits, Johnson County or Miami County road crossing permits, and any other applicable permits.
 2. A suitable performance and maintenance bond has been submitted and approved by the City Engineer and placed on file with the City.

3. For development projects, the final plat and development agreement have been approved and recorded by the City.
4. A contract for City inspection, executed by the developer, and a copy of the bid proposal for construction has been submitted to and approved by the City Engineer.
5. A preconstruction conference has been held and a Notice to Proceed has been issued. The Notice to Proceed will not be issued until all erosion control devices have been installed and approved by the City.
6. Five (5) working days advance notification from the contractor prior to actual start of work must be received by the Director of Public Works and the City Engineer.

Compliance with the above shall constitute a permit for construction activities. Work discovered underway not complying with these requirements shall be ordered to cease and shall not be allowed to commence until such requirements have been met.

D. AUTHORITY OF THE ENGINEER / DIRECTOR OF PUBLIC WORKS. The City Engineer and Director of Public Works are designated by the City of Spring Hill to exercise all authority on behalf of the City to ascertain that all construction of facilities is equal to or better than the minimum construction requirements set forth in these specifications. The City Engineer and Director of Public Works shall be represented by a project inspector or designated representative to check any and all work performed, including all materials to be incorporated in the work, and all construction methods and practices. The City Engineer and Director of Public Works shall have the authority to issue, in writing, any deviations from the provisions of these specifications or changes to any previously approved drawing.

E. OBSERVATION OF THE WORK.

1. General:
 - a. All materials and workmanship shall be subject to observation, examination, or test by the City of Spring Hill and the City Engineer or his representative at any and all times during construction and at any and all places where such construction is carried on. The City of Spring Hill shall have the authority to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall

be promptly segregated and removed from the project area and replaced with material of the specified quality to the satisfaction of the City Engineer or Director of Public Works. If the contractor fails to proceed at once with correction of rejected workmanship or defective material, the City of Spring Hill may contract or otherwise have the defects remedied or rejected materials removed from the project area and charge the cost of the same against the contractor, without prejudice to any other rights or remedies of the City of Spring Hill.

- b. The contractor shall have available on the work site at all times one copy of the approved plans and these Technical Specifications. He shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the City Engineer, his inspectors, and other contractors in every way possible. The contractor shall designate and have on the work site at all times, as his agent, a competent superintendent capable of reading and thoroughly understanding the plans and specifications, who shall receive instructions from the engineer or his authorized representatives. The superintendent shall have full authority to execute the orders or directions of the engineer without delay and to supply promptly such materials, tools, plant equipment, and labor as may be required. Such superintendent shall be furnished irrespective of the amount of work sublet.
- c. The contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time, as applicable, required by these specifications.

All workmen shall have sufficient skill and experience to perform properly the work assigned to them. Workmen engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the contractor or by any subcontractor who, in the opinion of the City Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the City Engineer, be removed forthwith by the

contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the City Engineer.

Should the contractor fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the City Engineer may suspend the work by written notice until such order(s) is/are complied with.

- d. The contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the City of Spring Hill will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the Technical Specifications.
- e. The contractor shall notify the City of Spring Hill sufficiently in advance of backfilling or concealing any facilities to permit proper observation. If any facilities are concealed without approval or consent of the City of Spring Hill, the contractor shall uncover for observation and recover such facilities all at his own expense, when so requested by the City of Spring Hill.
- f. Neither observing, testing, approval nor acceptance of the work, in whole or in part, by the City of Spring Hill or its agents shall relieve the contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the specifications.
- g. Any change or deviation from the approved plans and specifications that has been approved by the City Engineer and Director of Public Works must be received by the City's inspector in writing prior to implementing the change. The City's inspectors are not authorized to alter any provisions or to issue instructions contrary to these specifications, or to make any revisions to any previously approved drawing.

2. Defective Work:

- a. The term "defective" is used in these documents to describe work that is unsatisfactory, faulty, not in conformance with the requirements of the specifications, or not meeting the requirements of

any observation, test, approval, or acceptance required by law or the specifications.

- b. Any defective work may be disapproved or rejected by the City at any time before final acceptance, even though it may have been overlooked and included in a previous pay estimate.
- c. Contractor shall furnish samples of questionable equipment or materials from completed work for testing purposes when required by the City Engineer or Director of Public Works. All costs in connection with the testing of equipment and materials proven to be defective shall be paid by the contractor.

3. Uncovering Work:

- a. If any work is covered without concurrence of the City's inspector, it must, if requested by the City's inspector, be uncovered for his observation. Such work will be at the contractor's expense unless the contractor has given the City's inspector timely notice and the City's inspector has not acted within a reasonable time.
- b. Should it be considered necessary or advisable by the City of Spring Hill, at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, the contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the specifications, the actual cost of labor and materials necessarily involved in the examination and replacement, plus 15% of such cost to cover superintending, general expenses and profit, shall be allowed the contractor and he shall, in addition, if completion of the work of the entire contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

F. HOURS OF WORK, WEEKEND OR HOLIDAY WORK. Work on Saturdays or legal holidays shall be as approved by the Director of Public Works. Requests for permission to work on legal holidays shall be considered upon advance notification of a minimum of five (5) working days prior to the anticipated

date of the work to be performed. Sunday work shall not be permitted under any circumstance. The use of artificial light to permit night work shall not be permitted except in emergency situations.

Work will not be permitted prior to 7:00 a.m. and all work shall be completed prior to 5:00 p.m. No work will be permitted after sunset or before sunrise and the City's inspector must be present to observe or inspect such work. In addition, if after hours work is approved the developer or contractor shall be charged an observation/inspection fee equal to 1.5 times the inspector's current hourly rate to be paid to the City Engineer upon completion of the after hours activities. Additionally, no paving operations will be permitted to start after 3:00 p.m. which cannot be completed by 5:00 p.m. Requests for permission to work overtime (beyond 5:00) shall be made directly to the attending project inspector by 12:00 noon that day. Requests for permission to work on Saturdays shall be received no later than 3:00 p.m. the Thursday prior to the Saturday in question.

Legal holidays observed by the City of Spring Hill are New Year's Day, Martin Luther King Day, Presidents' Day, Good Friday, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day including the following Friday, and Christmas. The actual days off for these holidays may vary and in certain situations additional days may be a part of the amount of time granted as an official holiday by the City of Spring Hill. It shall be the contractor's responsibility to obtain these days prior to the actual request for inspection services.

- G. BONDS.** Suitable performance, maintenance and statutory bonds shall be furnished to the City of Spring Hill on approved Spring Hill documents guaranteeing the proper completion and maintenance of the construction involved in the public improvement project. The bonds shall be in an amount equivalent to the full cost of the improvements. Once the Final Inspection has been completed and a Letter of Acceptance issued, the maintenance bond will be in effect for a 2-year time period from the date the Acceptance letter is issued. This is for all public improvement projects. The statutory bond shall be filed by the City at the Johnson County or Miami County Courthouse prior to commencing any construction activity.

No project shall be accepted by the City prior to the submittal and acceptance of the maintenance bond by the City Engineer or City Attorney.

- H. CHANGES IN THE WORK.** Changes in the work from the approved project plans shall be made only upon the written consent of the City Engineer or Director of Public Works. All proposed

changes must be submitted to the City Engineer and Director of Public Works (by the design engineer) to receive written approval by the City. Said written approval shall be received by the City's inspector prior to implementing the deviation. Any change in the work made without the consent of the City Engineer and Director of Public Works shall be subject to removal by the contractor at his expense.

I. TRAFFIC CONTROL. Prior to construction, the developer or contractor shall provide to the Director of Public Works or his representative a Traffic Control Plan to include the following:

1. The flow of traffic in streets and access to private property shall be reasonably maintained at all times.
2. The contractor shall provide a safe roadway, and shall erect and maintain warning signs, barricades and sufficient safeguards around all excavations, embankments, and obstructions.
3. The contractor shall provide suitable warning lights or flares and shall keep them lighted from one-half hour prior to sunset until one-half hour after sunrise and all other times when visibility is limited.
4. The contractor shall further provide such flagmen and watchmen as required by the City Engineer or Director of Public Works or inspector for the protection of the public.
5. The design, placement and maintenance of traffic control devices shall correlate with and so far as possible conform to the system set forth in the most recent edition of the Manual on Uniform Traffic Control Devices for Streets and Highways.
6. The roadway shall be properly maintained and the contractor shall coordinate his operations with the Director of Public Works or his designated representative in order that suitable arrangements may be made for detours, parking, and access to private property, etc.
7. Whenever a street is closed or partially closed, the City of Spring Hill Public Safety Department shall be notified of the closing, and also when normal service is resumed.

In the event it is determined that the contractor is not maintaining a safe roadway, the City Engineer may improve the roadway conditions at the contractor's expense.

- J. DAMAGES.** The contractor hereby expressly binds himself or itself to indemnify and save harmless the City and its officers and employees against all suits or actions of every kind and nature brought or which may be brought, or sustained by any person, firm, or corporation, or persons, firms or corporations, in connection with or on account of the contractor's work or in consequence of any negligence in connection with same, or an account of any poor workmanship, or on account of any act of commission or omission of the contractor or his, its, or their agent or employees, or for any cause arising during the course of construction.
- K. CLEANING UP.** The contractor shall frequently clean up all refuse, rubbish scrap materials, and debris as a result of his operations, so that at all times the site of the work shall present a neat, orderly, and workmanlike appearance. In addition all streets and roadways adjacent to the project must be cleaned and cleared of all dirt, mud and gravel that are a result of the activities taking place upon and in the project area, daily. Upon completion of the work, the contractor shall remove from the site and any occupied adjoining property, all plants, buildings, rubbish, unused materials, form lumber, and other materials belonging to him or his subcontractor. Any costs incurred by the City due to failure by the contractor to clean up to the City's satisfaction will be charged to the account of the contractor or his surety.
- L. PROTESTS.** If the contractor considers any work demanded of him by the City's inspector to be outside the requirements of the specifications, he shall immediately ask for a written decision or instructions and shall proceed to perform the work to conform with the City's inspector's ruling. If the contractor considers such instructions unsatisfactory, he shall, within 24 hours after their receipt, file a written protest with the City Engineer, stating his objections and the reasons therefore. Unless protests or objections are made in the manner specified and within the time limit stated herein, the contractor hereby waives all grounds for protest.
- M. ACCEPTANCE OF WORK.**
1. Partial Acceptance. The City reserves the right to accept and make use of any completed section of the work without obligating the City to accept the remainder of the work or any portion thereof; however, the warranty period shall start when the project is complete and the City has issued the Project Completion Certificate.
 2. Final Acceptance. When the final clean-up has been performed, the contractor shall notify the inspector in writing that all work has been completed. At the same

time, the contractor shall notify the design engineer that the project has been completed and should forward to the City Engineer all changes he has noted on his plans during the course of the work. Upon receiving such notification, the design engineer shall compute any changes in the original contract amount and send a letter to the City verifying the final contract amount. Within a reasonable time the City's inspector shall perform all necessary inspection procedures on the completed work. The contractor shall receive written notification of any defects in the project. The Project Completion Certificate will be issued after all defects have been corrected and all fees for inspection services have been paid.

The City will re-inspect the project prior to the expiration of the maintenance bond. Any defects noted as a result of this inspection shall be corrected by the contractor at his expense upon written notification by the City Engineer.

N. SHOP DRAWINGS AND ENGINEERING DATA.

Engineering data covering all equipment and fabricated materials, which will become a permanent part of the work, shall be submitted to the City Engineer for review. This data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

All submittals, regardless of origin, shall be stamped with the approval of the contractor and identified with the City project number, contractor's name, and references to applicable specification paragraphs and drawings. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

The contractor's stamp of approval is a representation to the City and the City Engineer that the contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that he has reviewed or coordinated each submittal with the requirements of the work.

Each submittal shall include a statement prepared by the originator of the drawings and data certifying compliance

with the City Technical Specifications except for deviations, which are specifically identified.

All deviations from the City Technical Specifications shall be identified on each submittal and shall be tabulated in the contractor's letter of transmittal. Such submittals shall, as pertinent to the deviations, indicate essential details of all changes proposed by the contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

The contractor shall accept full responsibility for the completeness of each submission, and, in the case of re-submission, shall verify that all exceptions previously noted by the City Engineer have been taken into account. In the event that more than one re-submission is required because of failure of the contractor to account for exceptions previously noted, the contractor may be required to reimburse the City Engineer for the charges of the City Engineer for review of the additional re-submissions.

Any need for more than one re-submission, or any other delay in obtaining the City Engineer's review of submittals, will not entitle the contractor to extension of the contract time unless delay of the work is directly caused by a change in the work authorized by a Change Order or by failure of the City Engineer to return any submittal within 21 days after its receipt in the City Engineer's office.

The City Engineer's review of drawings and data submitted by the contractor will cover along general conformity to the drawings and specifications, external connections, and dimensions, which affect the layout. The City Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. The City Engineer's review of submittals shall not relieve the contractor from responsibility for errors, omissions, or deviations, nor responsibility for compliance with the City Technical Specifications.

Three (3) copies (or one reproducible copy) of each drawing and necessary data shall be submitted to the City Engineer. The City Engineer will not accept submittals from anyone but the contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades. Re-submittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the re-submittal.

When the drawings and data are returned marked NOT ACCEPTABLE or RETURNED FOR CORRECTION, the corrections shall be made as noted thereon and as instructed by the City

Engineer and three (3) corrected copies (or one corrected reproducible copy) resubmitted.

When corrected copies are resubmitted, the contractor shall, in writing, direct specific attention to all revisions and shall list separately any revisions made other than those called for by the City Engineer on previous submissions.

When the drawings and data are returned marked EXCEPTIONS NOTED, NO EXCEPTIONS NOTED, or RECORD COPY, no additional copies need be furnished. Distribution of acceptable submissions shall be as follows: Two (2) copies to the City and one (1) copy to the contractor.

END OF SECTION

SECTION 1000 - SITE PREPARATION

1001 SCOPE.

This section covers the necessary clearing, grubbing, demolition, and other appurtenant work at the locations shown on the contract drawings.

All Clearing and Grubbing activities will require a Land Disturbance permit, a Sediment and Erosion Control plan and a copy of the KDHE NOI (Notice Of Intent). See - *Spring Hill City Code Article 2 Chapter 18 and Spring Hill Zoning Ordinance Section 17.352*

1002 DEFINITIONS.

- a. Clearing. Clearing shall consist of the removal of all vegetable matter, such as trees, brush, down timber, rotten wood, sod, rubbish, and other objectionable combustible materials found on or above the surface of the site. It shall include the removal of wood buildings, fences, lumber, waste dumps, abandoned utilities, and trash, the salvaging of such materials as may be specified, and the disposal of the debris.
- b. Grubbing. Grubbing shall consist of the removal of all stumps, roots, buried trees and brush, and other objectionable combustible materials appearing on or below the surface of the ground which has not been included under the definition of "Clearing" above.
- c. Demolition. Demolition shall consist of the destruction and removal or incorporation into embankment all non-vegetable matter appearing above, on, or below the ground surface. This shall include, but not be limited to, all material derived from the demolition of portland cement concrete items such as base courses, curbs, curb and gutters, sidewalks, floors, steps, driveways, drainage structures of all sorts, guard fences, and other miscellaneous items such as foundations or walls of any sort, and iron or steel items, and asphalt items such as pavement and base courses.
- d. Trees. Vegetable growth 40 inches or greater in circumference, measured 2 feet above the ground, shall be classified as a tree.
- e. Brush. Vegetable growth less than 40 inches in circumference, measured 2 feet above the ground, shall be classified as brush.

1003 UTILITY COORDINATION.

The contractor shall be responsible for protecting any improvement of any agency, public or private, in the vicinity of clearing, grubbing or demolition operations. The contractor shall contact Kansas One Call and all other utility providers and provide to the City of Spring Hill verification prior to any land disturbance activities. The contractor may be responsible for the cost to any agency for assistance in the location of its facilities, but he shall be responsible for the cost of all damage to such facilities arising from his carelessness or negligence.

1004 LIMITS OF CONSTRUCTION.

In developed and semi-developed areas, the limits for clearing, grubbing, and demolition shall be as defined on the plans or specified in the Special Conditions but in no case shall work extend beyond the limits of the right-of-way, City property lines, or easements.

In undeveloped areas where improvements are limited or non-existent, clearing, grubbing, and demolition shall not extend beyond the right-of-way, City property lines, or easement, unless otherwise shown on the contract drawings or specified in the Special Conditions.

1005 PROGRESS OF CONSTRUCTION.

- a. Clearing. Clearing shall proceed well in advance of the construction operation so as not to delay the progress of the work. The refuse resulting from clearing may be hauled to a waste site secured by the contractor or shall be burned or buried in such a manner as to meet all laws, regulations, and requirements of any governing authority regarding health, safety, and public welfare. When authorized by the fire department, the contractor may dispose of such refuse by burning on the site of the project, provided all requirements as determined by the Fire Marshall are met. Under no circumstances will the authorization to burn on the site relieve the contractor in any way from damages that may result from his operations. In no case shall any materials be left on the project site, shoved into abutting properties, or buried in embankments or trenches on the site.
- b. Grubbing. **Erosion control measures shall be in place prior to the start of grubbing operations.** Grubbing shall parallel the clearing as nearly as the sequence of operations will permit. Except for the special circumstances enumerated below, all stumps, roots, and other objectionable matter within the construction area

shall be removed to a minimum depth of 12 inches below the subgrade or the original ground, whichever is lower. All stumps, roots, and other objectionable matter outside the limits of the construction area but within the right-of-way shall be cut off flush with the ground.

All stumps, roots, and other objectionable matter within the specified limits of embankments having a depth of 2 feet or less shall be removed and disposed of. Piling and butts of utility poles within the limits shall be removed to a minimum depth of 2 feet below the subgrade or the original ground, whichever is lower.

All stumps, roots, and other objectionable matter found within borrow material to be used for embankment or fill material shall be removed.

All stumps, roots, and other objectionable matter found within the bottoms or sidewalls of excavation and trenching areas shall be completely removed from the respective bottom areas, and removed to a minimum depth of 12 inches below the respective sidewalls.

- c. Demolition. Demolition work shall occur well in advance of the construction operation. Masonry and concrete walls, miscellaneous foundations, or other objects extending below ground shall be removed to a depth of at least 12 inches below the original ground or the subgrade, whichever is lower.

When explosives are used in demolition, the contractor shall comply with the provisions of Specification Section 6100 "Blasting."

In removing items such as portland cement concrete pavement, base courses, curbs, curb and gutters, gutters, sidewalks, and similar objects where portions of said objects are to be left in place, they shall be removed to an existing joint or to a new joint sawed to a minimum depth of 1 inch with a true line and vertical face. Sufficient portions of these objects shall be removed to provide for the proper grade and connection to the new work.

1006 PROTECTION OF TREES AND SHRUBS.

During his construction operation, the contractor shall leave in place and protect from damage all trees, shrubbery, and flower beds unless shown on the drawings to be removed.

Where trees existing on the project site are not to be removed, it shall be the responsibility of the contractor to trim low branches that would interfere with the normal

operation of his equipment. The trimming shall be performed in accordance with ANSI A300 standards for tree care operations.

1007 CONSTRUCTION STAKING.

The engineer shall, unless otherwise provided for, set construction stakes establishing lines, slopes, profile grades in roadway work, and center line and bench marks (hubs) for structure work and appurtenances as he may deem necessary and shall furnish the contractor with all necessary information relating to lines, slopes and grades.

These stakes and marks shall constitute the field control by and in accordance with which the Contractor shall establish other necessary controls and perform the work.

The contractor shall be responsible for giving the engineer reasonable notice of intent to perform work in a particular area of the project in order to afford the engineer sufficient time to set construction stakes establishing, lines, slopes and profile grades. For roadway work, the engineer will set construction stakes establishing, lines, slopes and profile grades and will furnish the contractor with all necessary information relating to these lines, slopes and grades. These stakes and marks will constitute the field control by and in accordance with which the contractor shall establish other necessary controls and perform the work. For structures, the engineer will stake and reference those centerlines and layout lines used as dimensional references on the plans and provide a benchmark (hubs) at each structure location. The contractor shall be responsible for all other lines, locations, alignment, grade elevations and any other necessary control by use of engineering instruments or other tools or methods as required to build the structure.

The contractor shall be responsible for the preservation of all stakes and marks, and if any construction stakes or marks are carelessly or willfully destroyed or disturbed by the contractor, the cost of replacing them may be charged against him and deducted from the payment for the work.

END OF SECTION

SECTION 1100 - GRADING

1101 SCOPE.

This section covers the performance of all the work and appurtenances required for grading the project in coordination with all previous work performed at the locations shown on the contract drawings.

1102 MATERIALS AND DEFINITIONS.

- a. Grading. Grading shall be defined as meaning 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 as shown on the contract drawings.

Unless otherwise provided for in the Special Conditions and included in the proposal, all excavation shall be unclassified excavation and the contractor shall satisfactorily remove and dispose of all materials encountered regardless of their nature.

When provided for in the Special Conditions and included in the proposal, the excavation may be classified according to the following categories.

- 1. Common Excavation. Suitable materials shall include all earth free of rock, sod, weeds, roots and other debris, and containing the soil characteristics and moisture content to obtain the required compaction.
- 2. Rock Excavation. Rock excavation will be so classified when sandstone, limestone, blue shale or other similar material is encountered and, in the opinion of the City Engineer, requires drilling or blasting to remove the material.
- c. Embankment. Embankment is defined as the placing and compacting of material in the construction area to the lines and grades as shown on the contract drawings. In no case will the side slopes exceed 3:1.

Material suitable for use as embankment shall be entirely imperishable and shall be determined as acceptable by the City Engineer.

Materials suitable for earth embankment shall be free of waste material, contain less than 10% by volume of rock and gravel, and contain no particles having a dimension greater than 3 inches.

Materials suitable for rock embankment shall be free of waste material and contain 10% or greater by volume of rock or gravel containing particles ranging in size from a minimum dimension of 3 inches to a maximum of 24 inches.

Material not suitable for use as embankment material shall include, but shall not be limited to, frozen material, organic material, topsoil, rubbish, rock, broken concrete, brick, asphalt concrete, and other debris and soil not containing the characteristics and moisture content to obtain the required compaction.

- d. Structures. Structures, as used herein, refer to bridges, basins, street drainage structures, headwalls, retaining walls, and similar construction.

1103 CONSTRUCTION - GENERAL.

During excavation and embankment grading operations, the work shall be performed in a manner and sequence that will provide drainage at all times. Soft spots or areas that develop during grading operations shall be removed, the area then backfilled with suitable material and compacted to obtain the required density. No additional payment will be made to the contractor for this work.

1104 EXCAVATION - GRADING.

Excavation of every character and of whatever materials encountered within the construction limits shall be performed to the lines and grades indicated on the contract drawings. In no case will the side slopes exceed 3:1.

All suitable material removed by excavation shall be used as far as practicable in the formation of embankments or elsewhere when and as directed by the City Engineer. It shall be the responsibility of the contractor to handle excavation in any manner he sees fit, provided that suitable materials will be available when required. No additional

compensation will be allowed for any special sequence of excavating or placing of such materials or any re-handling of materials.

Excavation materials in excess of the amount needed to complete the grading shall be considered as waste material, which shall be removed from the site by and at the expense of the contractor.

Any additional fill material required, which is not available from excavation within the construction limits, shall be supplied by the contractor at no expense to the owner unless provided for in the proposal and Special Conditions. All such material brought to the site and incorporated in the work shall be subject to the approval of the City Engineer. In the event during grading operations materials are encountered below grade or otherwise, which are determined as being unsuitable or unstable by the City Engineer or his representative, they shall be removed to the depth required to reach stable material. The area involved shall then be backfilled with suitable material, as determined by the City Engineer, and compacted to obtain the required density.

All roadway excavation in rock (shale, sandstone, limestone) shall be undercut no less than 12 inches for the full width of the roadway and backfilled with suitable soil or granular material. Undercut shall be unclassified excavation.

1105 EMBANKMENT - GRADING.

The embankments shall be formed with suitable materials, as herein defined, procured from excavations made on the project site, or from borrow pits as required to complete the grading work.

Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than 1 vertical to 6 horizontal (1:6), the existing slope shall be benched or stepped in approximately 18-inch rises as the new fill is brought up in 8-inch lifts.

Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Materials thus cut out shall be re-compacted to the required density along with the new embankment material. 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, such as topsoil, peat, mulch, coal seams, disintegrated shale, rubbish, logs or stumps, and unconfined saturated soils, removed to the depths shown 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 at optimum moisture 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 not larger than 24 inches maximum dimension, left in place and the embankment started thereon.

Earth embankment 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 in thickness (loose measurement) and shall be compacted to the density specified in Section 1106 before the next layer is placed hereon. As the compaction of each layer progresses, continuous blading 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 a blanket of snow prevents proper compaction.

Successive horizontal layers of rock embankment not exceeding 2 feet in depth, shall be made by placing larger stones uniformly over the embankment area. Small stone fragments, sand, earth, or gravel shall be placed between the larger stones to fill all voids. Each layer shall be thoroughly compacted before the next layer is placed.

Large rocks shall be withheld from the top 1 foot or more of the embankment and only crushed stone or earth used in this layer. The crushed stone shall be well graded to form a dense mass when compacted and maintain adequate cohesive and interlocking characteristics.

1106 EMBANKMENT - BACKFILL AND COMPACTION.

Each successive lift of backfill material shall be rolled with a tamping or sheep-foot roller, except as provided below for sand and gravel, making a sufficient number of trips over the entire surface to compact all material thoroughly and uniformly. Compaction shall be continued

until 95% of maximum density is obtained at the optimum moisture content as determined by ASTM D698.

Sand and gravel, which cannot be compacted satisfactorily with a sheep-foot roller, shall be rolled with a pneumatic-tired roller. Each lift shall be rolled until no further consolidation is evident.

All the work involved in either adding moisture to, or removing moisture from embankment materials shall be considered incidental to the completion of the grading operation.

Backfilling behind curb or curb and gutter shall not be done within seven (7) days after being laid unless otherwise approved by the City Engineer. All fill material placed behind the curb and gutter beneath and either side of sidewalks within the right-of-way shall be brought to 95% of maximum density at the optimum moisture content as determined by ASTM D698. 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 and that will self-compact. 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 12 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.

Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by disking or scarifying to a depth of 2 inches to permit bonding of the topsoil to the underlying surface.

1107 STRUCTURE BACKFILL.

Backfill around and outside of structures shall be deposited in layers not to exceed 8 inches in non-compacted thickness and brought to 95% of maximum density at optimum moisture

content as determined by ASTM D698. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

Material for structure backfill shall be composed of earth only and shall contain no organic materials, broken concrete, stones, trash, or debris of any kind.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose earth having a moisture content such that maximum density of the compacted soil will be obtained. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance that proper moisture distribution and compaction will be obtained.

Backfill around and outside of structures that will ultimately lie under proposed pavements shall be compacted to the requirements of Section 1205 "Compaction Requirements".

1108 SHEETING AND SHORING.

Except where banks are cut back on a stable slope, excavation for structures shall be properly and substantially sheeted, braced, and 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. Sheet piling, 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.

1109 FINAL GRADING.

After other outside work has been finished, and backfilling and embankments completed and settled, all areas on the site of the work which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours, including shoulder, berm, and sidewalk spaces. In no case will the final side slope exceed 3:1. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and conforming to the lines and grades shown on the plans. The contractor

shall repair any damaged surface and shall not use any equipment that will leave a marred surface.

1110 CLEANUP.

Cleanup shall follow the work progressively and final cleanup 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 a subsidiary obligation of the grading work.

In the event the contractor does not promptly comply with the terms of such instructions, the City may have the defective work corrected or the rejected work removed and replaced and all direct and indirect cost of such removal and replacement, including compensation for additional professional services, shall be paid by the contractor. The contractor will also bear the expenses of repairing work of others destroyed or damaged by his correction, removal or replacement of defective work.

1111 SETTLEMENT.

The contractor shall be responsible for all settlement of backfill, fills, and embankments that may occur within 2 years after final completion 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 30 days after notice from the City Engineer.

1112 TEMPORARY SURFACING.

If during construction activities it is deemed necessary to provide ingress and egress to the public by placement of temporary surfacing, the contractor shall do so at the direction of the City Engineer or his authorized representative. Temporary surfacing shall meet the requirements of the Kansas Department of Transportation classification CA-5, for aggregates, as shown below. Larger aggregates, meeting the requirements of KDOT CA-1, may be used if, in the opinion of the City Engineer additional stabilization is necessary. Temporary surfacing shall be

supplied by the contractor at no expense to the owner unless provided for in the proposal and Special Conditions.

Grading Requirements for Temporary Surfacing								
	% Retained - Square Mesh Sieve							
CA-1	1½"	1"	¾"	½"	⅜"	No. 4	No. 8	No. 30
	0	0-10	30-65	--	70-93	--	95-100	--
CA-5	--	0	0-5	--	40-60	--	95-100	--

END OF SECTION

SECTION 1200 - SUBGRADE PREPARATION

1201 SCOPE.

This section governs the furnishing of all labor, equipment, tools, and materials, and the performance of all work connected with subgrade preparation, prior to constructing pavements for streets, alleys, parking areas, sidewalks, drive approaches and the construction of concrete curb and curb and gutters. This section does not include the construction of any base courses.

1202 DEFINITIONS.

- a. Sub-grade. Sub-grade is defined as a well-graded and compacted surface, constructed as specified herein to the grades, lines, and cross-section shown, bladed and compacted to the specified density, preparatory to constructing pavements, or other improvements thereon.
- b. Sub-grade Preparation. Sub-grade preparation is the repeated operation of fine grading and compacting the subgrade until the specified lines, grades, and cross-sections have been obtained and the materials are compacted to the specified depth and density.

1203 CONSTRUCTION REQUIREMENTS.

- a. General. All underground work contemplated, including clearing, grubbing, and demolition, shall be completed in accordance with the requirements of Section 1100 "Grading" prior to commencement of any subgrade preparation.

Prior to beginning any work on street subgrade, the contractor shall secure the services of a qualified testing agency to acquire samples of the material to be used for subgrade construction. These samples shall be analyzed to determine proctor values, liquid limits, and plasticity index. Copies of the analysis shall be provided to the City Engineer for review prior to commencing any subgrade preparation. If it is determined that fly ash modification is required, the following guidelines shall be followed.

- (1) The contractor's testing agency shall determine the areas to be modified, the amount of fly ash to be used (% by weight), and the depth to be tilled.

- (2) Construction of pavements on high plasticity soils shall be modified with Class C" fly ash, or replaced with lower plasticity soils. High plasticity soils shall be defined as soils with a liquid limit greater than 50 and a plasticity index greater than 30. (See Section 1209.)

The subgrade surface shall be brought to the specified lines, grades, and cross-sections by repeatedly adding or removing material and compacting to the specified density with a suitable roller to perform these operations.

- b. Foundation Treatment. Unless otherwise specified or shown on the contract drawings, the soil below grade line in cut sections shall be scarified, broken up, adjusted to a moisture content within the designated moisture range and compacted to the designated type of compaction.

When the depth of compaction in cut sections is shown to be more than 9 inches, all material shall be removed to within 9 inches of the lower limit of the compaction. The layer of material left in place shall be scarified, broken up, adjusted to a satisfactory moisture content and compacted to the designated type of compaction. This process shall be repeated until the cut section is compacted to the grade as shown on the contract drawings.

All roadway excavation in rock (shale, sandstone, limestone) shall be undercut no less than 12 inches for the full width of the roadway and backfilled with suitable soil or granular material. Undercut shall be unclassified excavation.

- c. Moisture Control Requirements. The moisture content of the soil at the time of compaction shall be as necessary to obtain the density as designated on the contract drawings unless it is determined by the City Engineer that the soil is unstable with that moisture content.

When the moisture content of the soil is not satisfactory to the City Engineer, water shall be added or the material aerated, whichever is needed to adjust the soil to the proper moisture content. In no case, shall water be added without the consent of the City Engineer.

- d. **Compaction Control Requirements.** Roadway embankment earth (fill) materials shall be placed in horizontal layers not exceeding 8 inches unless otherwise approved by the City Engineer and shall be compacted as specified in Section 1205 "Compaction Requirements" before the next layer is placed. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compaction. Water shall be added or removed on the approval of the City Engineer, in order to obtain the required density.

1204 MOISTURE CONTENT REQUIREMENTS.

The moisture content of the soil at the time of compaction shall be uniform and shall be such that the soil can be compacted to the requirements of the type of compaction as designated on the contract drawings or as directed by the City Engineer.

If Type B compaction is specified with this moisture control, the content shall be sufficient to produce a uniform mixture of the soil and moisture. It will be determined by the City Engineer whether or not satisfactory compaction and moisture content is obtained.

1205 COMPACTION REQUIREMENTS.

- a. **Pavements.** The subgrade for pavements shall be compacted to a density of at least 95% of the maximum density for the material used for a depth of at least 9 inches below the finished subgrade elevation and within the tolerance of the moisture for the type of material at 95% of maximum density, as determined by the standard proctor test (ASTM D698) for cohesive soils. Any further compacted layers shall be accomplished in the same manner as specified.

When Type B compaction is specified or shown on the contract drawings, the compacted density is to be such that the tamping or sheep-foot roller, while rolling the layer or lift will walk out of the material and ride the top portion of the lift.

Sub-grade compaction for curbs and pavements shall be accomplished by use of sheep-foot rollers. The roller may be self-propelled or machine drawn. The sheep-foot roller shall be fully loaded with liquid or solid ballast to produce adequate compaction energy to the tamping foot. The roller shall have a minimum drum

diameter of 30 inches and a 6-inch minimum length of tamping feet.

Compaction of low plasticity or non-plastic, fine-grained material shall be considered adequate when additional passes of the roller do not bring the tamping feet closer to the surface of the lift, provided the entire weight of the roller is supported on the tamping feet and none by material directly in contact with the drum.

Construction of pavements on high plasticity soils shall be modified with hydrated lime or class "C" fly ash or replaced with lower plasticity soils. High plasticity soils shall be defined as soils with a liquid limit greater than 50 and a plasticity index greater than 30. Determination of the soil plasticity shall be provided by the contractor at the direction of the City Engineer.

Sand and gravel, which cannot be compacted satisfactorily with a sheep-foot roller, shall be rolled with a pneumatic-tired roller. Each lift shall be rolled until no further consolidation is evident.

- b. Sidewalks. The subgrade for sidewalk pavements shall be compacted to a density equivalent to the density of the immediately surrounding soil in areas not requiring fill. In areas where fill is required, the subgrade shall be compacted to 95% of the maximum dry density as determined by ASTM D698 for cohesive soils or to 70% relative density as determined by ASTM D2049 for non-cohesive soils.
- c. Drive Approaches and Concrete Curb & Gutter. The subgrade for drive approaches and concrete curb and gutter shall be compacted to the same requirements as stated above in part a. "Pavements."

1206 PROTECTION AND MAINTENANCE OF SUBGRADE.

The newly finished subgrade shall be repaired from action of the elements. Any settlement or washing that occurs prior to the acceptance of the work shall be repaired and the specific lines, grades, and cross-section re-established.

The contractor shall protect all pavements, curbs, curb and gutters, and sidewalks from his subgrade operation with an earth cushion, timber planking, or both, where tractors, graders, rollers, or other equipment are required to pass,

or turn around. All resulting damage shall be repaired. Any damaged work, which cannot be repaired to the satisfaction of the City Engineer, shall be replaced by the contractor at his own expense.

1207 COMPACTION TESTING.

At the option of the City Engineer, compaction testing may be performed in the field using a nuclear density-moisture measuring device to determine the density of the subgrade. If as a result of this field-testing the City Engineer determines that further compaction is required, the contractor shall revise his methods or procedures to obtain the specified density.

1208 PROOF ROLLING.

Proof rolling shall be performed with a heavy rubber-tired roller ***or tandem axel dump truck loaded within 1,000 pounds of its GVW (minimum load of 16 tons)***. A weight ticket must be provided at the time of the proof rolling. Proof rolling shall be done after specified compaction has been obtained.

Areas found to be weak (exhibit excessive pumping) and those areas which fail shall be ripped, scarified, wetted or dried if necessary and re-compacted to the requirements for density and moisture or excavated below subgrade and backfilled with asphalt, AB-3 or concrete at the contractor's expense. A second proof roll will be required for all sections that fail the initial proof roll including any sections repaired using asphalt, AB-3 or concrete. No curb and gutter or asphalt will be installed until the entire street has passed the proof roll.

If the subgrade for the curb and gutter or the pavement has been approved and there is a rainfall event before all of the curb and gutter or pavement has been laid, the subgrade will need to be dried by scarifying and recompacting and scheduling another proof roll with the city. The City Engineer and Public Works Director have sole discretion in determining the need for repair of the subgrade after a rainfall event.

1209 FLY ASH SUBGRADE TREATMENT.

The purpose of this specification is to secure a completed section of treated material which contains a uniform mixture of fly ash and pulverized material 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 work, to process a sufficient quantity of material to provide full depth as shown on the Plans, to use the proper amounts of fly ash, to maintain the work, and to rework areas as necessary to meet requirements.

a. The contractor shall secure the services of a qualified testing agency to perform on-site testing. A qualified field technician shall monitor placement, mixing, moisture content and in-place density. Copies of the test results shall be provided to the City Engineer for review prior to pavement placement. All costs incurred through the use of the testing agency shall be borne by the contractor/developer.

b.

b. A sample of the fly ash intended for use on the project will be submitted to the testing laboratory for the purpose of developing a fly ash proctor. The fly ash supplier will submit certified laboratory analysis indicating that fly ash used on the project conforms to ASTM C618, Class C, except the supplementary optional physical requirements in Table 4 will not apply and the minimum calcium oxide (CaO) content of the fly ash shall be 25%. Fly ash shall be sampled and tested in accordance with ASTM C311.

Fly ash furnished by the contractor shall comply with the requirements of ASTM C618 Class C. The minimum calcium oxide (CaO) content of the fly ash shall be 25%. Fly ash shall be stored and handled in closed waterproof containers prior to distribution on a roadway or fill. Fly ash that has been partially caked or set shall not be used. A certification indicating compliance to these Specifications shall be attached to or be part of the scale ticket for each load delivered. The certification shall be signed by the producer or his assigned representative.

c. Construction Requirements.

a. Preparation of Roadbed. The subgrade shall be trimmed as near as possible to finish subgrade elevations as shown on the plans. The contractor shall allow for potential swell of material to minimize waste during final trimming. This may require the subgrade to be trimmed to slightly below proposed finished grade, depending on the soil characteristics.

- b. Equipment. The machinery, tools and equipment necessary for proper execution of the work shall be on the project and approved by the City Engineer prior to beginning of construction operations. Pulverization of existing subgrade and blending of the mixture shall be accomplished by use of a drum-rotary type tiller equipped with an adjustable water proportioning system. Initial compaction shall be achieved using a self-propelled sheepsfoot compactor having a minimum operating weight of 12 tons with a minimum centrifugal force of 24 tons. Rubber-tired or smooth-wheeled rollers shall be used for final compaction of the stabilized section. All machinery, tools and equipment used shall be maintained in satisfactory and workmanlike manner. Fly ash shall be stored and handled in closed weatherproof containers until immediately before distribution. Fly ash exposed to moisture prior to mixing with recycled material shall be discarded.
- c. Application. The fly ash shall be spread in an approved manner at the rate specified. Care shall be taken to prevent the fly ash from flowing off the area to be treated. The fly ash shall be distributed at a uniform rate in such a manner as to minimize the scattering of fly ash by wind. Fly ash shall not be applied when wind conditions, in the opinion of the City Engineer, are such that blowing fly ash becomes objectionable to adjacent property owners or significantly reduces the amount of fly ash incorporated in the work.
- d. Moisture Control. The required moisture content will be established by the contractors testing agency based on laboratory tests on the materials and specific fly ash content to be used for the treatment. Water shall be introduced directly into the rotary mixing drum during the tilling procedure. Final moisture content of the mix, immediately prior to compaction, shall be uniform and not exceed plus or minus 3% of the optimum moisture content of the mix. If the moisture content exceeds the specified limits, additional fly ash may be added to lower the moisture content to required limits. Lowering the moisture content by aeration following addition of fly ash will not be allowed. If the moisture contents are below the specified limits, additional water shall be added and uniformly blended with the mixture.

Additional fly ash added to lower the moisture content shall be at the expense of the contractor.

- e. Mixing. The pulverized subgrade material and fly ash shall be thoroughly mixed and the mixing continued until a homogenous, friable mixture of pulverized subgrade material and fly ash meeting the specified size requirements is obtained. The subgrade material shall be pulverized through use of the specified equipment. Depth of pulverization shall be as designated. The pulverized subgrade material and fly ash shall be mixed thoroughly until a uniform mixture is obtained. All clods shall be reduced in size by mixing until the pulverized subgrade material-fly ash mixture meets the following size requirement when tested.

<u>Sieve Size</u>	<u>Percent Retained</u>
1"	0
1/2"	50

- f. Compaction. Compaction of the mixture shall begin immediately after mixing and confirmation that the moisture content is within the specified range. The specified compaction shall be obtained within 1 hour after incorporation of the fly ash. The material shall be sprinkled as necessary to maintain the specified moisture content. Compaction of the mixture shall begin at the bottom and shall continue until the entire depth of mixture is uniformly compacted to the specified density.

All non-uniform (too wet, too dry or insufficiently treated) areas which appear shall be corrected immediately by scarifying the areas affected, adding or removing material as required and reshaping and recompactng.

The stabilized section shall be compacted to a minimum of 95% of the combined materials maximum dry density.

In addition to the requirements specified for density, the section shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is compacted, tests will be made by the testing agency field technician. If the material fails to

meet the density requirements, the City Engineer may require it be reworked as necessary to meet those requirements and/or require the contractor to change his construction methods to obtain required density on the next section. Additional fly ash will be added to the areas that are reworked at no additional cost to the Owner, and the amount required shall be determined by the testing agency field technician. Should the section, due to any reason or cause, lose the required stability, density and finish before the surface is placed or the work is accepted, it shall be reprocessed, recompacted and refinished at the sole expense of the Contractor. Reprocessing shall follow the same patterns as the initial stabilization, including the addition of fly ash.

- g. Finishing and Curing. Following compaction of the stabilized section, the treated section will be trimmed to the required lines and grade by means of equipment which is automatically controlled with regard to grade. The surface shall then be compacted with a smooth wheel or pneumatic tired roller.

The City Engineer may waive the use of automatically controlled equipment on projects containing narrow or irregular dimensions where operation of the automated equipment is impractical. Finishing of these areas may be as set forth above or the surface will be lightly scarified during finishing operations and bladed to a uniform grade and cross-section to eliminate any imprints left by the equipment.

After the fly ash treated section has been finished as specified herein, the surface shall be protected against rapid drying by either of the following curing methods.

- a) Maintain in a thorough and continuously moist condition by sprinkling.
 - b) Apply an asphaltic prime coat.
- h. Weather Limitations. Fly ash mixing operations shall not be performed when the subgrade is frozen or when the ambient air temperature is less than 50° F. The contractor shall be responsible for protection and quality of the fly ash modified subgrade mixture under any weather conditions.

At cooler temperatures, additional passes may be required to reduce the nominal size of the soil agglomerates to less than 1 inch. Multiple passes of rollers may also be required to achieve specified densities in cooler weather conditions.

END OF SECTION

SECTION 1300 - ASPHALTIC CONCRETE PAVEMENT

1301 SCOPE.

This section covers asphalt concrete pavement for roadways and parking areas.

1302 GENERAL.

Pavement shall be constructed to the lines, grades, dimensions, and details contained herein or as shown on the plans.

Except as modified herein, asphalt concrete pavement shall conform to Division 600 of the latest edition of Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation, and shall be as follows:

Surface Course Mix.....BM-2, BM-2FR
Base Course Mix.....BM-2B, BM-2BFR

Alternate mix designs may be used only where approved by the City Engineer.

Erosion control devices located at the back of curb and gutter or at the right of way must be installed before paving operations will be permitted. The devices shall be installed immediately after the curb has been backfilled. An exception will be granted when one or more lifts of base asphalt need to be placed before the curb and gutter can be poured. The placement of subsequent lifts of asphalt will not be permitted until the curb is backfilled and erosion control devices are in place.

Paving will not be permitted until the compressive strength of the concrete used for curb and gutter construction has reached seventy five (75) percent of its design strength unless otherwise approved by the City Engineer.

- a. Composition of Mix. Mix designation BM-2 or BM-2B shall be composed of a combination of aggregates and mineral filler supplements meeting the requirements of Section 1103 of the referenced state specifications

For mix designations BM-2FR and BM-2BFR Fractionated Reclaimed Asphalt Pavement (FRAP) may be added as an aggregate source. FRAP is defined as having two or more stockpiles, where Reclaimed Asphalt Pavement (RAP) is processed into coarse and fine fractions. The fine

FRAP stockpile will contain only material passing the $\frac{1}{4}$ inch screen. The coarse FRAP stockpile will contain material retained on the $\frac{1}{4}$ inch screen and passing the $\frac{3}{4}$ inch screen. No mix shall contain greater than 25% FRAP. RAP shall not be used regardless of mix designation.

If FRAP is used, include the percent of added FRAP, extracted gradation, asphalt content, source and type of FRAP on the mix design submittal. The FRAP percentage contribution to the mix must be included in the design single point gradation.

- b. Production Requirements. After the mix design is approved by the City Engineer, the asphalt supplier must maintain combined single point gradation (FRAP, if any, and virgin aggregate), stability, flow and asphalt content within the required tolerances shown in the approved mix design. The ratio of % minus No. 200 material to % effective asphalt must be maintained within the range of 0.6 to 1.6 for field samples. FRAP stockpiles will be inspected and must meet the approval of the City Engineer.
- c. Field Density Requirements. BM-2, BM-2FR, BM-2B and BM-2BFR pavements shall have a minimum in place density of ninety-five percent (95%) of Standard established by the Marshall Density Procedure, using a fifty blow method. At the option of the City Engineer, compaction testing may be performed in the field using a nuclear density gauge to determine the density of the mixture as placed. If as a result of this testing the City Engineer determines that further compaction is required, the Contractor shall revise his rolling procedure to obtain the density as specified. Failure to achieve the required density shall result in rejection of the pavement.
- d. Non-conforming Test Results. When the results of the field sampling and testing confirm the delivered mix has failed to meet the required specifications, the asphalt supplier shall be required to make any and all adjustments necessary to regain compliance. Paving operations shall be suspended if the supplier cannot bring the mix into compliance within an acceptable period of time as decided by the City Engineer. A non-conforming asphalt mix will result in a corrective action up to and including removal and replacement as decided by the City Engineer. A new mix design submittal will be required if changes to the mix beyond

the specified allowances are necessary to regain conformance.

Immediately prior to the addition of the asphalt, the combined aggregate shall meet the following grading and plasticity requirements:

Tolerances	Percent Retained	
	Master Grading Sieve Size	Design Job-Mix Limits
1"	0*	
3/4"	0-5*	
1/2"	- - -	0-8
3/8"	10-30**	+6
4	- -	+6
8	42-72	+6
16	- -	+5
30	64-88	+5
50	- -	+4
100	- -	+4
200 (Wash & Scr.)	92-98	+2
Plastic Index, Max. 6 Moisture in Final Mix, Max. 0.5% *For base construction only. For surface courses, 100% shall pass the 3/4" sieve. **For base construction only. For surface courses, 8-22% shall be retained on 3/8" sieve.		

In addition, there shall not be less than three (3) nor more than 23% material between any two of the following successive sieves:

Numbers 4, 8, 16, 30, and 50.

The asphalt content for each bituminous mix shall be the optimum content +/- 0.5%, as determined by the City Engineer and shall be based on the Marshall Method test property curves for hot-mix design, to be submitted by the contractor a minimum of five days in advance of the paving operation.

- b. Permissive Recycling. The contractor may use all new materials or a blend of new materials in combination with a maximum of 10% reclaimed asphalt pavement (RAP) in conformance with Section 1103.02(d) of the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation.

1303 SUBGRADE PREPARATION.

Sub-grade preparation for pavement shall be as specified in Section 1200.

1304 TRANSPORTATION OF MIX.

The mix shall be transported to the jobsite in vehicles cleaned of all foreign material that may affect the mix. The inside of the truck beds shall be lubricated with a thin oil to prevent the mix from adhering to the bed, but an excess of lubricant will not be permitted. Vehicles shall be provided with covers of sufficient size and weight to protect the load and to prevent cooling of the mix during transportation to the site in cold weather when required by the City Engineer. The contractor shall provide a sufficient number of haul vehicles of the proper size, speed, and condition to ensure an orderly and continuous placement operation.

1305 PLACING REQUIREMENTS.

The bituminous mixture shall be spread and finished reasonably true to crown and grade by a mechanical, self-propelled paving machine. Bituminous mixtures may be spread and finished by other methods only where machine methods are impractical as determined by the City Engineer.

All bituminous mixtures shall be delivered to the paver at a temperature between 250°F and 325°F. Delivery of the material to the paver shall be at a uniform rate and in an amount well within the capacity of the paving and compacting equipment. No asphalt concrete shall be placed on frozen or wet subgrade.

The maximum depth of any individual lift shall be 5 inches. A minimum of one leveling course shall be placed prior to placement of the surface course for asphalt pavements, which consist of a total depth of 10 inches or less. A minimum of two leveling courses shall be placed for asphalt pavements greater than 10 inches.

When bituminous materials are being applied, the surface of all structures, curb and gutters, and other roadway appurtenances shall be protected in a satisfactory manner to prevent them from being splattered with bituminous material or marred by equipment operation. In the event that any appurtenances become splattered or marred, the contractor

shall, at his own expense, remove all traces of bituminous material and repair all damage, and leave the appurtenances in as good condition as they were before the work began.

All mixed material shall be delivered to the paver in time to permit completion of spreading, finishing, and compaction of the mixture during the daylight hours. Nighttime work on projects will not be permitted.

Hot-mix asphalt paving shall not be placed when the ambient temperature is below 35°F for base pavements and 50°F for surface pavements or when there is frost in the subgrade or at any other time when weather conditions are unsuitable for the type of material being placed without the expressed consent of the City Engineer. When the ambient temperature falls below 55°F, precautions shall be taken to compact the mix before it cools too much to obtain the required density.

In no case shall successive lifts of asphalt be placed until the previous lift has cooled to 175°F or less.

1306 MECHANICAL PAVING MACHINES.

Mechanical pavers shall be capable of spreading the mix, within the specified tolerances, true to the line, grade, and crown indicated on the contract drawings.

Pavers shall be 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, which place the mix evenly in front of adjustable screeds. They shall be equipped with either a vibrating screed or with a tamping bar immediately preceding a static screed.

The screed shall include any strike-off device operated by cutting, crowding, or other action 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 height and crown and shall be equipped with a controlled heating device for use when required.

Pavers shall be capable of spreading mixes without segregation or tearing. They shall also be capable of placing courses in thicknesses of from 1/2 inch to at least 3 inches, and from widths of 8 feet to at least 13 feet. Extensions and cut-off shoes shall permit changes in widths by increments of 6 inches, or smaller.

1307 COMPACTION REQUIREMENTS.

Rollers and other compacting devices shall be operated by competent and experienced roller personnel and shall be kept in operation continuously if necessary so that all parts of the pavement will receive substantially equal compaction. The City Engineer shall order the mixing plant to cease operations at any time proper rolling is not being performed.

After spreading and strike-off and as soon as the temperature and mix conditions permit the compacting to be performed without excessive shoving or tearing, the mixture shall be thoroughly and uniformly compacted.

Compacting equipment shall consist of both steel-wheeled and pneumatic-tired rollers and shall be on the site of the work prior to placement of the pavement. The compaction equipment shall be self-propelled and capable of smooth starting, stopping and reversing without backlash. Generally, the number and weight of rollers shall be sufficient to compact the pavement mixture to the required density while it is still in a workable condition.

Two-axle tandem steel rollers shall weigh not less than 8 tons or more than 12 tons. Three-axle tandem steel rollers shall not weigh less than 12 tons. Three-wheeled steel rollers shall weigh not less than 8 tons or more than 12 tons. All rollers shall be equipped with water tanks and sprinkling devices that shall be used for wetting the rollers to prevent adherence of the placed material.

Light pneumatic-tired rollers shall be constructed to allow loading to provide a gross weight of at least 225 pounds per inch of tire tread. Heavy pneumatic-tired rollers shall be constructed to allow loading to provide a gross weight of not less than 8 tons and not more than 12 tons. The tires on the front and rear axles of all pneumatic-tired rollers shall have smooth treads and shall be staggered to provide complete coverage over the entire area over which the roller travels.

The selection of the type of roller to be utilized in breakdown rolling may be varied to suit mix characteristics and shall be acceptable to the City Engineer. The final rolling of the top or surface course shall be accomplished with a steel roller unless otherwise approved by the City Engineer. In the event a vibratory roller is used for finish rolling, it shall be operated with the vibratory unit in its off position.

During rolling, the roller wheels shall be kept moist with only sufficient water to avoid picking up the material. The speed shall not exceed 3 miles per hour for steel-wheeled rollers and 5 miles per hour for pneumatic-tired rollers.

The line of rolling shall not be changed suddenly or the direction of rolling reversed suddenly. If rolling causes displacement of the material, the affected areas shall be loosened at once with lutes or shovels and restored to the original grade of the loose material before being re-rolled. Heavy equipment or rollers shall not be permitted to stand on the finished surface before it has been compacted and has thoroughly cooled.

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.

Any mixture that becomes loose, broken, mixed with foreign material, or which is in any way defective in finish or density, or which does not comply in all other respects with the requirements set forth herein, shall be removed, replaced with suitable material, and finished by and at the expense of the contractor in accordance with these Specifications.

1308 BITUMINOUS TACK COAT.

Prior to the distribution of bituminous materials, the contractor shall remove all loose materials from the surface by means of approved mechanical sweepers or blowers and/or hand brooms until it is as free from dust as is practicable. Side roads to receive bituminous treatment shall be shaped and bladed at the same time the sub-base is cleaned.

Contact surfaces of curbing, gutters, manholes, and similar structures shall be coated with a thin uniform coating of asphalt material. The bituminous mixture shall be so placed so that after compaction it will be 1/4 inch above the edge of the contact surfaces of such structures.

Joints between old and new pavements or between successive days' work shall be made so as to ensure thorough and continuous bond between the old and new mixtures.

Prior to placing the new pavement against a cut joint or against old pavement, the contact surface shall be sprayed or painted with a thin uniform coat of asphalt material.

The tack coat shall be applied to the areas to be surfaced as soon as practicable after they have been prepared and are sufficiently dry at the rate of from 0.2 to 0.5 gallons/square yard at application temperature. Tack coat shall not be applied in the early morning or in the late afternoon. Bituminous materials shall be applied by means of approved pressure distributors operated by skilled workmen.

The spray nozzles and spray bar shall be so adjusted and frequently checked that uniform distribution is ensured. The distribution shall cease immediately upon any clogging or interference of any nozzle and corrective measures taken before distribution is resumed. Hand sprays shall be used in tacking small patches or inaccessible areas that have been missed by the distributor.

The asphalt tack shall be entirely fogged over the base course and therefore require no sand blot. If, however, it has not been uniformly distributed, sufficient sand shall be spread over the surface to blot up the excess asphalt and prevent it from picking up. Prior to laying an intermediate or surface course, all loose or excess sand shall be swept from the base.

The contractor shall maintain the tack coat treatment and the surface of the sub-base intact until it has been covered by the surface course. Areas that have been damaged by traffic shall be repaired and shall receive applications of tack coat material in compliance with these Specifications. The maintenance and repair of the tack coat shall be done at the contractor's expense.

1309 DENSITY AND SURFACE REQUIREMENT.

The completed asphalt concrete pavement shall have a density of greater than or equal to 95% of Standard established by the Marshall Density procedure, using a 50-blow method.

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.

Both density and thickness shall be carefully controlled during construction and shall be in full compliance with plans and specifications. During compaction, preliminary tests, as an aid for controlling thickness shall be made by means approved by the City Engineer.

Upon request by the City Engineer, representative samples of the compacted asphalt paving shall be obtained by the contractor under the supervision of the City Engineer and shall be tested by a suitable independent or municipal testing laboratory as necessary to verify compliance with respective density requirements.

Selection of the independent testing laboratory, the number, timing, location and testing procedures for the representative samples shall be approved by the City Engineer. The testing laboratory shall submit to the City Engineer four copies of each report covering the details and results of the tests. All costs for the testing laboratory and all other costs of testing shall be borne by the contractor, unless otherwise specified.

The surface of the final surface course shall not vary from a 10-foot straight edge, applied parallel to the centerline, by more than 1/4 inch.

1310 PROTECTION OF PAVEMENT.

The contractor shall protect all sections of newly compacted base and surface courses from traffic until they have hardened properly, or as directed by the City Engineer.

1311 COMPACTION TESTING.

At the option of the City Engineer, compaction testing may be performed in the field using a nuclear density-moisture measuring device to determine the density of the mixture as placed. If as a result of this field-testing the City Engineer determines that further compaction is required, the contractor shall revise his rolling procedure to obtain the density as specified.

1312 BITUMINOUS SEALING.

Construction Requirements:

- a. Temperature of Bituminous Materials at the Time of Application. Bituminous materials shall be applied at a temperature within the range shown: Cutback Asphalt (MC 3000 Spraying: Minimum temperature 1500°F - Maximum Temperature 2500°F. Except for minor fluctuations, all asphalt cements reheated to temperatures above 500°F higher than the maximum shown above will be considered as overheated and may be rejected pending resampling and retesting of the material at the discretion of the City Engineer.

- b. Preparation of Road Surfaces. Prior to the distribution of bituminous material, the surface to be treated shall be cleaned with approved mechanical sweepers, blowers and/or hand brooms until it is free from dust, dirt and loose materials as practicable. If necessary, a blade or hand method may be used to remove materials such as packed mud, etc.
- c. Application of Bituminous Material. Bituminous material shall be applied by means of a pressure distributor in a uniform, continuous spread over the section to be treated and within the temperature range specified. The quantity of bituminous material to be spread at the rate of .30 gallons per square yard or as directed.

Any skipped areas or deficiencies shall be corrected. All radiuses shall be sealed. Junctions of spreads shall be carefully made to assure a smooth riding surface.

The length of spread of bituminous material shall not be in excess of that which the spreader can immediately cover.

The spread of bituminous material shall not be more than 6 inches wider than the width covered by the cover material from the spreading device. Under no circumstances shall operations proceed in such a manner that bituminous material will be allowed to chill, setup dry, or otherwise impair retention of the cover coat.

The bituminous distributor shall be equipped with positive shut-off and fittings to prevent the spray bar or other mechanisms from dripping bituminous materials on the surface of the traveled roadway.

Distribution of the bituminous material shall be so regulated, and sufficient bituminous material left in the distributor at the end of each application to insure a uniform distribution of the bituminous material. In no case should the distributor be allowed to "blow".

The angle of the spray nozzles and the height of the spray bar shall be adjusted and frequently checked to insure uniform distribution. The distribution of material shall cease immediately upon clogging or interference of any nozzle and corrective measures taken before distribution is resumed.

- d. Application of Aggregate. Immediately following the application of the bituminous material, cover material consisting of 3/8-inch Joplin Chat or CM-5 Baxter Springs Area Chat shall be spread with a self-propelled aggregate spreader at the rate of 25 lbs. per square yard.

Spreading shall be accomplished in such a manner that the tires of the trucks or aggregate spreader at no time contact the bituminous material.

If directed, the cover material shall be moistened to reduce the dust coating on the aggregate. Moistening shall be done the day before chip-sealing operations begin. In no case shall free moisture be draining from the truck bed.

The operation of distributing bituminous material shall not be in excess of 500 lineal feet ahead of the spreading of the aggregate.

Procedures of starting, stopping or turning of any piece of equipment which results in displacement of the cover material or damage to the seal coat shall be prohibited.

The spreading equipment shall be of such width and arrangement so that as the aggregate is placed, complete coverage will be obtained. No brooming, dragging or blading of the material shall be permitted prior to the initial rolling. Any rearrangement of the cover material shall be done using hand methods. Overlapping the application of cover material shall be avoided and all spillage shall be carefully removed from the surface. The bituminous material shall be uniformly covered before beginning the rolling operation.

- e. Manipulation. Following the application of bituminous material and aggregate to the road surface, the cover material shall be imbedded by rolling.

A sufficient number of pneumatic or steel rollers shall be furnished so that the initial rolling consisting of two complete coverage's shall be completed within 30 minutes after the cover material is applied. Rolling shall continue until satisfactory coverage with the roller is obtained.

All rollers shall be self-propelled, and shall operate on coverages so that each succeeding trip of the roller

will overlap slightly the coverage of the proceeding trip. The rollers shall be operated at a speed at which the aggregate will not be displaced.

The weight of the rollers shall be varied as directed to obtain the most satisfactory embedment of the cover material without crushing the aggregate.

The entire surface shall be kept completely covered at all times to prevent traffic from damaging the seal coat. When ordered by the City Engineer, additional cover material shall be applied and the additional material shall receive rolling per above specifications.

All loose aggregate shall be broomed from the surface of the road by the contractor. Brooming may commence as soon as the surface has cured sufficiently to prevent damage to the seal and shall continue until excess aggregate is removed. Aggregates likely to cause damage when picked up by vehicular traffic shall be broomed prior to opening any section to normal traffic. Aggregate is not likely to cause damage when picked up by vehicle wheels may be opened to traffic prior to brooming. Any section may be opened to traffic as soon as it has cured sufficiently to prevent cover material from being picked up by vehicular traffic.

- f. Maintenance of Completed Work. When ordered by the City Engineer, the contractor will be required to add bituminous material, or aggregate or both, to completed portions of the project when deemed necessary.

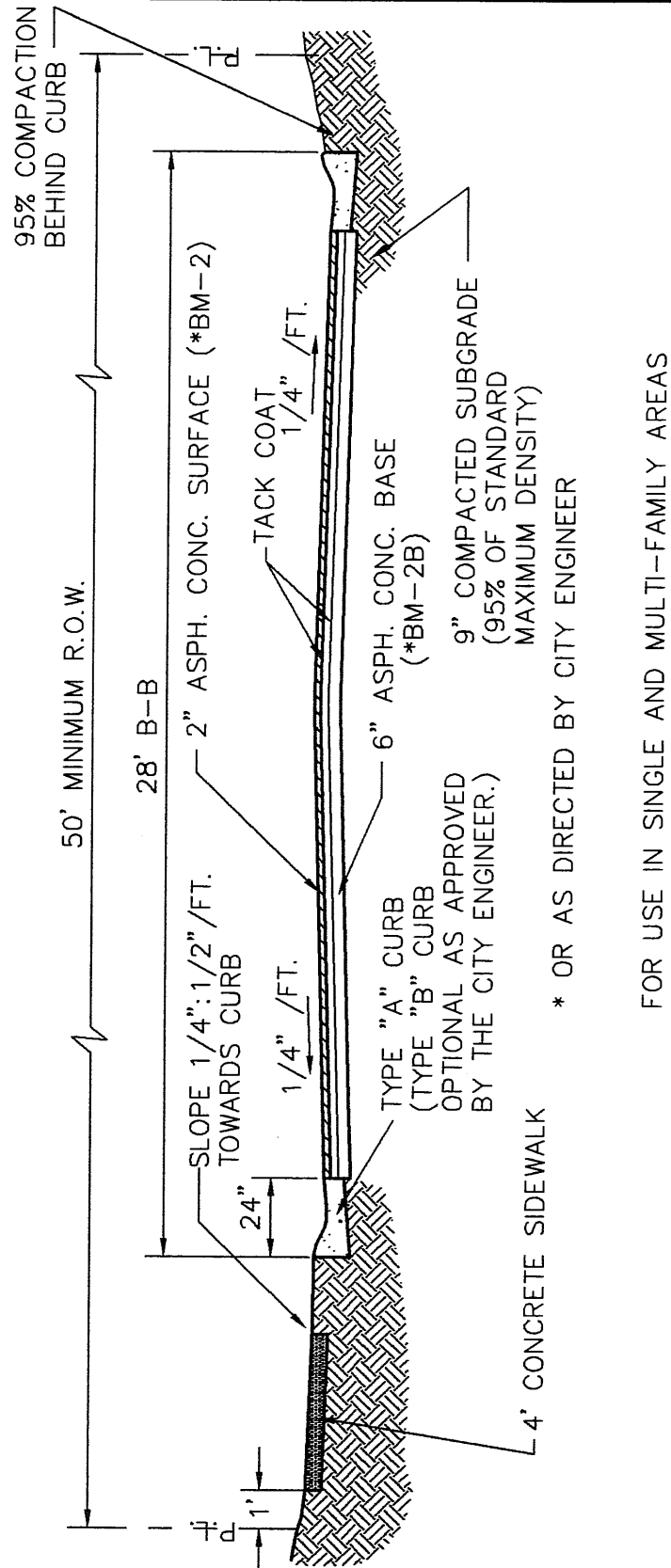
After all other work has been completed and prior to final acceptance of the road surfaces and providing there is insufficient vegetation on the shoulder to properly outline and define the edge of the driving surface, the excess loose cover material along the edges of the surface shall be broomed and/or bladed to provide a definite and distinct line along the edge of the sealed surface.

- g. Working Period. All work on the roadway will be completed during the time from sunrise to sunset and under favorable weather conditions.
- h. Weather and Seasonable Limitations. Bituminous sealing shall be constructed between May 1 and October 15 and operations carried out only when surface is dry, when

ambient temperature is above 60°F., and when the weather is not foggy, rainy or humidity is above 80%. The above requirements may be waived, but only when directed by the City Engineer.

END OF SECTION

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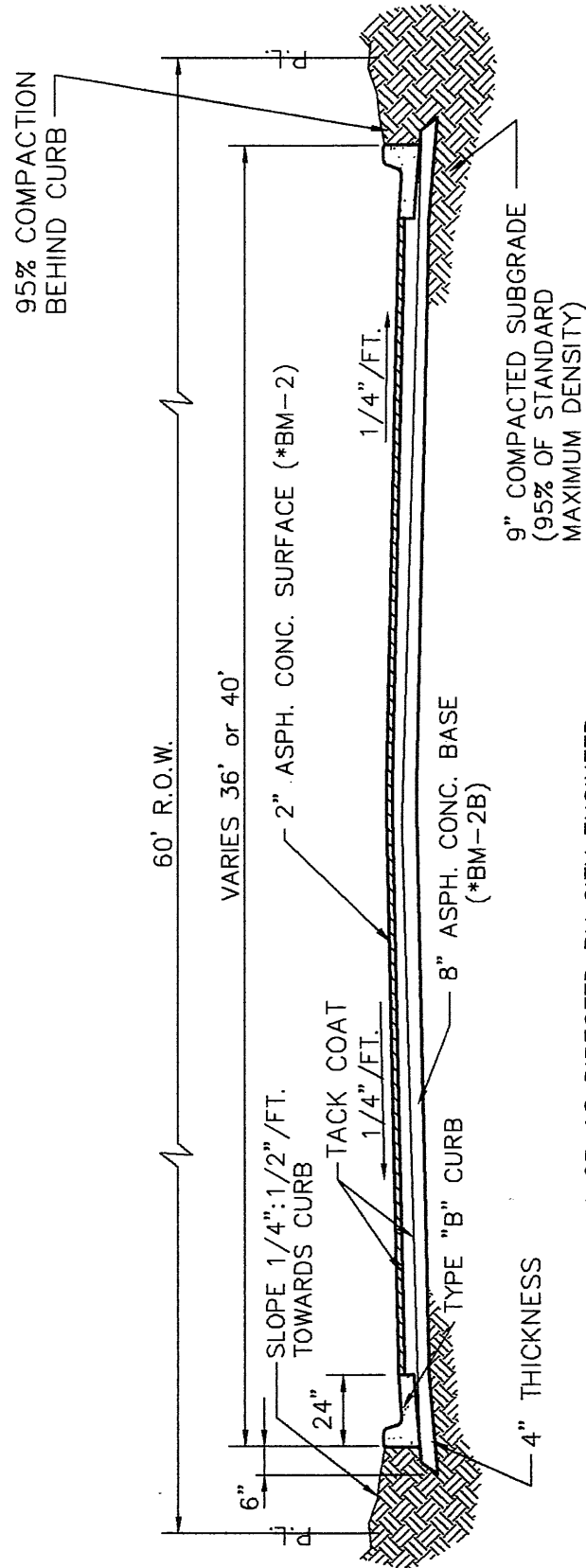
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DATE

REVISED

**TOTAL ASPHALT
LOCAL STREET
DETAIL**

STANDARD
DETAIL

13-1



* OR AS DIRECTED BY CITY ENGINEER

4' CONCRETE SIDEWALKS REQUIRED ON BOTH SIDES OF STREET.

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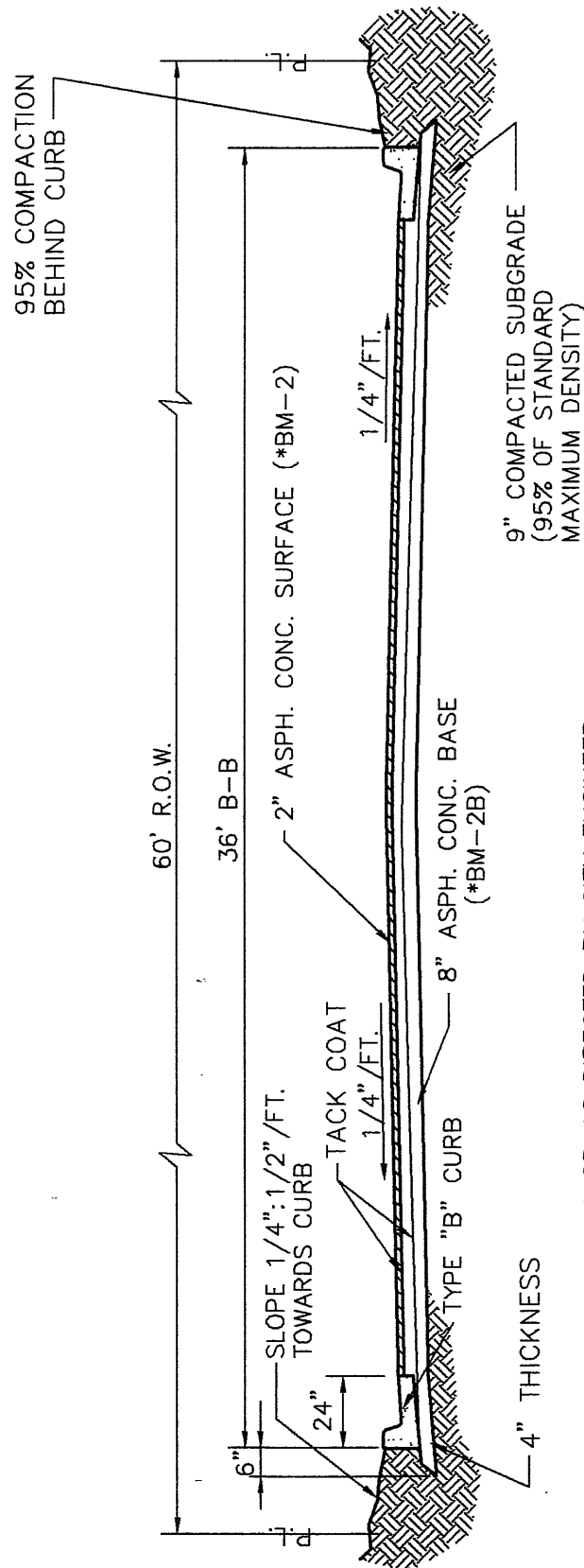
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REVISED

**TOTAL ASPHALT
COLLECTOR
STREET DETAIL**

STANDARD
DETAIL

13-2



* OR AS DIRECTED BY CITY ENGINEER

4' CONCRETE SIDEWALKS REQUIRED BOTH SIDES OF STREET FOR COMMERCIAL ZONING.

NO SIDEWALKS REQUIRED FOR INDUSTRIAL ZONING.

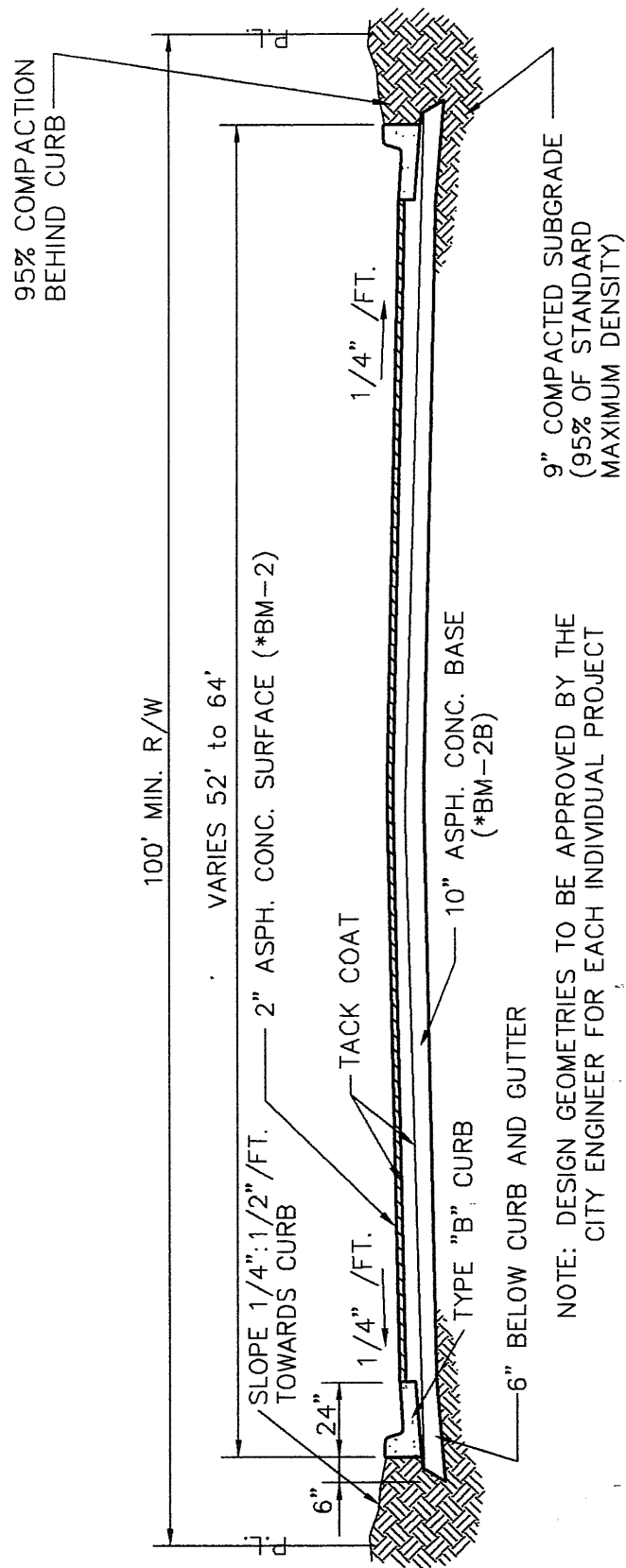
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CITY ENGINEER
5-8-08
DATE

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TOTAL ASPHALT
SERVICE
STREET DETAIL

STANDARD
DETAIL
13-2a



NOTE: DESIGN GEOMETRIES TO BE APPROVED BY THE CITY ENGINEER FOR EACH INDIVIDUAL PROJECT

* OR AS DIRECTED BY CITY ENGINEER

5' CONCRETE SIDEWALKS REQUIRED BOTH SIDES OF STREET.

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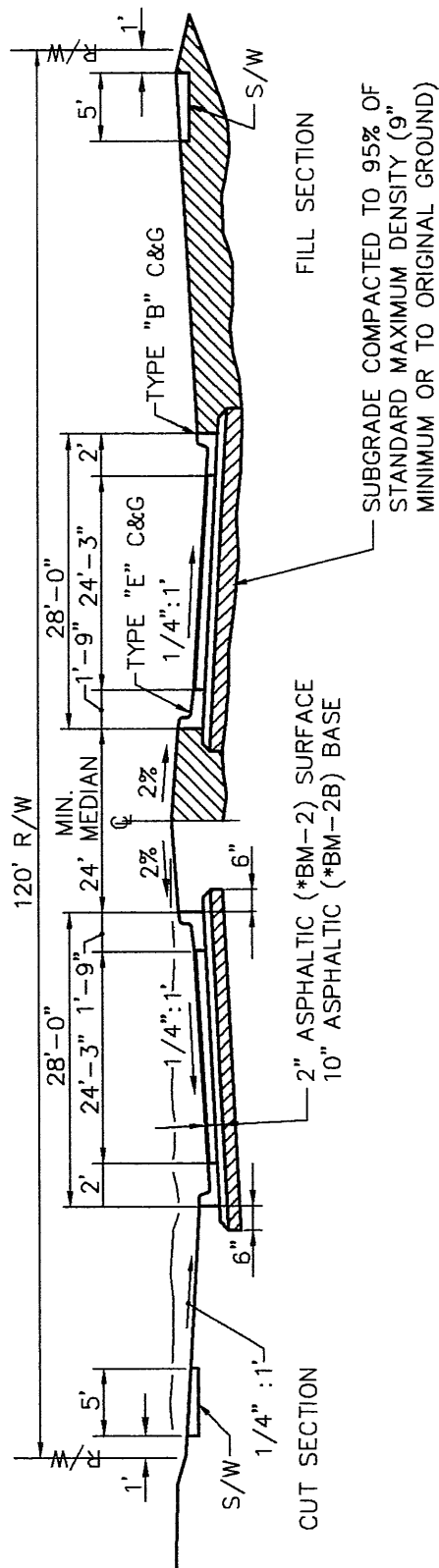
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TOTAL ASPHALT
MINOR ARTERIAL
STREET DETAIL

STANDARD
DETAIL

13-3



* OR AS DIRECTED BY CITY ENGINEER

TYPE "E" C&G USED FOR MEDIAN CONSTRUCTION SHALL BE A DRY GUTTER TIP OUT.

- NOTE: 1. DESIGN GEOMETRIES TO BE APPROVED BY THE CITY ENGINEER FOR EACH INDIVIDUAL PROJECT
2. TACK COAT SHALL BE APPLIED BETWEEN EACH ASPHALT LIFT.

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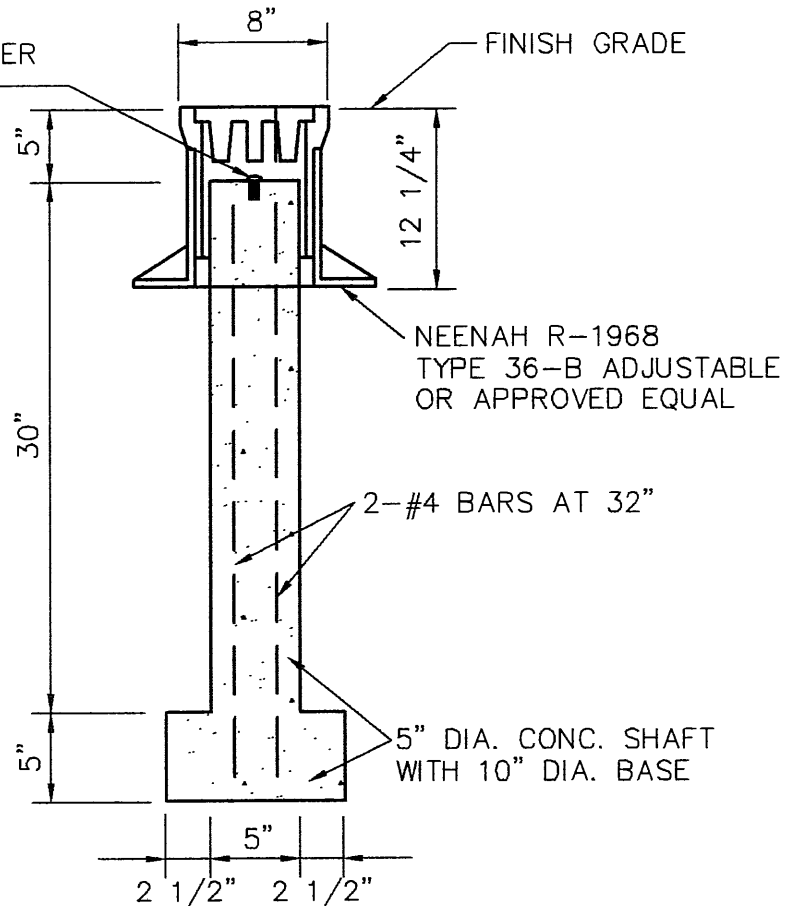
APPROVED
JWB
CITY ENGINEER
5-8-08
DATE

REVISED

MAJOR ARTERIAL
STREET DETAIL

STANDARD
DETAIL
13-4

2" DIA BRASS MARKER
FURNISHED BY CONTRACTOR.
MARKER TO HAVE
SECTION, TOWNSHIP
AND RANGE STAMPED ON
THE TOP WITH TRUE
SECTION CORNER ETCHED
ON THE SURFACE BY SURVEYOR
LICENSED IN THE STATE
OF KANSAS AFTER MARKER
IS SET.



SPRING HILL, KANSAS

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DEPARTMENT**

APPROVED

**JWB
CITY ENGINEER**

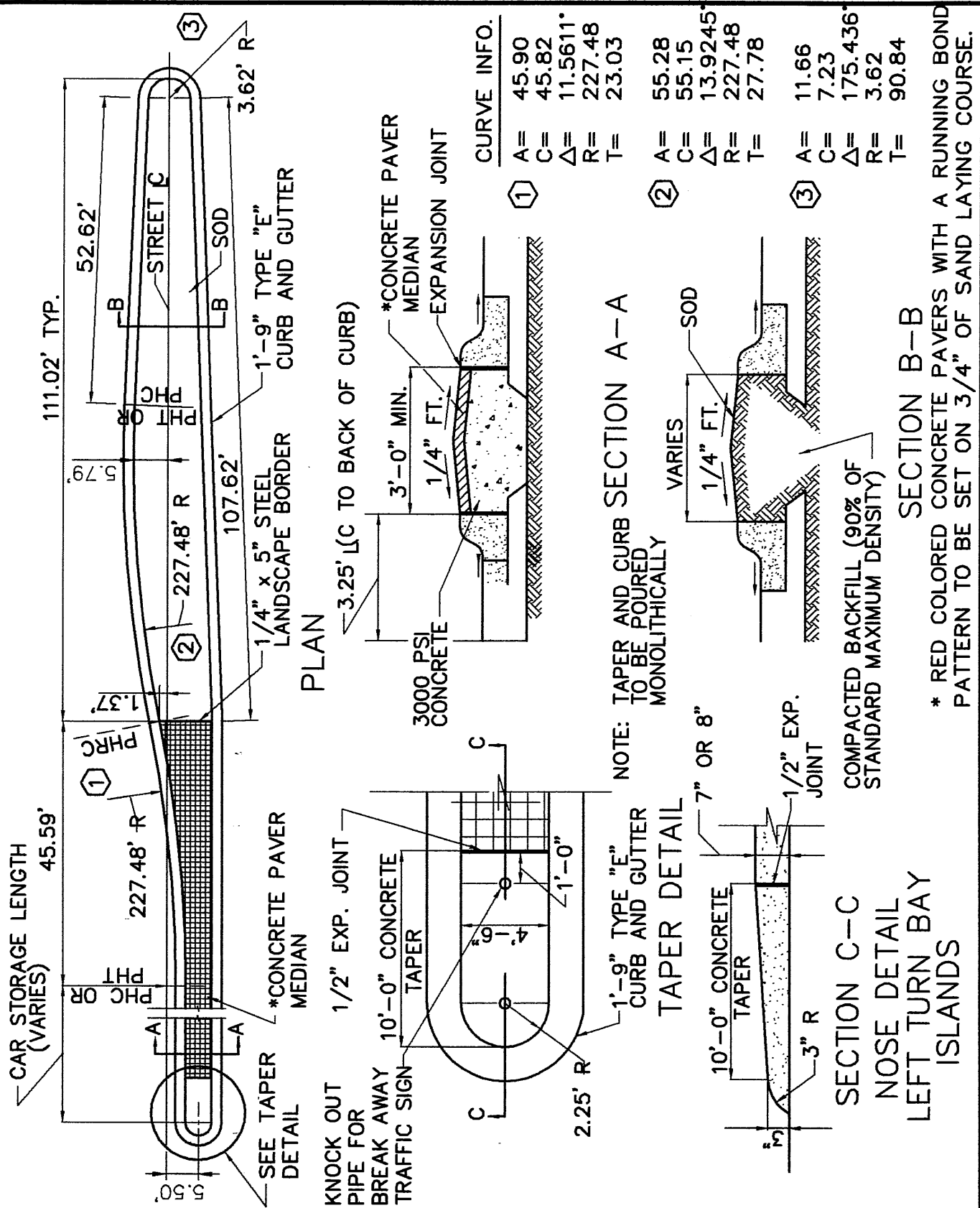
**5-8-08
DATE**

REVISED

**MONUMENT BOX
DETAIL**

**STANDARD
DETAIL**

13-5



* RED COLORED CONCRETE PAVERS WITH A RUNNING BOND PATTERN TO BE SET ON 3/4" OF SAND LAYING COURSE.

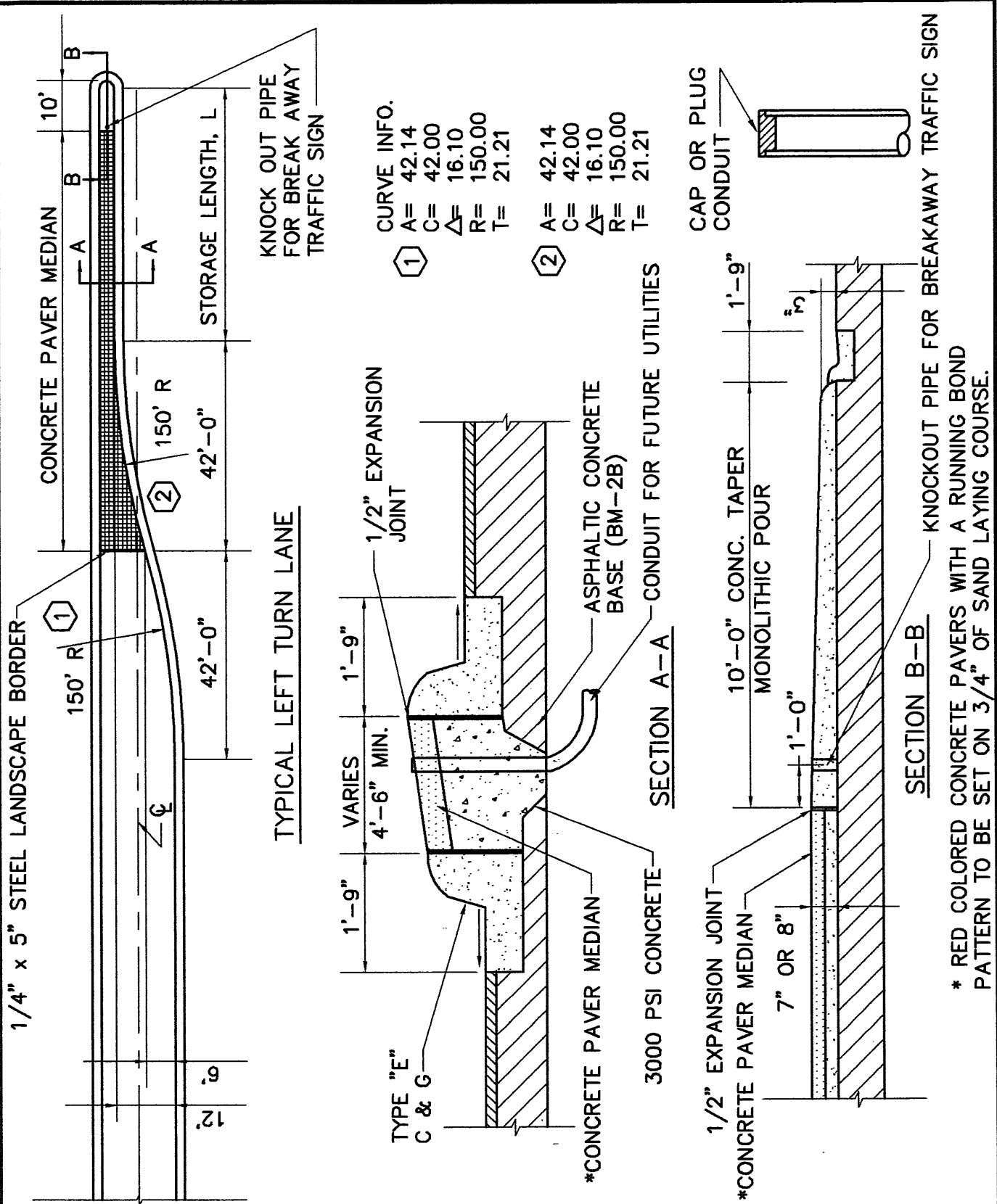
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5-8-08
DATE

REVISED

TYPICAL MEDIAN
DETAIL
MINOR ARTERIAL

STANDARD
DETAIL
13-6



SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED	TYPICAL MEDIAN DETAIL MAJOR ARTERIAL	STANDARD DETAIL 13-7
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SECTION 1400 - PORTLAND CEMENT CONCRETE PAVEMENT

1401 SCOPE.

This section governs the furnishing of all labor, equipment, tools, and materials and the performance of all work necessary to construct portland cement concrete pavement.

1402 MATERIALS.

Except as modified herein, all materials used for construction of portland cement concrete pavement shall conform to the requirements stipulated in applicable sections of this Technical Specification for Public Improvement Projects of the City of Spring Hill.

- a. Concrete. The concrete for use in construction of Portland cement concrete pavement shall be classified s JCCB-4K and mix designs shall be approved by the Johnson County Concrete Board prior to use.

- b. Reinforcing Steel.

Bars. Bars shall conform to ASTM A615, A616, and A617.

Welded Steel Wire Fabric ASTM A185.

Supporting Elements. Representative samples of supporting elements shall be submitted and approved by the City Engineer prior to their use in the project.

- c. Expansion Joint Fillers. Expansion joint fillers shall conform to ASTM D994, D1751 or D1752.

- d. Joint Sealing Compound. Joint sealing compounds shall meet Federal Specification TT-S-1543 and have the following minimum properties:

Durometer, Shore A 15-25 ASTM D 2240 Tensile stress 45 max. ASTM D 412 @ 150% Elongation, Die C psi Elongation, % 1200 min. ASTM D 412

- e. Curing Membrane. All material to be used or employed in curing portland cement concrete must be approved by the City Engineer prior to its use. It shall be of the liquid membrane type and shall conform to ASTM C309.

1403 CONSTRUCTION DETAILS.

The portland cement concrete pavement shall be constructed to the configuration, and to the lines and grades shown on the plans.

- a. Grading and Sub-grade Preparation. All excavation or embankment required shall be as defined in Sections 1100 and 1200 of these Technical Specifications entitled "Grading" and "Sub-grade Preparation".
- b. 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.
 - 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.
 - 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 that 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.
 - 5) Paving Machine. A slip-form paving machine may be used in lieu of forms. The machine must be equipped with mechanical internal vibrators, and be capable of placing the portland cement concrete pavement to the correct cross-section, thickness, line and grade within the allowable tolerances.

1404 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 standard drawings or as modified by the plans and specifications.

- a. Expansion Joints. Expansion joints shall be placed at all locations where shown on the plans and standard details or as directed by the City Engineer.
- 1) General. Expansion joints shall extend the entire width of the pavement and from the subgrade to 1 inch below the surface of the pavement or the material will have a suitable tear strip provided to allow for the application of the joint sealer.
 - 2) Under no circumstances shall any concrete be left across the expansion joint at any point.
 - 3) Material. Expansion joints shall be formed by a one-piece, 1-inch thick preformed joint filler cut to the configuration of the correct pavement section.
 - 4) Stability. Expansion joints shall be secured in such a manner that they will not be disturbed during the placement, consolidation and finishing of the concrete.
 - 5) Dowels. If expansion 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 which shall be installed in such a position that the center line of the joint assembly is perpendicular to the center line of the slab and the dowels lie parallel to the slab surface and parallel the center line of the slab. One-half of each dowel shall be painted in accordance with the directions shown on the Plans, and then thoroughly coated with hard grease, or an approved lubricant, to prevent the concrete from bonding to that portion of the dowel. As an option, a dowel sleeve of the dimensions shown on the plans or standard drawings may be used in lieu of grease.
- b. Contraction Joints. Contraction joints shall be of the type and dimensions and at the spacing shown on the Plans or standard drawings.
- 1) Templates. The templates shall be removed as soon as the concrete has attained its initial set and finished as outlined for tooling joints.
 - 2) Sawing. Sawed contraction joints shall be cut by means of wet sawing with an approved concrete saw. The joints shall not be sawed until the concrete

has hardened to the extent that tearing and raveling is precluded.

- 3) All joints shall be sawed during the initial curing period and the sawing shall begin before the pavement starts shrinking and before uncontrolled cracking takes place.
 - 4) Any procedure which results in premature and uncontrolled cracking shall be revised immediately by adjusting the sequence of cutting the joints or the time interval involved between the placing of the concrete or the removal of the curing media and the cutting of the joints. In no case shall the pavement be left overnight without having the joints sawed.
 - 5) The standard contraction joint configuration is a 1/8-inch - 3/16-inch wide joint sawed to a depth of 1/3 the thickness of the slab. Material created by sawing shall be flushed from the pavement before it has had time to dry or set. The spacing shall be as shown on the plans but should generally not exceed 15 feet.
 - 6) The joint shall be thoroughly cleaned by approved methods prior to the placing of the joint material. This is accomplished by sandblasting the dry joint in two passes, one for each joint face. This sand, as well as dust and dirt deposited by wind and traffic, must be blown out of the joint and away from the area around it using a high-pressure air blast prior to placing backer rod and joint material.
 - 7) Pre-Molded Strip Joints. Pre-molded strip joints shall be of the proper dimensions as shown on the plans and standard drawings and shall be secured at the proper location so as not to be disturbed by the finishing of the concrete.
- c. Longitudinal and Construction Joints. Longitudinal joints or construction joints shall be placed as shown on the plans or where the contractor's construction procedure may require them to be placed.
- 1) Center Joints. Longitudinal center joints shall be constructed using the methods specified in Section 1404b "Contraction Joints".

- 2) Longitudinal Construction Joints. Longitudinal construction joints (joints between construction lanes) shall be keyed joints or shall be constructed with tie bars. Joint configuration shall conform to the dimensions shown on the plans or standard drawings.
- 3) Transverse Construction Joints. 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 or for such a time that the concrete has begun to take its initial set. No construction joint shall be placed within 10 feet of an expansion, contraction, or other construction joint.
- 4) Tie bars. Tie bars shall be of deformed steel of the dimensions specified by the plans or standard drawings. Tie bars shall be supported in the proper position and at the specified spacing and be firmly secured so as not to be disturbed by the construction procedure. They shall be free from dirt, oil, paint, grease, loose mill scale, and thick rust, which could impair bond of the steel with the concrete.

1405 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 Section 2000 of these Technical Specifications and as specified herein.

- a. Concrete Placement. Prior to placement of the concrete pavement, all debris and foreign material shall be removed from the inner surfaces of the forms and all forms and subgrade properly moistened. All required reinforcement and other special metal parts shall be properly and firmly set into position to preclude movement during placement of the concrete.

The concrete shall be deposited over the entire width of the prepared subgrade between the forms in such a manner to prevent segregation and to require as little re-handling as possible. The pour shall be made 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. Concrete shall be thoroughly vibrated along the forms

or sides and along expansion and key type longitudinal joints. Attachments on finishing machines to vibrate the concrete adjacent to forms and longitudinal joints will be permitted provided satisfactory results are attained. Care shall be taken that the vibrator does not penetrate the subgrade or dislodge or move the joints. The vibrating shall be sufficient to produce a smooth pavement edge. Over vibrating will not be permitted, as it will cause segregation. Insufficient vibrating can cause honeycomb. Honeycomb in the edge may be cause for rejection of the pavement.

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. All utility appurtenances shall be boxed out and isolated using expansion joint material. The minimum size of a boxed out section shall be 2 feet x 2 feet.

Concrete shall not be allowed to extrude below the forms.

- b. Concrete Finishing. The pavement shall be struck off and consolidated with a mechanical finishing machine or by hand-finishing methods.

When a mechanical finishing machine is used, the concrete shall be struck off at such a height that after consolidation and final finishing it shall be at the exact elevations as shown on the plans. A depth of at least 2 inches of concrete shall be carried in front of the strike-off screed for the full width of the slab, whenever the screed is being used to strike off the pavement. The finishing machine shall be provided with a screed, which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with the least possible number of passes of the machine. The edge of the screeds along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand-finishing tools shall be kept available for use in case the finishing machine breaks down.

When hand finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the exact elevation as shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off; it shall not be allowed to idle on the concrete. Internal mechanical vibration shall be used along all formed surfaces.

- 1) Longitudinal Floating. After the concrete has been struck off and consolidated, it shall be further smoothed by means of a mechanical longitudinal float or float finishers using a longitudinal hand float. If a longitudinal hand float is used, it shall be operated from footbridges spanning the pavement and shall be worked with a wiping motion parallel to the centerline, and passing from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than 1/2 of the length of the float. The float shall not be less than 12 feet in length and 6 inches in width, and shall be properly stiffened and provided with handles at each end. This operation may be eliminated if specified tolerances can be attained by some other approved method.

In cases where the longitudinal floating operation has been eliminated, the pavement shall be scraped with a straight edge 10 feet long, equipped with a handle to permit it to be operated from the edge of the pavement. The longitudinal float and straightedge shall be operated so that any excess water and laitance are removed from the surface of the pavement. After the scraping operation, the surface of the pavement shall be within the specified tolerances.

- 2) Straight Edging. While the concrete is still plastic, the slab surface shall be tested for smoothness with a 10-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be placed on the surface parallel to the centerline of the pavement and at not more than 5-foot intervals transversely. After each test the straightedge shall be moved forward one-half its length and the operation repeated. When irregularities are discovered, they shall be corrected by adding or removing concrete. All disturbed places shall be smoothed with a float not less than 3 feet long

and not less than 6 inches wide, and again straight edged. The pavement surface shall have no depression in which water will stand.

- 3) Edging. Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be carefully finished with an edger of the radius shown on the plans or standard details.
- 4) Final Surface Finish. A burlap drag or a broom finish shall be used as the final finishing method. When a drag is used it shall be at least 3 feet in width and long enough to cover the entire pavement width. It shall be kept clean and saturated while in use. It shall be laid on the surface of the pavement and dragged in the direction in which the pavement is being laid. When broom finishing, a hard bristle broom shall be used. The broom shall be kept clean and used in such a manner as to provide a uniform textured surface. The curb shall have the same final finish as the pavement.

The final surface of the concrete pavement and curb shall have a uniform gritty texture free from excessive harshness and true to the grades and cross section shown on the plans. The City Engineer may require changes in the final finishing procedure as required to produce the desired final surface texture.

- c. Curing. Curing shall conform to the requirements set forth in Section 2000 "Concrete," with the exception that waterproof paper or polyethylene sheeting shall not be acceptable as curing methods for concrete pavement. The use of straw or burlap for curing shall be as approved by the City Engineer.

As soon as practical after the concrete is finished, it shall be cured with one of the acceptable methods. If a liquid curing membrane is used, it shall be according to the manufacturer's directions.

A nozzle producing a uniform mist pattern will be used on all spray equipment when applying the liquid curing membrane. Rate of application to the pavement shall be 1 gallon per 175 feet with a wet thickness of 6 to 10 mils.

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, these surfaces shall also be cured.

- d. 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 City. Concrete pavement, which is not acceptable to the City Engineer because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the City Engineer, at the expense of the contractor.

All vehicular traffic shall be prohibited from using the new concrete pavement until it has attained the proper strength. The concrete pavement shall not be opened for light traffic until the concrete is at least 72 hours old and has attained a minimum compressive strength of 3000 pounds per square inch. The pavement shall not be opened to all types of traffic until the concrete is at least 120 hours old and has attained a minimum compressive strength of 3500 pounds per square inch. If high early strength concrete is used, the pavement may be opened to all types of traffic when the concrete has attained a compressive strength of 3500 pounds per square inch.

- e. Temperature Limitation. Concrete work shall proceed in accordance with the requirements established in Section 2000 "Concrete."

1406 BACKFILL.

A minimum of 24 hours shall lapse before forms are removed and 5 days shall lapse before pavement shall be backfilled unless otherwise approved by the City Engineer.

Backfill shall be accomplished in accordance with Sections 1100 and 1200 entitled "Grading" and "Sub-grade Preparation".

The contractor shall be responsible for the repair of any existing street pavement disturbed by the construction to the satisfaction of the City Engineer.

1407 JOINT SEALING AND CLEANUP.

All joints shall be sealed with an approved joint sealer and backer rod applied in accordance with the manufacturer's directions and City Specifications, Standards and Design

Criteria. The joints shall be sealed within 7 days of the placement of the concrete and prior to the opening of the pavement to traffic.

The contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the area of the construction.

1408 CONCRETE CURB.

Concrete curb will be constructed as shown on the plans unless otherwise approved by the City Engineer. The three options available for concrete curb are as listed below and detailed in standards 14-1, 2, 3, and 4.

- a. Integral curb. Integral curb shall be constructed immediately following the finishing operation unless otherwise shown on the plans. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "cold joint".

Steel curb forms shall be required to form the backs of all curbs except where impractical because of small radii street returns or other special sections.

In placing curb concrete, sufficient spading shall be done to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms and with a float not less than 4 feet in length.

The finished surface of the curb and gutter shall be checked by the use of a 10-foot straightedge and corrected if necessary. Where grades are flat and while the concrete is still plastic, the drainage of the gutter should be checked with a 4-foot level.

- b. Separate Curb and Gutter with Tie bars. Separate curb and gutter may be poured prior to pouring the remaining pavement. Tie bars 5/8 inches in diameter and 24 inches long shall be cast in the curb and gutter at 30-inch centers as shown on the standard details.
- c. Separate Curb and Gutter with Keyway. Separate curb and gutter may be poured prior to pouring the remaining pavement. A keyway of the configuration and dimensions

shown on the standard details shall be cast in the curb and gutter section.

1409 SURFACE TOLERANCES.

Concrete pavement shall have a surface tolerance in all directions of 1/4-inch in 10 feet when checked with a 10-foot straightedge.

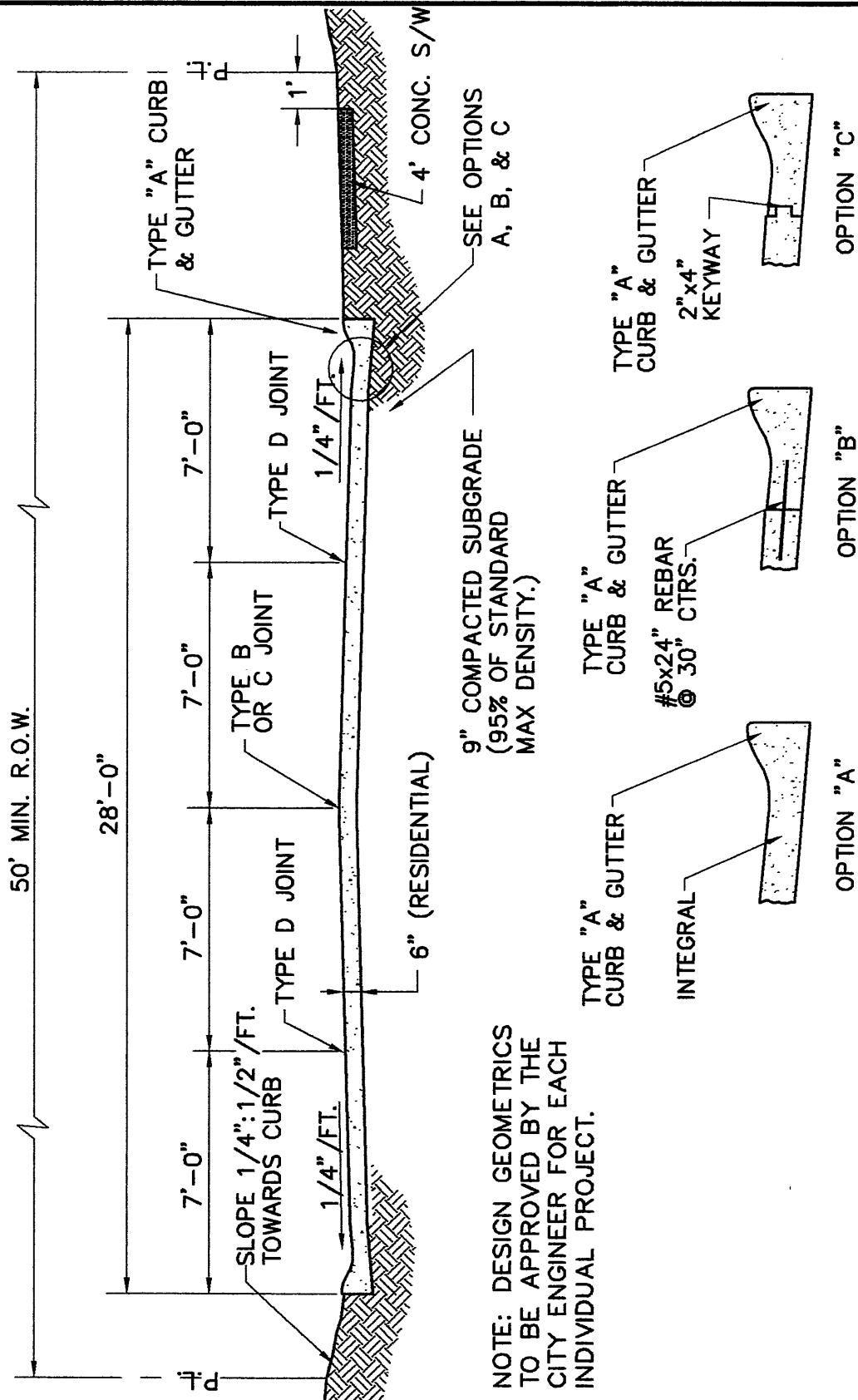
1410 THICKNESS TOLERANCES.

It is the intent of these Specifications that pavement shall be constructed strictly in accordance with the thickness shown on the plans. The thickness of the pavement may be measured by coring, and where any pavement is found deficient in thickness, it may be compensated for at an adjusted unit price or shall be removed and replaced.

In removing pavement, it shall be removed from the outside edge of the curb and gutter (curb and gutter with tie bars or keyway may remain if in good condition) to a longitudinal joint, or between longitudinal joints, and on each side of the deficient measurement until no portion of the exposed cross sections are more than 2/10 inch deficient, except that there shall not be less than 5 linear feet of pavement removed. If there remains less than 10 feet of acceptable pavement between the section that has been removed and a transverse contraction, expansion, or construction joint, the contractor shall remove pavement to the joint.

END OF SECTION

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CURB CONSTRUCTION OPTIONS

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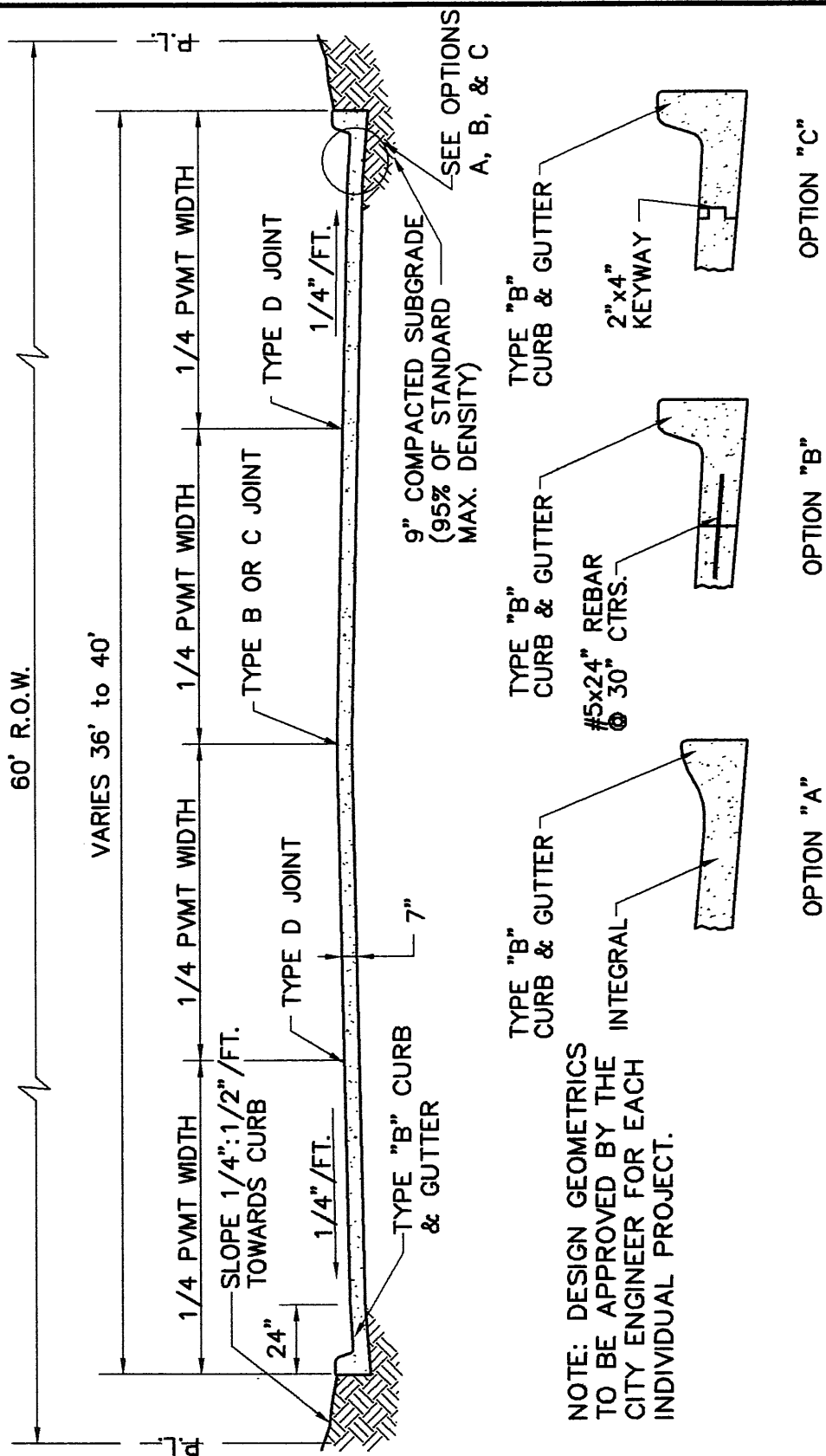
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REVISED

CONCRETE PAVING
PAVEMENT CROSS
SECTION AND JOINT
LOCATIONS
(LOCAL STREET DETAIL)

STANDARD
DETAIL

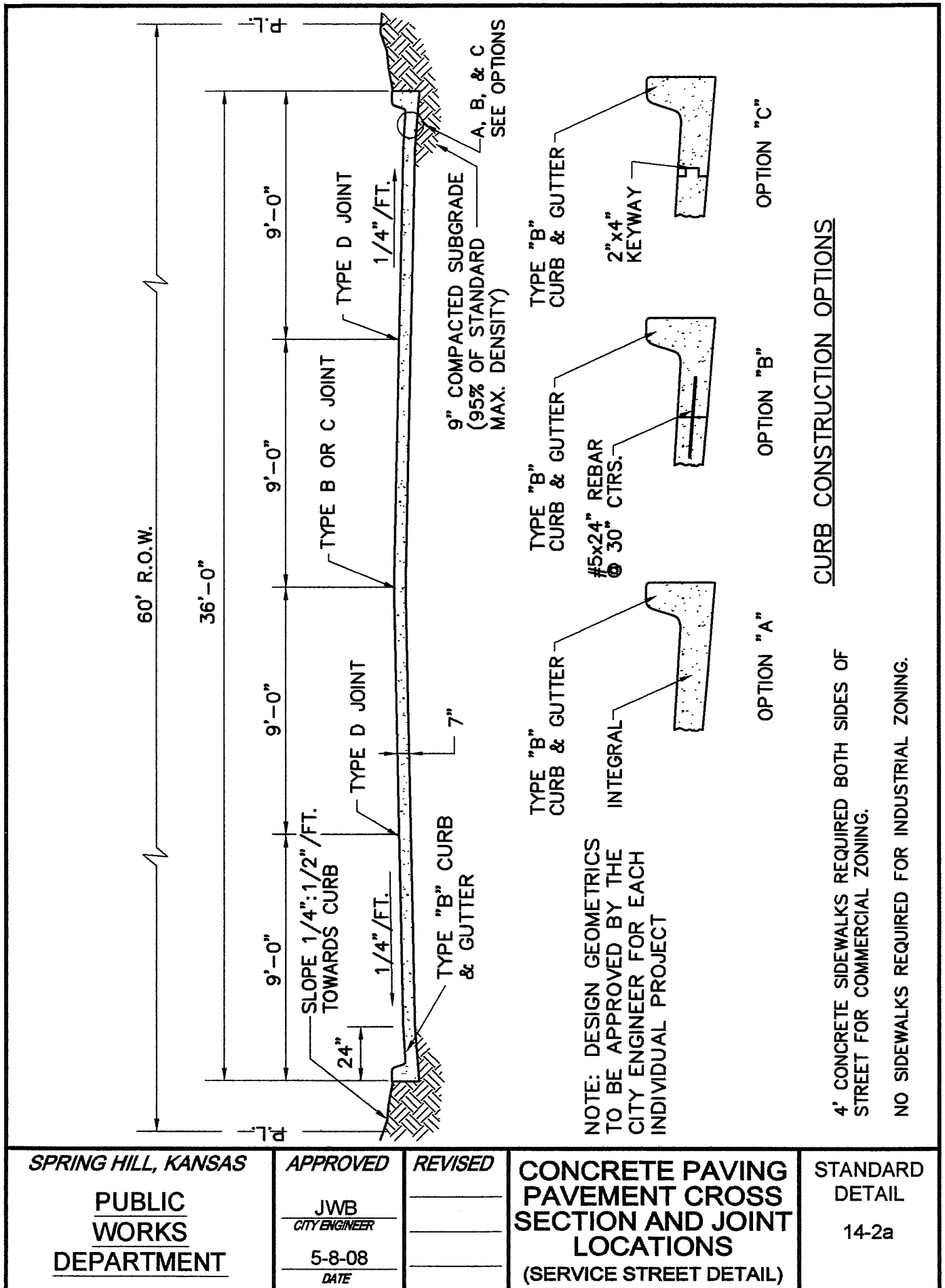
14-1

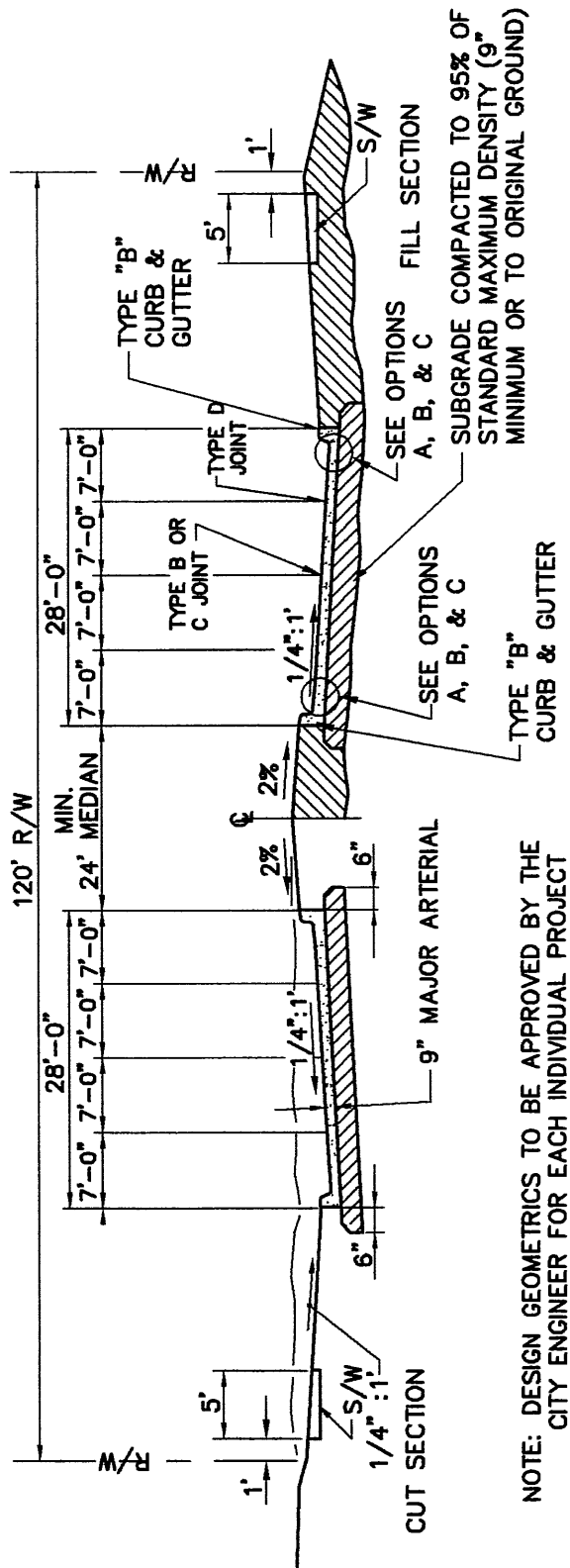


4' CONCRETE SIDEWALKS REQUIRED ON BOTH SIDES OF STREET.

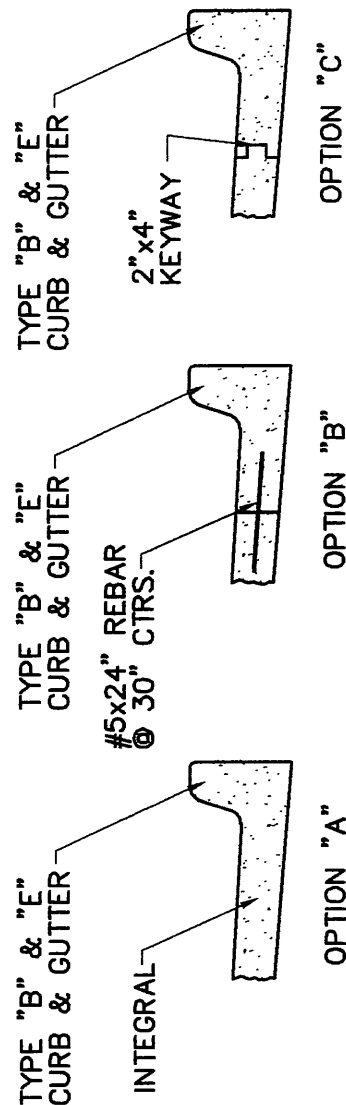
CURB CONSTRUCTION OPTIONS

SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED 	CONCRETE PAVING PAVEMENT CROSS SECTION AND JOINT LOCATIONS (COLLECTOR STREET DETAIL)	STANDARD DETAIL 14-2
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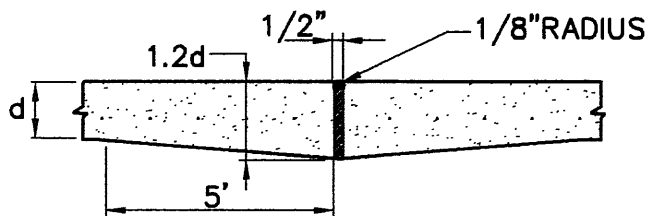


NOTE: DESIGN GEOMETRICS TO BE APPROVED BY THE CITY ENGINEER FOR EACH INDIVIDUAL PROJECT

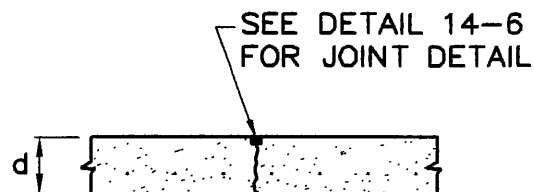


CURB CONSTRUCTION OPTIONS

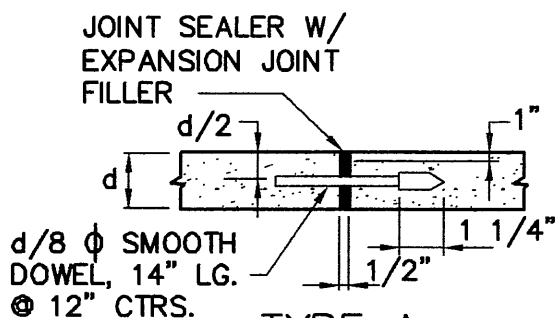
SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED	CONCRETE PAVING PAVEMENT CROSS SECTION AND JOINT LOCATIONS (MAJOR ARTERIAL DETAIL)	STANDARD DETAIL 14-4
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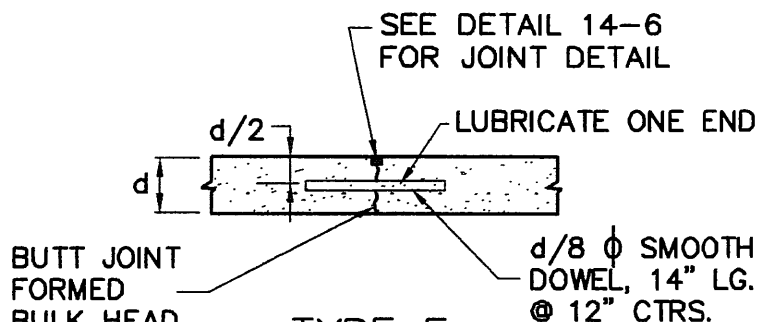
TYPE A
EXPANSION JOINT



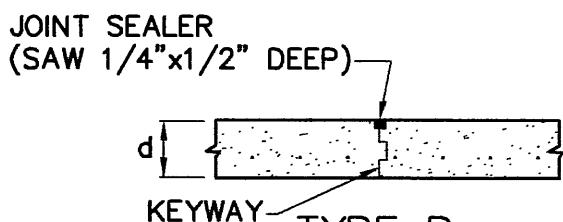
TYPE D
SAWED LONGITUDINAL OR TRANSVERSE



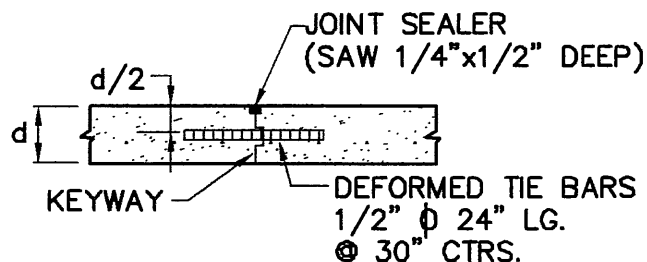
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ALTERNATE EXPANSION JOINT



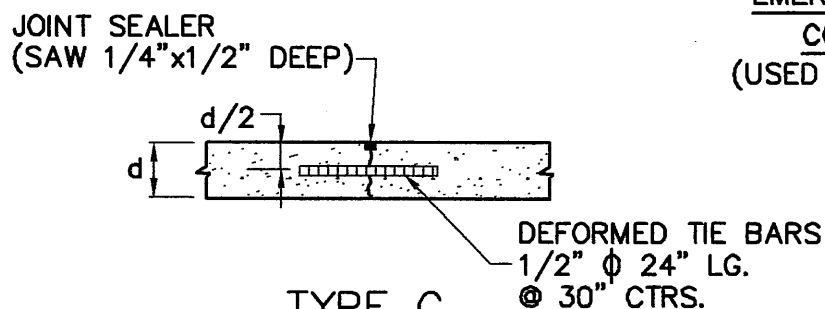
TYPE E
PLANNED TRANSVERSE CONSTRUCTION JOINT
(USED AT NORMAL JOINT SPACING)



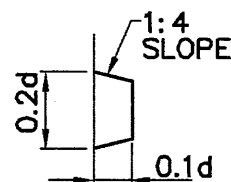
TYPE B
LONGITUDINAL CONSTRUCTION JOINT



TYPE F
EMERGENCY TIED TRANSVERSE
CONSTRUCTION JOINT
(USED AT MIDDLE THIRD NORMAL
JOINT SPACING)



TYPE C
TIED BUTT LONGITUDINAL CONSTRUCTION JOINT



KEYWAYS FOR TYPE B AND F
CONSTRUCTION JOINT

SPRING HILL, KANSAS

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JWB
CITY ENGINEER

5-8-08
DATE

REVISED

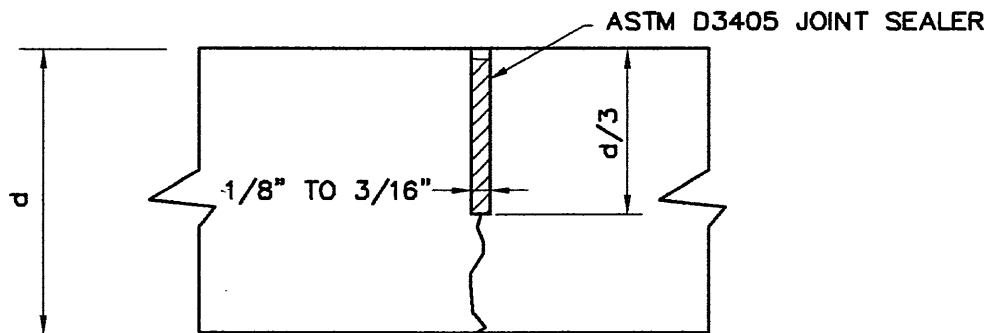
CONCRETE PAVING
JOINT DETAILS

STANDARD
DETAIL

14-5

NOTES:

1. JOINT SEALING MATERIAL SHALL CONFORM TO ASTM D3405 AND SHALL BE APPLIED IN ACCORDANCE WITH MATERIAL MANUFACTURER'S RECOMMENDATIONS.
2. d = DEPTH OF SLAB



TYPICAL SECTION

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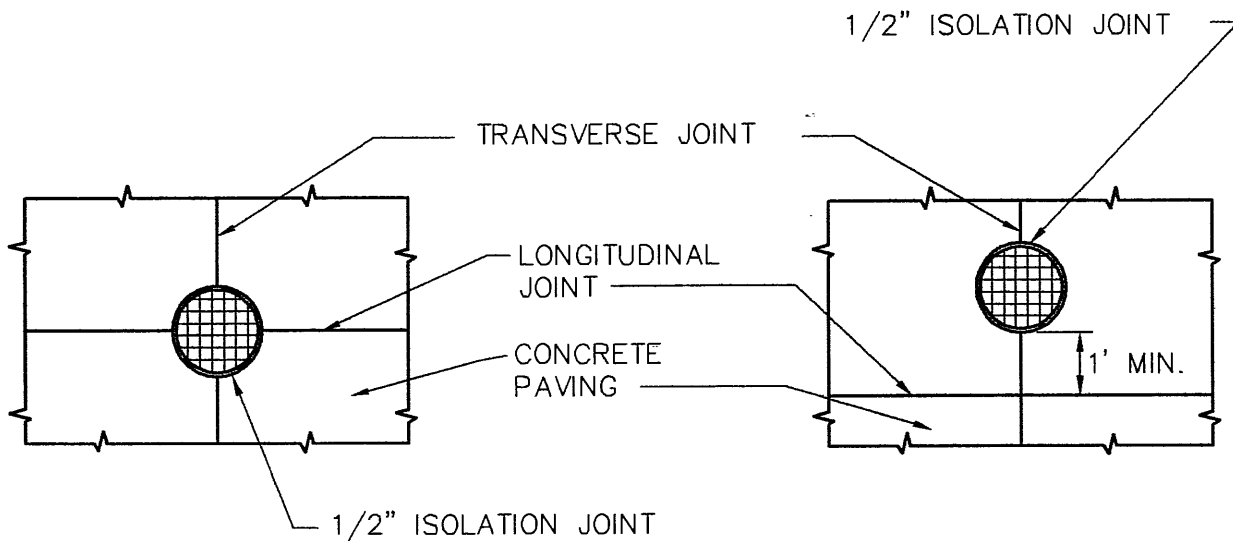
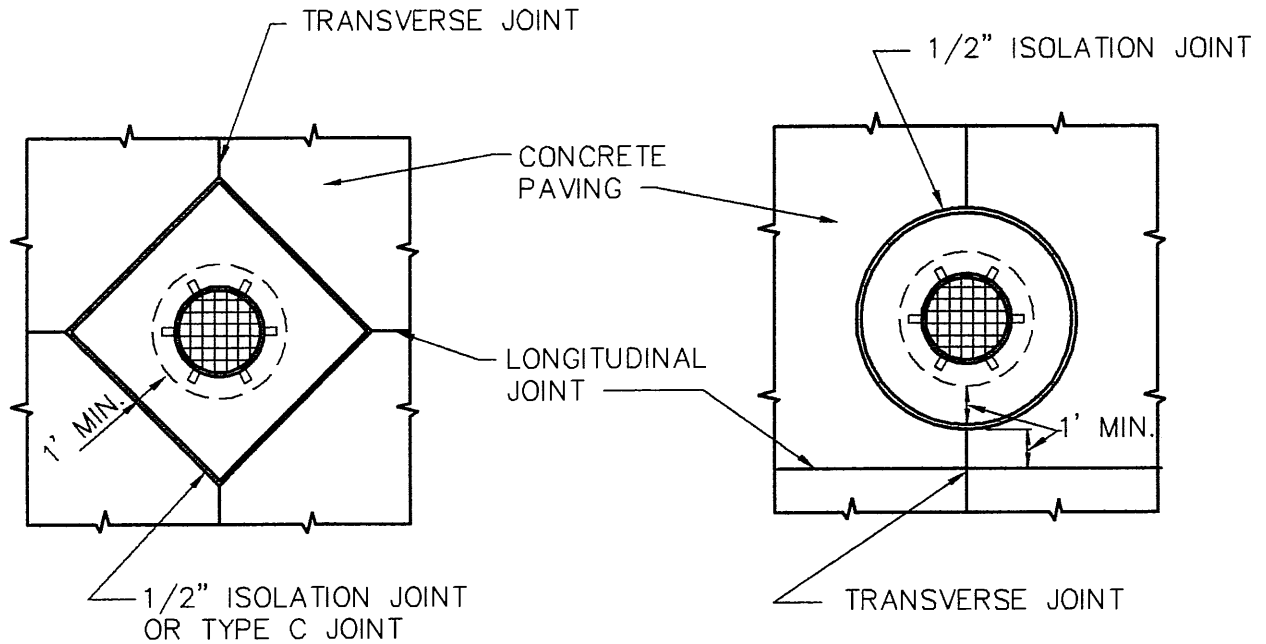
5-8-08
DATE

REVISED

**CONCRETE PAVING
JOINT SEALING DETAILS**

**STANDARD
DETAIL**

14-6



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DEPARTMENT**

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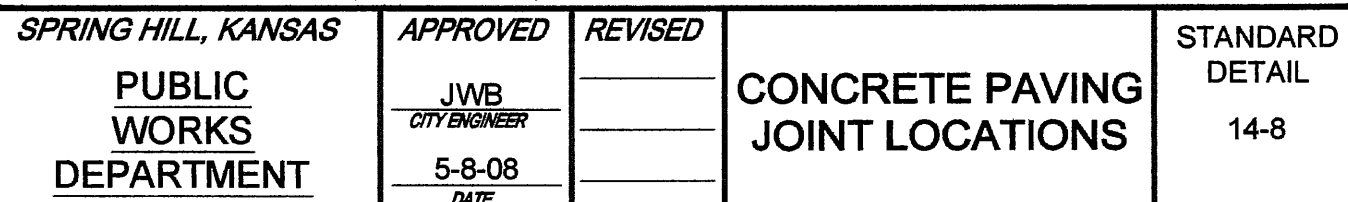
5-8-08
DATE

REVISED

**CONCRETE PAVING
ISOLATION JOINT DETAILS**

**STANDARD
DETAIL**

14-7



SECTION 2000 - CONCRETE

2001 SCOPE.

This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing, and other appurtenant work.

2002 GENERAL.

All cast-in-place concrete shall be accurately formed, and properly placed and finished as shown on the drawings and specified herein.

Where governing specifications are referred to, material and construction requirements shall conform to the governing specification as modified herein. "KHS" shall refer to Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation, 1980 edition, or latest revision.

The contractor shall inform the City Engineer at least 24 hours in advance of the times and places at which he intends to place concrete.

2003 MATERIALS.

All material used in the manufacture of concrete shall conform to the following:

Cement	ASTM C150, Type I, II or III For concrete pavement see Section 1400.
Water	Clean and free from deleterious substances.
Fine Aggregate	KHS Section 1102, Type FA-A, except that artificial or manufactured sand will not be acceptable. Recycled aggregate will not be acceptable.
Coarse Aggregate	KHS Section 1102. Additionally, all crushed stone used as aggregate for concrete requiring a 4000 psi strength shall be obtained from quarries and beds designated by the Kansas Department of Transportation as meeting

durability requirements of Class 1 or Class 6, as shown on the current listing on file in the office of the City Engineer. Certification by an independent testing laboratory that the aggregates used were obtained from an approved source and identifying the name and location of the quarry and bed number shall be filed, at the contractor's expense, with the City Engineer. Recycled aggregate will not be acceptable.

All concrete used to construct PCC pavement and concrete curb shall be classified as KCMMB-4K and mix designs approved by the Kansas City Metropolitan Materials Board prior to use.

Curing Membrane	Type 2-White Pigmented compound, AASHTO Designation M148
Air-Entraining Agent	ASTM C260
Admixtures	ASTM C494
Reinforcing Steel	ASTM A615; Bars - Grade 60; Beamstirrups and column ties - Grade 40
Welded Wire Fabric	ASTM A185, and AASHTO Designation M55

2004 PRELIMINARY REVIEW.

A report shall be submitted to the City Engineer prior to the placement of concrete and shall include data on proposed use, design strength, concrete mix proportions, maximum water/cement ratio, slump designated at the point of delivery, the percent of air in the concrete for air-entrained concrete, and the fine and coarse aggregate gradation. Mix proportions shall be selected preferably on the basis of field experience and may be adjusted upon approval of the City Engineer where required to produce concrete of proper workability, uniform consistency, and acceptable density and strength. Failure to get a mix design approved from the City Engineer prior to concrete placement is just cause for removal of the concrete.

When specifically required by the City Engineer, a tentative concrete mix shall be designed and tested for each

size and gradation of aggregate and for each slump intended to be used on the work. Design quantities and test results of each mix shall be submitted to the City Engineer for review and approval.

2005 CONCRETE MIX DESIGNATIONS.

The following tabulation indicates minimum strengths for the various types of concrete, which will be accepted.

Class	Minimum Compressive Strength		Slump
	7 Days	28 Days	
I	2000 psi	3000 psi	4 inches max.
II	2650 psi	4000 psi	2-4 inches max.

All cast-in-place or pre-cast construction, unless otherwise stated in these Specifications or allowed by the City Engineer, shall be of Class II concrete. When high-early strength cement is to be used for concrete, the mix shall obtain a 7-day strength not less than the minimum 28-day strength specified to concrete of the same class.

2006 LIMITING REQUIREMENTS.

Each concrete mix shall be designed and concrete shall be controlled within the following limits.

	Slump	Max. Size Coarse Aggregate	Cement Content Lbs./C.Y.	Max. Water Cement Weight Ratio	Max. Gals. Water Per Cement (Sack)
Class I (3000 psi)	4"	1"	480	.542	6.12
Class II (4000 psi)	2"	1"	558	.421	4.75
	3"	1"	558	.421	4.75
	4"	1"	618	.421	4.75

The quantity of portland cement shall be not less than that shown in the preceding table.

Concrete slump shall be kept as low as possible, consistent with proper handling and thorough compacting. Maximum slump for portland cement concrete pavement shall be 2 inches.

Slumps for concrete work other than pavement construction shall not exceed 4 inches. Use of slumps in excess of those specified shall be only when authorized by the City Engineer. The use of water to obtain so-called "improved workability" shall not be permitted.

The initial set as determined by ASTM C403 shall be attained 5 1/2 hours, plus or minus one hour, after the water and cement are added to the aggregates. If such use has been approved by the City Engineer, the quantity of retarding or accelerating admixture shall be adjusted to compensate for variations in temperature and job conditions.

The use of admixtures other than air-entraining agents is discouraged and shall not be allowed without the express approval of the City Engineer. When approved for specific purposes, the admixture content shall be in accordance with the recommendations of the manufacturer for compliance with these Specifications.

The total volumetric air content of concrete after placement shall be 6%, plus or minus 1.0%.

The minimum acceptable compressive strengths shall be as determined by ASTM C39.

As the work progresses, the City Engineer reserves the right to change the proportions from time to time if conditions warrant such changes to produce a satisfactory job. Any such changes may be made within the limits of the specifications at no additional compensation to the contractor.

2007 BATCHING AND MIXING.

Concrete shall be furnished by an acceptable ready-mixed concrete supplier and shall conform to ASTM C94.

The consistency of concrete shall be suitable for placement conditions. Aggregates shall float uniformly throughout the mass and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.

2008 PLACEMENT.

The limits of each concrete pour shall be predetermined by the contractor and shall be acceptable to the City Engineer. All concrete within such limits shall be placed in one continuous operation.

Before concrete is placed, forms, reinforcements, and embedment shall be rigidly secured in proper position and all dirt, mud, water and debris shall be removed from the space to be occupied by the concrete. Bonding surfaces shall be cleaned of all foreign material and shall be free from laitance. Concrete shall not be placed on frozen subgrade or in excavations, which have not been dewatered.

Placement of concrete shall conform to requirements of ACI 304. Concrete shall be placed within 45 minutes of mixing operations, with the exception that the City Engineer may extend the period to 90 minutes (maximum), dependent upon weather conditions.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. Concrete shall not be placed in horizontal layers exceeding 18 inches and shall not be deposited in large quantities at any point in the forms and then run or worked along the forms, thus causing segregation of the materials. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcements and embedment and into the corners of the forms. The concrete shall be vibrated or spaded to produce a solid mass without honeycomb or surface air bubbles.

Where steep slopes are required for placing concrete with chutes, the chutes shall be equipped with baffle boards or be in short lengths that reverse the direction of movement. Chutes, troughs and pipes shall not be made of aluminum.

Concrete shall not be dropped in the forms a distance of more than 5 feet, unless confined by chutes or pipes; and care shall be taken to fill each part of the form by depositing the concrete as near final position as possible. After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of projecting reinforcement.

2009 COLD WEATHER CONCRETING.

Unless authorized in writing by the City Engineer, mixing and concreting operations shall be discontinued when the descending air temperature in the shade and away from artificial heat reaches 40°F or when forecast to drop below 40°F within 24 hours of placement, and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

When concrete work is authorized during cold weather, the aggregates may be heated by methods approved by the City Engineer prior to being placed in the mixer. No ingredient that is frozen or contains ice shall be placed in the mixer. The temperature of the concrete shall be not less than 60°F and not more than 80°F at the time of placement in the forms. Under no circumstances shall concreting operations continue when the air temperature is less than 20°F. No concrete shall be placed on frozen subgrade. Sudden cooling of concrete shall not be permitted. Concrete injured by frost action or freezing weather shall be removed and replaced at the contractor's expense.

2010 HOT WEATHER CONCRETING.

The provisions of this section shall apply to all concrete work, which is done when the air temperature is above 80°F at the time of placement.

The temperature of the concrete, when placed, shall not be high enough to cause excessive loss of slump, flash set or cold joints. In no case shall the temperature of the concrete, when placed, exceed 90°F. Forms, reinforcing and subgrade surfaces against which the concrete is to be placed shall be wetted down immediately before placement.

When the air temperature exceeds 90°F and as soon as practicable without causing damage to the surface finish, all exposed concrete shall be kept continuously moist by means of fog sprays, wet burlap, cotton mats, or other means acceptable to the City Engineer. This cooling with water shall be in addition to the initial sealing by membrane curing compound.

2011 CURING AND PROTECTION.

Concrete shall be cured by protecting it against loss of moisture, rapid temperature changes and mechanical injury for at least four days after placement. Acceptable methods shall be moist curing, white polyethylene sheeting, liquid membrane-forming compounds, or a combination thereof. After concrete finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by the curing medium applicable to local conditions and acceptable to the City Engineer. The contractor shall have the necessary equipment for adequate curing on hand and be ready to install prior to concrete placement.

Moist curing shall be accomplished by a covering of burlap or other approved fabric mat used singly or in combination. Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the surface for the duration of the moist-curing period. Burlap or fabric mats shall be long enough to cover the entire surface of the work and lapped at joints to prevent drying between adjacent sheets.

White polyethylene sheets shall be large enough to cover the entire surface of the work and shall be lapped not less than 18 inches. The sheets shall be adequately weighted to prevent displacement or billowing due to wind. Tear holes appearing in the material during the curing period shall be immediately repaired or replaced with material in acceptable condition.

White membrane curing compound shall be applied after finishing operations have been completed and immediately after the free water has left the surface. The surface of the work shall be completely coated and sealed with a uniform layer of the curing compound at a rate of not less than 1 gallon per 150 square feet. The compound shall not be thinned and shall be kept agitated to prevent settlement of pigment. On surfaces where forms are removed prior to the end of the specified curing period, the entire exposed surface shall be coated at the specified rate of coverage. If rain falls on the newly coated surface before the film dries sufficiently to resist damage, or if the film is damaged in any other way, the contractor will be required to apply a new coat of compound to the affected area.

During cold weather concreting when the ambient air temperature is expected to drop below 40°F, a sufficient supply of burlap, straw, hay, or other blanketing material shall be provided along the work to protect the concrete and maintain a minimum temperature of 40°F in the concrete as measured on the surface. An approved moisture barrier such as wet burlap or plastic sheeting shall be placed on the concrete prior to placement of the blanketing material. This type of curing shall be maintained for a period of 6 days as the initial cure.

Sidewalks, curb and gutter, and miscellaneous concrete shall be protected and cured for a period of not less than 72 hours after the placing of the concrete by covering with wet burlap or by the application of a membrane curing compound as specified above.

2012 FORMS.

Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions shown on the drawings. They shall be sufficiently tight to prevent leakage of mortar and shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement.

Forms may be of wood or metal and shall be designed to permit easy removal without injury to the concrete. Forms for all exterior exposed surfaces which will be visible after backfilling shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard. Forms shall be coated with an approved light oil to prevent concrete from adhering and shall be thoroughly cleaned and re-oiled before re-use.

Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, and other damage to the concrete. The following table gives the approximate minimum time that forms shall be left in place.

Structural Member	Average air temperature greater than				Time in Place (24-hr days)
	70°	60°	50°	40°	
Slab Shoring	10	12	14	21	
Slab Forms	7	7	7	7	
Beams, Soffits and Shoring	10	12	14	21	
Beam Side Forms	1	1	2	3	
Wall Side Forms	2	2	3	4	

2013 FINISHING FORMED SURFACES.

Fins and other surface projections shall be removed from all formed surfaces except exterior surfaces that will be in contact with backfill. A power grinder shall be used, if necessary, to remove projections and provide a flush surface. Surfaces to be damp-proofed shall have fins removed and tie holes filled, but no additional finishing will be required.

Tie holes in all formed surfaces shall be cleaned, wetted, and filled with an expansive cement mortar. Tie hole patches shall be left flush, sound, smooth, even and shall match the texture and color of the adjacent concrete.

Unless provided otherwise in the plans all exposed edges shall be beveled by using dressed, triangular molding, having 3/4-inch sides.

2014 REPAIRING DEFECTIVE AND DAMAGED CONCRETE .

Any concrete found not to be formed as indicated on the plans, or out of alignment or level, or having a defective surface, or damaged prior to acceptance of the project by the City, shall be considered as not conforming to the intent of these Specifications and may be ordered removed and replaced by the contractor at his expense unless the City Engineer authorizes patching of the defective or damaged area. Surface defects such as ridges and bulges shall be removed by grinding.

Honeycombed and other defective concrete that does not affect the structural integrity of the structure shall be chipped out and the vacated area shall be filled. The methods used in this type of repair shall be approved by the City Engineer. Material used for patching shall be a non-shrink, non-metallic grout with a minimum 28-day compressive strength of 5000 psi or a similar material approved by the City Engineer. Prior to placement of the repair filling, the contact surface of the affected area shall be thoroughly cleaned of all loose and foreign material and shall be coated with an epoxy bonding agent.

Concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured and protected from further damage.

2015 REINFORCEMENTS .

The metal reinforcement shall be protected by the thickness of concrete indicated on the construction drawings. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

Location of Reinforcement	Cover (in Inches)
Surfaces where concrete is deposited directly against the ground	3
Formed surfaces exposed to the ground, to water, or to weathering	2
Beams, girder, and columns not exposed to ground, water, or weathering	1 ½
All surfaces other than those above	1

Reinforcing steel shall be accurately placed and positioned on supports, spacers, hangers, or other reinforcing steel as approved by the City Engineer and shall be secured in place with wire ties or suitable clips. The minimum clear distance between parallel bars shall not be less than 1-1/2 times the diameter of round bars, except that in no case shall clear spacing between parallel bars be less than 2 inches or less than 1-1/2 times the nominal size of the coarse aggregate.

Splices in reinforcing steel will not be permitted at points of maximum stress. When it becomes necessary to splice reinforcing steel at points other than those shown on the contract drawings, the character and location of the splice shall be approved by the City Engineer. Welding or tack welding of reinforcement will not be permitted. Reinforcements upon which unauthorized welding has been done shall be removed and replaced as directed by the City Engineer. Spliced bars shall be placed in contact and securely tied together.

Metal reinforcement at the time concrete is placed shall be free from rust, scale, or other contaminants that will destroy or reduce the bond.

2016 CONSTRUCTION JOINTS.

Construction joints shall be made at locations indicated on the drawings or specified, and shall conform to the requirements of ACI 318. When the contractor desires to make construction joints at other locations, he shall anticipate such changes far enough in advance of the construction operations to allow the City Engineer to investigate such changes and approve additional construction joints.

2017 EXPANSION AND CONTRACTION JOINTS.

Expansion and contraction joints shall be at locations indicated on the drawings or as specified.

Contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the concrete. Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. Sawed joints shall be constructed by sawing through the surface of the concrete with an approved concrete saw. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to prevent excessive raveling.

Expansion joints shall be formed with pre-formed expansion joint filler of the non-extruding and resilient types which shall include the following: Cork, self-expanding cork, sponge rubber, cork rubber, and bituminous fiber. These materials shall meet the requirements of ASTM D994, D1751 and D1752.

2018 REINFORCED CONCRETE BOX FORMING SEQUENCE.

Wall forms may be placed the day following the placement of the bottom slab, as long as care is taken to protect the slab against rough or abusive handling of forms and or placing equipment. The actual placement of concrete shall not occur prior to the fifth day after placing the bottom slab. Top forms may be placed with wall forms if the walls and top are to be monolithic construction; otherwise top forms are not to be placed until the third day after placing the walls. The actual placement of concrete for the top shall not occur prior to the fifth day after placing the walls (for base to top shoring) or until the walls have reached their design strength for slab forms shored by the walls. Wall forms shall remain in place a minimum of two days after the walls are poured. Supports for the top slab shall be left in place according to the schedule shown in Section 2012 "Forms."

The above guidelines for placing forms for reinforced concrete boxes are based on the use of standard forming procedures and with the use of concrete containing no admixtures to achieve high early strength. Variations in forming techniques and/or the use of high early strength concrete shall only be allowed after the contractor obtains the written approval of the City Engineer.

END OF SECTION

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SECTION 2100 - CONCRETE CURB, CURB AND GUTTER, SIDEWALK, AND DRIVEWAY ENTRANCES

2101 SCOPE.

This section covers concrete curb, curb and gutter, concrete sidewalk and concrete driveway entrances, including reinforcing steel, forms, joints, finishing, curing, and other appurtenant work.

2102 MATERIALS.

All items of material included in this work shall conform to the requirements of Section 2000 "Concrete."

2103 GENERAL.

All construction covered in this section shall conform to the requirements of Section 2000 "Concrete." All curb or curb and gutter construction shall be performed prior to placement of pavement or sidewalk, except when otherwise approved by the City Engineer. All forms shall be in good condition with not more than 1/4 inch variation in horizontal and vertical alignment for each 10 feet in length.

2104 GRADING AND SUBGRADE PREPARATION.

All excavation required in the grading and sub-grading preparation shall be considered as "Unclassified Excavation" as defined in Section 1100 "Grading." All grading shall be done in conformance with Sections 1100 "Grading" and 1200 "Subgrade Preparation."

See notes on Details 21-4, 21-5, 21-9, 21-10, 21-10A and 21-11 for an alternative to laboratory testing for subgrade preparation.

2105 EXPANSION AND CONTRACTION OR CONSTRUCTION JOINTS.

Expansion and contraction or construction joints shall be as herein specified on the standard detail sheets or as otherwise specified by the City Engineer.

2106 FINISHING.

Finishing shall be performed as follows:

- a. Curb and Curb and Gutter. The curb shall be tooled to the required radii as soon as possible after the

concrete takes its initial set. After the forms and templates are removed, the joints shall be tooled and the curb surface finished with a wood or cork float to remove all imperfections without additional mortar. In all cases the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The finished curb shall have a true surface, free from sags, twists, or warps, and shall have a uniform appearance, and shall be true to the specified lines, grades, and configurations shown on the drawings.

- b. Sidewalk and Driveway Entrances. After the concrete has been thoroughly consolidated and leveled, and the initial set has taken place, the surface shall be finished with a soft wood or cork float and either burlap or broom finished with no other mortar than that contained in the concrete. The resulting surface shall be uniform in color and contain no imperfections. The edges shall be rounded with a tooling edge. Special care shall be taken to ensure a straight, neat appearance along the edges of the sidewalk or driveway entrance and at the joints.

2107 REINFORCEMENT (Curb and Gutter).

Reinforcement for concrete curb and gutter shall be as designated on Standard Details and 21-2. The exception to this shall be when the curb and gutter is to be constructed on an asphalt concrete base with a minimum depth of 3 inches. In this case, no reinforcement shall be required unless otherwise determined by the City Engineer.

2108 REINFORCEMENT (Other).

Reinforcement for all other work shall be as shown on the contract drawings or as depicted on details contained in this specification.

2109 REPAIRS TO DEFECTIVE WORK.

Any defective work shall be replaced at the expense of the contractor. The defective area shall be removed to the nearest construction joint by saw cutting to produce a clean, smooth joint. The replacement section shall be dowelled into the existing concrete using #4 bars. The bars shall be drilled and grouted into the existing concrete a minimum of 4-inches. The contractor will be allowed to use

a smooth dowel/rod with greased caps on one end for the driveway approach section of the driveway.

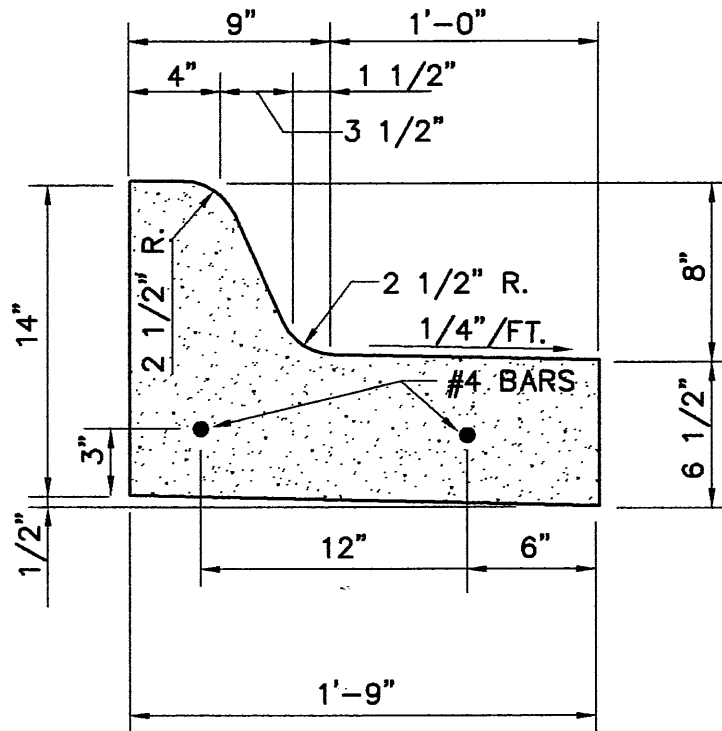
END OF SECTION

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1. EXPANSION JOINTS SHALL BE FORMED BY A ONE-HALF (1/2) INCH THICK PREFORMED JOINT FILLER, CUT TO THE CONFIGURATION OF THE FULL SIZE OF THE CURB AND GUTTER SECTION AND BEING SECURED SO THAT THEY ARE NOT MOVED BY DEPOSITING AND COMPACTING THE CONCRETE AT THESE JOINTS. THE EDGES OF THESE JOINTS SHALL BE ROUNDED WITH AN EDGING TOOL ONE-EIGHTH (1/8) INCH RADIUS.

-
- Technical drawing of a gutter cross-section. The drawing shows a gutter with a total width of 24 inches. The left side has a vertical height of 11 inches and a radius of $R=1/4"$. The gutter has a curved top with a radius of $R=12\ 1/2"$ and a bottom radius of $R=31"$. The gutter is reinforced with #4 bars, with a vertical spacing of 2 inches. The gutter is divided into two sections: a 12-inch section on the left and a 6-inch section on the right. The gutter has a vertical height of 5 1/2 inches and a total height of 8 inches. The gutter is labeled "GUTTER LINE".

SPRING HILL, KANSAS <u>PUBLIC</u> <u>WORKS</u> <u>DEPARTMENT</u>	APPROVED	REVISED	TYPE "A" CURB AND GUTTER DETAIL	STANDARD
	JWB			DETAIL
	<i>CITY ENGINEER</i>			
	5-8-08			21-1
	<i>DATE</i>			



NOTE:

1. EXPANSION, CONTRACTION, OR CONSTRUCTION JOINTS ARE TO BE SAME AS NOTED ON TYPE "A" CURB AND GUTTER DETAIL.
2. REBAR IS NOT REQUIRED FOR CURB CONSTRUCTION ON A MINIMUM OF 3" ASPHALT.

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

**JWB
CITY ENGINEER**

**5-8-08
DATE**

REVISED

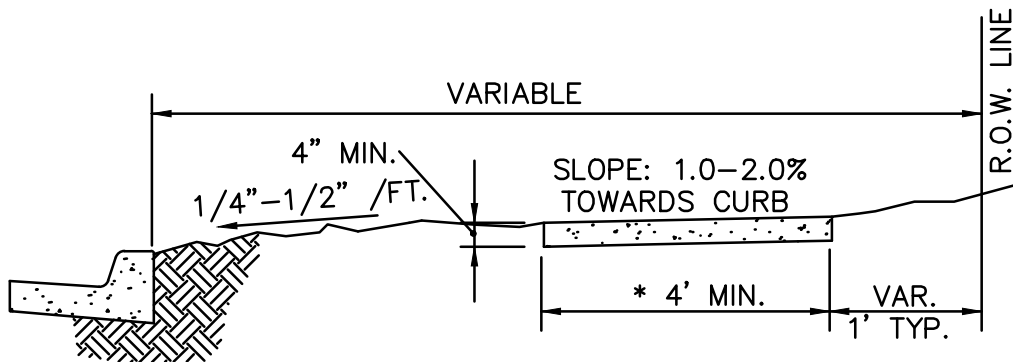
**TYPE "E"
CONCRETE MEDIAN
CURB AND GUTTER**

**STANDARD
DETAIL**

21-3

NOTES:

1. JOINTS SHALL BE FORMED AT RIGHT ANGLES TO THE ALIGNMENT OF THE SIDEWALK AND TO THE DEPTHS INDICATED BELOW.
2. THE SIDEWALK SHALL BE MARKED OFF INTO SQUARE STONES BY CONTRACTION JOINTS. CONTRACTION JOINTS SHALL BE ONE-EIGHTH ($\frac{1}{8}$) INCH WIDE BY ONE (1) INCH DEEP AND MAY BE FORMED BY TOOLING OR BY USE OF A CONCRETE SAW.
3. EXPANSION JOINTS SHALL BE FORMED BY A ONE-HALF ($\frac{1}{2}$) INCH THICK PREFORMED JOINT FILLER, EXTENDING THE FULL DEPTH OF THE SLAB, AND SECURED SO THAT THEY ARE NOT MOVED BY DEPOSITING AND COMPACTING THE CONCRETE AT THESE JOINTS. $\frac{3}{4}$ " JOINT FILLER WILL BE USED WHEN SPACING EXCEEDS 100'
4. EXPANSION JOINTS SHALL BE PLACED WHERE SIDEWALK ABUTS OTHER STRUCTURES AND SHALL NOT BE SPACED MORE THAN 50 FEET APART ON STRAIGHT RUNS FOR HAND LAID SIDEWALK AND NOT MORE THAN 200 FEET APART ON STRAIGHT RUNS FOR MACHINE LAID SIDEWALKS.
5. IF THE CONTRACTOR CHOOSES NOT TO PROVIDE LABORATORY TESTING OF SUBGRADE COMPACTION, AS DEFINED IN SECTION 1200, THEN 16 GAGE 6X6 WIRE MESH SHALL BE USED FOR SIDEWALK AND DRIVEWAY ENTRANCES. THE WIRE MESH SHALL BE INSTALLED WITH 1- $\frac{1}{2}$ " CLEARANCE FROM THE TOP AND SIDES OF THE CONCRETE.



* 5' SIDEWALKS REQUIRED ALONG ALL ARTERIAL STREETS.

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER

12--1
DATE

REVISED

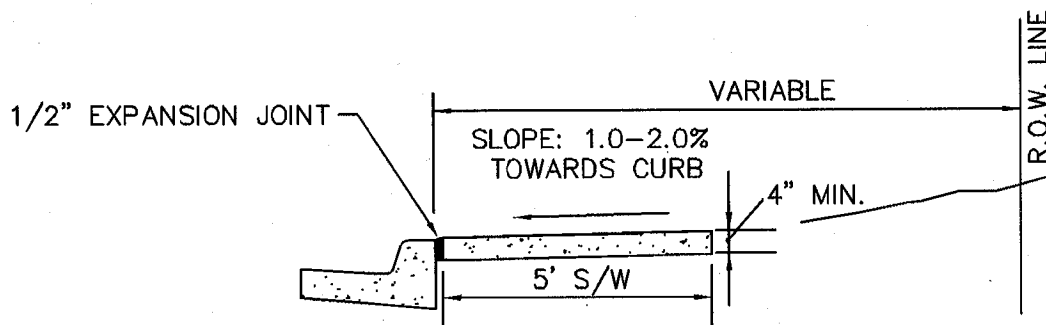
**SIDEWALK
DETAIL**

STANDARD
DETAIL

21-4

NOTES:

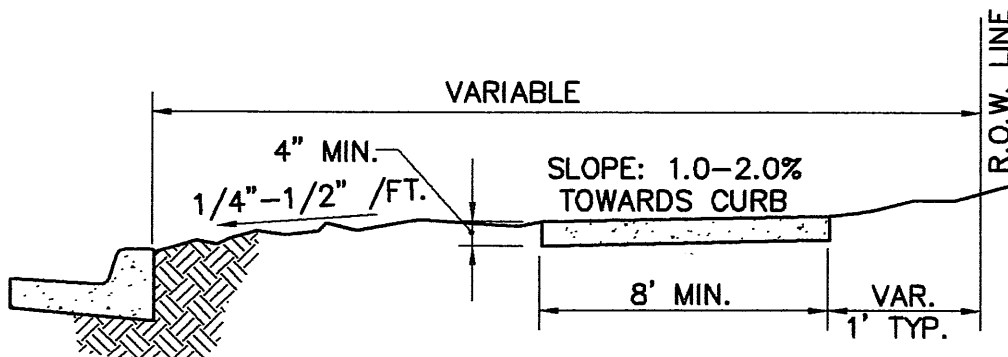
1. JOINTS SHALL BE FORMED AT RIGHT ANGLES TO THE ALIGNMENT OF THE SIDEWALK AND TO THE DEPTHS INDICATED BELOW.
2. THE SIDEWALK SHALL BE MARKED OFF INTO SQUARE STONES BY CONTRACTION JOINTS. CONTRACTION JOINTS SHALL BE ONE-EIGHTH ($\frac{1}{8}$) INCH WIDE BY ONE (1) INCH DEEP AND MAY BE FORMED BY TOOLING OR BY USE OF A CONCRETE SAW.
3. EXPANSION JOINTS SHALL BE FORMED BY A ONE-HALF ($\frac{1}{2}$) INCH THICK PREFORMED JOINT FILLER, EXTENDING THE FULL DEPTH OF THE SLAB, AND SECURED SO THAT THEY ARE NOT MOVED BY DEPOSITING AND COMPACTING THE CONCRETE AT THESE JOINTS. $\frac{3}{4}$ " JOINT FILLER WILL BE USED WHEN SPACING EXCEEDS 100'
4. EXPANSION JOINTS SHALL BE PLACED WHERE SIDEWALK ABUTS OTHER STRUCTURES AND SHALL NOT BE SPACED MORE THAN 50 FEET APART ON STRAIGHT RUNS FOR HAND LAID SIDEWALK AND NOT MORE THAN 200 FEET APART ON STRAIGHT RUNS FOR MACHINE LAID SIDEWALKS.
5. IF THE CONTRACTOR CHOOSES NOT TO PROVIDE LABORATORY TESTING OF SUBGRADE COMPACTION, AS DEFINED IN SECTION 1200, THEN 16 GAGE 6X6 WIRE MESH OR TWO (2) NO. 4 REBARS SHALL BE USED FOR SIDEWALK AND DRIVEWAY ENTRANCES. THE WIRE MESH SHALL BE INSTALLED WITH 1- $\frac{1}{2}$ " CLEARANCE FROM THE TOP AND SIDES OF THE CONCRETE.



SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 12-03-13 DATE	REVISED _____ _____ _____	5' SIDEWALK DETAIL	STANDARD DETAIL 21-5
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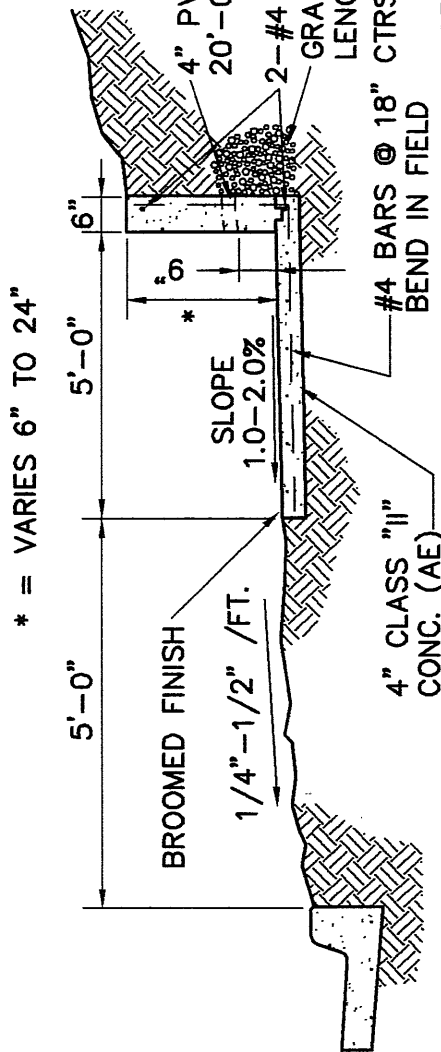
NOTES:

1. JOINTS SHALL BE SAWED AT RIGHT ANGLES TO THE ALIGNMENT OF THE SIDEWALK AND TO THE DEPTHS INDICATED BELOW.
2. THE SIDEWALK SHALL BE MARKED OFF INTO SQUARE STONES BY CONTRACTION JOINTS. CONTRACTION JOINTS SHALL BE ONE-EIGHTH (1/8) INCH WIDE BY ONE (1) INCH DEEP AND MAY BE MADE BY THE USE OF A CONCRETE SAW ONLY.
3. EXPANSION JOINTS SHALL BE FORMED BY A ONE-HALF (1/2) INCH THICK PREFORMED JOINT FILLER, EXTENDING THE FULL DEPTH OF THE SLAB, AND SECURED SO THAT THEY ARE NOT MOVED BY DEPOSITING AND COMPACTING THE CONCRETE AT THESE JOINTS. 3/4" JOINT FILLER WILL BE USED FOR 100' SPACING.
4. EXPANSION JOINTS SHALL BE PLACED WHERE SIDEWALK ABUTS OTHER STRUCTURES AND SHALL NOT BE SPACED MORE THAN 50 FEET APART ON STRAIGHT RUNS FOR HAND LAID SIDEWALK AND NOT MORE THAN 100 FEET APART ON STRAIGHT RUNS FOR MACHINE LAID SIDEWALKS.
5. CONCRETE SHALL BE USED FOR THE CONSTRUCTION OF THE BICYCLE TRAILS LOCATED WITHIN CITY STREET R-O-W. AT THE DISCRETION OF THE CITY ENGINEER, A 4" THICK ASPHALT SIDEWALK 8 FEET WIDE ON 4" THICK AB-3 BASE MAY BE CONSTRUCTED ON CITY R-O-W NOT ADJACENT TO A STREET.



<i>SPRING HILL, KANSAS</i> PUBLIC WORKS DEPARTMENT	<i>APPROVED</i> JWB CITY ENGINEER 5-8-08 DATE	<i>REVISED</i>	8' BICYCLE TRAIL	STANDARD DETAIL 21-6
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NOTE: FOR HEIGHTS GREATER THAN 24", DESIGN CALCS. MUST BE SUBMITTED



SECTION

NOTE:
IF SLAB THICKNESS IS INCREASED,
THEN THE DEPTH OF CONTROL
JOINTS NEED TO BE INCREASED
PROPORTIONALLY.

NOTES:
1. JOINTS SHALL BE SAWED AT RIGHT ANGLES TO THE ALIGNMENT OF THE SIDEWALK AND TO THE DEPTHS INDICATED BELOW.

2. THE SIDEWALK SHALL BE MARKED OFF INTO SQUARE STONES BY CONTRACTION JOINTS. CONTRACTION JOINTS SHALL BE ONE-EIGHTH (1/8) INCH WIDE BY ONE (1) INCH DEEP AND FORMED BY TOOLING OR BY USE OF A CONCRETE SAW. CONTRACTION JOINTS FOR BICYCLE TRAIL SHALL BE MADE WITH THE USE OF A CONCRETE SAW ONLY.

3. EXPANSION JOINTS SHALL BE FORMED BY A ONE-HALF (1/2) INCH THICK PREFORMED JOINT FILLER, EXTENDING THE FULL DEPTH OF THE SLAB, AND SECURED SO THAT THEY ARE NOT MOVED BY DEPOSITING AND COMPACTING THE CONCRETE AT THESE JOINTS. 3/4" JOINT FILLER WILL BE USED FOR 100' SPACING.

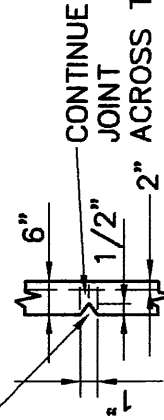
4. EXPANSION JOINTS SHALL BE PLACED WHERE SIDEWALK ABUTS OTHER STRUCTURES AND SHALL NOT BE SPACED MORE THAN 50 FEET APART ON STRAIGHT RUNS FOR HAND LAID SIDEWALK AND NOT MORE THAN 100 FEET APART ON STRAIGHT RUNS FOR MACHINE LAID SIDEWALK. THREE 24" #4 SMOOTH DOWELS (TWO IN SIDEWALK ONE IN WALL) WILL BE REQUIRED AT ALL EXPANSION JOINTS BETWEEN TWO SECTIONS OF SIDEWALK WITH ABUTTING RETAINING WALL.

5. CONCRETE SHALL BE USED FOR THE CONSTRUCTION OF THE BICYCLE TRAILS LOCATED WITHIN CITY STREET R-O-W. AT THE DISCRETION OF THE CITY ENGINEER, A 4" THICK ASPHALT SIDEWALK 8 FEET WIDE ON 4" THICK AB-3 BASE MAY BE CONSTRUCTED ON CITY R-O-W NOT ADJACENT TO A STREET.

6. PROVIDE 4" DIA. PVC DRAIN TILE AT 20'-0" INTERVALS ALONG LENGTH OF RETAINING WALL WITH GALVANIZED SCREEN AND GRANULAR BACKFILL WHEN WALL HEIGHT IS GREATER THAN OR EQUAL TO 1'-6" FROM TOP SURFACE OF SIDEWALK.

7. ALL EXPOSED CORNERS OF WALL SHALL BE CHAMFERED. (I.E.; BOTH SIDES, TOP AND CORNERS.)

FORMED VERTICAL JOINT
FULL HEIGHT IN FACE OF
WALL @ 4'-0" O.C.



TOP VIEW

OF RETAINING WALL

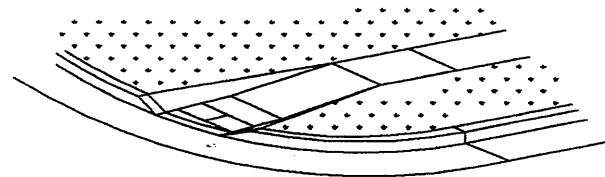
SPRING HILL, KANSAS
PUBLIC
WORKS
DEPARTMENT

APPROVED
JWB
CITY ENGINEER
5-8-08
DATE

REVISED

SIDEWALK DETAIL
W / ABUTTING
RETAINING WALL

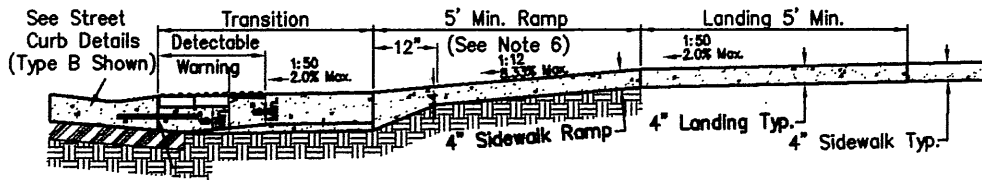
STANDARD
DETAIL
21-7



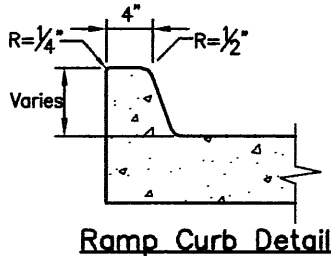
Gutter is 1 1/2" Below Lip of Curb

Gutter is 1 1/2" Below Lip of Curb

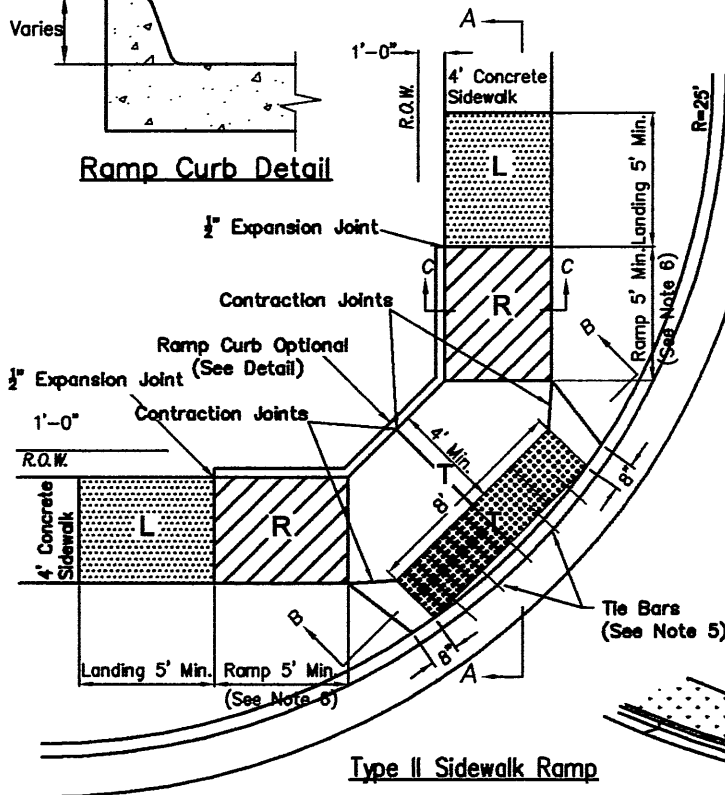
Use With Type B Curb Use With Type A Curb
Street Curb Details at Ramp



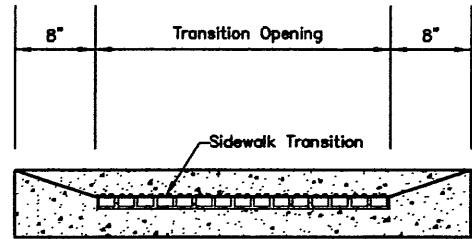
Section A-A



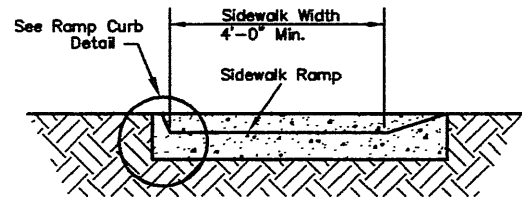
Ramp Curb Detail



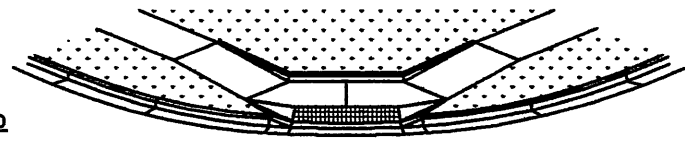
Type II Sidewalk Ramp



Section B-B



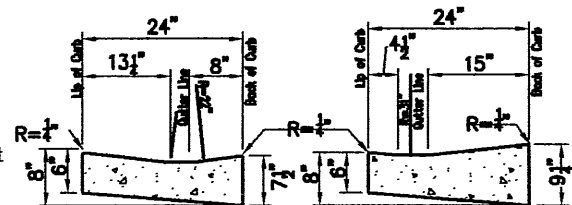
Section C-C



3-D View Type II Sidewalk Ramp

Sidewalk & Sidewalk Ramp Notes:

1. Curb depression location determined from the intersection of the extension of back of sidewalk and back of curb & gutter.
2. All concrete used in this work shall meet the requirements of the City of Olathe Technical Specifications and Design Criteria.
3. Longitudinal joint spacing to match width of sidewalk.
4. Expansion joints shall be placed between ramp and landing where walk abuts driveways and similar structures, and 200' centers max.
5. Transition area behind detectable warning pavers shall match adjacent sidewalk width or 4' minimum. Install 18" tie bars #4 epoxy coated @ 18" o.c.
6. Sidewalk Ramp shall be lengthened to provide ADA compliance slope but need not exceed 15'.
7. ADA maximum ramp slope = 1"/Ft. (1:12)
ADA maximum cross slope = 2.0% (1:50)
8. See Detectable Warning detail sheet for the installation requirements. (Detail 21-8b)
9. The curb transitions shall be 2' in length.



Use With Type B Curb

Use With Type A Curb

Street Curb Details at Ramp

SPRING HILL, KANSAS

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CITY ENGINEER**

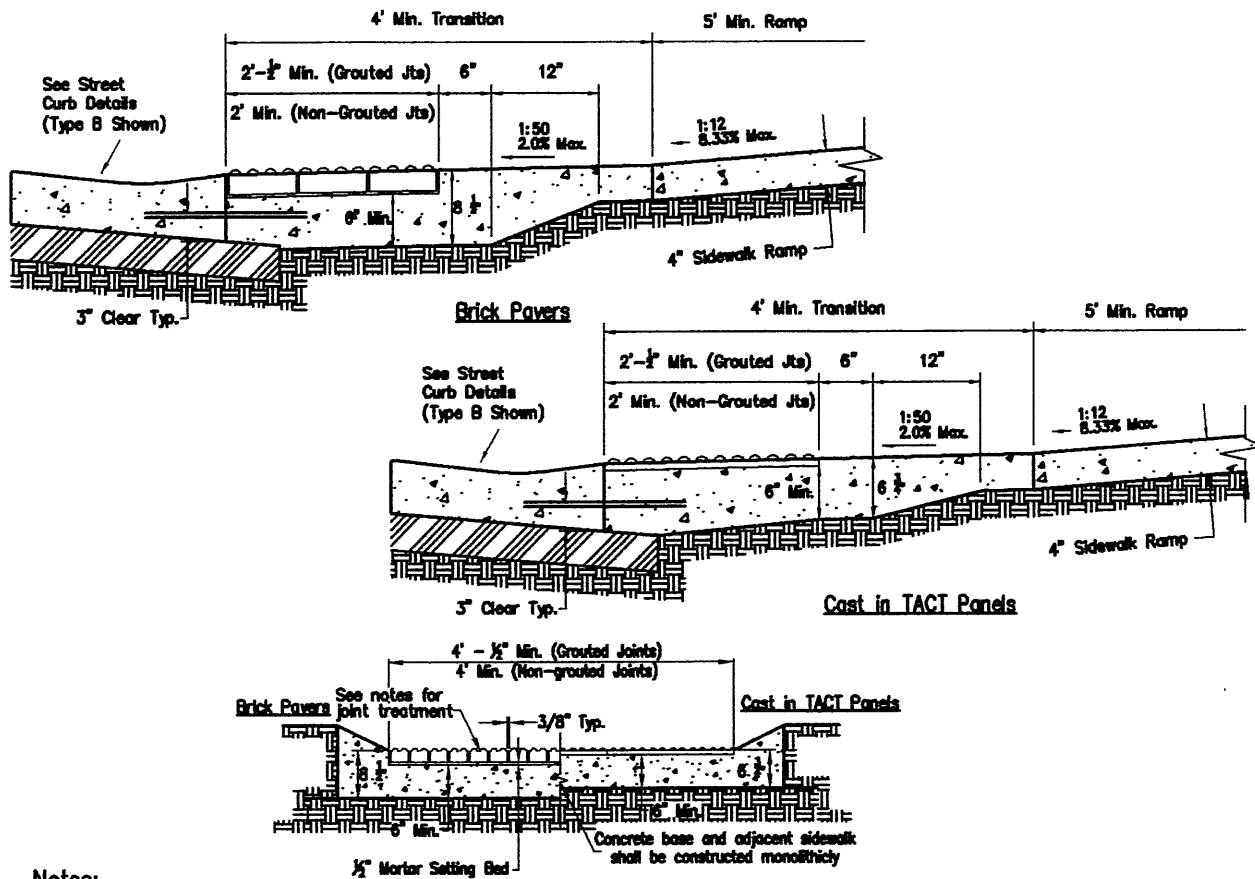
**5-8-08
DATE**

REVISED

**TYPE II
SIDEWALK RAMP
DETAIL**

**STANDARD
DETAIL**

21-8a



Notes:

Brick Installation Details

1. Paving Brick shall be 2 $\frac{1}{4}$ " x 3 $\frac{5}{8}$ " x 7 $\frac{5}{8}$ " if grouted and 2 $\frac{1}{4}$ " x 4" x 8" if non-grouted Endicott Clay Products Co., Handicap Detectable Warning Pavers, Medium Ironspot #46 color, 2'x2' CAST in TACT Panels by MASCO, or approved equal and shall meet the requirements of ASTM C902 for Class SX Type 1 Brick and ASTM C1272.
2. The bricks shall be placed in a Soldier Course pattern on ramps as shown.
3. The bricks shall be saw cut only and any brick shall not be less than 25% of a full brick.
4. Type M mortar shall be used for the setting bed and optional grouted joints in accordance with ASTM C270, Table 1 (Masonry Cement Type only). Broom $\frac{50}{50}$ sand/cement mix into non-grouted joints after brick placement. Remove excess from surface of paving brick. The maximum allowable non-grouted joint width shall be $\frac{1}{8}$ ".
5. Detectable warning surface to extend a minimum of 2 ft. in direction of travel.
6. Use of the manufacturer's template is required for CAST in TACT installations.

TYPE	LEGEND	RUNNING SLOPE	CROSS SLOPE	RUNNING LENGTH	WIDTH (PERPENDICULAR TO TRAVEL)
RAMP		1" / Ft. Max. (1:12 Max.)	2.0% Max. (1:50 Max.)	15 Ft. Max.	48" Min. or Width of Existing Sidewalk. Whichever is Greater
LANDING		2.0% Max. (1:50 Max.)	2.0% Max. (1:50 Max.)	60 Inches Min.	48 Inches Min.
TRANSITION W/ WARNING SURFACE		2.0% Max. (1:50 Max.)	2.0% Max. (1:50 Max.)	24 Inches Min.	48 Inches Min.
TRANSITION		2.0% Max.	2.0% Max.	24 Inches Min.	48 Inches Min.

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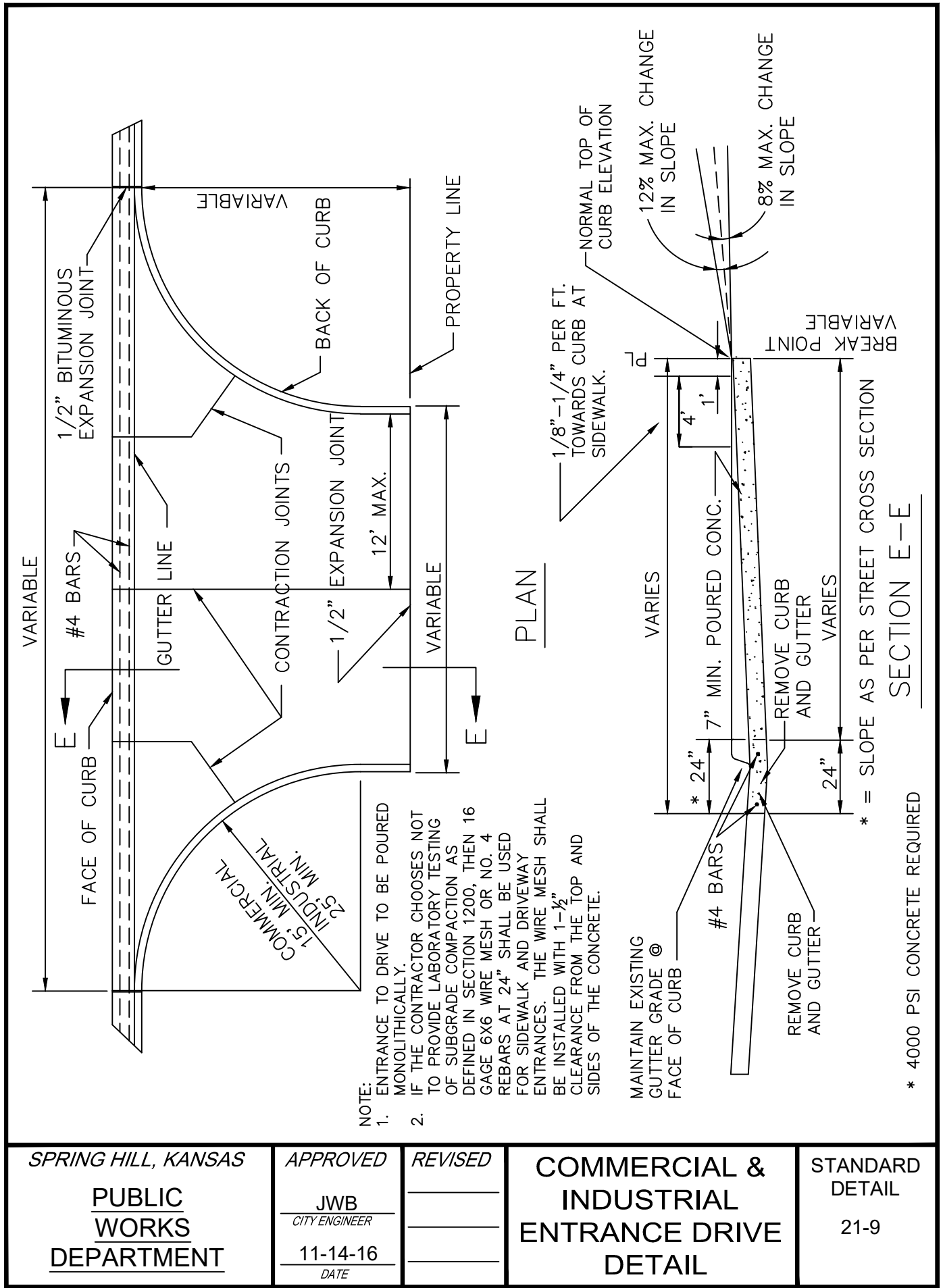
5-8-08
DATE

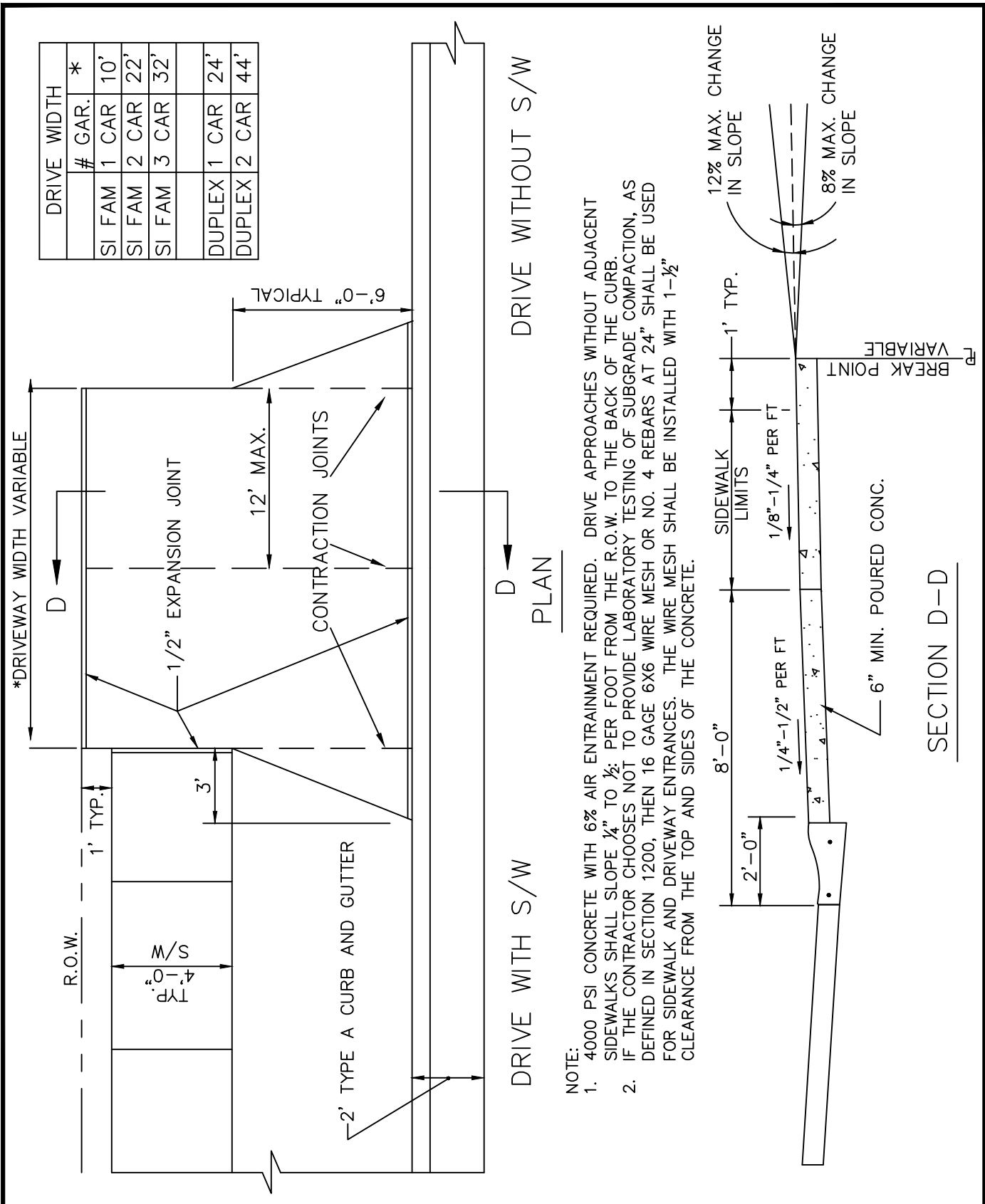
REVISED

SIDEWALK RAMP
PAVER BRICK
DETAILS

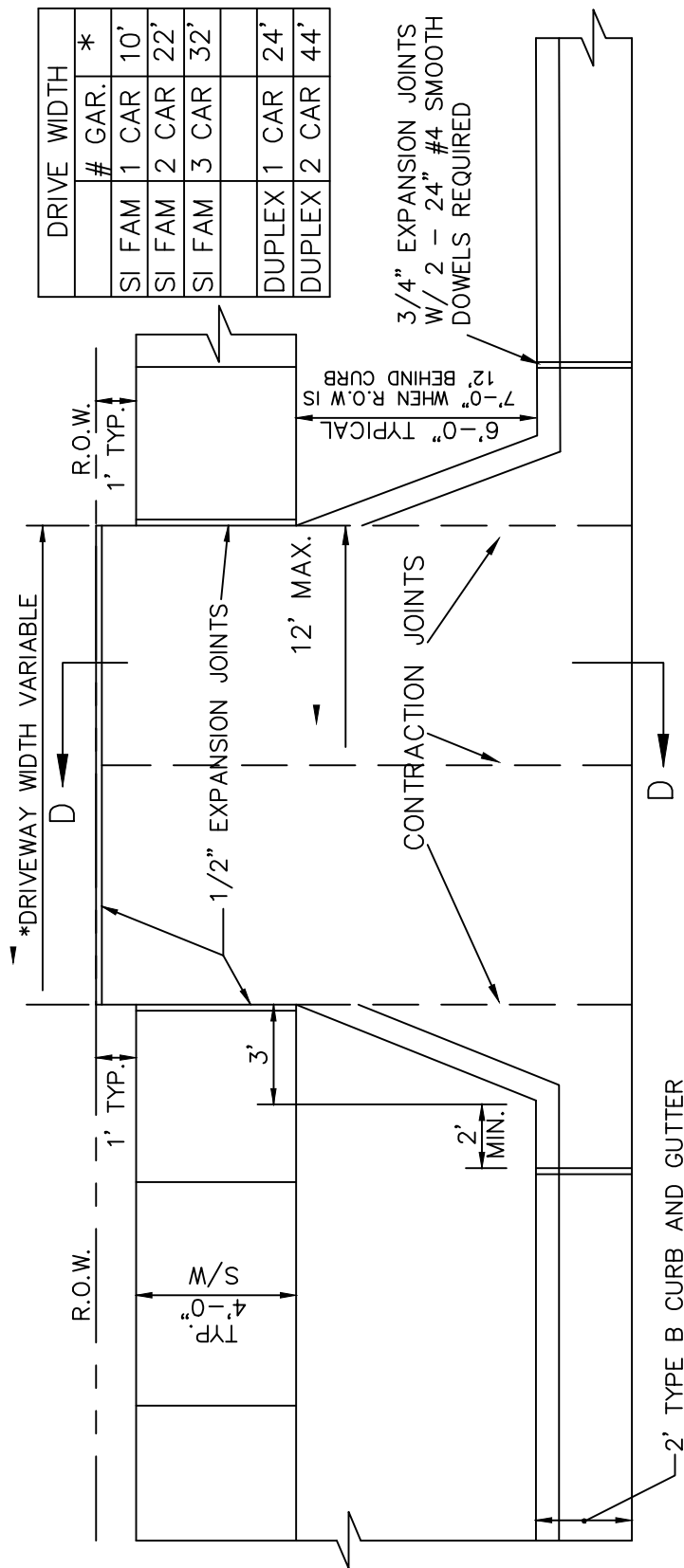
STANDARD
DETAIL

21-8b





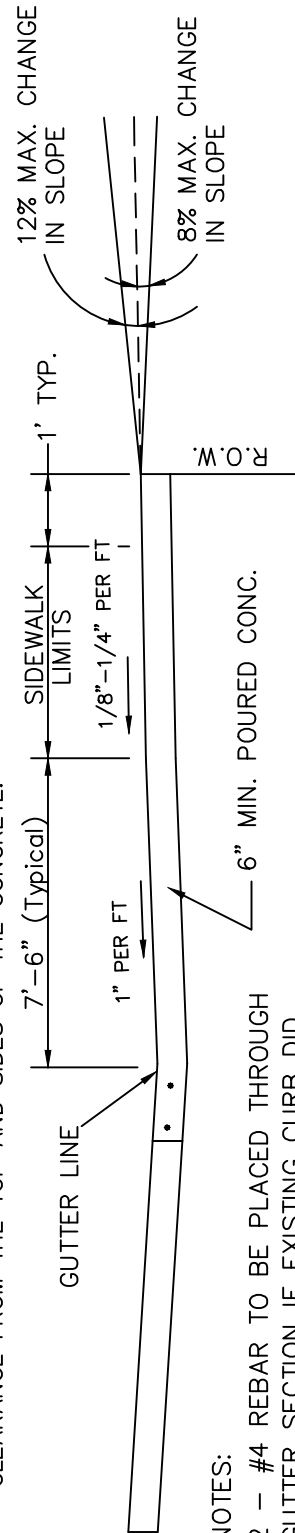
SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 11-14-16 DATE	REVISED 	RESIDENTIAL DRIVE DETAIL TYPE A CURB	STANDARD DETAIL 21-10
--	--	-----------------------------	--	---------------------------------



PLAN

NOTE:

1. 4000 PSI CONCRETE WITH 6% AIR ENTRAINMENT REQUIRED. DRIVE APPROACHES WITHOUT ADJACENT SIDEWALKS SHALL SLOPE $\frac{1}{4}"$ TO $\frac{1}{2}"$ PER FOOT FROM THE R.O.W. TO THE BACK OF THE CURB.
2. IF THE CONTRACTOR CHOOSES NOT TO PROVIDE LABORATORY TESTING OF SUBGRADE COMPACTION, AS DEFINED IN SECTION 1200, THEN 16 GAGE 6X6 WIRE MESH OR NO. 4 REBARS AT 24" SHALL BE USED FOR SIDEWALK AND DRIVEWAY ENTRANCES. THE WIRE MESH SHALL BE INSTALLED WITH 1- $\frac{1}{2}"$ CLEARANCE FROM THE TOP AND SIDES OF THE CONCRETE.



NOTES:

- 2 - #4 REBAR TO BE PLACED THROUGH GUTTER SECTION IF EXISTING CURB DID NOT REST ON ASPHALT BASE.

SECTION D-D

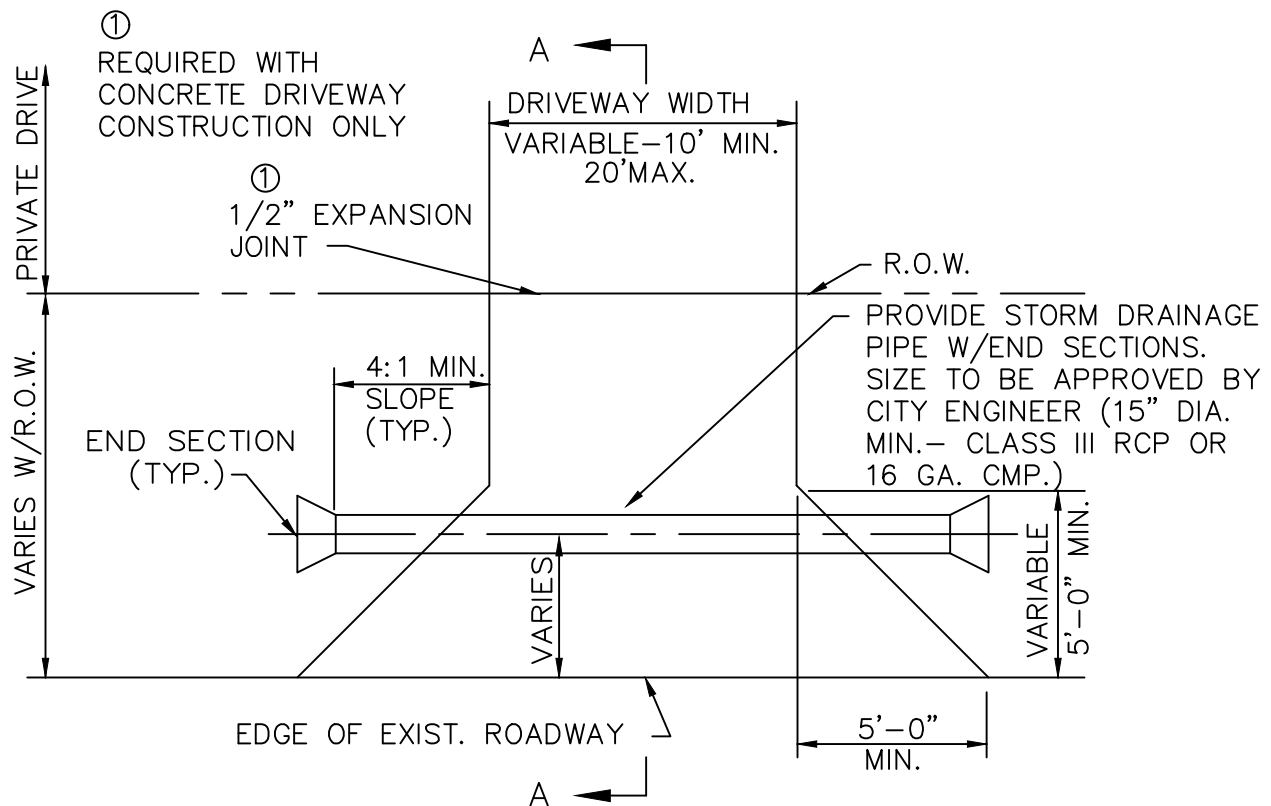
SPRING HILL, KANSAS
PUBLIC
WORKS
DEPARTMENT

APPROVED
JWB
CITY ENGINEER
11-14-16
DATE

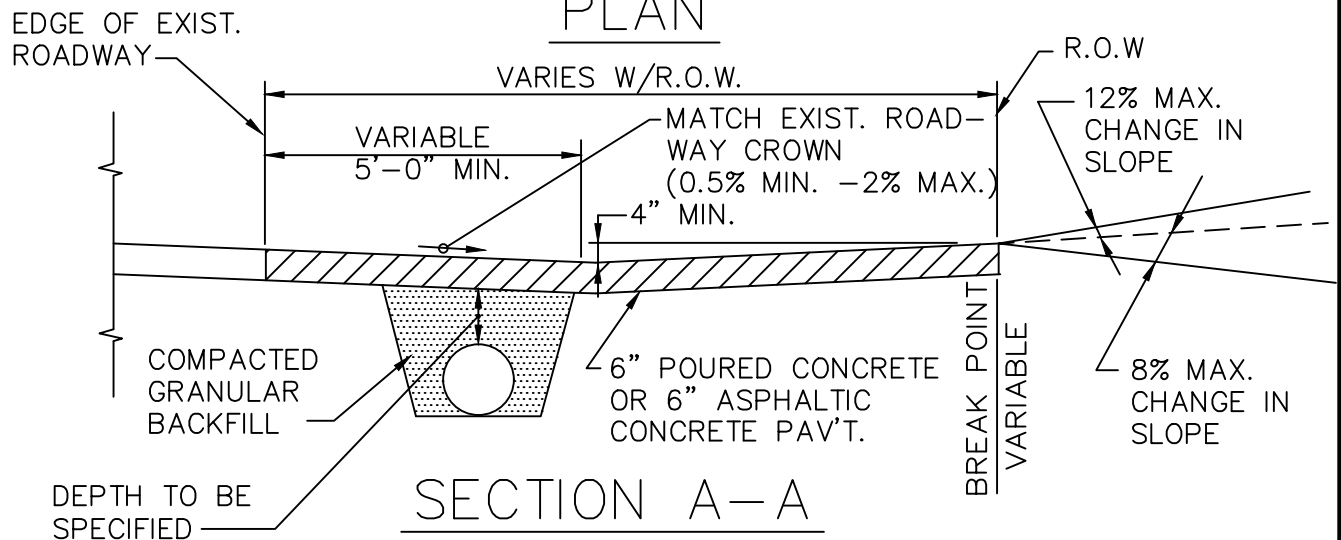
REVISED

RESIDENTIAL
DRIVE DETAIL
TYPE B CURB

STANDARD
DETAIL
21-10A



PLAN



NOTES:

- IF THE CONTRACTOR CHOOSES NOT TO PROVIDE LABORATORY TESTING OF SUBGRADE COMPACTION, AS DEFINED IN SECTION 1200, THEN 16 GAGE 6X6 WIRE MESH OR NO. 4 REBARS AT 24" SHALL BE USED FOR SIDEWALK AND DRIVEWAY ENTRANCES. THE WIRE MESH SHALL BE INSTALLED WITH 1-1/2" CLEARANCE FROM THE TOP AND SIDES OF THE CONCRETE.

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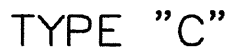
11-14-16
DATE

REVISED

**RESIDENTIAL
DRIVE AT
NON-CURBED
STREET**

STANDARD
DETAIL

21-11



1. EXPANSION, CONTRACTION, OR CONSTRUCTION JOINTS ARE TO BE SAME AS NOTED ON TYPE "A" CURB AND GUTTER DETAIL.
2. ALL CURBS MUST BE CAST IN PLACE.

<i>SPRING HILL, KANSAS</i>	<i>APPROVED</i>	<i>REVISED</i>	PARKING LOT CONC. CURBING	STANDARD DETAIL
<u>PUBLIC WORKS DEPARTMENT</u>	JWB <i>CITY ENGINEER</i>			21-12
	5-8-08 <i>DATE</i>			

SECTION 3000 - SANITARY SEWERS

3001 SCOPE .

This section applies to sanitary sewer construction and shall consist of furnishing all labor, materials, and equipment for the complete installation of sewers and appurtenances.

3002 GENERAL .

It is understood that throughout this section these Specifications may be modified or deleted by appropriate items in the contract documents.

When reference is made to a standard specification (ASTM, AWWA, etc.), the specification referred to shall be understood to mean the latest revision of said specification except as otherwise noted in the contract documents.

3003 MATERIALS .

A. Reinforced Concrete Pipe

Pipe	ASTM C76, except as modified herein.
Fine Aggregate	Clean natural sand, ASTM C33. Artificial or manufactured sand will not be permitted.
Cement	ASTM C150, containing not more than 5% tricalcium aluminate.
Gaskets	ASTM 361 polymer shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.
Liner	A PVC T-Lock liner shall be installed on the entire inside perimeter, 360°. The liner shall be pre-manufactured plastic lining material for application to reinforced concrete sewer pipe and employing a plastic sheet with T-Lock ribs for mechanical bond to the interior surface of the pipe. The lining shall be a minimum of 65 mils thick. Manufacturer's recommendations for installing, sealing joints, testing and inspection of the plastic lining

shall be considered as incorporated in and forming a part of these Specifications. The pipe supplier shall furnish to the Engineer the manufacturer's lining recommendation prior to fabrication of any pipe. The PVC liner shall be white in color.

B. Ductile Iron Pipe

Pipe	ANSI A21.51; ASTM A536, Grade 60-42-10, Thickness Class 50 unless otherwise required by the City Engineer.
Mechanical and Push-On Joint	ANSI 21.11, except gaskets shall be neoprene or synthetic rubber. Natural rubber will not be acceptable.
Flanged Joints	ANSI A21.10.
Fittings	ANSI A21.10, pressure rating of not less than that specified for pipe.
Lining and Coating	Lining application shall be performed by pipe manufacturer only. On-site application will not be allowed. All lining shall be done at point of pipe manufacture. 1) Calcium Aluminate Lining: Before lining the pipe with cementitious material, a portion of the gasket cavity and a portion of the pipe barrel shall be coated with a minimum of 8 mils of Tnemec Series 61-D1182 black epoxy. The bell end portion to be epoxy coated starts with the gasket seating area, continues through the bell shoulder, and concludes with the first 4 inches of the pipe barrel interior. The spigot end shall be epoxy coated on the interior and exterior surfaces.

The lining shall be a pure fused calcium aluminate mortar comprised of fused calcium aluminate cement combined with fused calcium aluminate aggregates. A seal coat shall be applied to the lining.

The thickness of the lining shall be a minimum of 0.125 inches (125 mils) for 6" through 12" pipe, and 0.187 inches (187 mils) for 14" through 24" pipe. The lining thickness may taper to less than the specified minimum at the ends of the pipe.

Field-cut end repairs are to be done in accordance with the pipe manufacturer's recommendations. End repairs are limited to exposed metal within the pipe joint. The calcium aluminate cement lining does not require sealing or protection.

Cracks, other than closed hairline cracks and/or fine crazing, shall not be acceptable. Loose areas of cement are not allowable. Visual inspection of the lining is sufficient.

- 2) Ceramic Epoxy Lining: Within 8 hours of abrasive blasting, and with no evident stains or rust, the interior of the pipe shall be lined with 40 mils dry film thickness of amine-cured epoxy containing at least 20% by volume of ceramic quartz pigment. The gasket area and spigot end must be coated with 6 mils nominal, 10 mils maximum, after the application of the liner, due to the tolerances involved.

A certification of the following standards should be available from the manufacturer upon request:

- a) Permeability rating of 0.00 according to Method A of ASTM E-96 66.
- b) ASTM B-117 Salt Spray - results to equal 0.0 undercutting after 2 years.
- c) Immersion Testing rated using ASTM D-714-87: 120° F Tap Water - 0.0 undercutting after 2 years.

Lining material shall be re-coatable without roughening the surface. The manufacturer shall furnish a touch-up and repair kit.

Ceramic epoxy lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc., shall be placed inside the pipe and fitting for lifting, positioning, or laying. The line pipe shall not be dropped, hammered, or allowed to strike fixed or hard objects while being moved.

Protecto 401 Ceramic Epoxy is an acceptable ceramic epoxy lining.

C. Polyvinyl Chloride (PVC) Pipe

Pipe

Pipe material shall conform to ASTM D 1784 and shall have a minimum cell classification of 12364A, 12454B, 12454C or 13364B. Pipe sizes less than 18-inch shall conform to ASTM D 3034 or ASTM F-789. Pipes 18-inch or larger shall conform to ASTM F-679 or F-794. Minimum pipe stiffness for pipe used for stub-lines shall be SDR 23.5.

Joints

All gasket joints shall be compression, bell and spigot push on conforming to ASTM D 3212-89 "Standard Specification for Joints for Drain and Sewer Plastic Pipes

Using Flexible Elastomeric Seals", conforming to ASTM F 477. Lubricant shall be as recommended by the pipe manufacturer.

Fittings

Fittings defined as tee connections suitable for assembly to 6-inch house or building sewers shall be saddle-type fittings molded of PVC materials conforming to ASTM D 1784. All fittings shall utilize Elastomeric seals and shall be suitable for use with the respective ASTM PVC pipe standard or molded PVC. Insert-A-Tee is acceptable for service connections on 12-inch and larger service mains.

D. Cured In Place Pipe (CIPP)

Occasionally, a development must include part of an existing sewer system that is in need of substantial repair and the sewer will not handle the impact of increased flow without replacement. The City Engineer may approve CIPP as an alternative to sewer replacement.

Lining

CIPP lining material shall be a polyester fiber felt tubing, lined on one side with polyethylene and fully impregnated with liquid thermosetting resin. Minimum lining thickness shall be:

Diameter of Original Pipe (inches)	Minimum CIPP Thickness		
	mm		inches
8 - 12	6.5	&	.256
15	9.5	&	.374
18	12.0	&	.472
24	15.0	&	.591
30	18.0	&	.709

The cured lining material shall conform to ASTM D 790 for the minimum structural standards. Liner tube shall also meet the requirements of ASTM F 1216, Section 5-1.

3004 ALIGNMENT.

Piping shall be laid to the lines and grades indicated on the drawings using laser beam equipment, surveying instruments or batter boards to maintain alignment and grade. If batter boards are used, they shall be erected at intervals not exceeding 25 feet. Not less than three batter boards shall be maintained in proper position at all times during the trench grading operation.

3005 HANDLING.

Pipe, fittings, and appurtenances shall be transported, unloaded, stockpiled, distributed, and installed or otherwise handled in a manner which prevents damage thereto and which will ensure the delivery and installation thereof in a sound and acceptable condition. Hooks shall not be permitted to contact joint surfaces. Damaged pipe shall be removed from the site.

3006 CLEANING.

The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

Whenever pipe laying is stopped, the open end of the pipe must be closed by using a pipe plug to prevent trench water, sand, and earth from entering the pipe. In no case shall said plug be removed and water allowed to enter the sewer until the City Engineer is satisfied that the sewer will not be injured by water coming in contact with the pipe, pipe backfill or subgrade. The City Engineer may require the contractor to pump the water from the trench before continuing trenching or pipe laying operations.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing, or other materials shall be placed in the pipe.

3007 LAYING PIPE.

Lateral displacement of the pipe shall be prevented during embedment operations. Pipe shall not be laid in water, or under unsuitable weather or trench conditions.

Pipe laying shall begin at the lowest elevation with bell ends facing the direction of laying except when reverse laying is permitted by the City Engineer.

3008 JOINTING.

All joint preparation and jointing operations shall comply with the instructions and recommendations of the pipe manufacturer. Immediately before joints are pushed together, all joint surfaces shall be coated with the lubricant furnished with the pipe. The position and condition of each rubber gasket (unbounded gaskets) shall be checked with a feeler after the joint is completed.

Joints for reinforced concrete pipe shall conform to Section 7 of ASTM C361, except that gaskets shall have a circular cross section and shall be confined in a groove in the pipe spigot. Pipe with collars in lieu of integral bells will not be acceptable.

Joints for PVC pipe shall comply with all recommendations and instructions of the pipe manufacturer.

3009 TEMPORARY PLUGS.

Provide and install plugs as manufactured by pipe supplier or as fabricated by contractor of approved construction. Plugs shall be watertight against heads up to 20 feet of water. Secure plugs in place in a manner to facilitate removal when required to connect pipe.

Mechanical plugs, braced with a 4x4 timber wedged against the opposite wall of the manhole, shall be installed at the downstream end (connection with existing line) on all sanitary sewer extension projects under construction and shall be verified by the contractor at the completion of each working day. Also, the open end of the sewer shall be plugged at the end of the work day with a suitable mechanical plug to prevent entry of foreign material until work is resumed.

3010 CONNECTIONS TO EXISTING PIPELINES AND STRUCTURES.

Connect pipe to existing structures and pipelines where indicated. Observe pertinent articles of specifications pertaining to joint locations.

Core drill opening in structure so that the size of opening is compatible with the size of field-applied pipe connector

to be used with the pipe being connected to the structure. Refer to 3102 for the acceptable product to be used. Follow the manufacturer's recommendation for field installation that will provide a watertight seal around the pipe.

Lateral sewer service line tap connections into manholes is prohibited.

Manholes to be built on an existing sewer shall be constructed in such a manner as will not disrupt service of the existing sewer. In the case where it is anticipated that the sewage flow will be interrupted for a significant period of time, as determined by the City Engineer, a bypass pumping plan shall be submitted that includes type of pump, flow capacity of pump and names and phone numbers of emergency contact persons. The manhole base, walls, and invert shall be completed before the top half of the sewer pipe is cut or broken away. Water stops shall be required for all connecting sewer pipes to be cast into the base. Rough edges of the pipe thus exposed shall be covered with expansive grout, in such a manner as to produce a smooth and acceptable finish. Any portion of the existing sewer damaged by the contractor shall be repaired or replaced by the contractor at no expense to the City.

Connections between different pipe materials shall be made using proprietary transition coupling, unless otherwise specified on the drawings.

3011 TEE BRANCHES AND SADDLES.

Tee branches and saddles shall be pitched at 45° and installed at locations designated on the plans. The contractor shall verify that tee branch or saddle locations have been marked in advance of the construction of sewers serving any property which will require sewer service and, if the locations have not been designated, shall stop the sewer construction until the necessary tee branch or saddle locations have been obtained.

Provisions for temporary pumping or bypass pumping may be required depending on flow conditions. Depending on flow conditions, placing sand bags in the upstream manhole for a short period of time while the connection is made may also be a method selected by the contractor.

Tee branches and saddles shall be installed with the lower lip not more than 2 inches below the outside top of the

pipe. Tee branches or saddles shall not be covered until each location has been recorded.

Each tee branch or saddle shall be marked with a wooden strip extending from the tee vertically to within 1 foot of the ground surface. Markers shall be securely anchored and maintained vertical until backfilling has been completed. Tee branches or saddles shall be closed with a suitable plug held in place by an approved joint sealing compound.

3012 SERVICE CONNECTIONS.

Service connections made to the sanitary sewer main prior to backfilling shall not be installed as vertical risers but shall be laid on a slope not to exceed 1 foot vertical to 1 foot horizontal. A 45° bend shall be used to join the tee branch to the service connection or stub line. The service pipe shall make such a horizontal angle with the sewer line that a proper connection to the 45° bend or stub line is obtained without trimming the pipe. Each service connection pipe shall have a solid bearing on rock backfill.

A stub line shall be provided for all service lines and shall extend a minimum of one pipe joint distance from the 45° riser. All stubs that are not connected immediately to the structure shall be plugged to prevent any inflow/infiltration into the sewer. The service line shall be installed to provide a minimum slope in the service line of 1%, taking into account at least 3 feet Minimum Serviceable Floor Elevation (MSFE) at the structure to be served. Where the service crosses the street, the stub line shall be extended from the tee on the main across the street to the right-of-way line of the property to be served.

3013 CONCRETE ENCASEMENT.

Concrete encasement shall be installed where and as shown on the drawings and where, in the opinion of the City Engineer, such pipe encasement is necessary because of unforeseen conditions encountered in the work. All pipe which is to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation. The pipe shall be encased with Controlled Low Strength Material (CLSM). The CLSM mix design shall consist of a per cubic yard mixture of 100 lb of Portland Cement, 100 lb of Fly Ash, 2760 lb of Sand, 386 lb of Water, 5% Air Entraining Agent and have a minimum compressive strength at 56 days of 202 psi. Unless otherwise required, CLSM shall be placed to 1 foot below subgrade elevation if the subgrade elevation is

not more than 5 feet over the top of the pipe. If the subgrade is more than 5 feet over the top of the pipe, CLSM shall be placed to an elevation 2 feet over the top of the pipe, and the remainder shall be backfilled with soil designated by the City Engineer.

3014 WATER LINE CLEARANCES.

A. Gravity Sanitary Sewers.

When potable water pipes and gravity sanitary sewers are laid parallel to each other, the horizontal distance between them shall not be less than 10 feet. The distance shall be measured from edge of pipe to edge of pipe. The laying of water pipes and sanitary sewers shall be in separate trenches with undisturbed earth between them. In cases where it is not practical to maintain a 10-foot separation, the City, with concurrence from KDHE, will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the Design Engineer. Equivalent protection may require sanitary sewer construction with one of the following additional protective features: concrete encasement, vacuum sewers or jointless pipe such as polyethylene or cured-in-place.

When water and sanitary sewer pipes cross, and the sewer is 2 feet or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossings, the sanitary sewer is to be constructed of one of the following materials (or approved equal) and pressure tested to assure water tightness pursuant to Chapter VI of the KDHE Minimum Standards of Design of Water Pollution Control Facilities.

- 1) Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.51 with minimum pressure Class 350 for 3"-12" Class 250 for 14"-20", Class 200 for 24", and Class 150 for 30"-64", and gasketed, push-on or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.
- 2) PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR35, ASTM F679, ASTM F789, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212.

- 3) Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

Where a water main is laid across or through an area where there is an existing sanitary sewer, which is not constructed of one of the above specified materials and is 2 feet or less below the water pipe, the existing sewer shall be encased in concrete, using CLSM as described above in Section 3013, for a 10-foot distance on each side of the crossing or the crossed section of sewer replaced to meet the above specified construction requirements. KDHE will consider proposals providing equivalent protection by other means on a case-by-case basis, if supported by data from the Design Engineer.

Where sanitary sewer lines are to be installed under and across water lines and a 2-foot clearance cannot be obtained because of limiting grades or grades of existing structures, then the sewer line shall be constructed of ductile iron pipe for a distance of at least 10 feet in each direction from the crossing.

Joints in sewer pipe shall be located as far as practical from the intersected water line.

B. Sewer Connections.

There are to be no physical connections between any parts of the potable water system with building sewers, sanitary sewers, storm sewers or wastewater treatment facilities by means of which it would be possible for sewage, even under exceptional circumstances, to reach the wells, storage reservoirs or distribution systems.

C. Pressure Sewer Lines.

When force mains run parallel to water lines, the separation distance shall be as far as practical, but at least a 10-foot horizontal separation shall be maintained. There shall be at least a 2-foot vertical separation at crossings with the water main crossing above the sewer force main. In cases where it is not practical to maintain the required vertical or horizontal separation distance between a water line and a sanitary sewer force main, the City Engineer will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the Design Engineer.

D. Sewer Manholes.

No water pipe shall pass through or come in contact with any part of a sewer manhole.

E. Storm Sewers.

Required separation distances between water mains and storm sewers are equivalent to those for water mains and gravity sanitary sewers.

F. Drains.

Underground drains from fire hydrants or valve pits should not be directly connected to sanitary or storm drains.

All of the above recommended protective measures shall apply to water and sewer service lines.

All special protective measures outlined herein shall be required in the final design and implemented during the construction phase when it is impractical, for geotechnical reasons, to cross water lines over sewer lines.

3015 SEWER MANHOLES.

Manhole construction shall comply with all of the applicable requirements of Section 3100 "Sanitary Sewer Manholes."

3016 ACCEPTANCE TEST.

Each reach of sewer shall meet the requirements of the following acceptance tests. All defects shall be repaired to the satisfaction of the City Engineer by and at the expense of the contractor.

- a. Video Camera Recording. The Contractor will be required to provide videos in DVD medium to the City after all testing of the sewer line is complete. The video camera shall be placed in the downstream manhole for each section and pulled to the upstream manhole or by using a self-propelled camera unit which typically travels in a downstream direction. The video shall clearly show the interior of the manhole and the construction of the invert along with the appropriate verbal "audio" and/or video typed on the monitor screen. If service lines or service stubs have been installed with the project, each service must be noted

as a distance in feet from the downstream manhole. The completed video must include monitoring of distance in feet from the downstream manhole for all sections of pipe installed. The City will complete a second video of the sewer pipe prior to the expiration of the 2-year maintenance bond. If any maintenance is required during the 2-year maintenance period, the Contractor will be required to video all repaired sections of pipe to verify corrections.

- b. Infiltration Test. An infiltration test will be required when the sewer line is below the ground water level. The amount of water leaking into the sewer shall be measured and it shall not be more than 50 gallons per day per mile of pipe, per inch nominal diameter.
- c. Air Test. The contractor shall perform a low-pressure air test for pipe between successive manholes. The section of pipe between successive manholes shall be sealed with suitable plugs. One of the plugs shall have an orifice through which to pass air into the section of pipe being tested. The air supply line shall have a positive on-off valve and suitable means for readily disconnecting it at the control panel. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge having a range from 0 to 10 psi. The gauge shall have minimum divisions of 0.10 psi, and shall have an accuracy of +0.04 psi. The gauge will be calibrated with an expiration (or recalibration) date on the gauge. If the gauge calibration date has expired, a different gauge shall be used that is within its calibration timeline.

The testing methods and air leakage rates shall conform to the requirements of ASTM F1417-92 or the latest revision thereof. Each reach of sewer pipe between manholes shall be tested after completion of the installation of the pipe and appurtenances and the backfill of the sewer trench.

Internal air pressure shall be monitored so that it will not exceed 9.0 psig. After reaching 4.0 psig, the air supply shall be maintained at 4.0 psig for at least 2 minutes in order to allow equilibrium between air temperature and pipe walls. During this time all plugs shall be checked to detect any leakage. If any of the plugs are found to leak, air shall be bled and the

plugs retightened prior to re-supplying air. After temperature has stabilized, the pressure is to be maintained at 4.0 psig. Upon reaching a stabilized pressure of 4.0 psig, timing shall begin to determine the time required for the pressure to drop to 3.0 psig. If the time, in seconds, for the air pressure to decrease from 4.0 psig to 3.0 psig is greater than that shown in the following table, the pipe shall be presumed to be free of defects.

Pipe Size	Required Time per 100 LF	Maximum Required Time
8"	70 seconds	227 seconds
10"	110 seconds	283 seconds
12"	158 seconds	340 seconds
15"	248 seconds	425 seconds
18"	356 seconds	510 seconds
21"	485 seconds	595 seconds
24"	634 seconds	680 seconds
27"	765 seconds	765 seconds
30"	851 seconds	851 seconds
33"	935 seconds	935 seconds

If the air test fails to meet the above prescribed requirements, the test shall be repeated as necessary after all leaks and defects have been repaired. Prior to acceptance, all constructed sewer lines shall satisfactorily pass the low-pressure air test.

In areas where ground water is known to exist, a 1/2 inch diameter capped pipe nipple approximately 10 inches long is to be installed through the manhole wall on top of one of the sewer lines entering the manhole. This installation is to be done at the time the sewer line is constructed. Immediately prior to the performance of the line acceptance test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground to clear it and then connecting a clear plastic tube to the pipe nipple. The tube shall then be held vertically and a measurement of height in feet of water shall be taken after the water height has stabilized in the tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure to be added to all readings.

All pressure sewage force mains shall have hydrostatic pressure and leakage tests performed prior to acceptance. No pressure sewer line shall be accepted unless passing the prescribed requirements. All tests shall conform to AWWA C600 procedures as modified herein and shall be applicable to all pressure sewers. The test shall be conducted after line installation and trench backfilling is complete.

The test shall be performed separately in segments between sectionalizing valves and a test plug, or between test plugs. Test segments shall be selected so that adjustable seated valves are isolated for individual checking. The contractor shall furnish and install test plugs at no additional cost to the owner, including all required anchors, braces and other devices to withstand hydrostatic pressure on the plugs. Any damage to public or private property caused by failure of the plugs shall be the responsibility of the contractor. The fill rate of the line shall be limited to the available venting capacity.

The pressure test shall be conducted at 150 psi.

All joints shall be watertight and free from leaks as determined by the test.

If any of the above tests fail to meet the above-prescribed requirements, the test shall be repeated as necessary after all leaks and defects have been repaired.

- d. Deflection Test. A deflection test shall be required on all installations involving flexible or semi-rigid pipe after said pipe has been laid and backfilled. The maximum allowable deflection shall not exceed 5.0% of the pipe's actual internal diameter as measured in the field. The deflection test shall consist of guiding a device of the appropriate size for the pipe involved to accurately measure any deflection in the pipe. The device to be used shall be approved by the City Engineer prior to its use. Attention is directed to the fact that the pipe's nominal diameter is greater than the actual internal diameter of the pipe. Lamping will not be approved as a substitution for deflection testing.

Upon completion of the testing, all piping showing a deflection greater than 5.0% shall be excavated,

replaced, backfilled, and retested to the satisfaction of the City Engineer.

3017 BORING WITH CASING PIPE.

Steel casing for bored and jacked construction shall have a smooth wall and a minimum yield strength of 35,000 psi, conforming to ASTM A-139 with a minimum diameter as shown on Standard Detail 50-7. Steel casing for bored and jacked construction shall be steel pipe conforming to ASTM A-139 with a minimum diameter as shown on Standard Detail 50-7. Steel shall be Grade B under railroads and Grade A on all other uses. Steel pipe shall have welded joints in accordance with AWWA C-206 and shall have minimum wall thickness as indicated on the following table.

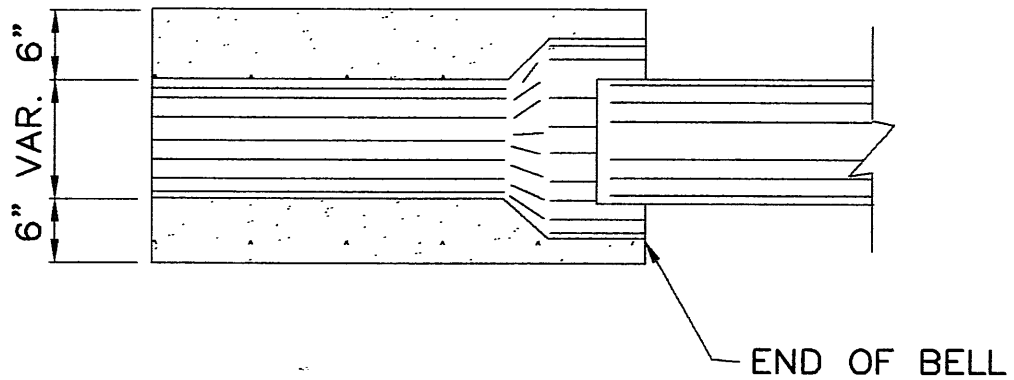
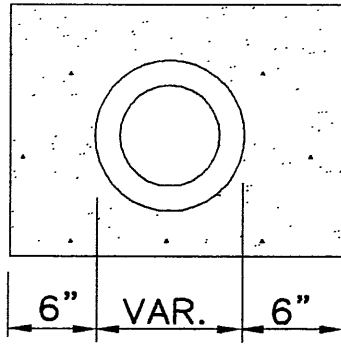
Diameter of Casing (inches)	Nominal Wall Thickness (inches)	
	Under Railroads	All Other Uses
12	0.282	0.188
14	0.282	0.188
16	0.282	0.188
18	0.312	0.250
20	0.344	0.281
22	0.375	0.281
24	0.406	0.281
26	0.438	0.312
28	0.469	0.312
30	0.469	0.312
32	0.500	0.344
34	0.531	0.344
36	0.531	0.344
38	0.531	0.344
40	0.563	0.375
42	0.563	0.375
44	0.563	0.375
48	0.563	0.375
50	0.625	0.406
52	0.625	0.406
54	0.625	0.406
60	0.650	0.450

Boring and jacking operations shall be performed by experienced crews using a rotary type boring machine designed especially for this purpose. The casing shall be jacked as the boring proceeds. Steel casing or carrier pipe shall be cleaned of all debris after its installation is complete. Casing spacers with plastic runners shall be secured to the barrel of the pipe with metal bands in such a manner as to support the weight of the pipe along its full barrel length on the skids without any of the weight supported by the pipe bell, and in such a manner as to properly position the carrier pipe to the specified elevations and alignment. 304 Stainless Steel casing spacers with plastic skids shall be as manufactured by PSI, Cascade, or APS.

End seals shall be used at each end of the casing and shall be the wrap-around, synthetic rubber type, using stainless steel bands. There shall be no voids between the earth and the casing. Any voids that do occur shall be filled by pressure grouting.

END OF SECTION

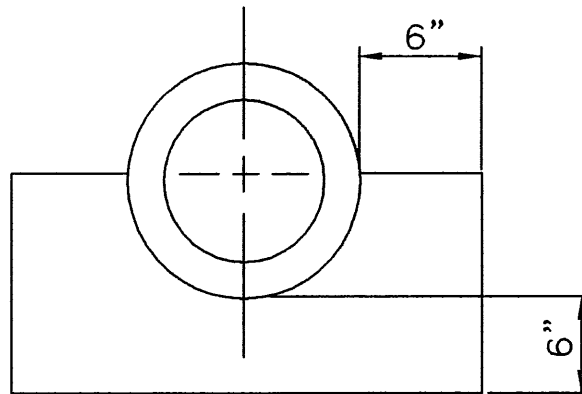
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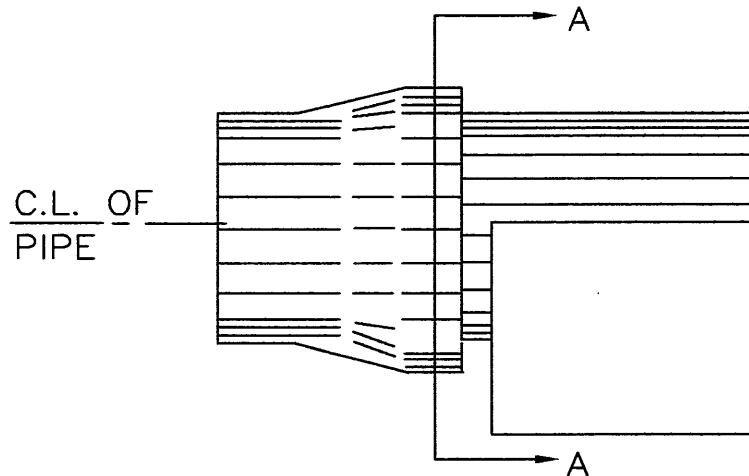
FOR USE ONLY WHERE INDICATED ON PLANS. THE CONCRETE ENCASEMENT SHALL BE CONTROLLED LOW STRENGTH MATERIAL (CLSM) WITH A MINIMUM THICKNESS ON ALL SIDES OF 6". SEE SECTION 3013 FOR CLSM REQUIREMENTS.

1. 8" DIA. = .11 C.Y. OF CONCRETE PER LINEAL FT.
2. 10" DIA. = .12 C.Y. OF CONCRETE PER LINEAL FT.
3. 12" DIA. = .14 C.Y. OF CONCRETE PER LINEAL FT.
4. 15" DIA. = .15 C.Y. OF CONCRETE PER LINEAL FT.

SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED _____ _____ _____	CONCRETE ENCASEMENT DETAIL	STANDARD DETAIL 30-1
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SEC. A-A



FOR USE ONLY WHERE INDICATED ON PLANS. THE CONCRETE SHALL BE CONTROLLED LOW STRENGTH MATERIAL. THE MINIMUM THICKNESS, ON THE SIDES AND BOTTOM SHALL BE 6". THE TOP OF THE CONCRETE SHALL BE AT LEAST TO THE CENTER OF THE PIPE.

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER

5-8-08
DATE

REVISED

**CONCRETE
CRADLE
DETAIL**

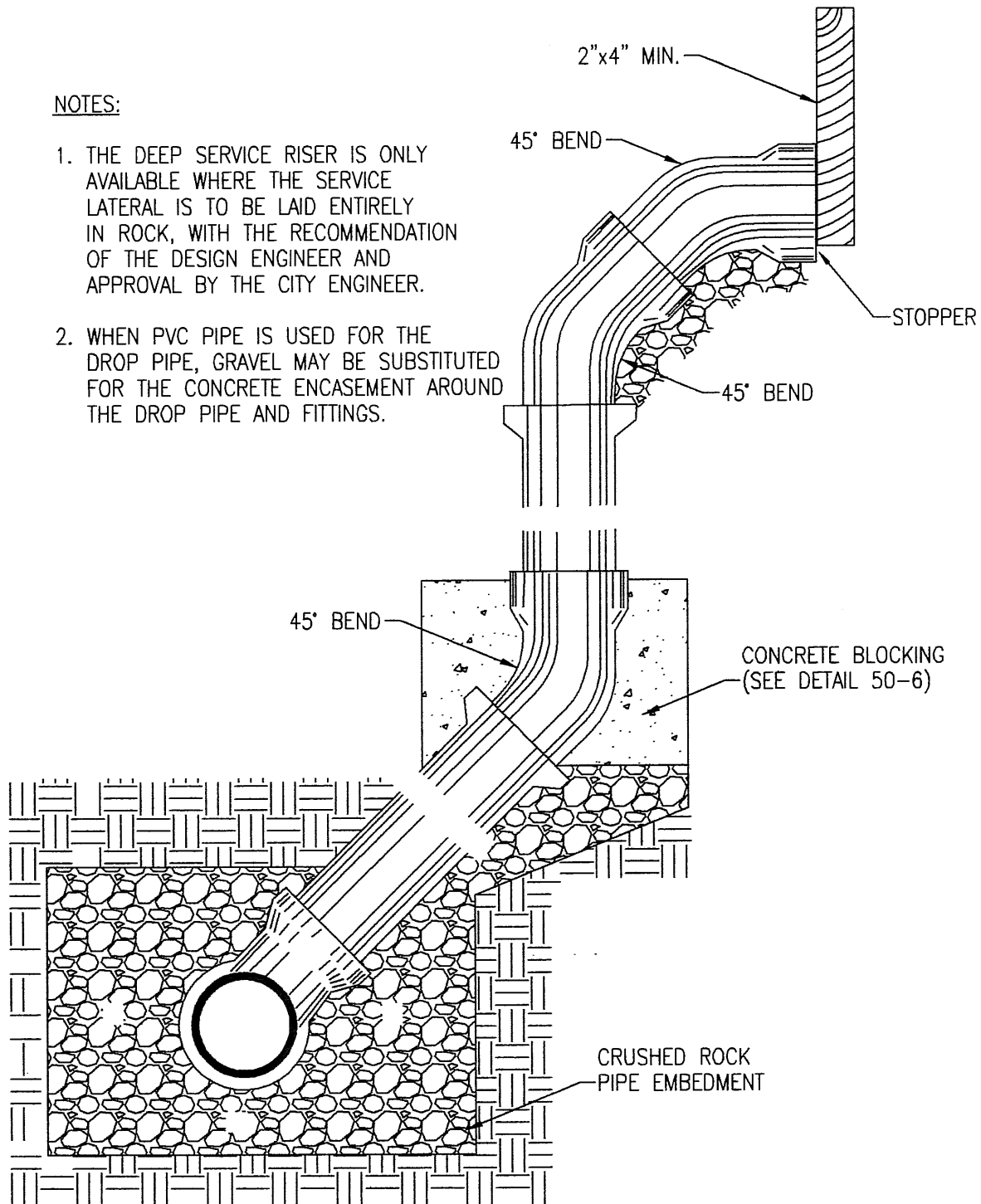
**STANDARD
DETAIL**

30-2

30-3

NOTES:

1. THE DEEP SERVICE RISER IS ONLY AVAILABLE WHERE THE SERVICE LATERAL IS TO BE LAID ENTIRELY IN ROCK, WITH THE RECOMMENDATION OF THE DESIGN ENGINEER AND APPROVAL BY THE CITY ENGINEER.
2. WHEN PVC PIPE IS USED FOR THE DROP PIPE, GRAVEL MAY BE SUBSTITUTED FOR THE CONCRETE ENCASEMENT AROUND THE DROP PIPE AND FITTINGS.



SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER

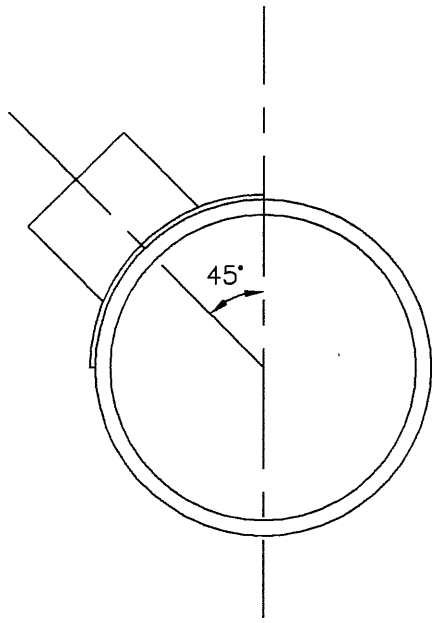
5-8-08
DATE

REVISED

**DEEP
TRENCH SERVICE
RISER
(IN ROCK)**

**STANDARD
DETAIL**

30-4



SECTION

NOTES:

ALL TAPS INTO SANITARY SEWER MUST BE "CLEAN CUT" BY DRILLING OR SAWING. NO "BREAK IN" TAPS WILL BE ALLOWED.

GLUED OR CEMENTED SADDLES WILL NOT BE ALLOWED.

A MINIMUM OF 2 STAINLESS STEEL (SERIES 300 or EQUAL) STRAPS CAPABLE OF A MINIMUM OF 60 LBS. TORQUE SHALL BE USED TO SECURE SADDLE TO SANITARY SEWER.

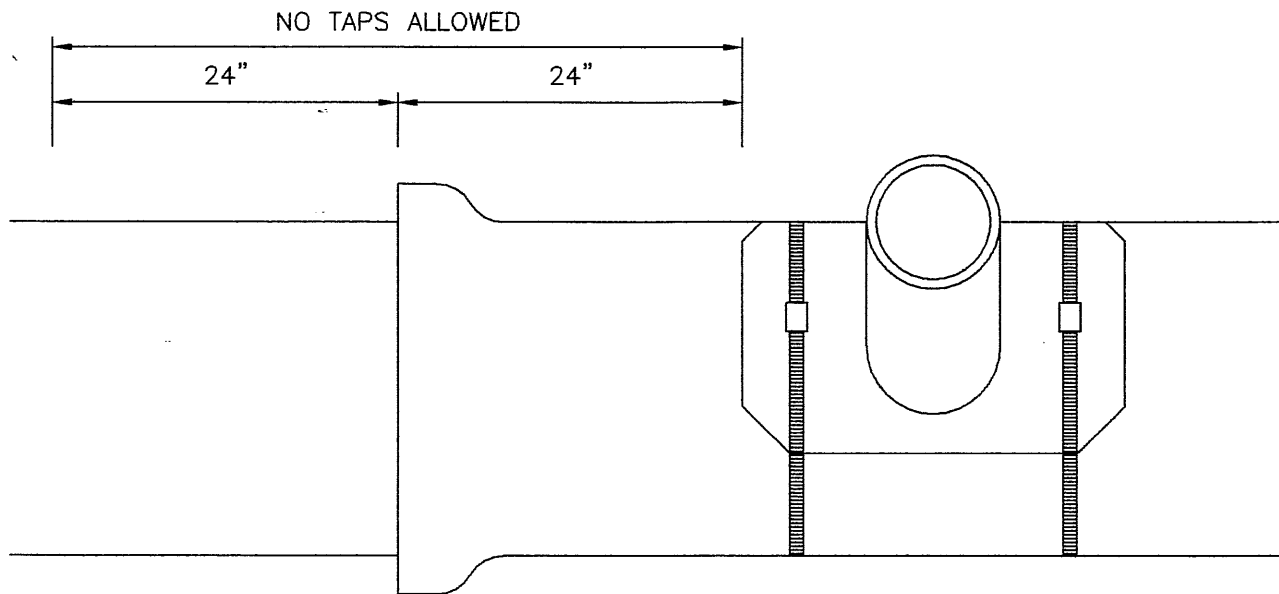
SADDLES SHALL BE CONSTRUCTED OF NEOPRENE, P.V.C., OR OTHER APPROVED MATERIALS.

SADDLES SHALL BE DESIGNED TO BE USED ON THE OUTSIDE DIAMETER OF THE PIPE ENCOUNTERED.

SADDLES APPROVED ARE AS FOLLOWS:

- A. DFW/HPI FLEXIBLE SADDLE.
- B. PLASTIC TRENDS P.V.C. SADDLE w/ GASKET.
- C. GPK GASKETED P.V.C. SADDLE w/ GASKET.
- D. HARCO GASKETED P.V.C. SADDLE w/ GASKET.

24" MINIMUM DISTANCE BETWEEN SERVICE CONNECTIONS.



ELEVATION VIEW

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

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CITY ENGINEER

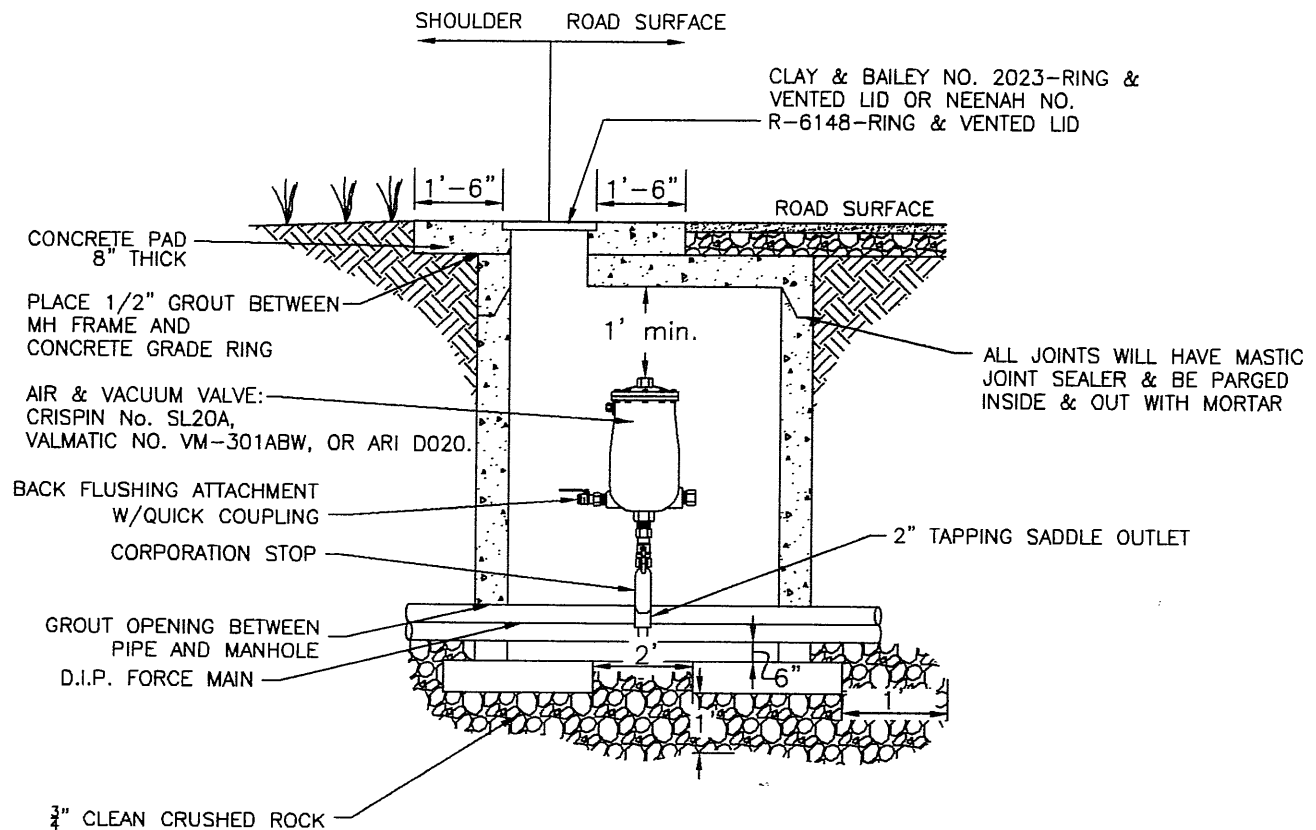
5-8-08
DATE

REVISED

**TAPPING SADDLE
DETAIL**

**STANDARD
DETAIL**

30-5



NOTES:

1. FORCE MAIN 4" DIA. AND SMALLER TO BE ONE FULL JOINT OF D.I.P. THRU AIR RELEASE MANHOLES.
2. PRECAST MANHOLE - 4'-0" I.D. AND UP TO 10' CUT. 5'-0" I.D. OVER 10' CUT.
3. STEPS SHALL BE MA. INDUSTRIES, INC. MODEL PS-2-PF, OR AMERICAN STEP CO., INC., MODEL ML-13.

<i>SPRING HILL, KANSAS</i> PUBLIC WORKS DEPARTMENT	<i>APPROVED</i> JWB <i>CITY ENGINEER</i> 5-8-08 <i>DATE</i>	<i>REVISED</i>	FORCE MAIN AIR/VACUUM VALVE AIR RELEASE MANHOLE	STANDARD DETAIL 30-6
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SECTION 3100 - SANITARY SEWER MANHOLES

3101 SCOPE .

This section covers standard, drop, and special sewer manholes. Manholes shall be constructed complete with covers, steps, fittings, and other appurtenances, in accordance with the details indicated on the construction drawings.

At the option of the contractor, standard and drop manholes shall be constructed of precast concrete sections or cast-in-place concrete.

Only manholes, which are required to have outside pipe and fittings for dropping sewage into the lower line, will be designated as drop manholes. Inside drop manholes where the incoming line discharges directly into the manhole and which do not require special fittings will be considered standard manholes. Note: Drop manholes should only be considered as a last resort. Design Engineers shall design gravity sewer mains for continuous, uninterrupted flow lines of the wastewater from one sewer line segment, crossing a manhole and into another sewer line segment.

3102 MATERIALS .

Concrete

Materials, handling, forms, finishing, curing, and other work as specified in Section 2000 "Concrete."

Pre-cast Sections

Circular pre-cast concrete; ASTM C478, except as modified. Joints shall be of a bitumastic material or preformed flexible joint sealant applied in accordance with manufacturer's recommendation.

Minimum Thickness

As indicated on the drawings.

Reinforcement

As indicated on the drawings.

Openings

Openings with manhole/pipe connectors that are cast into the wall are required. If a straddle manhole is approved, and the straddle manhole is placed over an existing sewer line, the opening

shall be closed with a cast-in-place waterstop, or a field-applied pipe connector, as specified in Manhole/Pipe Connectors.

Portland Cement

ASTM C150

Sand

Concrete sand (fine aggregate) sieved through 8 mesh screen.

Shrinkage-Correcting Aggregate

Master Builders "Embeco", Sika "Kemox", or Sonneborn "Ferrolith G-DS".

Mortar

One part portland cement Type II, 3 parts sand, 1/4 part hydrated lime, ASTM C-207.

Non-Shrinking Mortar Premixed or Job mixed

Job mixed shall be one part shrinkage-correcting aggregate, one part portland cement, one part sand.

Gaskets

Mastic

Hamilton-Kent "Kent-Seal No. 2" (minimum two-1" or one-2" beads per joint), or approved equal. Enough material shall be applied to fill the joint so that a minimum of 1/4-inch bead is visible, to be smoothed off after completion.

Flexible Joint

Preformed "O" ring, butylrubber or bituminous polymer are acceptable. Natural rubber is not acceptable

Coal Tar Paint

Koppers "Bitumastic Super-Service Black", Porter "Tarmastic 103", Tnemec "450 Heavy Tnemecol", or approved equal.

Castings

ASTM A48, with asphalt varnish coating applied at the foundry.

Manhole/Pipe Connectors

Flexible gaskets shall conform to ASTM C923. For connectors pre-cast into the concrete, A-Lok products

Z-Lok for sizes 8" through 18" ID pipe diameters and X-cel for greater than 18" diameter pipes. Connections to existing manholes shall use PSX-Direct Drive, or G-3 Boot System.

External Joint Sealing

Adhesive tape shall conform to ASTM C877 Type III and shall be EZ Wrap Rubber or Plastic as supplied by PRESS-SEAL Gasket Corp., Ft. Wayne, Indiana.

3103 STANDARD MANHOLES.

All manholes shall be constructed, complete with covers and ladder steps, in accordance with the details shown on the drawings and found herein. Standard manholes above the foundations, unless otherwise required by the plans, shall be constructed of poured-in-place concrete or solid, pre-cast, curved segmental concrete masonry units of circular sections specially cast for use in manhole construction. Manholes shall be constructed with eccentric cones unless otherwise approved by the City Engineer.

Foundations for all standard manholes shall have a minimum 28-day compressive strength of 4000 psi.

Pre-cast concrete manholes shall have a wall thickness of not less than 1/12 of the outside diameter plus 1 inch, or 5 inches, whichever is greater.

Pre-cast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units rejected.

3104 CONSTRUCTION.

Manhole inverts shall be constructed of concrete conforming to the requirements of Section 2000 "Concrete," with the exception that the concrete shall have a minimum 28-day compressive strength of 3000 psi. In no case shall the invert section through a manhole be greater than that of the outgoing pipe. The shape of the invert shall conform exactly to the lower half of the pipe it connects. Side branches shall be connected with as large of a radius of curve as practicable. All inverts shall be troweled to a smooth clean surface.

Circular pre-cast sections shall be provided with a mastic gasket or preformed flexible joint to seal joints between sections. The space between connecting pipes and the wall of precast sections shall be closed by a manhole pipe connector (See 3108 and 3108A for Connections to Manholes). The connecting pipe for installation with resilient connectors shall be plain-end, square-cut spigots and shall not protrude more than 2 inches inside the manhole wall. A clear distance of at least 1 inch from the end of each connecting pipe and around the pipe shall be provided when the concrete invert fill is installed. After completion of the manhole, the boxout shall be filled with mastic filler material, completely filling the space beneath the pipe and extending to at least the spring line. The filler material, Kent-Seal No. 2, shall provide a smooth, uniform surface between the outside diameter of the pipe and the manhole invert.

All manholes under construction shall be covered in an appropriate manner to prevent the entry of any stormwater runoff, trench water, sand, earth or any other foreign substances at any time during construction or while the manhole is unattended.

3105 DAMPPROOFING AND EXTERNAL JOINT SEALING.

- A. Dampproofing. Surfaces to receive coat shall be dry. Before backfilling is started, the exterior surfaces of precast and poured-in-place manholes shall be coated with 14 mils dry film thickness of coal tar epoxy. Application shall be in accordance with the manufacturer's specifications and instructions.
- B. External Joint Sealing. Adjustment ring and manhole joints below grade shall be sealed with joint tape that meets or exceeds ASTM C877 Type III. Manhole surface to be covered shall be free of dirt, sharp points and moisture. The tape and primer shall be applied according to the manufacturer's recommendations, not stretched, and shall include the joints between sections and the entire surface of the adjustment rings and overlapping onto the manhole ring 4 to 6 inches. The butyl component of the tape shall consist of 50% (minimum) butyl rubber, contain 2% or less volatile matter, and shall be 0.030 inches thick. Rubber or plastic backing can be used.

3106 CASTINGS.

Manhole rings and covers shall be Clay and Bailey No. 2008 BV, Deeter No. 1315, GCI Castings SM2202, or approved equal.

The exception shall be for use on shallow manholes where manhole covers shall be Clay & Bailey No. 2020, Deeter No. 2016, GCI Castings SM 2100, or approved equal.

When bolt-down type manhole rings and covers are required and specified, Clay and Bailey No. 2014 M, GCI Casting SB 2200STD, or approved equal, with rubber gaskets and stainless steel cover bolts 5/8-inch diameter with hexagonal-head bolts shall be furnished. Bolt-down type manhole rings shall be anchored to the manhole with not less than four 3/4-inch diameter stainless steel anchor bolts having a minimum of 14 inches of embedment, except in concrete manholes in which the ring is embedded in concrete.

If castings arrive on the job without a foundry coating, one coat of coal tar paint shall be applied. Before painting, all castings shall be thoroughly cleaned and properly supported. All loose rust shall be removed by wire brushing. Castings shall not be handled until the paint is dry and hard. All castings shall be interchangeable with the Clay and Bailey model numbers.

3107 STUBLINES.

Stub-lines for future connections shall be provided in manholes at the locations indicated on the drawings and shall terminate in a bell and plug.

3108 CONNECTIONS TO MANHOLES.

A pipe to manhole connector using an ASTM C923 resilient device that provides a positive, flexible watertight seal for pipes entering and exiting pre-cast concrete manholes shall be installed by the pre-cast concrete manhole manufacturer.

Approved products are listed in Section 3102.

- A. Connections to Existing Manholes. A pipe to manhole connector using an ASTM C923 resilient device that provides a positive, flexible watertight seal for pipes entering and exiting manholes shall be installed by the contractor from outside the manhole. All openings to accommodate these connectors shall be core drilled.

Approved products are listed in Section 3102. **Lateral service line tap connections to existing manholes are prohibited.**

- B. Connections to Existing Sewer Lines. Dog House or Straddle manholes are approved only with the authority of the City Engineer. All other cases require placement of a new, pre-cast manhole and replacement of the sewer to the first downstream joint.

3109 PLASTIC MANHOLE STEPS.

Polypropylene coated steel reinforced steps "plastic steps" shall be M.A. Industries, Inc., model PS-2-PF or approved equal manhole step for pre-cast concrete manholes.

3110 GRADE RINGS.

All manholes shall be fitted with an adjusting ring or rings providing a minimum adjustment of 1½ inches and a maximum adjustment of 12 inches, and one adaptor ring between the cone section and the casting in conformance with Detail 31-6. Concrete grade rings shall meet requirements of ASTM C478 #4 wire - ASTM A82 and 4000 psi concrete. HDPE adjustment rings shall be manufactured from polyethylene plastic as described in ASTM D1248, and as manufactured by Ladtech, Inc. Tapered grade rings may be used on a case by case basis under the approval of the City Engineer, Public Works Director or their representative.

3111 ACCEPTANCE TESTING.

Vacuum tests shall be conducted on all newly constructed manholes and existing manholes that have been repaired or restored or manholes constructed over existing sewers.

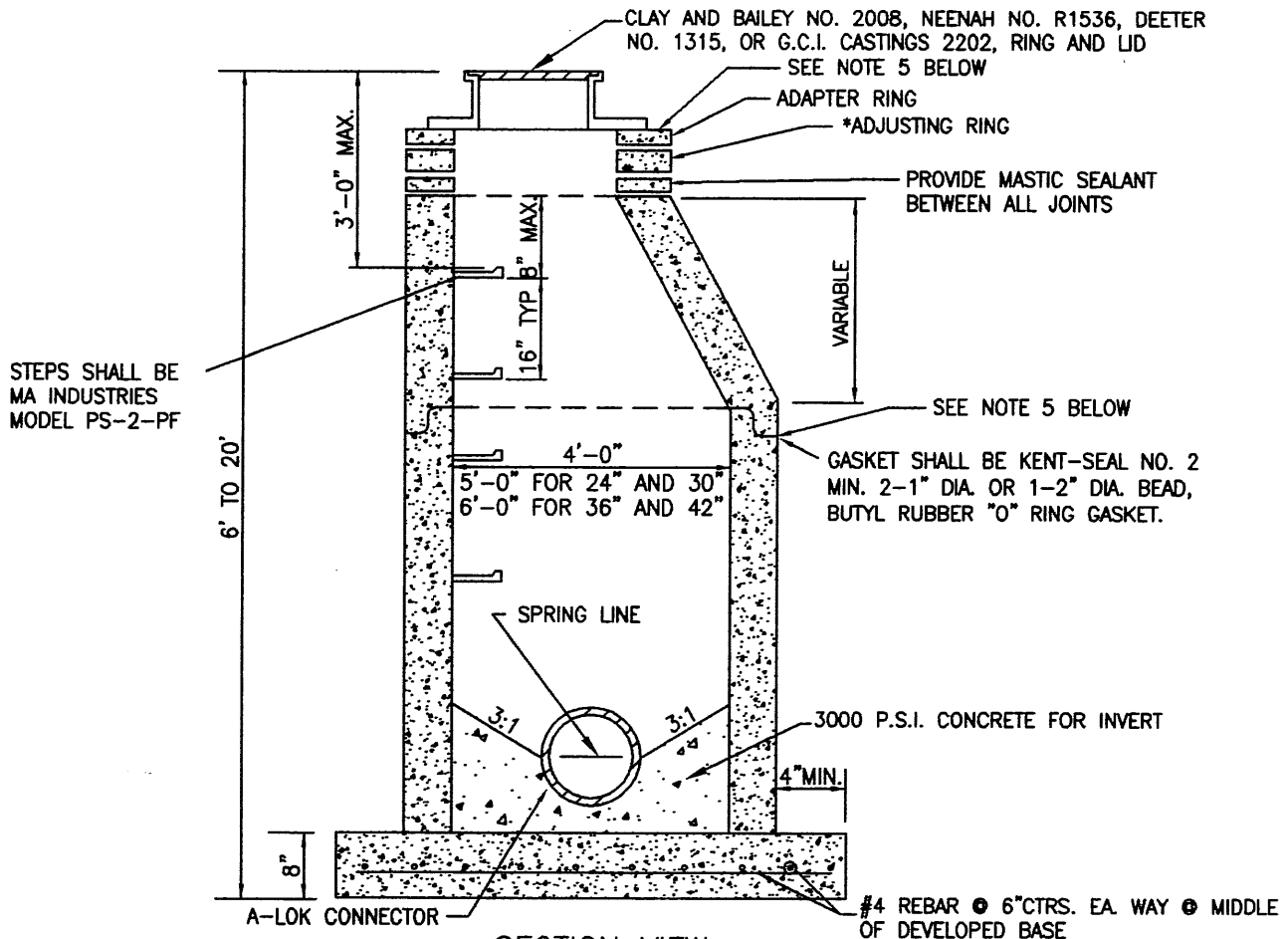
All lift holes shall be plugged with a non-shrinking mortar, as approved by the City Engineer. The contractor shall plug all pipes connected to the manhole using pneumatic plugs. The pneumatic plugs should be placed into the pipe after the inside surface has been cleaned. Air shall be introduced into the plugs to 25 psig. Bracing can be used to ensure that the plugs are not pulled into the manhole during vacuum testing. After the manhole has been properly prepared, the vacuum tester shall be installed. The test head shall be placed on top of the casting or fit inside the casting in a manner that incorporates the casting and all adjusting and adaptor rings into the vacuum test. The vacuum pump shall be connected to the outlet port with the valve open. The

outlet valve shall be closed after a vacuum draw of 10 inches of Hg. has been obtained. The test shall pass if the vacuum remains at 10 inches Hg. or drops to 9 inches Hg. in a time greater than one minute. If the manhole fails, the contractor shall locate the leak and make proper repairs and then re-test.

The manhole vacuum tester shall be as manufactured by P.A. Glazier, Inc., or approved equal. The vacuum gauge shall be calibrated with an expiration date on the gauge. The pneumatic plugs, a part of Cherne Air-Loc Equipment as manufactured by Cherne Industrial of Hopkins, MN., or approved equal. These plugs shall have a sealing strength equal to or greater than the diameter of the connecting pipe to be sealed. A visual inspection will be performed for each manhole by the City Engineer after the manhole has met the requirements of the vacuum test and is considered in its final state. The inspection shall determine the completeness of the manhole. Any defects identified shall be repaired to the City Engineer's satisfaction.

END OF SECTION

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NOTES:

1. PRECAST CONCRETE MANHOLES SHALL CONFORM TO ASTM C478 EXCEPT AS MODIFIED BY THE SPECIFICATIONS. WALL THICKNESS NOT LESS THAN 1/12 OF MANHOLE INSIDE DIAMETER "PLUS" ONE-INCH, OR FIVE INCHES, WHICHEVER IS GREATER.
2. MANHOLE MAY BE TRANSITIONED TO 4'-0" DIA., 8' ABOVE F.L. OF OUTFALL FOR 5'-0" AND 6'-0" MANHOLES.
3. THE BOTTOM SECTION OF ALL PRECAST MANHOLES NOT BUILT MONOLITHIC WITH THE BASE SHALL BE SET INTO A STEEL REINFORCED POURED CONCRETE BASE A MINIMUM OF 4" (#4 @ 6" E.W.). IN THIS CASE, THE BASE THICKNESS SHALL BE INCREASED TO 12".
4. WATERPROOFING SHALL BE REQUIRED ON THE OUTSIDE OF MANHOLES. THE BITUMEN COATING SHALL CONFORM TO ASTM D450 AND SHALL BE AMERON 'AMERCOAT 78HB COAL TAR EPOXY', CARBOLINE 'BITUMASTIC 300 M', OR TNESEC '46H-413 HIGH-BUILD TNESE-TAR. THE MINIMUM DRY FILM THICKNESS SHALL BE 14 MILS.
5. ADJUSTMENT RINGS AND MANHOLE JOINTS BELOW GRADE SHALL BE SEALED WITH TAPE THAT COMPLIES WITH ASTM C877, TYPE III. USE TAPE WITH A MINIMUM 9-INCH WIDTH TO COVER JOINTS AND ENTIRE SURFACE OF THE ADJUSTMENT RINGS, OVERLAPPING ONTO THE MANHOLE RING 4 TO 6 INCHES.
6. THE COMPRESSIVE STRENGTH OF CONCRETE USED IN THE CONSTRUCTION OF PRECAST REINFORCED CONCRETE MANHOLES SHALL NOT BE LESS THAN 4000 PSI.
7. ONLY ECCENTRIC MANHOLE CONES WILL BE ALLOWED.
8. CONTRACTOR SHALL PROVIDE STEPS SPACED AT 1'-4" O.C. WHERE INLET OR MANHOLE DEPTH IS GREATER THAN 4'-0". STEPS SHALL BE M.A. INDUSTRIES, INC. MODEL PS-2-PF.
- * 9. ADJUSTING RING(S) SHALL PROVIDE A MAXIMUM ADJUSTMENT OF 12".

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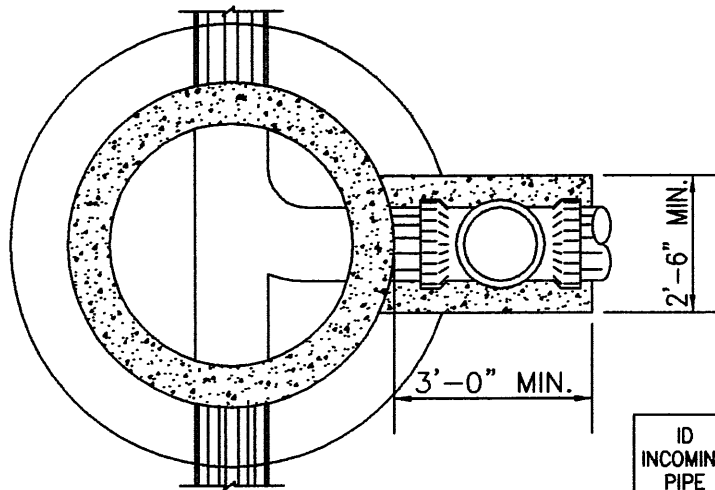
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**PRECAST
MANHOLE**

**STANDARD
DETAIL**

31-1

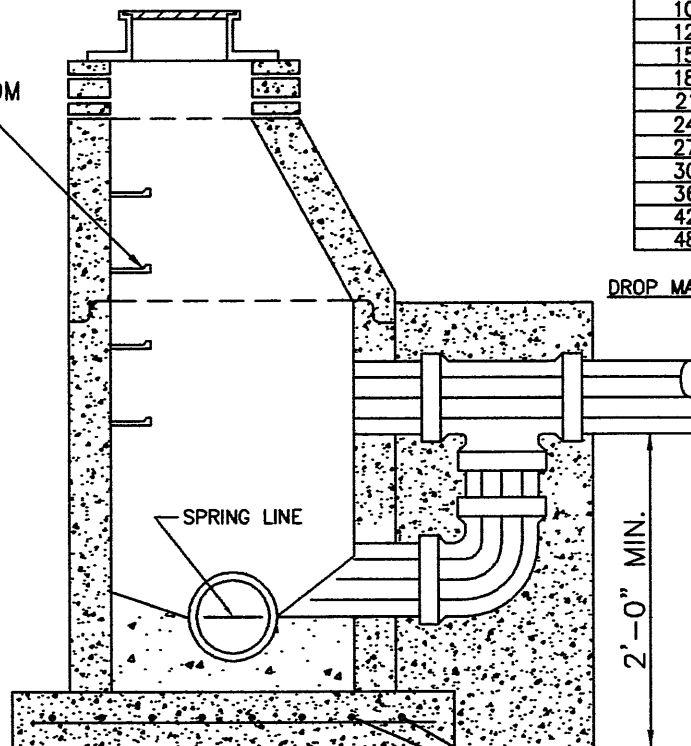


PLAN VIEW

ID INCOMING PIPE INCHES	ID DROP PIPE INCHES
8	8
10	10
12	12
15	12
18	15
21	18
24	18
27	18
30	18
36	18
42	24
48	30

DROP MANHOLE DIMENSIONS

STEPS TO BE LOCATED 90° FROM
DROPPED PIPE ALIGNMENT.



SECTION VIEW

#4 REBAR @ 6" CTRS/ EACH WAY.

NOTES:

1. FOR ALL INFORMATION NOT SHOWN, SEE STANDARD DETAIL 31-1.
2. WATERPROOFING SHALL BE REQUIRED ON THE OUTSIDE OF THE DROP MANHOLE (NOT ON THE OUTSIDE SUPPORT PORTION.). THE COAL TAR COATING SHALL CONFORM TO ASTM D450 AND SHALL BE AMERON "AMERICOAT 78HB COAL TAR EPOXY", CARBOLINE "BITUMASTIC 300M", OR TNE MEC "46H-413 HIGH BUILD TNE ME-TAR". THE MINIMUM THICKNESS SHALL BE 14 MILS.
3. ADJUSTMENT RING AND MANHOLE JOINTS BELOW GRADE SHALL BE SEALED WITH TAPE THAT COMPLIES WITH ASTM C877, TYPE III. USE TAPE WITH A MINIMUM 9-INCH WIDTH TO COVER JOINTS AND ENTIRE SURFACE OF THE ADJUSTMENT RINGS, OVERLAPPING ONTO THE MANHOLE RING 4 TO 6 INCHES.
4. WHEN P.V.C. IS USED FOR THE DROP PIPE, GRAVEL MAY BE SUBSTITUTED FOR CONCRETE ENCASEMENT (CLSM) AROUND DROP PIPE AND FITTINGS.

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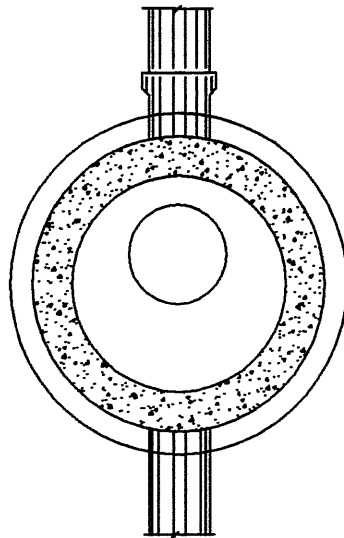
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DROP
MANHOLE

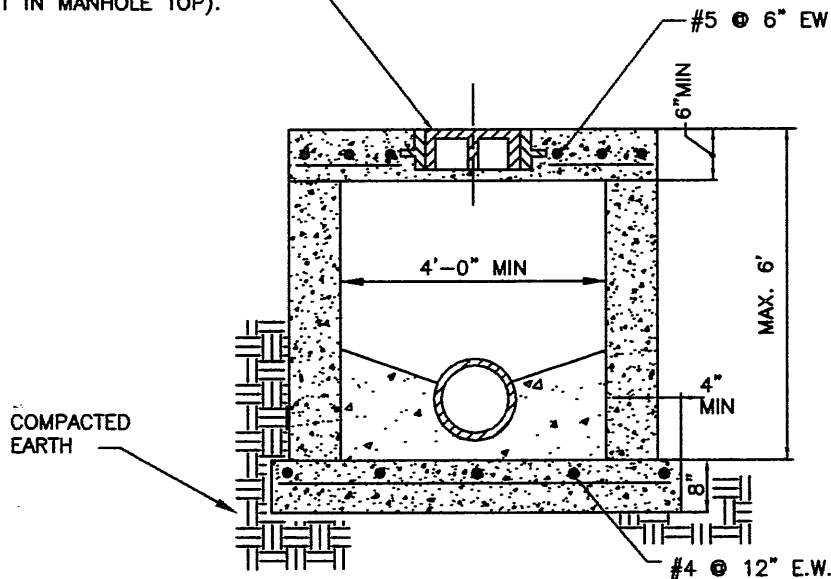
STANDARD
DETAIL

31-2



PLAN VIEW

CLAY AND BAILEY NO. 2020
DEETER NO. 201. RING AND LID
(CAST IN MANHOLE TOP).



SECTION VIEW

NOTES:

1. FOR ALL INFORMATION NOT SHOWN, SEE STANDARD DETAIL 31-1.
2. WATERPROOFING SHALL BE REQUIRED ON THE OUTSIDE OF MANHOLES. THE COAL TAR COATING SHALL CONFORM TO ASTM D450 AND SHALL BE AMERON "AMERICOAT 78HB COAL TAR EPOXY", CARBOLINE "BITUMASTIC 300M", OR TNESEC "46H-413 HIGH BUILD TNESEC-TAR". THE MINIMUM THICKNESS SHALL BE 14 MILS.
3. ADJUSTMENT RING AND MANHOLE JOINTS BELOW GRADE SHALL BE SEALED SEALED WITH TAPE THAT COMPLIES WITH ASTM C877, TYPE III.
4. CONTRACTOR SHALL PROVIDE STEPS SPACED AT 1'-4" O.C. WHERE INLET OR MANHOLE DEPTH IS GREATER THAN 4'-0". STEPS SHALL BE M.A. INDUSTRIES, INC. MODEL PS-2-PF.

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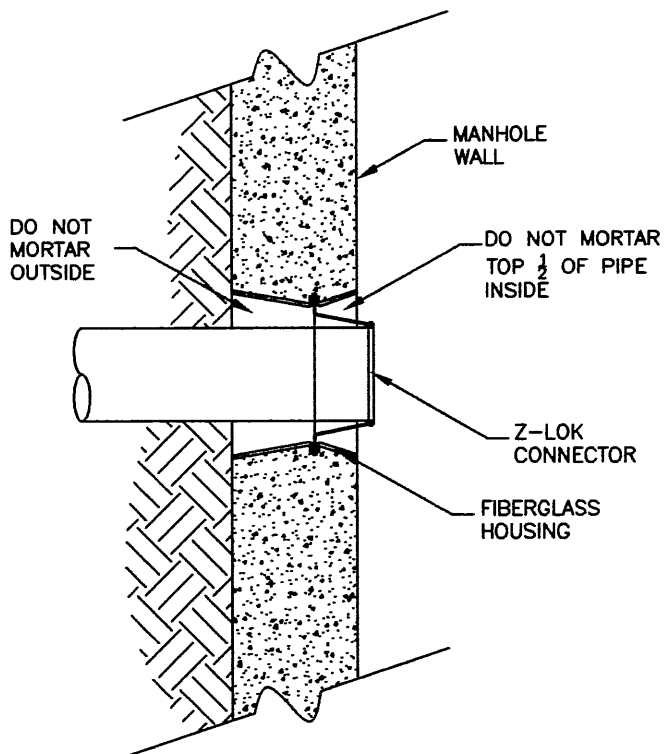
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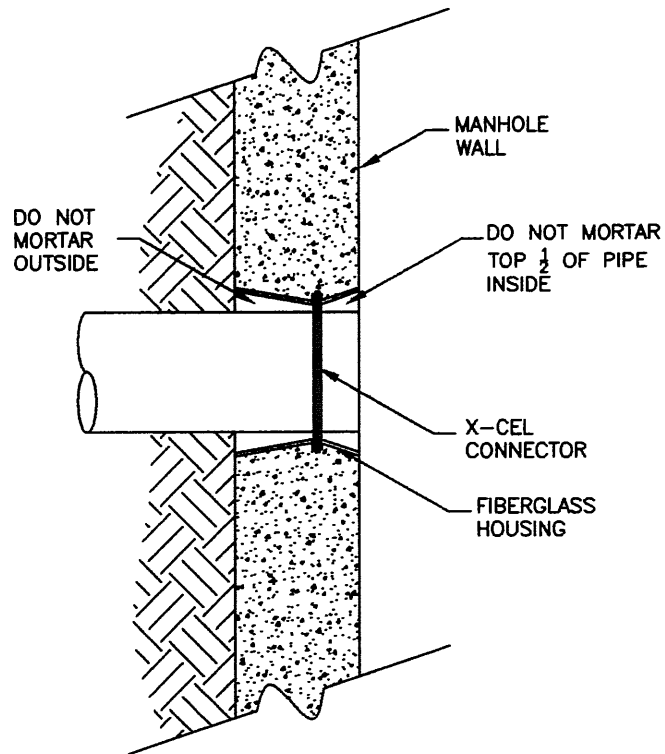
**SHALLOW
MANHOLE**

**STANDARD
DETAIL**

31-3



SECTION VIEW
FOR PIPE SIZES:
8" DIA. THROUGH 18" DIA.



SECTION VIEW
FOR PIPE SIZES:
GREATER THAN 18" DIA.

NOTES:

1. FLEXIBLE CONNECTOR SHALL BE CAST INTO ALL PRECAST MANHOLES AND SHALL CONFORM TO ASTM C923.
2. CONNECTORS SHALL BE A-LOK MODELS: Z-LOK FOR SIZES OF PIPE FROM 8" DIA. THROUGH 18" DIA. AND X-CEL FOR SIZES OF PIPE GREATER THAN 18" DIA.
3. PRECAST MANHOLE MANUFACTURER SHALL CLOSELY FOLLOW THE INSTRUCTIONS OF THE CONNECTOR MANUFACTURER TO CAST THEM IN PLACE PROPERLY.

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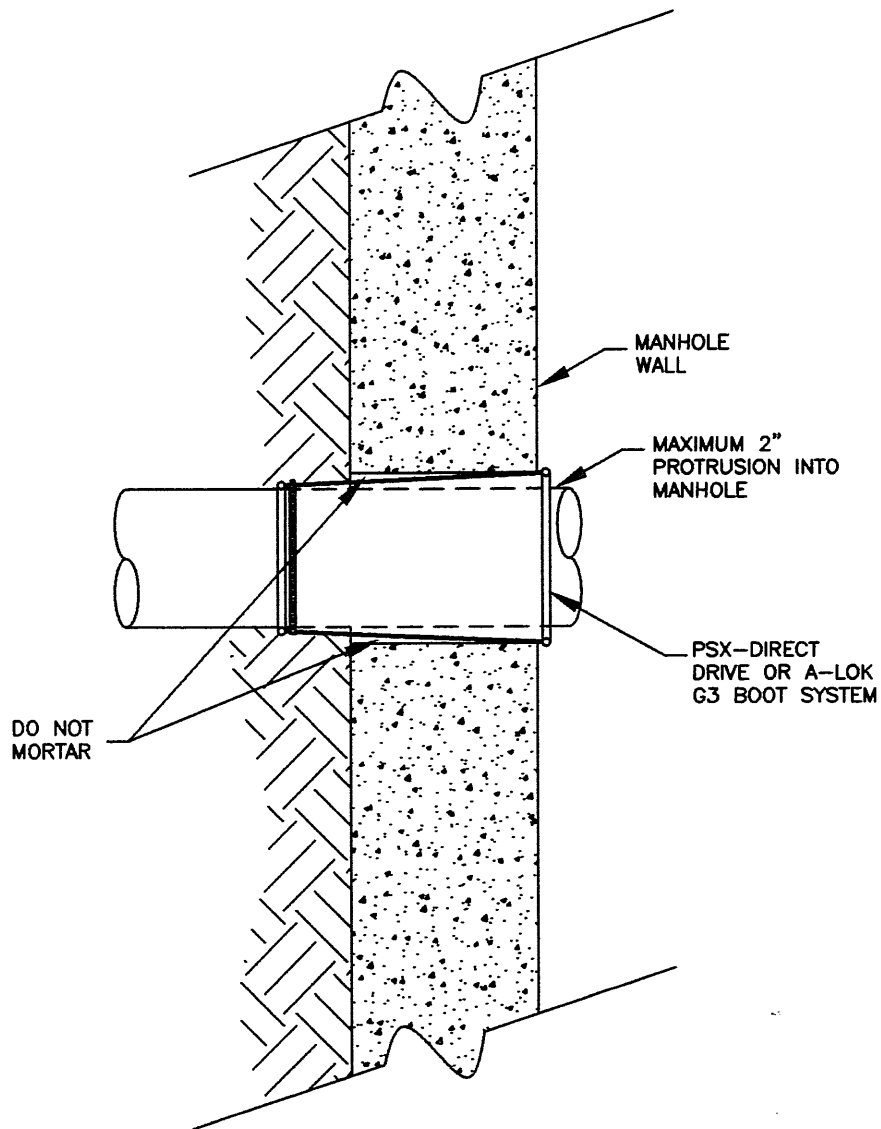
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**CONNECTIONS TO
NEW PRECAST
MANHOLE**

**STANDARD
DETAIL**

31-4



SECTION VIEW

NOTES:

1. A PIPE TO MANHOLE CONNECTOR USING AN ASTM C923 RESILIENT DEVICE THAT PROVIDES A POSITIVE, FLEXIBLE WATERTIGHT SEAL FOR PIPES ENTERING EXISTING MANHOLES SHALL BE INSTALLED BY THE CONTRACTOR FROM OUTSIDE THE MANHOLE.
2. ALL OPENINGS TO ACCOMODATE THESE CONNECTORS SHALL BE CORE-DRILLED.
3. CONNECTORS TO EXISTING MANHOLES SHALL BE PSX-DIRECT DRIVE OR A-LOK G3 BOOT SYSTEM.

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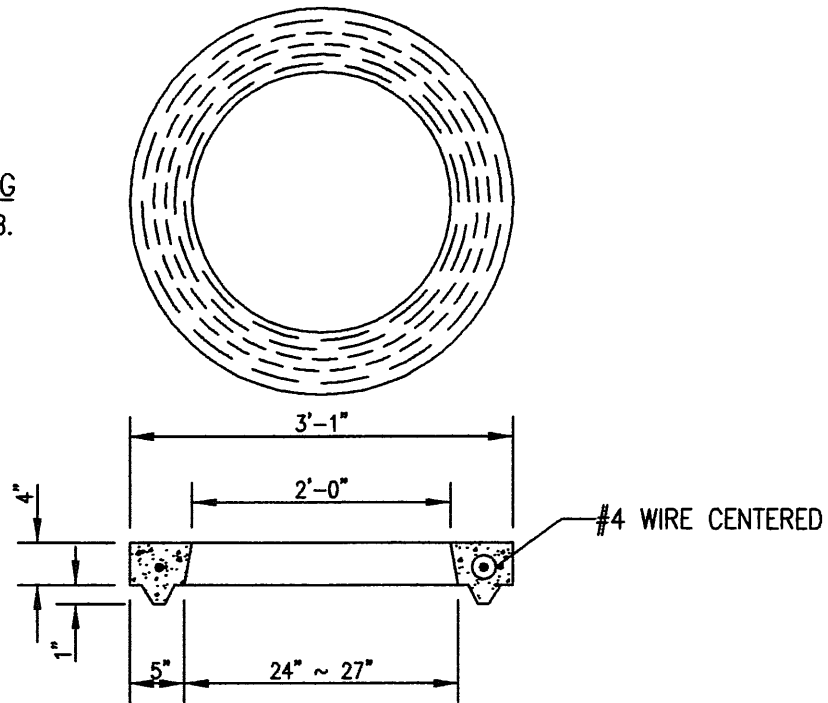
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**CONNECTIONS
TO EXISTING
MANHOLES**

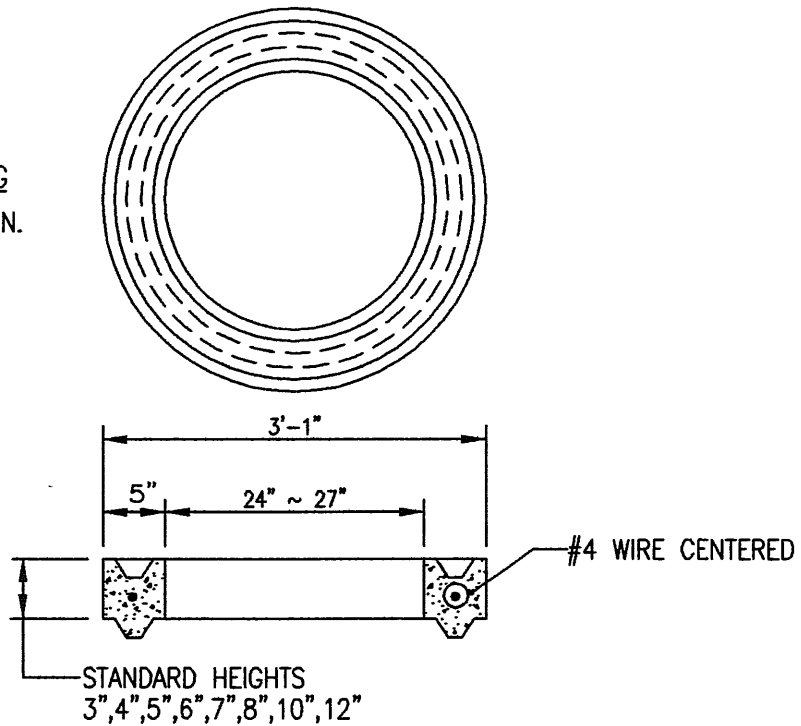
**STANDARD
DETAIL**

31-5

ADAPTER RING
WEIGHT:165 LB.



ADJUSTING RING
WEIGHT:41 LB./V IN.



NOTE:

GRADE RINGS SHALL MEET REQUIREMENTS OF ASTM DESIGNATION C-478-80 STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS. REINFORCEMENT: #4 WIRE, ASTMA-82. CONCRETE: 4000 P.S.I.

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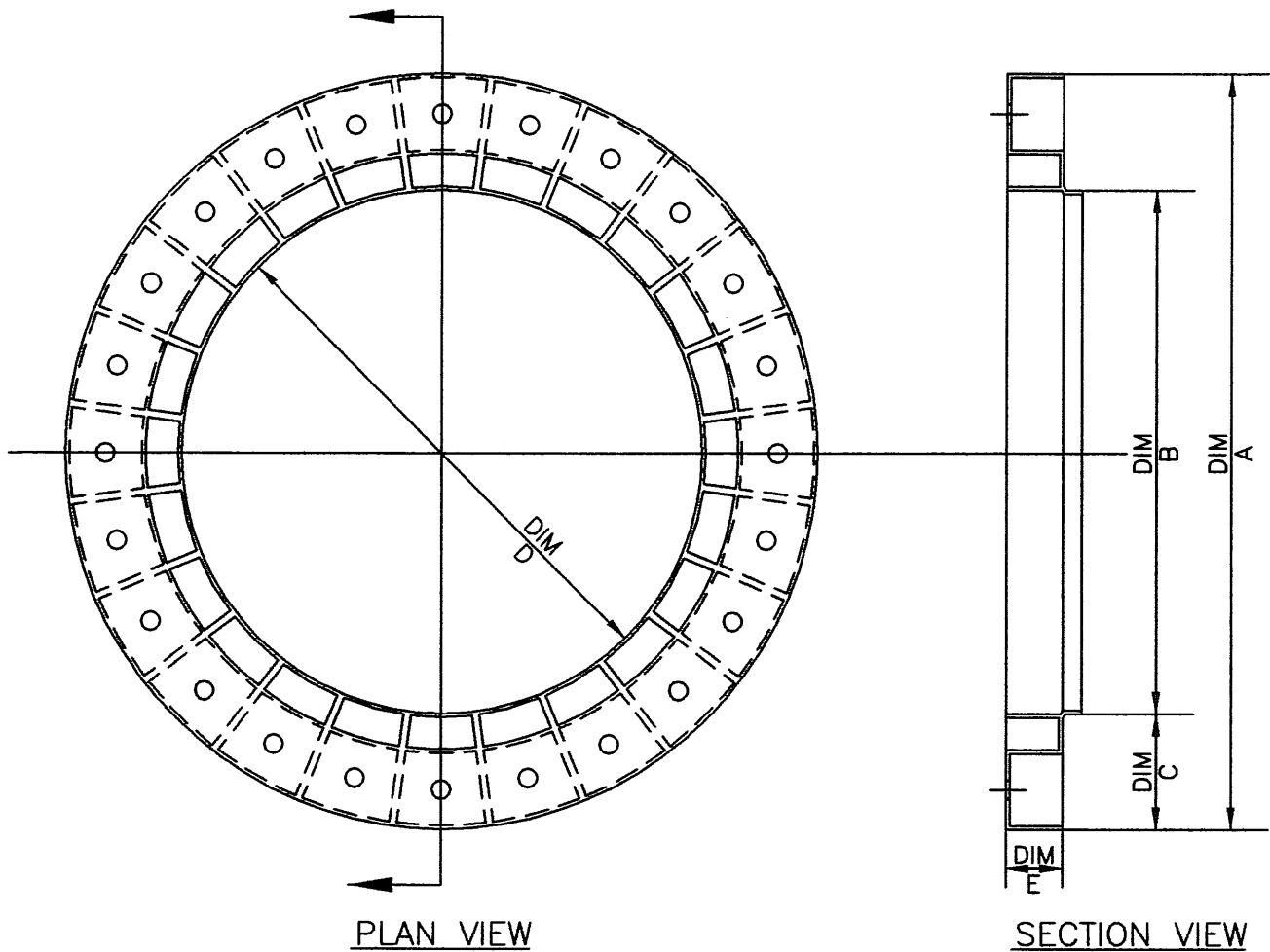
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GRADE RINGS

**STANDARD
DETAIL**

31-6



DIMENSION SCHEDULE					
CONE SIZE	DIM A	DIM B	DIM C	DIM D	DIM E
24	23.75	33.50	5.00	23.25	1.25, 1.50, 2.00, 4.00
27	26.75	36.50	5.00	26.25	1.25, 1.50, 2.00, 4.00

NOTE: ALL DIMENSIONS IN INCHES

DESCRIPTION:

PLASTIC INJECTION MOLDED RING.

MOLDED FROM HIGH DENSITY POLYETHYLENE
AS DEFINED IN ASTM SPECIFICATION D1248.

ACTUAL RESIN PROPERTIES WILL VARY ALLOWING FOR THE
UTILIZATION OF A MAXIMUM PERCENT OF RECYCLED MATERIAL.

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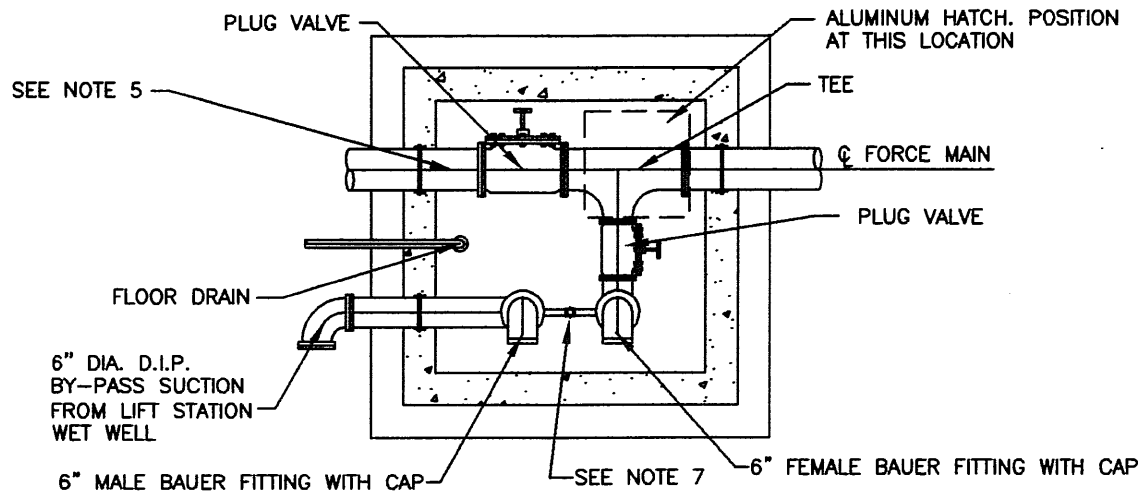
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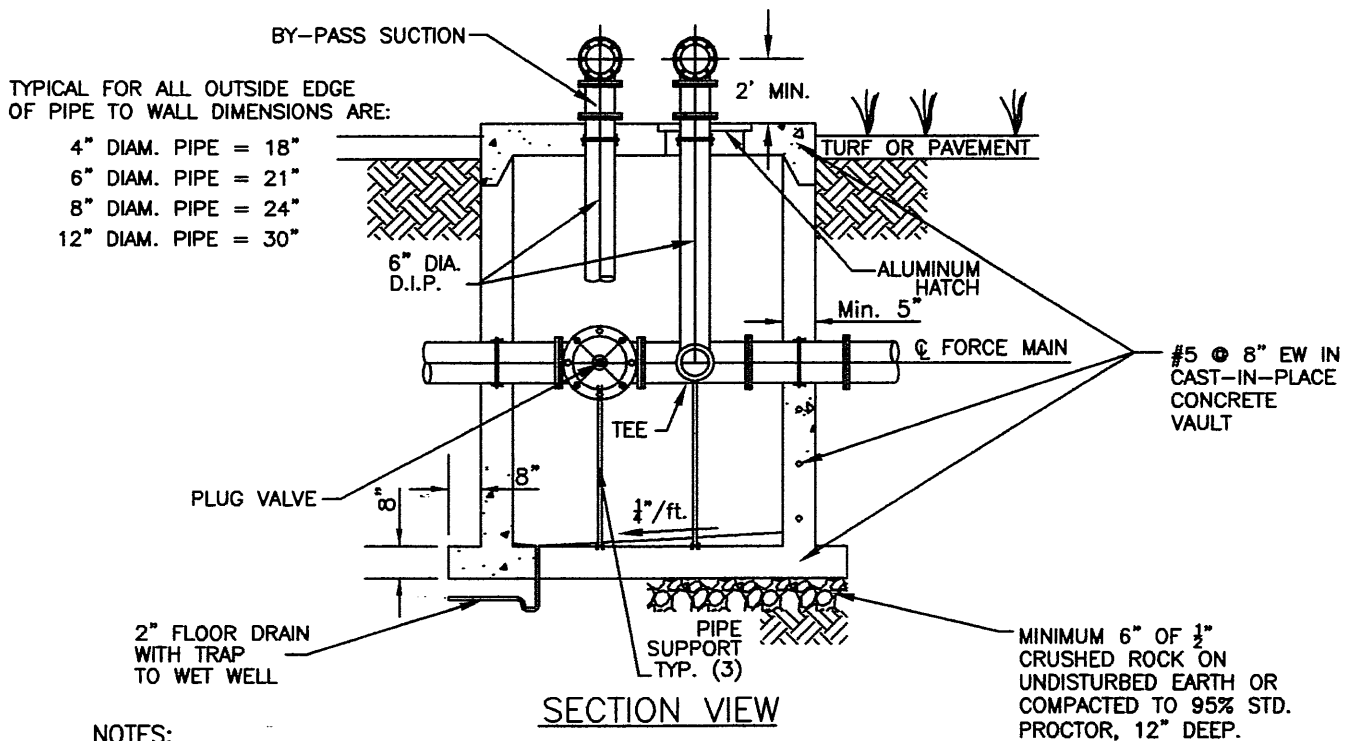
**H.D.P.E.
ADJUSTING RING**

**STANDARD
DETAIL**

31-7



PLAN VIEW



NOTES:

1. EXTENSIONS SHALL ATTACH TO THE ACTUATOR AND EXTEND TO 3 FT. ABOVE THE TOP SLAB. GEAR AND HANDWHEEL OPERATOR SHALL BE MOUNTED TO THE TOP OF THE EXTENSION AND SHALL INCLUDE A LOCKING DEVICE.
2. PLUG VALVE SHALL BE INSTALLED ON IT'S SIDE SO PLUG ROTATES TO THE TOP OF PIPELINE WHEN OPEN.
3. THE DESIGN ENGINEER MAY BE REQUIRED TO FURNISH A SURGE ANALYSIS.
4. ALL PIPE PENETRATIONS SHALL REQUIRE A CAST-IN-PLACE WALL FITTING.
5. INSTALL A FLANGED COUPLING ADAPTOR (FCA) BETWEEN VALVE AND WALL WITH A MINIMUM OF 9" BETWEEN END OF FCA AND WALL.
6. PROVIDE STEPS PER STANDARD DETAIL 31-1.
7. TO DRAIN DISCHARGE PIPE, TAP SUCTION & DISCHARGE PIPES & CONNECT WITH 1" K COPPER TUBING. INSTALL A BALL VALVE IN THE DRAIN THAT CAN BE OPERATED FROM TOP OF VAULT.

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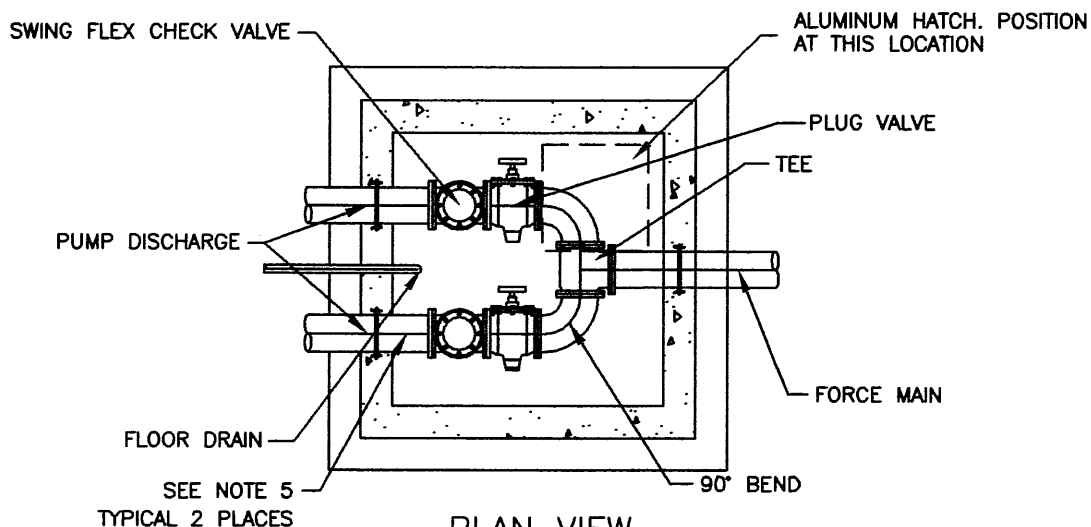
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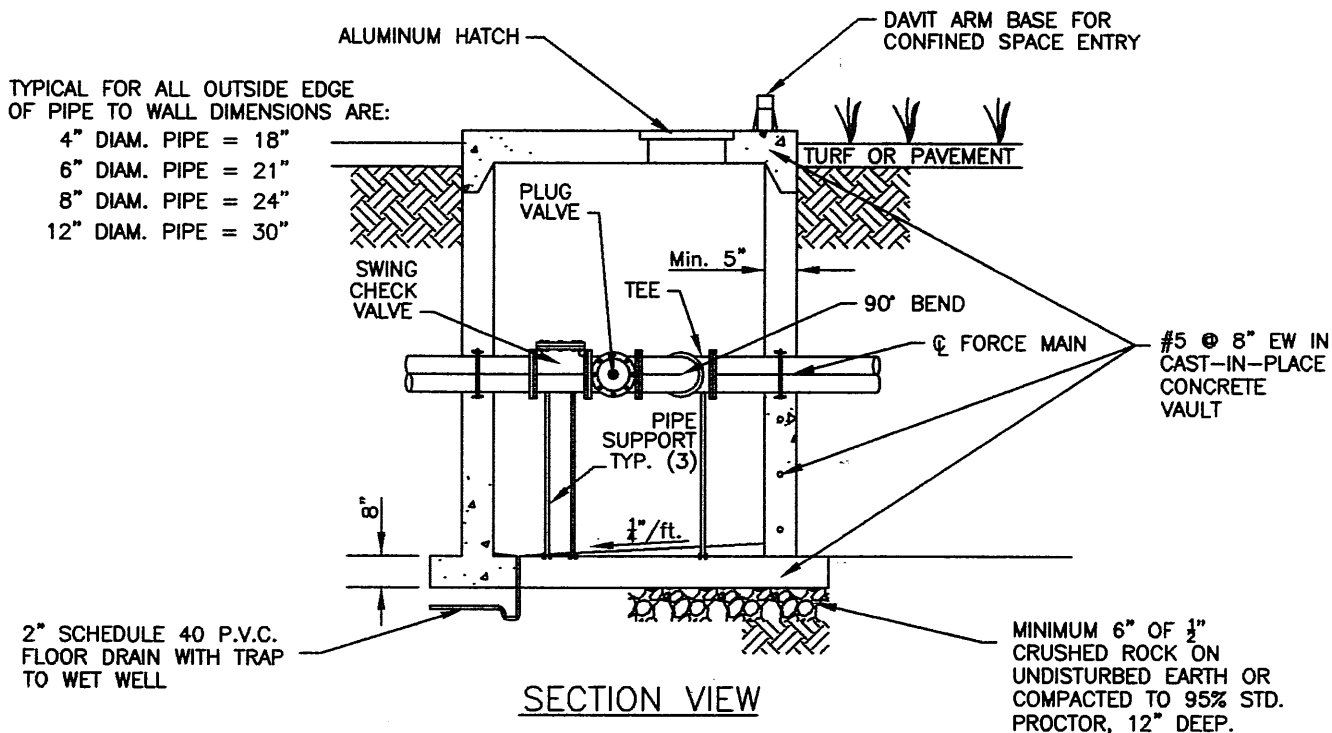
**LIFT STATION
BAUER
CONNECTIONS**

**STANDARD
DETAIL**

31-8



PLAN VIEW



SECTION VIEW

NOTES:

1. EXTENSIONS SHALL ATTACH TO THE ACTUATOR AND EXTEND TO 3 FT. ABOVE THE TOP SLAB. GEAR AND HANDWHEEL OPERATOR SHALL BE MOUNTED TO THE TOP OF THE EXTENSION AND SHALL INCLUDE A LOCKING DEVICE.
2. PLUG VALVE SHALL BE INSTALLED ON IT'S SIDE SO PLUG ROTATES TO THE TOP OF PIPELINE WHEN OPEN.
3. THE DESIGN ENGINEER MAY BE REQUIRED TO FURNISH A SURGE ANALYSIS.
4. ALL PIPE PENETRATIONS SHALL REQUIRE A CAST-IN-PLACE WALL FITTING.
5. INSTALL A FLANGED COUPLING ADAPTOR (FCA) BETWEEN VALVE AND WALL WITH A MINIMUM OF 9" BETWEEN END OF FCA AND WALL.
6. PROVIDE STEPS PER STANDARD DETAIL 31-1.

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**LIFT STATION
VALVE VAULT**

**STANDARD
DETAIL**

31-9

SECTION 4000 - STORM SEWERS

4001 SCOPE.

This section covers the furnishings of all labor, materials, and equipment for the complete installation of storm sewers and appurtenances in accordance with the contract documents.

The work shall consist of the construction of storm sewers for the removal of water from collection points, in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the contract drawings or established by the City Engineer. Unless otherwise indicated in these Specifications, the phrase "Storm Sewer" shall refer to pipe sewers, box culvert sewers, or paved or rock lined channels.

4002 REINFORCED CONCRETE PIPE.

All reinforced concrete pipe shall conform to ASTM C76, Class III. This Specification covers reinforced concrete pipe of 15 to 108 inches in diameter and is intended for use in conveyance of storm water and for the construction of culverts.

Installation shall conform to the requirements of Section 6000 "Excavation," Trenching, and Backfilling. No pipe culverts shall be placed until the embedment below the proposed reinforced concrete pipe have been approved by the City Engineer.

4003 CORRUGATED METAL PIPE.

Corrugated metal storm sewer pipe shall be furnished with connecting bands, elbows, and fittings. Corrugated metal storm sewer pipe shall have annular ends. The same type of pipe base metal (steel or aluminum) shall be used throughout any individual run or installation of pipe or for pipe extensions. Materials shall conform to the requirements provided in the current edition of the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation. All Ultra-Flo pipe shall be aluminized Type 2.

Corrugated metal culvert pipe gauge requirements shall conform to Design Aid 4-9 of the Design Criteria. In no case shall any pipe be lighter than 16 gauge.

Corrugated metal storm sewer pipe shall be handled in such a manner that it is not chipped, dented, or bent. If in handling the culvert the base metal is exposed in any way, then it shall be rejected or repaired to the satisfaction of the City Engineer.

The excavation, trenching, and backfilling of corrugated metal pipe storm sewers shall be performed in accordance with the requirements of Section 6000 of these Specifications. No pipe culverts shall be placed until the embedment below the pipe has been approved by the City Engineer.

- A. Corrugated Metal Pipe; Alumized Type 2. Sheet steel for aluminized CMP shall conform to ASTM A929 or AASHTO M274. Pipe manufacture shall conform to ASTM A760 or AASHTO M36. Fittings shall be fabricated from the same material as the pipe.

4004 SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE.

This specification applies to high-density polyethylene corrugated pipe with an integrally-formed smooth interior. This specification is applicable to nominal sizes 12- to 60-inch diameter. **HDPE pipe shall be used unless the recommended pipe size is not available in which case CMP or RCP will be used.** Requirements for test methods, dimensions, and markings are those found in AASHTO Designation M-294 Type S. Pipe and fittings shall be made of polyethylene compounds which meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D-1248 with the applicable requirements defined in ASTM D-1248. Clean rework material may be used.

Minimum parallel plate pipe stiffness values at 5% deflection shall be as follows:

Diameter	Pipe Stiffness
12"	50 psi
15"	42 psi
18"	40 psi
24"	34 psi
30"	28 psi
36"	22 psi
42"	20 psi
48"	18 psi
54"	16 psi
60"	14 psi

* Per ASTM Test Method F-2306

The pipe and fittings shall be free of foreign inclusion and holes, and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.

The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings produced by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the City Engineer. Joints shall be made with split couplings, corrugated to match the pipe corrugations, and shall engage a minimum of four corrugations. A neoprene gasket shall be utilized with the coupling to provide a soil-tight joint. Installation shall be in accordance with Section 6000 of these Specifications. A manufacturer's certification that the project was manufactured, tested, and supplied in accordance with this specification shall be furnished.

4005 CATCH BASINS, INLETS, AND JUNCTION BOXES.

The methods of excavation and backfilling for catch basins, inlets, and junction boxes shall conform to the requirements of Section 6000 "Excavation, Trenching, and Backfilling" and Standard Details of these Specifications.

Reinforced concrete catch basins and inlets shall conform to the standard concrete inlet drawings and shall be constructed of concrete having a minimum 28-day compressive strength of 4000 psi. Concrete cover over steel reinforcement shall be not less than 1-1/2 inches for covers and 1-1/2 inches for walls and floors. All exposed concrete shall have smooth steel trowel or brushed finish. Interiors of structures shall have the forms removed and surface voids filled.

Foundations for all standard catch basins and inlets shall have a minimum 28-day compressive strength of 3000 psi.

The floors of all catch basins, inlets, and junction boxes shall have inverts. Inverts shall be constructed of concrete conforming to the requirements of Section 2000 "Concrete," with the exception that the concrete shall have a minimum 28-day compressive strength of Class I 3000 psi.

All catch basins, inlets, pipes, and junction boxes shall be thoroughly cleaned of any accumulation of silt, debris or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

4006 REINFORCED CONCRETE BOX CULVERTS.

The work performed herein covers the installation of concrete work in strict accordance with the applicable provisions of Section 2000 "Concrete," Section 6000 "Excavation, Trenching, and Backfilling," Standard Details, all of these Specifications, the current edition of the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation, and the applicable contract drawings.

4007 PAVED DITCHES AND RIPRAP.

Paving concrete for paved ditches shall conform to the applicable provisions of Section 2000 "Concrete" of these Specifications and shall conform to the standard drawings or approved equal.

The concrete shall be placed beginning at the lower end of the portion of the ditch to be lined and progressing toward the upper end. If required on the contract drawings, the concrete shall be reinforced with the type of reinforcement and in the manner indicated. Contraction or construction joints shall be spaced and formed as indicated on the contract drawings.

The surface shall be finished with a wooden float. A light brooming may be required for a more acceptable finish. Immediately after the finishing operations are completed, the concrete shall be protected and cured in conformance with the requirements specified in Section 2000 "Concrete."

Riprap shall be placed at the locations and to the dimensions shown on the contract drawings in accordance with the specified requirements.

Riprap shall be graded as necessary to form a dense blanket. The finished surface shall present an even surface conforming to the lines, grades, and sections given. Riprap shall be placed to a minimum depth of 18 inches.

Riprap shall be placed in such a manner that voids created by larger pieces are filled in by smaller pieces and no voids extend directly through the riprap to the surface below. The riprap shall be placed in rows transversely to the centerline of the ditch and in the manner indicated on the drawings. The riprap shall be placed with ends and sides abutting and the joints between rows breaking with the joints in the preceding row.

Riprap shall consist of durable field or quarry stones. Riprap pieces shall range in weight from 5 pounds to 200 pounds. Not less than 75% shall be within the range of 100 pounds to 200 pounds.

Stone for riprap shall be free from earth, soapstone, shale, shale-like or other easily disintegrated material that will tend to decrease the durability of the material after placement.

When grouted stone riprap is indicated, the spaces between stones of grouted riprap shall be filled with grout consisting of one part Portland cement and three parts of fine aggregate with sufficient water to form a plastic mix. The grout shall be poured and broomed into the spaces until they are completely filled.

All rip rap and grouted rip rap shall be installed with weed guard under the rip rap for weed control.

4008 HEADWALLS, WINGWALLS, ENDWALLS, AND END SECTIONS.

Construction will be according to details in the approved plans. Pre-cast concrete or fabricated metal end sections may be used in place of cast-in-place concrete structures with the City Engineer's approval. Shop drawings will be submitted for pre-cast box culvert pieces.

Materials will be in accordance with Section 2000 "Concrete" and Section 4000 "Storm Sewers" and Standard Details of this Specification. The same type of pipe base metal (steel or aluminum) shall be used throughout any individual run or installation of pipe or for pipe extension, including end sections.

The end sections for pipe culverts shall be installed in accordance with the requirements specified in Section 6000 of these Specifications.

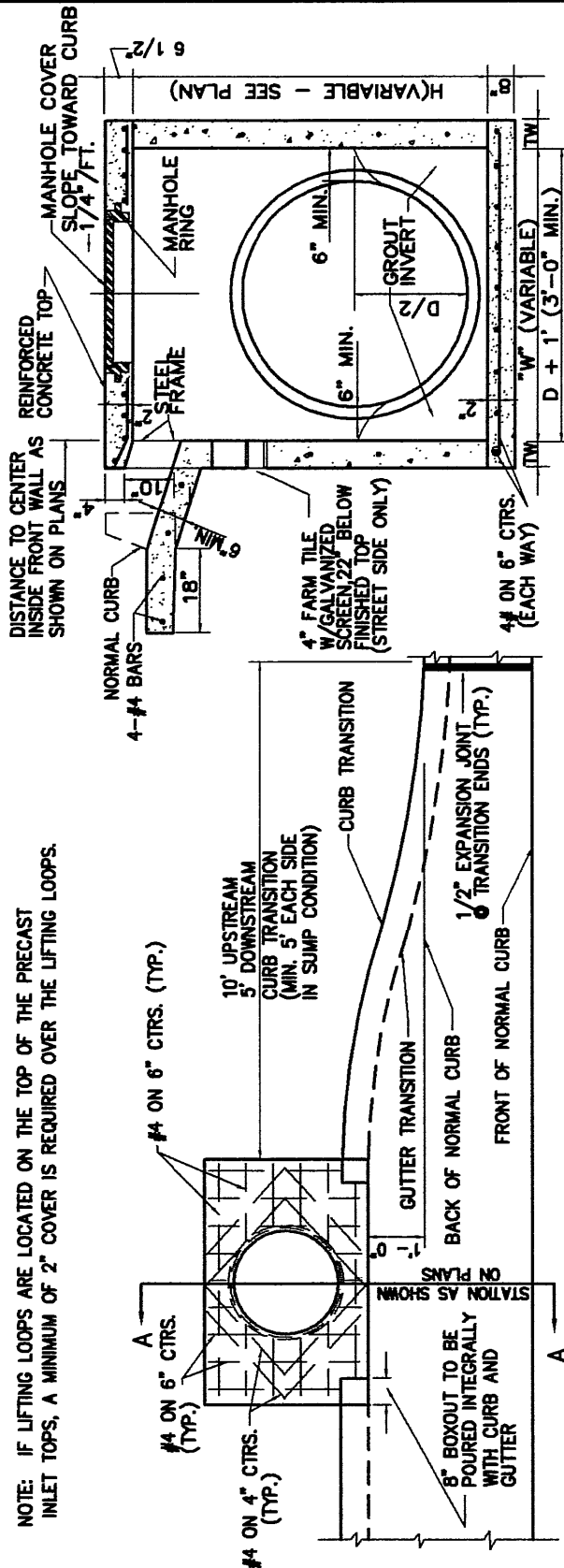
The area excavated for the pipe and headwalls shall be backfilled with suitable material and the material shall be compacted in accordance with the provisions of Section 6000 of these Specifications.

4009 RESTORATION OF SURFACE CONSTRUCTION.

The restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during the progress of the work covered by this section shall conform to the applicable provisions of Section 7000 "Restoration of Surface Construction" of these Specifications.

END OF SECTION

NOTE: IF LIFTING LOOPS ARE LOCATED ON THE TOP OF THE PRECAST INLET TOPS, A MINIMUM OF 2" COVER IS REQUIRED OVER THE LIFTING

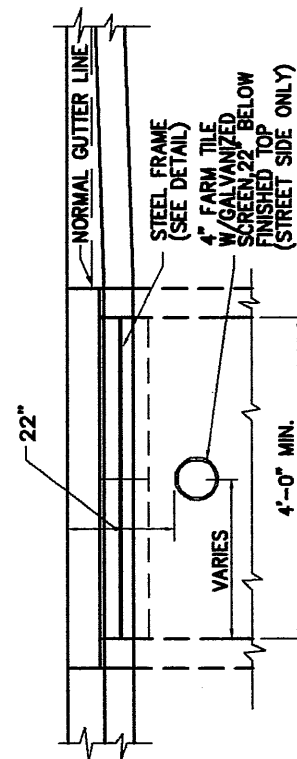


SECTION A-A

PLAN VIEW

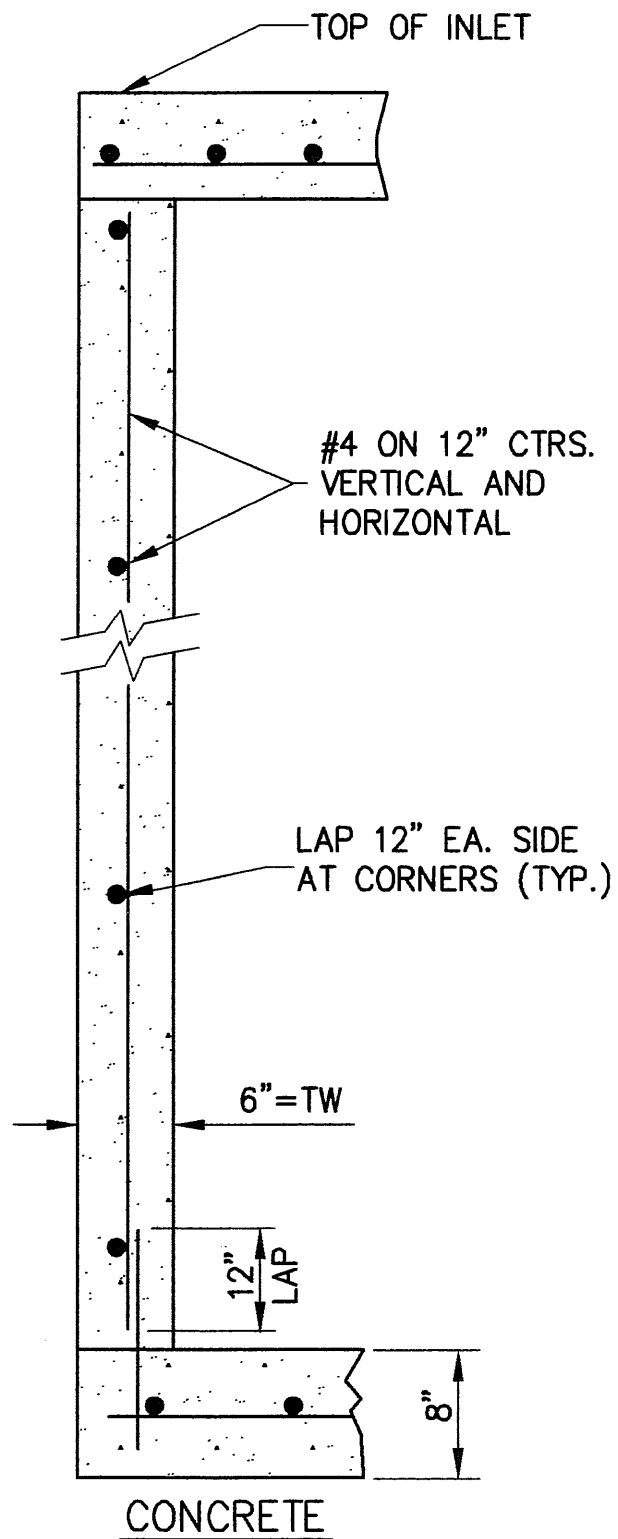
NOTES:

1. CONTRACTOR SHALL PROVIDE STEPS SPACED AT 1'-4" O.C. WHERE INLET OR MANHOLE DEPTH IS GREATER THAN 4'-0". STEPS SHALL BE M.A. INDUSTRIES, INC. MODEL PS-2-PF OR APPROVED EQUAL.
2. USE OF PRECAST CONCRETE REQUIRES CITY ENGINEER'S APPROVAL OF SHOP DRAWINGS
3. MANHOLE RING AND LID SHALL BE CLAY & BAILEY NO. 2020, DEETER 2016 (185 LBS.) OR AN APPROVED EQUAL.
4. SPACER SHALL BE PLACED AT EQUAL INTERVALS ACCORDING TO THE FOLLOWING: L = 4'-0", 2 SPACES; L = 5'-0", 2 SPACES; L = 6'-0", 2 SPACES; L = 7'-0", 2 SPACES; L = 8'-0", 3 SPACES; L=10'-0", 3 SPACES.
5. THE FIRST DIMENSION IN THE PLAN NOTATIONS REFERS TO THE "L" DIMENSION; I.E., TYPE VI DENOTES L=6'-0".
6. THE SECOND DIMENSION IN THE PLAN NOTATIONS REFERS TO THE "W" DIMENSION.
7. "JUNCTION BOX" AS CALLED FOR IN THE PLANS, SHALL BE CONSTRUCTED TO CONFORM, WHERE APPLICABLE, WITH THE DIMENSIONS, THICKNESSES AND DETAILS SHOWN.
8. ALL METAL SURFACES, AFTER BEING CLEANED OF ALL DUST, MILL SCALE AND WELD SCALE SHALL BE COATED UNIFORMLY WITH ONE COAT OF RED EPOXY PRIMER NO. 66-1211 AS MANUFACTURED BY TEMEC CO., INC. THE PRIMER SHALL BE APPLIED TO A DRY FILM THICKNESS OF 4-8 MILS. APPLIED AT THE RATE RECOMMENDED BY THE MANUFACTURER (APPROX. 250 SQ. FT. PER GALLON), OR METAL SURFACES MAY BE ZINC COATED BY THE HOT DIP PROCESS CONFORMING TO ASTM A123-89.
9. CURB CONTRACTOR SHALL HAND FORM AND FINISH GUTTER WITHIN THE INLET THROAT TO THE REAR OF FRONT INLET WALL AT THE TIME THE FINISHING OF NORMAL CURB IS ACCOMPLISHED.
10. USE CLASS I 3000 PSI CONCRETE FOR ALL STANDARD CATCH BASIN AND INLET INVERTS.
11. THE INVERT SHALL HAVE A TROWEL FINISH TO SECURE SMOOTH
12. INVERT SLOPING TO OUTLET PIPE.
13. OUTLET OR INLET PIPE SHALL BE PLACED AS SPECIFIED OR AS DIRECTED BY THE ENGINEER. REINFORCING STEEL SHALL BE BENT AROUND PIPE.
14. USE CLASS II 4000 PSI CONCRETE FOR ALL STANDARD CATCH BASINS AND INLETS.



FRONT ELEVATION

SPRING HILL, KANSAS <u>PUBLIC</u> <u>WORKS</u> <u>DEPARTMENT</u>	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED 	STANDARD CURB INLET	STANDARD DETAIL 40-1
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NOTE: SEE NOTES STANDARD CURB INLET
DETAIL SHEET.

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WORKS
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APPROVED

JWB
CITY ENGINEER

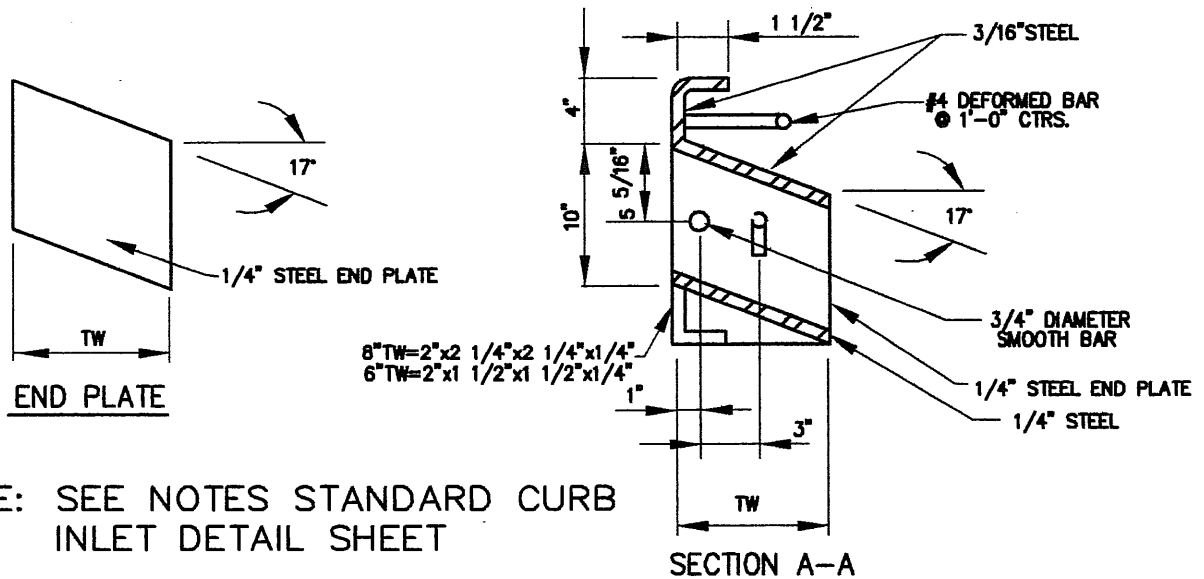
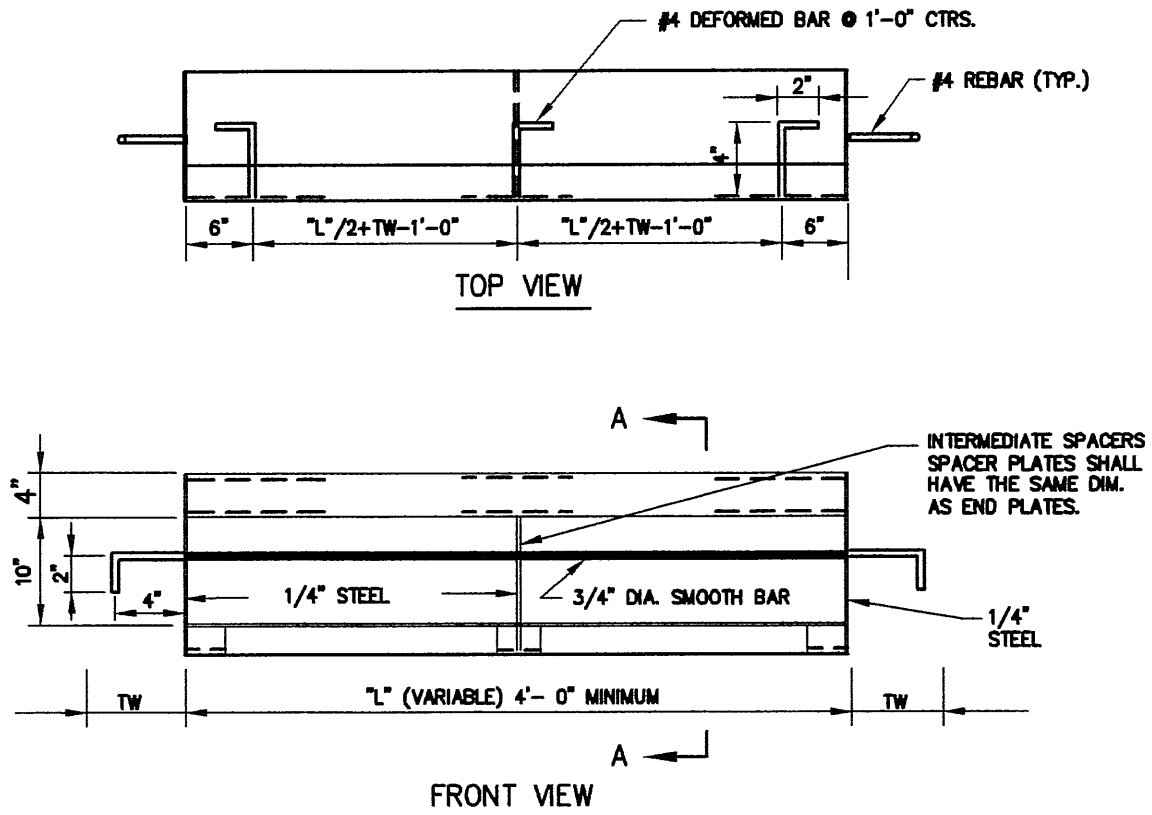
5-8-08
DATE

REVISED

WALL SECTIONS
(CONCRETE
CONSTRUCTION)

STANDARD
DETAIL

40-2



NOTE: SEE NOTES STANDARD CURB
INLET DETAIL SHEET

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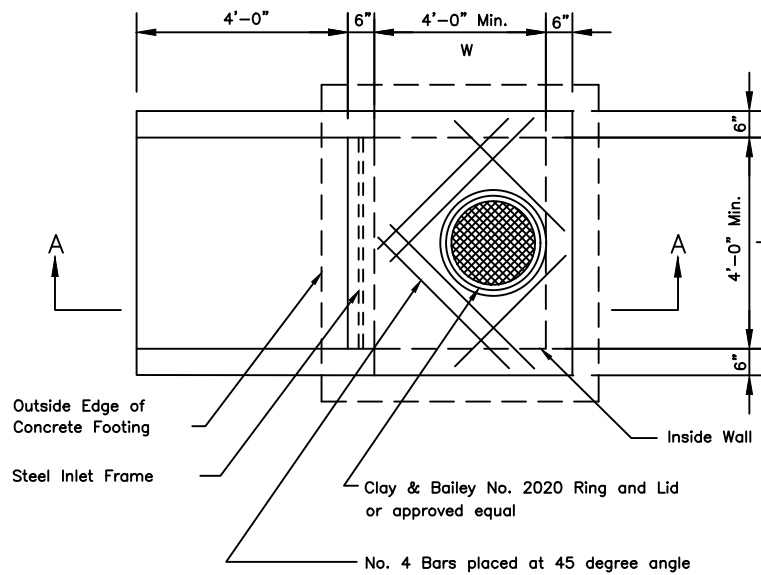
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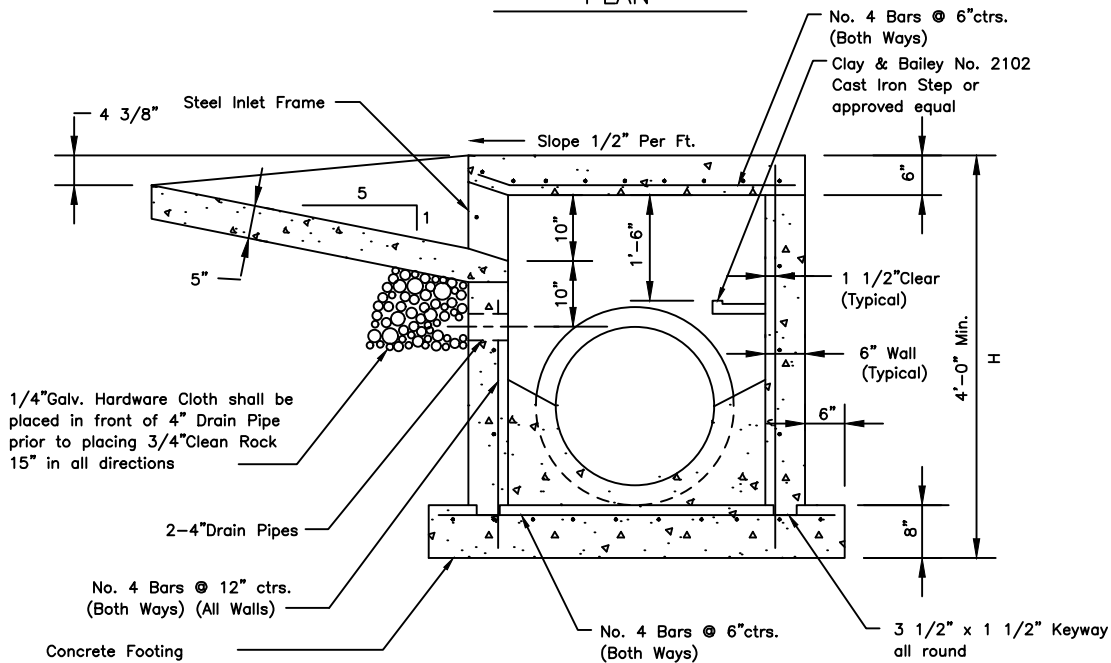
STEEL FRAME
DETAIL

STANDARD
DETAIL

40-3



PLAN



SECTION A-A

NOTES:

1. Use Class "A" Concrete (AE) throughout (4000 PSI).
2. The First Dimension listed in the Construction Notes is the "L" Dimension. The Second Dimension is the "W" Dimension.
3. Floor of Inlet shall be shaped with Non-Reinforced Class "A" Concrete (AE) Invert to provide Smooth Flow
4. Steel Inlet Frame Spacers shall be placed at Equal Spacings not to exceed 4'-0".
5. Cast Iron Steps shall be spaced at 1'-4" O.C. Vertically
6. Bevel all Exposed Edges with 3/4" Triangular Moulding.
7. Walls may either be poured in place or pre-cast.
8. All Crushed Stone used as Aggregate for Concrete Construction shall be obtained from Quarries and Beds designated by the Kansas Department of Transportation as meeting Durability Requirements of Class 1 or Class 6, as shown on file in the office of the City Engineer.

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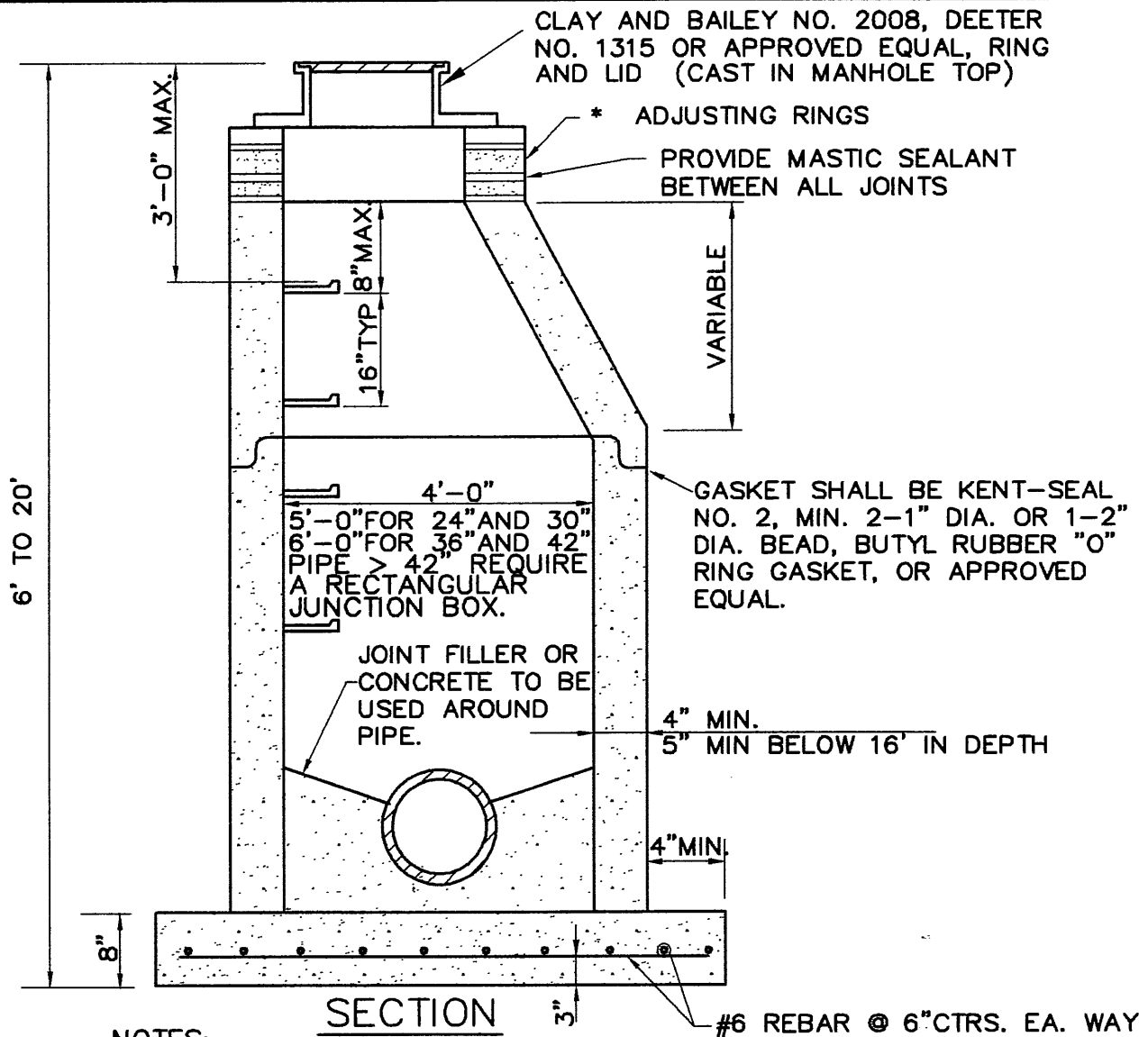
8-23-16
DATE

REVISED

**YARD INLET
DETAIL**

STANDARD
DETAIL

40-4



NOTES:

1. CONTRACTOR SHALL PROVIDE STEPS SPACED AT 1'-4" O.C. WHERE INLET OR MANHOLE DEPTH IS GREATER THAN 4'-0". STEPS SHALL BE M.A. INDUSTRIES, INC. MODEL PS-2-PF OR APPROVED EQUAL.
2. PRECAST CONCRETE MANHOLES SHALL CONFORM TO ASTM C478 EXCEPT AS MODIFIED BY THE SPECIFICATIONS.
3. BASES NOT BUILT MONOLITHIC WITH BOTTOM SECTION SHALL BE POURED OF CLASS I 3000 PSI CONCRETE.
4. MANHOLE MAY BE TRANSITIONED TO 4'-0" DIA., 8' ABOVE F.L. OF OUTFALL FOR 5'-0" AND 6'-0" MANHOLES.
5. THE BOTTOM SECTION OF ALL PRECAST MANHOLES NOT BUILT MONOLITHIC WITH THE BASE SHALL BE SET INTO A STEEL REINFORCED POURED CONCRETE BASE A MINIMUM OF 8". (#4 @ 6" E.W.)
6. THE COMPRESSIVE STRENGTH OF CONCRETE USED IN THE CONSTRUCTION OR PRECAST REINFORCED CONCRETE MANHOLES SHALL NOT BE LESS THAN 4000 PSI.
7. ONLY ECCENTRIC MANHOLE CONES WILL BE ALLOWED UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
- * 8. ADJUSTING RING(S) SHALL PROVIDE A MINIMUM ADJUSTMENT OF 4" AND A MAXIMUM ADJUSTMENT OF 12".

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5-8-08
DATE

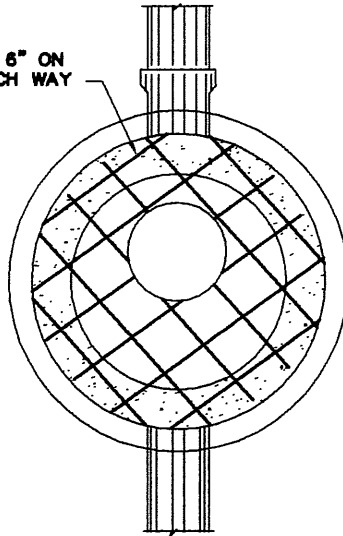
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STANDARD
STORM SEWER
PRECAST
JUNCTION BOX

STANDARD
DETAIL

40-5

#5 BARS AT 6" ON CENTERS EACH WAY



PLAN

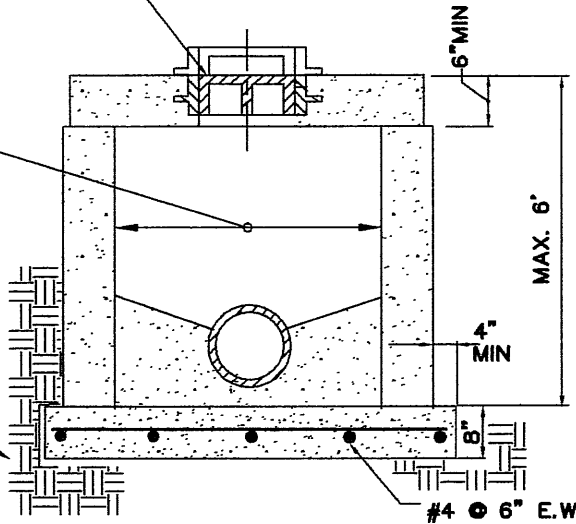
NOTES:

1. IF LIFTING LOOPS ARE LOCATED ON THE TOP OF THE PRECAST INLET TOPS, A MINIMUM OF 2" COVER IS REQUIRED OVER THE LIFTING LOOPS.
2. USE OF A STANDARD LID AND RING WILL BE ALLOWED WHERE GRADE PERMITS. (SEE SPEC. FOR APPROVED TYPES)
3. CONTRACTOR SHALL PROVIDE STEPS SPACED AT 1'-4" O.C. WHERE INLET OR MANHOLE DEPTH IS GREATER THAN 4'-0". STEPS SHALL BE M.A. INDUSTRIES, INC. MODEL PS-2-PF OR APPROVED EQUAL.

CLAY AND BAILEY NO. 2020
DEETER NO. 2016 OR APPROVED
EQUAL. RING AND LID (CAST IN MANHOLE TOP).

DIAMETER SHALL BE
AS REQ. IN STD.
PRECAST MANHOLE.

COMPACTED
EARTH



SECTION

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5-8-08
DATE

REVISED

SHALLOW
JUNCTION BOX
DETAIL

STANDARD
DETAIL

40-6

Top view of a mechanical part. The main body is a square with dimensions 4'-0" by 4'-0". A central rectangular feature, labeled 'G' and 'C', has dimensions 2'-0" by 2'-0". A circular feature on the left is labeled 'A'. The central feature contains a grid of vertical lines. A dashed line indicates the center of the central feature.

B ← PLAN

SECTION A-A

4'-0"

2"

6"

8"

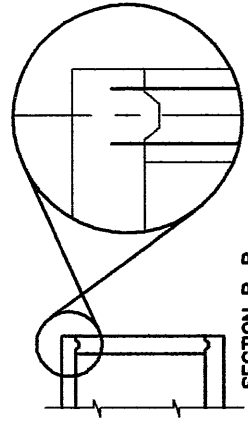
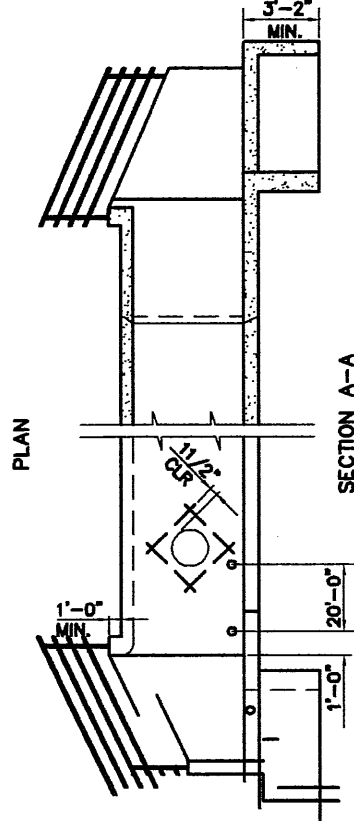
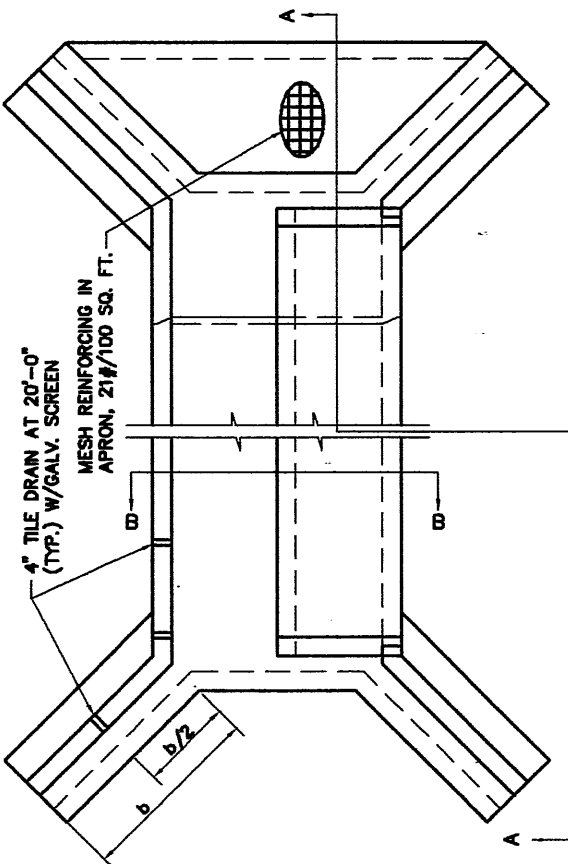
VARIES

GROUT INVERT

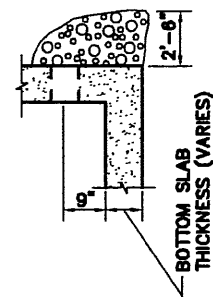
#4 @ 6" CTRS. (EACH WAY)

TW

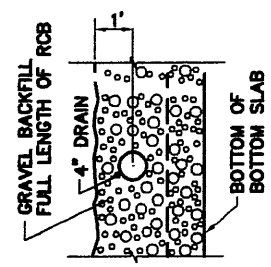
40-7



NOTE: IF TOP AND WALLS ARE MONOLITHICALLY POURED THEN UPPER KEYWAY CAN BE DELETED. REBAR MUST CONTINUE THROUGH KEYWAY AS SHOWN.



DETAIL OF COURSE AGG. AROUND TILE DRAINS



- GENERAL NOTES**
- RCB'S SHALL BE DESIGNED TO CARRY AASHTO HS20 44 LOADING AS OUTLINED IN THE STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, LATEST EDITION.
 - ALL CONCRETE SHALL DEVELOP A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF $F_c = 4000$ PSI.
 - REINFORCING STEEL SHALL BE ASTM A 615 GRADE 60, EXCEPT TIES AND STIRRUPS WHICH SHALL BE GRADE 40.
 - AT ALL HOLES IN CONCRETE WALLS, ADD 4 #5 BARS (OPENING DIMENSION PLUS 60 BAR DIAMETERS LONG) DIAGONALLY TO THE MAIN WALL REINFORCEMENT. SPREAD MAIN REINFORCEMENT AT ALL PENETRATIONS, DO NOT CUT OR ELIMINATE.
 - A SEAL COURSE CONSISTING OF CLASS "A" CONCRETE SHALL BE CONSTRUCTED WHERE SPECIFIED ON THE PLANS OR BY THE CITY ENGINEER. ALL RCB BASE SLABS SHALL BE CONSTRUCTED WHERE SPECIFIED ON THE PLANS OR BY THE CITY ENGINEER. ALL RCB BASE SLABS SHALL BE CONSTRUCTED ON STABLE SUBGRADE.
 - KEYED JOINTS SHALL BE PROVIDED AS SHOWN IN ALL CULVERTS WHERE THE LENGTH IS 40' OR MORE. THESE JOINTS SHALL BE SPACED SO AS TO DIVIDE THE BOX INTO SECTIONS OF EQUAL LENGTH. THE REINFORCING STEEL SHALL BE CARRIED THROUGH EACH KEYED JOINT AND STEEL LAPS SHALL BE 24 TIMES THE BAR DIAMETER OR A MINIMUM OF 12".
 - STANDARD CONCRETE COVER OF BARS UNLESS OTHERWISE NOTED SHALL BE:
WHERE DIRT FORMED.....3"
CONCRETE EXPOSED TO EARTH OR WEATHER #5 BARS AND SMALLER.....1 1/2"
#6 THROUGH #18 BARS.....2"
 - BACKFILLING MAY NOT BEGIN UNTIL THE CONCRETE REACHES A STRENGTH EQUAL TO 75% OF THE DESIGN STRENGTH OR A MINIMUM OF 14 DAYS AFTER POURING THE TOP UNLESS THE DESIGN STRENGTH OF THE CONCRETE (4000 PSI) IS ATTAINED PRIOR TO THE 14 DAY PERIOD.
 - A 48" STEEL HANDRAIL SHALL BE INSTALLED AT EACH END OF ALL RCB'S UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER. STEEL HANDRAILS SHALL EXTEND CONTINUOUSLY ALONG THE HUB GUARD AND DOWN EACH WINGWALL. SEE DETAIL 40-9 FOR HANDRAIL DETAILS.
 - HUB GUARDS SHALL BE DESIGNED TO ACCOMMODATE GRADING WITH A 6:1 MAXIMUM SLOPE BETWEEN BACK OF CURB AND THE HUB GUARD (OR EDGE OF SIDEWALK AND THE HUB GUARD IF APPLICABLE).
 - CONTRACTOR TO SUPPLY AN EXTRA AMOUNT OF REINFORCEMENT, 1% OF THE TOTAL WEIGHT OF THE DESIGNED REINFORCEMENT IN VARIOUS LENGTHS AND SIZED TO BE USED AT THE DISCRETION OF THE CITY ENGINEER.
 - FLOATING APRON SHALL BE REQUIRED AT DOWNSTREAM END OF RCB, UNLESS BOTTOM OF CHANNEL RESTS ON SOUND BEDROCK.
 - TOE WALL TO BE CONSTRUCTED AT EACH END OF RCB. TOE WALL TO 3'-2" MINIMUM BELOW FLOWLINE OF RCB OR 6" INTO BEDROCK IF APPLICABLE.

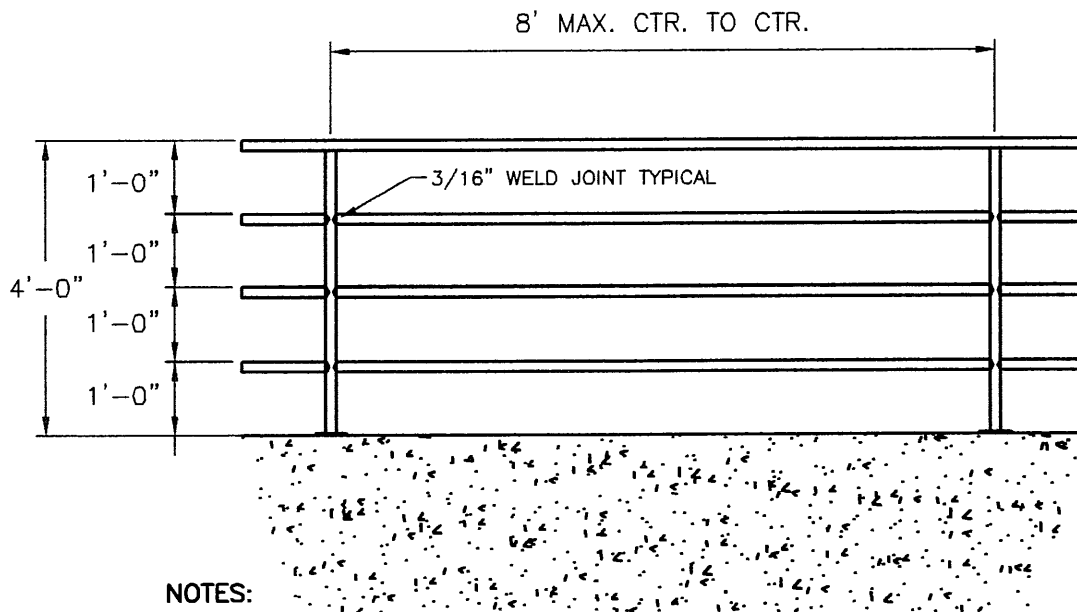
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DEPARTMENT

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JWB
CITY ENGINEER
5-8-08
DATE

REVISED

REINFORCED
CONCRETE BOX

STANDARD
DETAIL
40-8



NOTES:

1. ALL RAILING SHALL BE 2" SQUARE STEEL PIPE.
2. ALL EXPOSED STEEL SHALL BE PRIMED WITH ZINC OXIDE PAINT AND PAINTED WITH TWO COAT OF HIGH GLOSS EXTERIOR BLACK PAINT.
3. SPACING AND LOCATION AS SHOWN ON DETAILS.
4. SPACING OF VERTICAL POSTS SHALL BE EQUAL THROUGHOUT EACH SECTION OF THE HANDRAIL.
5. THE CONTRACTOR SHALL ATTACH THE HANDRAIL TO THE STRUCTURE BY WELDING 4"x6"x1/4" STEEL PLATES TO THE BOTTOM OF THE POSTS. FASTEN PLATES TO THE STRUCTURE WITH FOUR 1/2" DIA. x 4" LONG EPOXY CAPSULE ANCHORS. (EMBED ANCHORS INTO STRUCTURE 2 1/2" MIN.).
6. HANDRAIL SHALL BE PLACED CONTINUOUSLY ALONG THE TOP OF THE HUB GUARD AND WING WALLS AT BOTH ENDS OF THE R.C.B.

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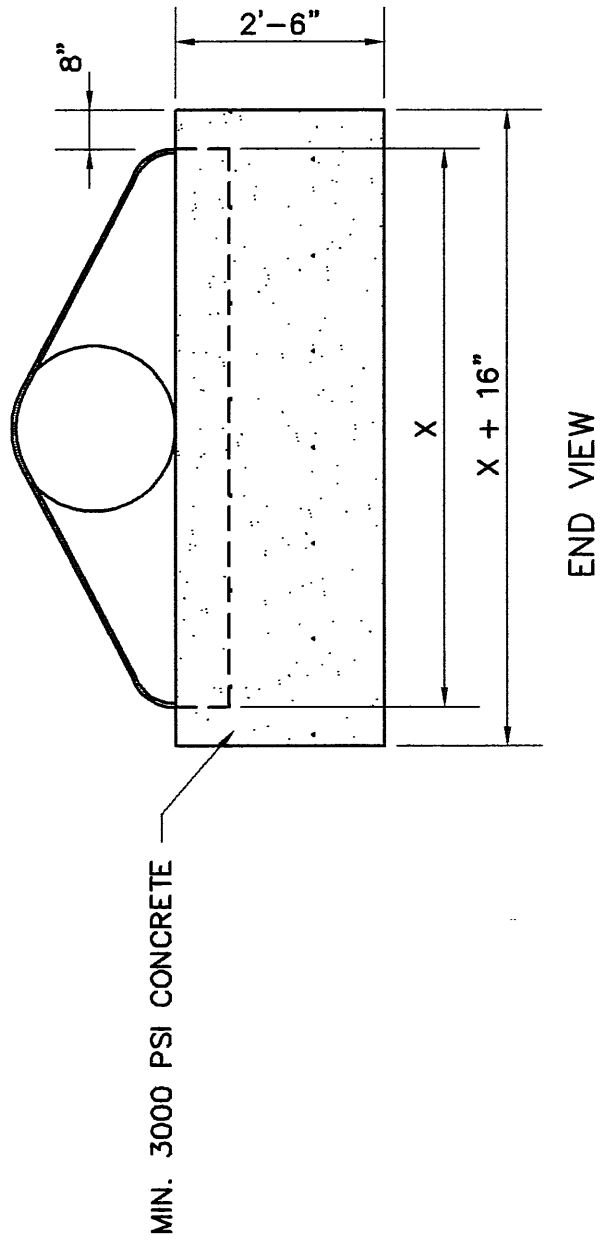
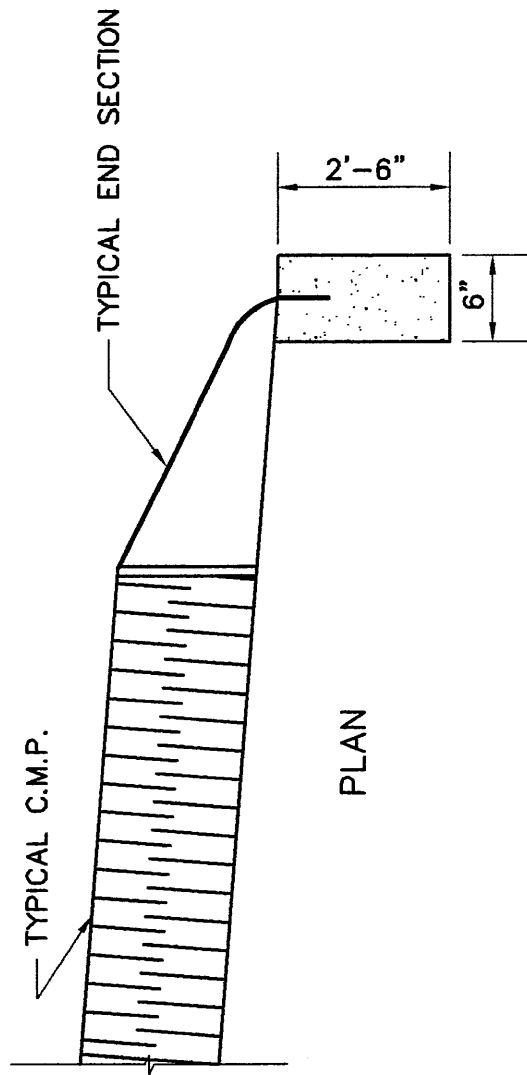
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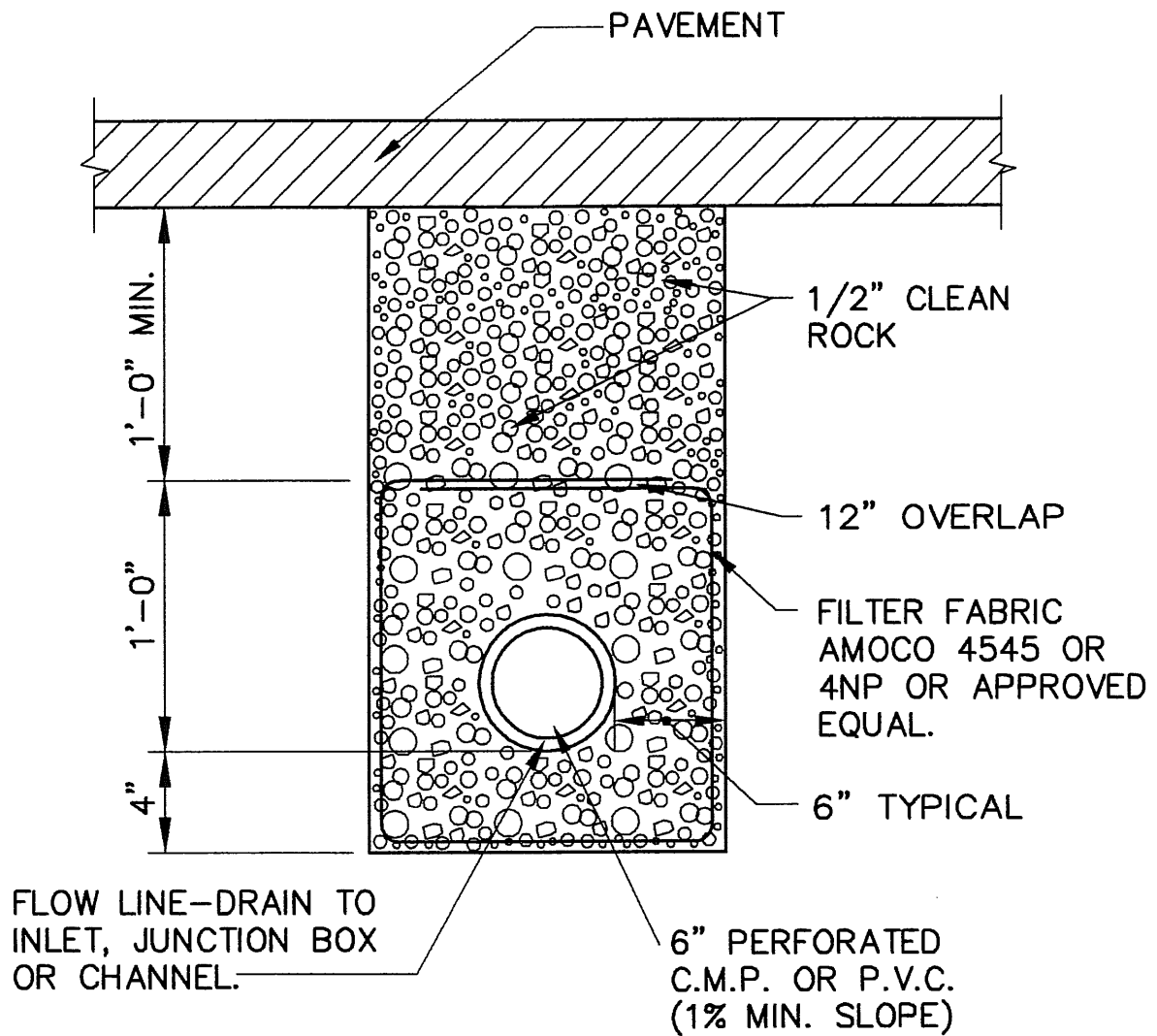
**HANDRAIL
DETAIL**

**STANDARD
DETAIL**

40-9



SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB CITY ENGINEER 5-8-08 DATE	REVISED _____ _____ _____	TYPICAL END SECTION DETAIL	STANDARD DETAIL 40-10
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CITY ENGINEER

5-8-08
DATE

REVISED

**UNDERDRAIN
DETAIL**

**STANDARD
DETAIL**

40-11

SECTION 5000 - WATER LINES

5001 SCOPE.

This section covers all labor and materials for the construction of water lines including all thrust blocks, plugs, valves, pipe encasement, valve boxes, hydrants, connections to existing mains and other appurtenant work.

Unless otherwise noted on the drawings, all water mains shall be AWWA C900, Class 200 (DR 14) or AWWA C905, class 235 (DR 18) PVC pipe.

5002 DUCTILE IRON PIPE.

Unless otherwise shown on the drawings, joints in ductile iron piping shall be mechanical or push-on type. If mechanical joints are used, all T-Bolts shall be stainless steel.

The ductile iron pipe shall conform to ANSI A21.51; ASTM A536, Grade 60-42-10; AWWA C151. The minimum pressure class for ductile iron pipe 6-inch through 12-inch diameter shall be Class 350; 14-inch through 20-inch diameter shall be Class 250; and 24-inch diameter shall be Class 200, unless otherwise directed by the City Engineer.

- A. Polyethylene Encasement for Ductile Iron Pipes. All ductile iron water mains shall be polyethylene encased and shall conform to ASTM A6741
 - 1. Polyethylene Film. Tubular or sheet form without tears, breaks or defects, conforming to the following requirements shall be used to encase the DIP. Linear low-density film manufactured from virgin polyethylene material conforming to ANSI/AWWA C105/A21.5.
 - 2. Polyethylene Tape. Provide 1½-inch wide, plastic-backed, adhesive tape. Acceptable tapes are Fulton No. 355, Polyken No. 900 or Scotchwrap No. 50. Fulton tie Strips are an approved alternative to tape. Duct tape or other tape not specified shall not be used.

Installation shall be as described in detail in ASTM A674.

- 3. Repairs. Repair any cuts, tears, punctures, or damage to polyethylene with adhesive tape or short length of polyethylene sheet or cut open tube,

wrapped around pipe to cover damaged area, and secured in place.

4. Backfill. Prevent damage to film by assuring that backfill material is free from cinders, refuse, boulders, rocks, stones or other material that could damage the film. Follow AWWA C600 for backfilling.
5. Certification. The Contractor shall provide written certification that he has furnished polyethylene material that meets the ANSI/AWWA C105/A21.5 specification and written certification that he has installed this material according to ASTM A674. This certification shall be provided in duplicate to the City Inspector and the City Engineer.

5003 PLASTIC PIPE.

AWWA C900 (4-inch through 12-inch) and AWWA C905 (16-inch) pipe and fittings shall be fabricated from a raw virgin compound meeting the requirements of ASTM D1784: PVC 12454-B, 12454-C, or 12454-D. Gasketed joint pipe shall be fabricated in conformance with Dimension Rating DR14 (AWWA C900) and DR18 (AWWA C905). All pipe shall pass rigid quality control tests from a dimensional standpoint in accordance with the standard dimensions and tolerances for pressure rating.

All joints shall be the boltless, gasketed, slip-on type, meeting ASTM D3139 requirements and NSF approval. The male end of each section of externally-coupled plastic pipe shall be marked with a line around the circumference which can be used to check the depth of socketing after the pipe is coupled. Pipe may be furnished with plain ends, for use with gasketed couplings, or with gasketed bell on one end. Plain ends shall be factory beveled. All joints shall provide for expansion and contraction. Jointing of PVC pipe to CIP or others shall be with factory manufactured slip-on or mechanical joint fittings.

Restrained joints for PVC shall be boltless, gasketed, coupling-type Certainteed C900/RJ, C905/RJ or equal. The joints shall be capable of holding together under the pushing or pulling forces generated by the insertion or removal of the continuous joined length in a casing pipe without causing undue stress on the joint or the pipe itself.

Fittings for buried PVC pipe (4 inches and larger) shall be cast or ductile iron fittings conforming as specified under

iron pipe. They shall be mechanical joint cast or ductile iron fittings with gaskets and stainless steel T-bolts. Fittings for buried PVC pipe less than 4 inches in diameter shall be gasketed PVC, unless otherwise shown. Provide equal to Harco Plastiline type, or as provided by pipe manufacturer (200 psi minimum pressure rating), with compatible tolerances to fit the pipe. PVC couplings for plain end pipe shall be furnished by the pipe manufacturer and shall be manufactured with compatible tolerances to fit the pipe, shall have a minimum pressure rating of 200 psi or the rating of the PVC pipe, whichever is greater, and shall bear the NSF seal of compliance.

Gasketed joint PVC pipe shall be provided with thrust blocking at all fittings in accordance with blocking details.

All PVC pipe shall be provided with a locator tone wire made from insulated copper. Insulation shall be blue color, type TW or better and a minimum wire size of #12 stranded AWG. All splices are to be made with a 3M splice kit or approved kit.

Locator tone wires shall be accessible to utility line locating equipment at all valve box locations. The 12 gauge stranded Type TW copper tracer wire shall be attached to the outside of the valve box and shall surface at every valve. The PVC valve box riser shall have a $\frac{1}{4}$ " slot from the top to just below the top hat and 18 inches of tracer wire left inside the PVC riser. Wires shall not be brought up inside the PVC riser valve box.

5004 GATE VALVES.

The type, size, and location of valves shall be as indicated on the plans. Except as modified or provided herein, all gate valves in ductile iron water mains shall be 200 psi, resilient seated valves of the waterworks type. All gate valves shall have ductile iron bodies and buried valves shall have non-rising stems with O-ring stem seals. Buried valves shall not be installed with the stem vertical unless the bonnet will be below the frost line. Valves used for potable water service shall have a working pressure rating for 250 psi. Valves installed inside a structure shall be of the rising stem type.

Resilient-seated gate valves shall conform to all applicable requirements of AWWA A509 and shall be American 80 "CRS", Mueller A2370-20, or Kennedy "Ken-Seal" or Mullen "Waterous" series NRS.

Valve ends shall be of the mechanical joint type conforming to ANSI A21.10 except where flanged ends are required by the drawings and specifications. The end flanges of flanged gate valves shall be compatible with the connecting pipe as required by ANSI/AWWA 500.

All valves shall be provided with manual operators equipped with a wrench type square operating nut conforming to the requirements of AWWA C509.

The direction of rotation of the wrench nut to open the valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

All exposed T-bolts below grade shall be 304 stainless steel with Teflon coated nuts. As an alternative the T-bolt and nuts can be low alloy corrosion resistant high strength steel (Core-Ten) in accordance with ANSI/AWWA C153/A21.53.

The manufacturer shall provide written certification that the valve meets the requirements of the City's Technical Specifications. The certification shall be shipped with the valve(s) to the job site and the contractor shall provide the certification for viewing by the City Inspector.

5005 BUTTERFLY VALVES.

Butterfly valves shall be of the rubber-seat, tight-closing type. Valve discs shall seat at 90° with the pipe axis. Flanged end valves shall be of the short-body type. For buried service, shaft shall be O-ring type.

All butterfly valves and operators shall conform to AWWA C504. Metal mating seat surfaces shall be 18-8 stainless steel or nickel copper alloy. Each valve shall be provided with an operator with a torque rating at least equal to the torques listed in AWWA C504, Table 1.

Butterfly valve shall be Kennedy 50C, American C-150B, Mueller "Line Seal III" or approved equal.

All exposed T-bolts below grade shall be 304 stainless steel with Teflon coated nuts. As an alternative the T-bolts and nut can be low alloy corrosion resistant high strength steel (Core-Ten) in accordance with ANSI/AWWA C153/A21.53.

The manufacturer shall provide written certification that the valve meets the requirements of the City's Technical Specifications. The certification shall be shipped with the valve(s) to the job site and the contractor shall provide the certification for viewing by the City Inspector.

5006 TAPPING SLEEVES AND VALVES.

Tapping sleeves and valves shall be furnished and installed where required by the drawings. The valves shall be 200 psi, resilient-seated, cast or ductile iron body, non-rising stem gate valves conforming to all applicable requirements of AWWA C509 and shall be Mueller "No. A-2307-16" or an approved equal. Each tapping valve shall be provided with a flanged inlet end designed, faced, and drilled for connection to the outlet end of the tapping sleeve. The outlet end of the tapping valve shall be provided with a tapping flange for attachment of a standard drilling machine and also with a mechanical joint-type bell end for connection of the branch main. The tapping sleeve must have a pipe tap connection for hydrostatic pressure testing (water pressure only). The tapping sleeve and valve will be tested in place with water prior to making the actual tap in the water main. Test pressure must not exceed the rated working pressure of the pipe (150 psi on 16-inch, 200 psi on sizes 4-inch through 12-inch). No leaks will be permitted. The hydrostatic pressure test shall be conducted for one (1) hour in duration and a city representative shall be on site to witness the test.

Tapping sleeves shall be of the flanged-outlet type designed for attachment to the flanged inlet end of the tapping valve, and shall be provided with mechanical joint ends at each end of the run and shall be Mueller "No. H-615" for ductile iron pipe, Mueller "No. H-619" or PowerSeal Model 3490 for asbestos-cement pipe, PowerSeal Model 3490 for sandcast iron pipe, JCM model heavy duty stainless steel, with full neoprene gasket or approved equals.

5007 VALVE COATINGS.

All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop-painted with epoxy coating that meets or exceeds all applicable requirements of ANSI/AWWA C550 standard and said coating shall be certified by ANSI/NSF61.

5008 AIR RELEASE AND VACUUM RELIEF VALVES.

Combination air release and vacuum relief valve assemblies shall be installed in the locations indicated on the drawings. Each valve assembly shall be installed complete with appurtenant piping and valves as specified or shown.

Combination air release and vacuum relief valves shall be of the integral type with a valve assembly which functions as both an air and vacuum valve and an air release valve.

Relief valves shall be sized for each situation and shall have a minimum 2-inch inlet connection.

The valves shall be designed for a water working pressure of 150 psi, shall have stainless steel floats, and all working parts shall be brass, stainless steel, or other non-corroding materials. Valves shall be as manufactured by Valmatic, APCO or ARI.

Isolation valves shall be provided in the piping to each combination air release and vacuum relief valve assembly. Isolation valves shall be 2-inch solid wedge gate valves. The 2-inch vent shall be provided with #24 mesh, non-corrodible screen on the end. A pre-cast concrete vault will be positioned at air release location conforming to Standard Detail 50-3.

5009 EXTENSION STEMS.

Extension stems and stem guides shall be provided where shown, specified, or required for proper operation. Extension stems shall be fabricated from solid steel shafting not smaller in diameter than the stem of the valve or from galvanized steel piping having an ID not smaller than the OD of the valve stem. Extension stems shall be connected to the valve by a flexible, socket-type coupling. All connections shall be pinned, keyed, or socket type. Pipe couplings will not be acceptable.

Extension stems shall be provided for buried valves when the operating nut is more than 3 feet below finished grade. Each extension stem for a buried valve shall extend to within 3 feet of the ground surface, shall be provided with spacers, which will center the stem in the valve box, and shall be equipped with a wrench nut.

5010 VALVE BOXES.

All buried valves shall be provided with valve boxes. Valve boxes shall be of Class 200 PVC with a CI top hat and lid, suitable for the depth of cover required by the drawings and as shown on Standard Detail 50-1. The valve box must fit securely on and around the valve bonnet. Covers shall have cast thereon the word "Water."

Valves and valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box. 12 gauge stranded Type TW copper tracer wire shall be attached to the outside of the valve box and shall

surface at every valve. The PVC shall have a ¼" slot from the top to just below the top hat and 18 inches of tracer wire left inside the PVC. Where two or more valves surface at the same location, they will be backfilled with CA5 if within 5 feet of curb or edge of pavement. Fill with 1/2-inch clean rock if more than 5 feet behind curb or edge of pavement.

5011 FIRE HYDRANTS.

Fire hydrants shall be Mueller Model A-423 5¼-inch, Kennedy Model K-81D 5¼-inch or American Darling B-84-B 5¼"-inch or approved equal, and shall be furnished with a 6-inch auxiliary gate valve. The fire hydrants shall be pressure rated at 150 psi working pressure and 300 psi test pressure. Hydrants shall be traffic model with breakaway flange or coupling. Fire hydrants shall conform to AWWA C502 with information required by Section 2 as follows:

Type of Shutoff	Compression
Size of Hydrant	5 ¼ inches
Inlet Connection	6 inches
Outlet Nozzles	Two (2) 2½-inch hose and One (1) 4½-inch pumper
Outlet Nozzle Threads	ANSI B-26
Direction to Open	Counterclockwise
Stem Seals	O-Ring
Outlet Nozzle Cap Chains	Required
Drain Outlet	Required
Finish Paint	Factory painted above the ground line with red enameled paint. Exterior of hydrant below the bury line shall be coated with asphalt varnish.
Weather Cap on Operating Nut	Required

Hydrants shall be restrained joint, furnished with all joint glands, gaskets, bolts, and nuts required for installation. Hydrants shall be set so that at least the minimum pipe cover is provided for the branch supply line. Each hydrant shall be set on a concrete foundation at least 18 inches square and 6 inches thick. Each hydrant shall be suitably anchored. All exposed T-bolts below grade shall be 304 stainless steel with Teflon coated nuts. As an alternative

the T-bolt and nuts can be low alloy corrosion resistant high strength steel (Core-Ten) in accordance with ANSI/AWWA C153/A21.53.

Hydrant drainage shall be provided by installing around the hydrant, and below the top of the hydrant supply pipe, at least 1/2-cubic yard of 3/4-inch rock.

Fire hydrant installations shall conform to Standard Detail 50-2. All hydrants shall stand plumb. The exact direction the nozzles will be facing shall be determined by the City Engineer.

The hydrant barrel and shoe shall be secured by means of stainless steel nuts and bolts. All exposed nuts and bolts below the ground level shall be stainless steel. The lower seat shall be threaded into a bronze insert, which is threaded into a shoe to form a bronze-to-bronze assembly. Cross arm shall be all bronze.

Immediately before installation of a hydrant, the following operations shall be performed: (a) the hydrant shall be thoroughly inspected; (b) the hydrant interior shall be thoroughly cleaned; (c) the hydrant shall be opened and closed as many times as may be necessary to determine if all parts are in proper working order, with valves seating properly and the drain valve operating freely; and (d) the packing gland checked to determine if the packing is in place and the gland nut properly tightened; (e) all bolts that secure sections of the fire hydrant together shall be checked and any loose bolts tightened before the fire hydrant is installed and the excavation site is backfilled.

5012 CORPORATION COCKS.

One-inch corporation cocks shall be furnished by the contractor for installation along the pipelines where necessary to vent the lines during filling. The number and location of the corporation cocks shall be as determined by the contractor. After testing and disinfection of the lines, the corporation cocks shall be removed and a suitable plug installed in each opening.

5013 FLUSHING ASSEMBLIES.

Flushing assemblies shall be provided at the locations shown on the drawings. Each installation shall be complete with all piping, the gate valve, valve box, covers and lids as required, and shall conform to Standard Detail 50-3 or Standard Detail 50-3A for end of cul-de-sac flushing assemblies.

5014 MECHANICAL JOINT PIPE AND FITTINGS.

Gray iron mechanical joint fittings shall conform to ANSI A21.10, 250 psi pressure rating. Ductile iron mechanical joint fittings shall conform to ANSI A21.10, 350 psi pressure rating, ASTM A536, Grade 80-60-03 or 70-50-05. Pipe sockets, socket flanges, packing glands, gaskets, and bolts shall conform to ANSI 21.11. All T-bolts shall be 304 stainless steel with Teflon coated nuts. As an alternative the T-bolts and nuts can be low alloy corrosion resistant high strength steel (Cor-Ten) in accordance with ANSI/AWWA C153/A21.53.

The mechanical joint shall be used only where shown on drawings or called for in the specifications. The rubber gasket and packing gland shall, after proper joint cleaning, be in position on the spigot before shoving the pipe to its final position. It is important that the entering spigot is centered in and that the gland or follower ring is parallel to the face of the connection bell. At joints where angular deflections are required, the gasket should be shoved home and the gland properly positioned with respect to the connecting bell with the connection pipes being in as nearly perfect alignment as practicable. The bolts shall be slightly and uniformly tightened as specified hereinafter.

Immediately prior to connecting any two mechanical joint piping units, the gasket shall be coated with odorless, tasteless and non-toxic gasket lubricant and all surfaces of the bell, spigot and gland which will come in contact with the gasket at any time during assembly shall be wire brushed, wiped clean, coated with odorless, tasteless and non-toxic gasket lubricant and the gland and gasket slipped over the spigot end of the pipe. The spigot shall then be inserted to the full depth of the socket and then retracted (a) 1/8-inch in straight runs, or (b) one-half of the amount of the calculated joint opening in the plane of deflection (assuming that the pipe is shoved home and the amount of the retraction assured with the two connecting pipes in alignment).

The gasket shall then be carefully pushed into position and evenly seated in the bell. The gland shall be shoved into place against the gasket, the bolts inserted and the nuts tightened with the fingers until snug. Final tightening of the bolts shall be done with a ratchet torque wrench.

It is essential that the gland be brought toward the pipe flange (bell face) evenly, maintaining approximately the same distance between the gland and the face of the bell at all points around its circumference. This may be done by partially tightening the bottom bolt, then the top bolt,

next the bolts on either side, and finally the remaining bolts, alternately tightening bolts 180° apart. This cycle is then to be repeated until all bolts are tightened to a torque for:

5/8" bolts	40 to 60 foot pounds
3/4" bolts	60 to 90 foot pounds

If effective sealing is not obtained at the maximum torque specified for the size of bolt used, the joint shall be disassembled, thoroughly cleaned and reassembled. Over-stressing of bolts to compensate for poor installation practice will not be permitted.

5015 PUSH-ON JOINT PIPE AND FITTINGS.

Push-on joints shall be ductile iron in accordance with ANSI/AWWA C153/A21.53, 250 psi pressure rating. Gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.

In the case of the push-on joint, the gasket seat in the bell shall be wiped clean with a cloth after which the gasket should be sprung into place. Thereafter a thick film of lubricant should be applied to the entire inner surface of the gasket that will come into contact with the entering pipe.

The lubricant and the gaskets shall be as recommended and supplied by the manufacturer of the pipe being used. The lubricant shall be odorless, tasteless, and shall be non-toxic.

The plain end of the pipe shall be wiped clean and a thin film of lubricant shall be applied to the outside of the plain end of the pipe and its beveled edge. The plain end of the pipe should then be placed in approximate alignment with the bell of the pipe to which it is to be joined. The joint can be made up with the entering pipe deflected at an angle, but this angle should not exceed the recommended maximum of the manufacturer. The plain end of the pipe should then be lifted and started into the socket so that it is in contact with the gasket.

The joint is made up by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket (which is thereby compressed) until it makes contact with the base of the socket of the bell. This force can be applied by means of a jack-type tool or backhoe.

Field cut pipe, in the case of the push-on joint, shall be bevel-filed to remove any sharp or rough edges that might otherwise injure the gasket.

5016 FLANGED JOINTS.

Flanges shall conform to ANSI B16.1, 125 pound or U.S. Pipe "Flange-Tyte." Bolts shall be Grade 8, ASTM A307, chamfered or rounded ends projecting 1/4- to 1/2-inch beyond the outer face of the nut, which shall be ASTM A307, hexagonal, ANSI B18.2, heavy semi-finished pattern. Gaskets shall conform to ASTM D1330, Grade I, red rubber, ring type, 1/8-inch thick or U.S. Pipe "Flange-Tyte", 1/8-inch thick.

The pipe end and flange face shall be machine-finished in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

When bolting flanged joints, care shall be taken to ensure that there is no restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bell and spigot joints shall not be packed or assembled until all flanged joints affected thereby have been tightened. Bolts shall be tightened gradually and at a uniform rate, so that gasket compression is uniform.

5017 RESTRAINED JOINTS.

Restrained joints for pipe larger than 12 inches shall be American "Lockfast", U.S. Pipe "Lok-Tyte", or Clow "Super-Lock". Restrained joints for pipe 12 inches and smaller shall be American "Lock-Fastite" (ductile iron pipe), U.S. Pipe "Loc-Tyton", or Clow "Super-Lok".

Restrained joint pipe shall be used where shown on the drawings and shall be installed in accordance with the recommendations of the pipe manufacturer. Each restrained joint shall be capable of resisting the thrust of the pressures to be applied.

5018 SHOP COATING AND LINING.

The interior surfaces of all pipe, regardless of length or type of joint, and the interior surfaces of all 14-inch or larger fittings shall be lined with cement conforming to ANSI A21.4. Flange faces shall be shop-coated with Rust-Oleum "R-9" or Houghton "Rust Veto 344" rust preventative compound. All other surfaces of pipe and fittings shall be coated with a bituminous coating.

5019 HANDLING.

Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition.

Equipment, tools, and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that the pipe, pipe coating, and fittings are not damaged. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

The final decision regarding the integrity of the cement lining shall reside with the City Engineer's field inspector.

Pipe and fittings in which the cement lining has been broken or loosened shall be replaced by and at the expense of the contractor. Where the damaged areas are small and readily accessible, the contractor may be permitted to repair the lining.

All pipe coating, which has been damaged, shall be repaired by the contractor before installing the pipe.

5020 CUTTING PIPE.

Cutting shall be done in a neat manner, without damage to the pipe or to the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.

5021 CLEANING.

The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.

5022 INSPECTION.

Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective pipe and fittings shall be removed from the site of the work.

5023 ALIGNMENT.

Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the quantities stipulated in Table 1 or Table 2 of AWWA C600.

Either shorter pipe sections or fittings shall be installed where the alignment or grade requires them.

5024 THRUST BLOCKING.

The contractor shall furnish and construct complete in place in accordance with Standard Detail 50-4 the thrust blocks as indicated on the contract drawings. The minimum 28-day compressive strength of concrete used for thrust blocking shall be 3000 psi.

Concrete blocking shall extend from the fitting to solid undisturbed earth and shall be installed so that all joints are accessible for repair. If adequate support against undisturbed ground cannot be obtained, metal harness anchorages, consisting of steel rods across the joint and securely anchored to pipe and fitting or other adequate anchorage facilities, shall be installed to provide the necessary support.

The additional cost of furnishing and installing metal harness anchorages will not be allowed as an increase in contract price where reaction blocking, anchorages or other supports for fittings are installed in fills or other unstable ground or where there is a lack of suitable solid vertical excavation.

5025 DEAD END LINES.

At the termination of all water mains or at locations indicated on the drawings, the contractor shall furnish and construct complete, in accordance with Standard Detail 50-5, the fittings and valves necessary to allow for future water main extensions. Flushing assemblies as described in Section 5012 shall be furnished and installed at locations as required to allow for complete flushing of all water mains within the project area.

5026 CONNECTIONS TO EXISTING WATER MAINS.

The contractor shall furnish and install all of the fittings necessary for connections between new water mains and existing water mains. The fittings shall be as indicated on the plans unless otherwise authorized by the City Engineer.

When the fittings consist of tapping sleeves and valves, the contractor shall perform the actual tapping operation of the

mains under the direction of the Public Works Department. (The Public Works Department will not perform any tapping operations of the water mains unless specified otherwise in the construction drawings).

No connections to existing mains shall be started without prior approval of the Public Works Department, and each connection with an existing main shall be made at a time and under conditions which will least interfere with service to customers affected thereby.

In all cases where it is necessary to take an existing main or service line out of service in order to accomplish the work to be performed, the contractor shall notify the Public Works Department at least 24 hours in advance as to the approximate length of time the main or service line will be out of service. The contractor shall also be responsible for notifying all customers to be affected by loss or interruption of service by means of printed information sheets 24 hours in advance of taking the main or service line out of operation.

When the closing of a valve to make the connections affects a customer who cannot be without service, the contractor shall arrange to supply a temporary service and schedule the time that is most convenient to the customer for making the connection to the existing mains.

Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatered lines and excavations without damage to adjacent property.

Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing pipe. No trench water, mud, or other contaminating substances shall be permitted to get into the lines.

It shall be the responsibility of the contractor to make any and all excavations and backfill as required and furnish all labor, equipment, and material necessary to complete the connection as detailed on the plans.

5027 SEWER LINE CROSSINGS.

When potable water pipes and gravity sanitary sewers are laid parallel to each other, the horizontal distance between them shall be not less than 10 feet. The distance shall be measured from edge of pipe to edge of pipe. The laying of water and sewer pipes shall be in separate trenches with undisturbed earth between them. In cases where it is not practical to maintain a 10-foot separation, the City, in conjunction with KDHE, will consider proposals providing

equivalent protection by other methods on a case-by-case basis. Equivalent protection may require sanitary sewer construction with concrete encasement, vacuum sewer or jointless pipe such as HDPE or cured in place liner.

When a water pipe and a sanitary sewer cross, and the sewer is 2 feet or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossings, the sewer is to be constructed of one of the following materials and pressure tested to assure water tightness pursuant to the most recent revision of KDHE's Minimum Standards for Design of Water Pollution Control Facilities.

- A. Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.51 with minimum thickness Class 50, and gasketed, push-on or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.
- B. PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR35, ASTM F679, ASTM F789, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212.
- C. Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

Joints in the sewer pipe shall be located as far as practical from the intersected water main.

Where a new water main is laid across or through an area where there is an existing sanitary sewer, which is not constructed of one of the above specified materials and is 2 feet or less below the water pipe, the existing sewer shall be encased in concrete with a minimum thickness of 6" for a 10-foot distance on each side of the crossing or the crossed section of sewer replaced to meet the above specified construction requirements. The above requirements shall also apply where a water main must cross under an existing sanitary sewer. The City in conjunction with KDHE will consider proposals providing equivalent protection by other means on a case-by-case basis, if supported by data from the design engineer.

When a water main and a sanitary sewer must cross, it is preferred that the water main cross over the sanitary sewer, regardless of whether the sanitary sewer is new or existing.

Special provisions may be required to ensure adequate structural support for, and to maintain minimum pipe-to-pipe clearances between, a water main and a sanitary sewer at a water main and sanitary sewer crossing.

Other situations relative to the proximity of water and sewer lines should be taken case by case and brought to the attention of the City Engineer, Johnson County Environmental Department and KDHE for design guidance, for example, where a new water line is to be installed near an existing septic system absorption field.

5028 SEWER CONNECTIONS

There are to be no physical connections between any parts of a potable water system and building sewers, sanitary sewers, or wastewater treatment facilities by means of which it would be possible for sewage, even under exceptional circumstances, to reach a well, storage reservoir or distribution system.

5029 PRESSURE SEWER LINES

When pressure sewer lines (force mains) run parallel to water lines, the separation distance shall be as far as practical, maintaining a minimum horizontal separation distance of at least 10 feet. There shall be at least a 2 foot vertical separation at crossings with the water main always crossing above the sewer force main. Where it is not practical to maintain the required horizontal or vertical separation distance between a water line and a sanitary sewer force main, the City in conjunction with KDHE will consider proposals providing equivalent protection by other methods on a case-by-case basis, if supported by data from the design engineer.

5030 SEWER MANHOLES

No water pipe shall pass through or come in contact with any part of a sewer manhole. Required horizontal separation distances between water mains and manholes are equivalent to those for water mains and gravity sanitary sewers.

5031 STORM SEWERS

The separation distance between a storm sewer (which is not a combined storm/sanitary sewer) and a water main should be based on geotechnical considerations. Required separation distances between water mains and combined storm/sanitary sewers are equivalent to those for water mains and gravity sanitary sewers.

5032 DRAINS

Underground drains from fire hydrants, pits or underground structures in general (valve pits, meter pits, underground pump stations, etc.) shall not be directly connected to sanitary or storm drains.

5033 SEPARATION OF WATER MAINS AND OTHER POLLUTION SOURCES

It is of the utmost importance that potable water lines be protected from any source of pollution. The following shall pertain to instances where septic tanks, absorption fields, waste stabilization ponds, feedlots or other sources of pollution are encountered.

- A. A minimum distance of 25 feet shall be maintained between all potable water lines and all pollution sources, e.g., septic tanks, septic tank absorption fields, waste stabilization ponds, sewage contamination, wastewater, landfill leachate and all CAFO facilities.
- B. Under no circumstances shall a water line be extended through an area that is a real or potential source of contamination to the water line or water supply.
- C. Under no circumstances shall the encasement of a water line be considered as adequate protection of a water line or a water supply for the purposes of extending the water line through a real or potential source on contamination.

5034 CROSS CONNECTIONS

There shall be no physical connection between the PWSS and any pipes, pumps, hydrants, tanks or non-potable water supplies whereby unsafe water or other contaminating materials may be discharged or drawn into the system. KDHE approval shall be obtained for interconnections between potable water supplies.

5035 SURFACE WATER CROSSINGS

For above water crossings, the waterline shall be adequately supported, protected from damage and freezing and accessible for repair or replacement.

For underground crossings on navigable streams, underground waterlines shall be buried at a minimum depth of 7 feet beneath the streambed, whereas, on all other streams, underground waterlines shall be buried at a minimum depth of 5 feet beneath the streambed.

When crossing water courses which are greater than 15 feet in width, the waterline should be of special construction, having flexible, restrained or welded watertight joints. Valves should be provided at both ends of the water crossing so that the section can be isolated for testing and repair; the valves should be easily accessible, and not subject to flooding. Permanent taps or other provisions to allow

operators to determine leakage and obtain water samples should be made.

5036 RAILROAD CROSSING AND MAINS NEAR TRACKS

Where a waterline crosses under railroad tracks, all joints lying within 10 feet of the rails shall be either mechanical joints with rubber gaskets or pipe with bell joints. Also, local requirements should be investigated. Some railroads require that the waterline be enclosed in a culvert, tunnel or conduit to reduce the effects of vibration, to provide drainage in case of leakage or rupture of the pipe, or reduce damage to the track and to facilitate repairs.

5037 MECHANICAL ENCASEMENT

Where a waterline must be sleeved within a pipe in order to protect the waterline, such as at road, railroad or pipe way crossings, the waterline must be sleeved with seamless, jointless pipe of equal or greater mechanical strength for distance of at least 10 feet beyond the crossing in both directions, kept separate from the sleeve pipe with plastic spacers or wooden skids, and the annular spaces formed at the ends of the carrier/sleeve pipes must be made watertight with flexible boot type end seals.

5038 ROCK EXCAVATION.

Where rock is encountered, either dug or shot, the pipe shall be bedded with a minimum of 6 inches of granular material, as indicated on Standard Detail 60-1, between the pipe and trench bottom. Granular embedment shall be used at locations directed by the City Engineer and shall be considered a subsidiary obligation unless specifically provided for as a bid item in the proposal.

5039 RESTORATION OF SURFACE CONSTRUCTION.

The restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during the progress of the work covered by this section shall conform to the applicable provisions of Section 7000 "Restoration of Surface Construction" of these Specifications.

5040 END OF CUL-DE-SAC.

All cul-de-sacs shall include 2-inch Class 200 Yellowmine pipe with a flushing assembly (SD 50-3A) as shown in Standard Detail 50-8R.

5041 BORING WITHOUT CASING PIPE.

Borings for water main construction without casing pipe will be permitted only with the approval of the City Engineer.

5042 BORING WITH CASING PIPE.

Steel casing for bored and jacked construction shall have a smooth wall and a minimum yield strength of 35,000 psi, conforming to ASTM A-139 with a minimum diameter as shown on Standard Detail 50-7. Steel shall be Grade B under railroads and Grade A on all other uses. Steel pipe shall have welded joints in accordance with AWWA C-206 and shall have minimum wall thickness as indicated on the following table.

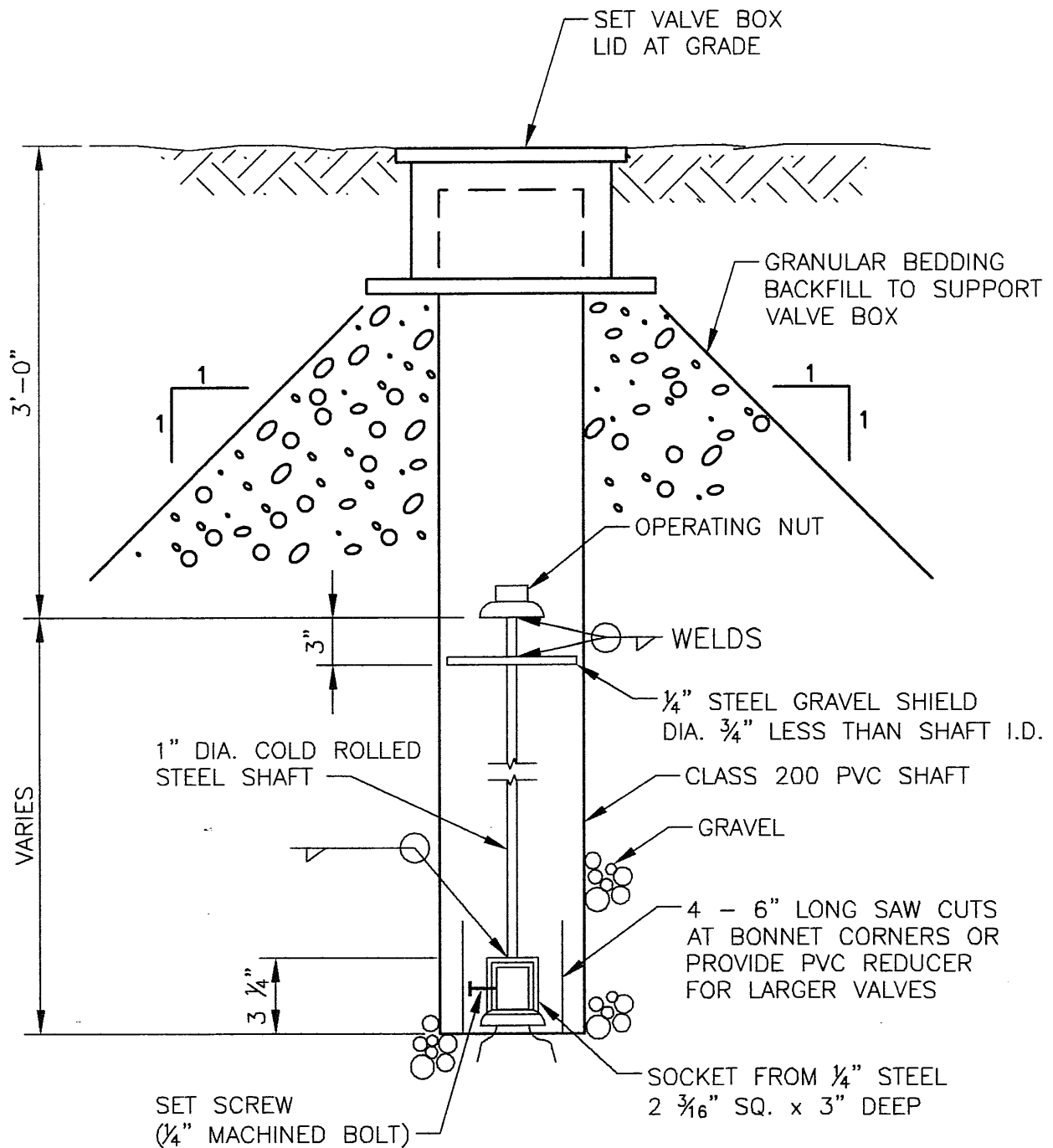
Diameter of Casing (inches)	Nominal Wall Thickness (inches)	
	Under Railroads	All Other Uses
12	0.282	0.188
14	0.282	0.188
16	0.282	0.188
18	0.312	0.250
20	0.344	0.281
22	0.375	0.281
24	0.406	0.281
26	0.438	0.312
28	0.469	0.312
30	0.469	0.312
32	0.500	0.344
34	0.531	0.344
36	0.531	0.344
38	0.531	0.344
40	0.563	0.375
42	0.563	0.375
44	0.563	0.375
48	0.563	0.375
50	0.625	0.406
52	0.625	0.406
54	0.625	0.406
60	0.650	0.450

Boring and jacking operations shall be performed by experienced crews using a rotary type boring machine designed especially for this purpose. The casing shall be jacked as the boring proceeds. Steel casing or carrier pipe shall be cleaned of all debris after its installation is complete. Casing spacers with plastic runners shall be secured to the barrel of the pipe with metal bands in such a manner as to support the weight of the pipe along its full barrel length on the skids without any of the weight

supported by the pipe bell, and in such a manner as to properly position the carrier pipe to the specified elevations and alignment. Casing spacers with plastic skids shall be 304 stainless steel spacers, as manufactured by PSI, Cascade, or APS.

End seals shall be used at each end of the casing and shall be the pull over, one piece, synthetic rubber type, using stainless steel bands. There shall be no voids between the earth and the casing. Any voids that do occur shall be filled by pressure grouting.

END OF SECTION



NOTE:

1. SET STEEL POST 3'-0" ABOVE GRADE NEXT TO VALVE BOX LOCATION. POST TO REMAIN UNTIL FINAL GRADING AND SEEDING OR SOD IS IN PLACE.

2. SEE GENERAL NOTES FOR TRACER WIRE REQUIREMENTS.

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER

5-8-08
DATE

REVISED

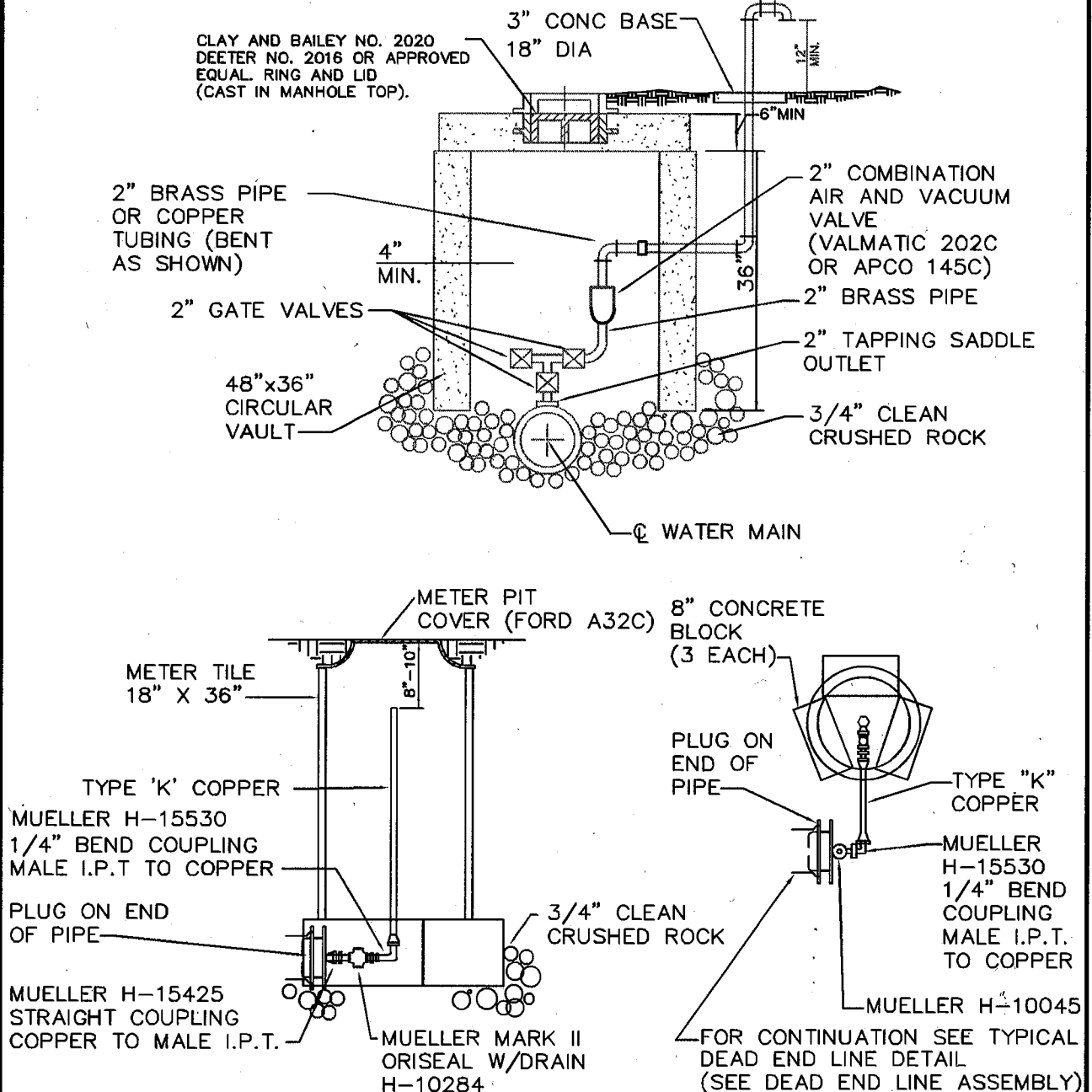
**ADJUSTABLE
VALVE BOX
DETAIL**

**STANDARD
DETAIL**

50-1

NOTES:

1. WHERE MAIN IS LOCATED BEHIND CURB IN STREET R/W OR EASEMENT, FLUSHING ASSEMBLY MAY BE CONSTRUCTED OVER END OF LINE WITHOUT THE OFFSET AS SHOWN BELOW.
2. BELOW TO BE USED ON NEW MAIN EXTENSION WHERE MAIN IS WITHIN PAVED SURFACE, SHOULDER OR IN DITCH LINE. LOCATE TILE IN ESTABLISHED GRADE AREA.
3. SET 5'-0" STEEL POST NEAR BLOW OFF ASSEMBLY.
4. ALL FITTINGS AND PIPING SHALL BE 2".
5. FOR MANUALLY OPERATED VALVES ONLY.
6. 24-MESH NONCORRODIBLE SCREEN OVER END OF VENT PIPE.
7. FLUSHING ASSEMBLY ALLOWED ON 6 INCH WATERLINES AND SMALLER ONLY.



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6-26-13

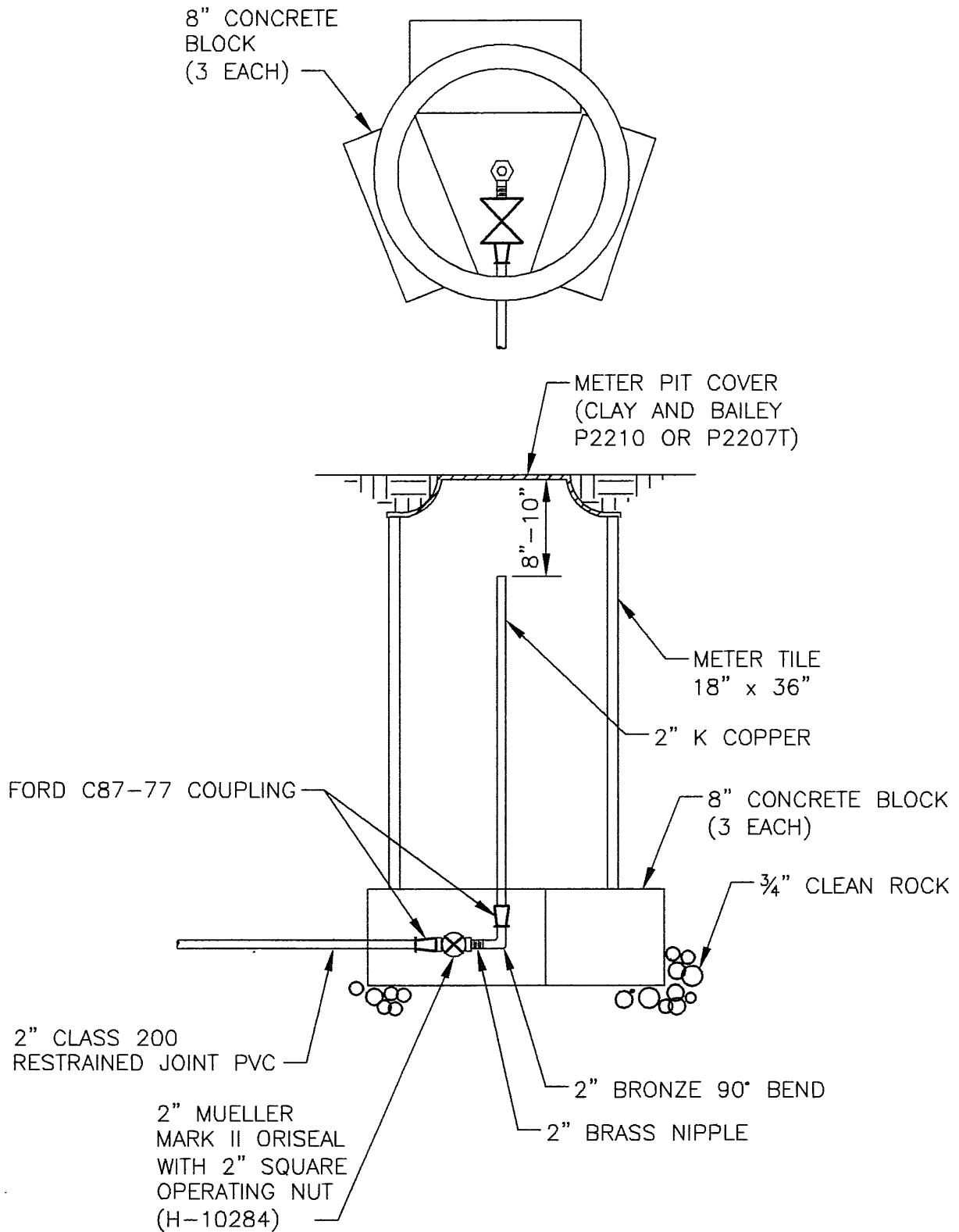
DATE

REVISED

**FLUSHING
ASSEMBLY AND
AIR AND VACUUM
DETAILS**

STANDARD
DETAIL

50-3



SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

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JWB
CITY ENGINEER

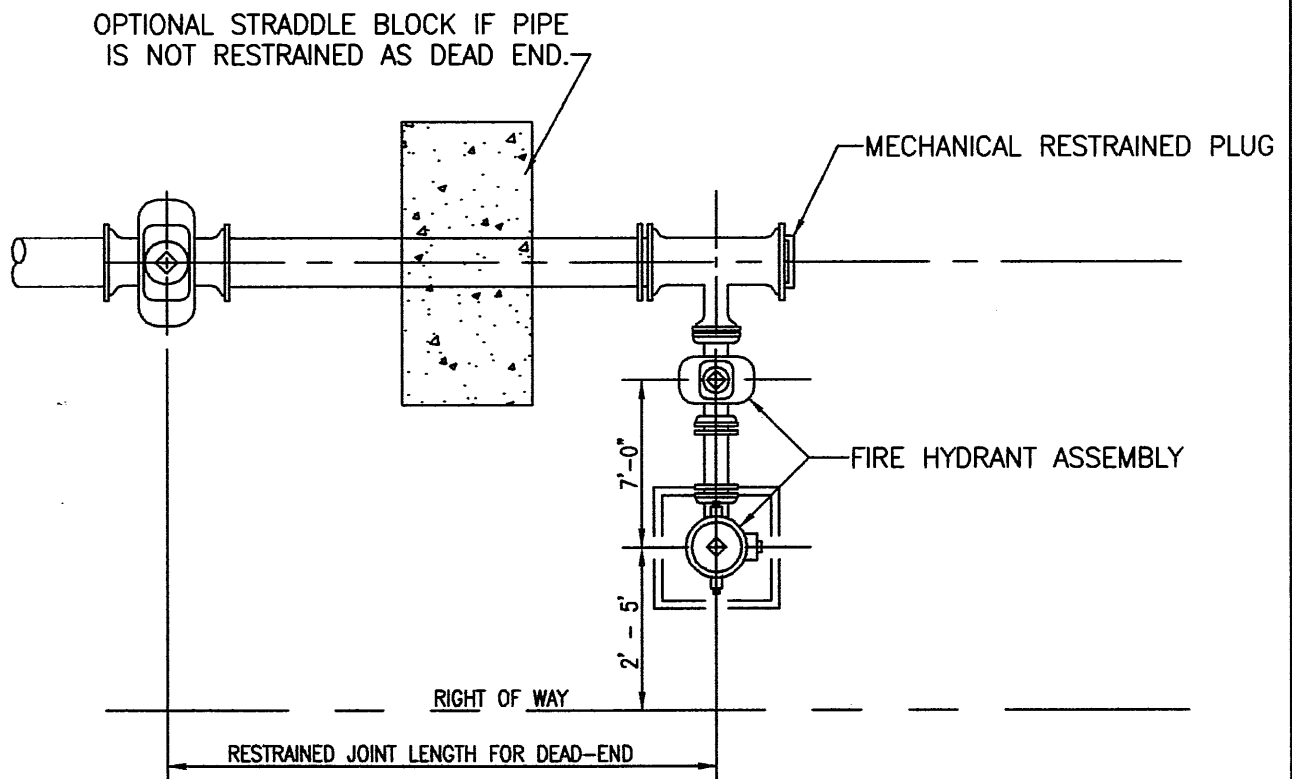
5-8-08
DATE

REVISED

**FLUSHING
ASSEMBLY FOR
DEAD END
STREETS**

**STANDARD
DETAIL
50-3A**

NOTE:
 USE WHERE APPROPRIATE
 FIRE HYDRANT SPACING ALLOWS
 FOR PERMANENT INSTALLATION.



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**JWB
 CITY ENGINEER**

**5-8-08
 DATE**

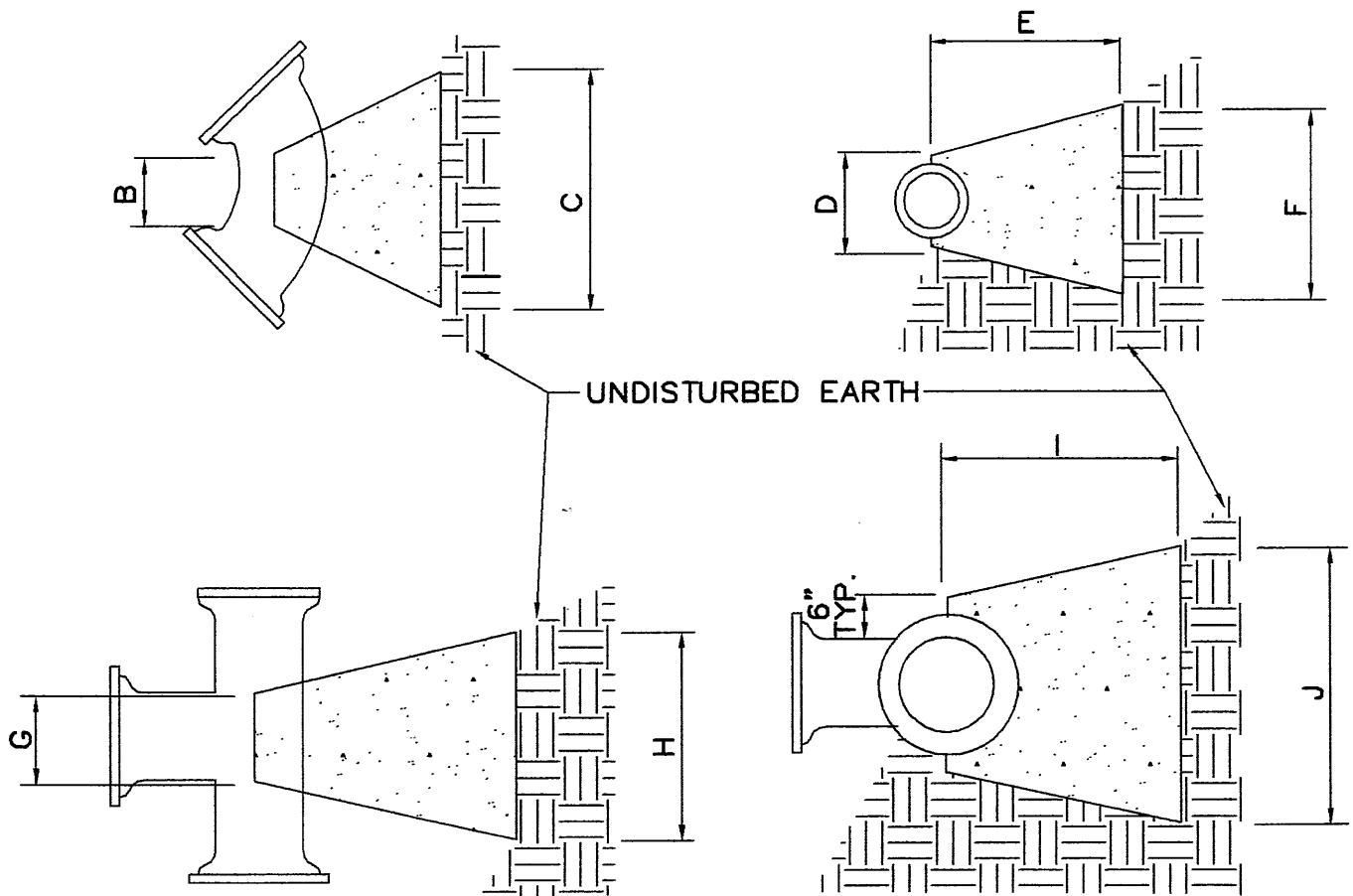
REVISED

**FLUSHING
 ASSEMBLY FOR
 FUTURE STREET
 EXTENSION**

**STANDARD
 DETAIL**

50-3B

BENDS	B	C	D	E	F	BENDS	B	C	D	E	F
6" 11 1/4 DEG	8"	15"	12"	24"	12"	6" 45 DEG.	8"	30"	12"	24"	14"
6" 22 1/2 DEG	8"	19"	12"	24"	13"	6" 90 DEG.	8"	30"	12"	24"	27"
8" 11 1/4 DEG	8"	20"	12"	24"	12"	8" 45 DEG.	8"	30"	12"	24"	24"
8" 22 1/2 DEG	8"	22"	12"	24"	17"	8" 90 DEG.	8"	38"	12"	24"	36"
12" 11 1/4 DEG	8"	30"	12"	24"	15"	12" 45 DEG.	8"	40"	12"	24"	40"
12" 22 1/2 DEG	8"	35"	12"	24"	25"	12" 90 DEG.	8"	60"	12"	24"	52"
TEES	G	H	I	J	TEES	G	H	I	J		
6" X 6" X 6"	12"	24"	24"	18"	12" X 12" X 6"	12"	24"	24"	18"		
8" X 8" X 6"	12"	24"	24"	18"	12" X 12" X 8"	12"	24"	24"	24"		
8" X 8" X 8"	12"	24"	24"	24"	12" X 12" X 12"	12"	36"	24"	36"		



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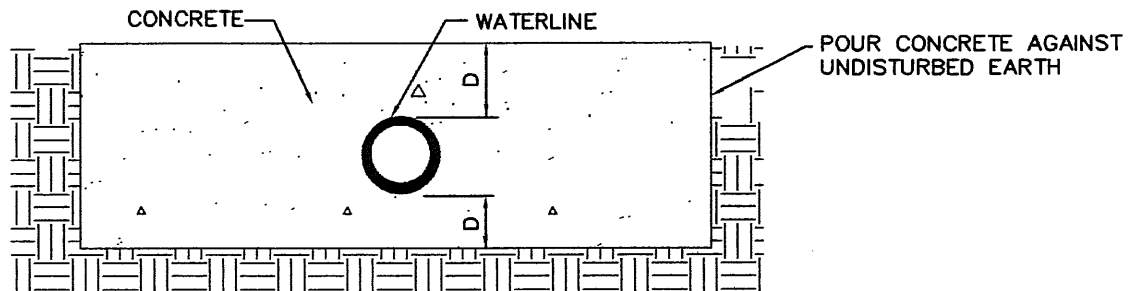
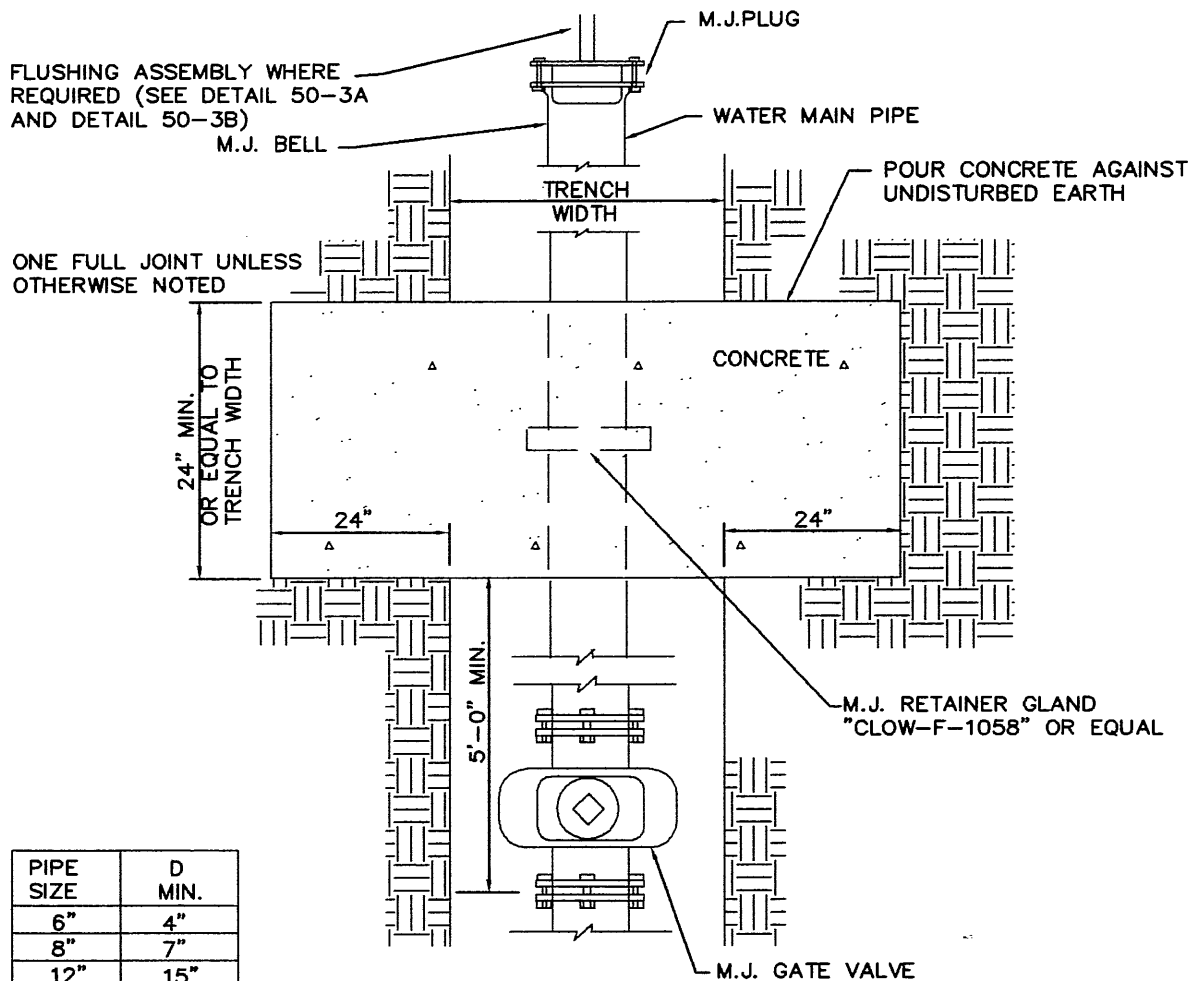
5-8-08
DATE

REVISED

CONCRETE
BLOCKING
DETAIL

STANDARD
DETAIL

50-4



DEAD END LINE ASSEMBLY

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

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CITY ENGINEER

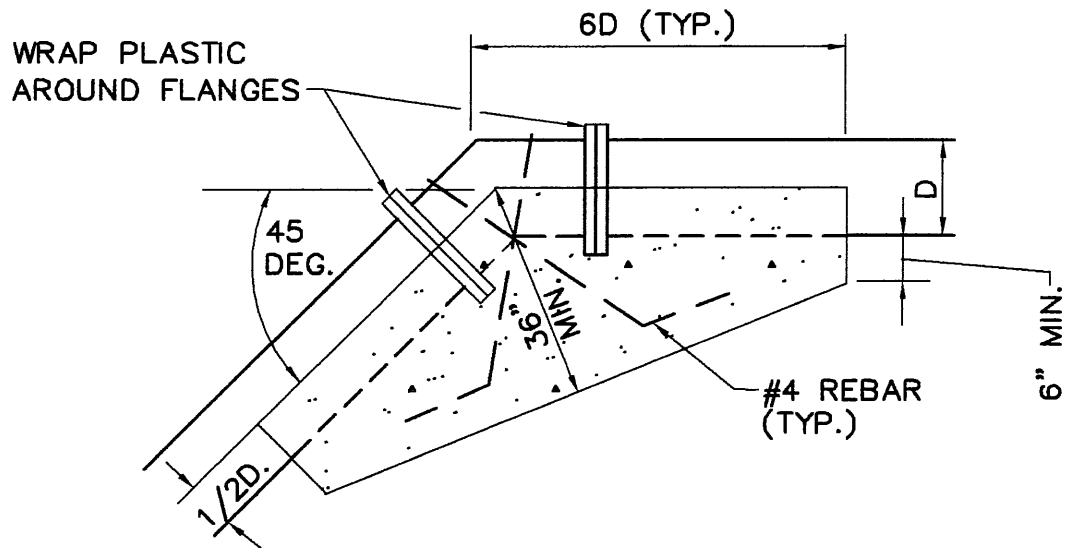
5-8-08
DATE

REVISED

**STRADDLE
BLOCK
DETAIL**

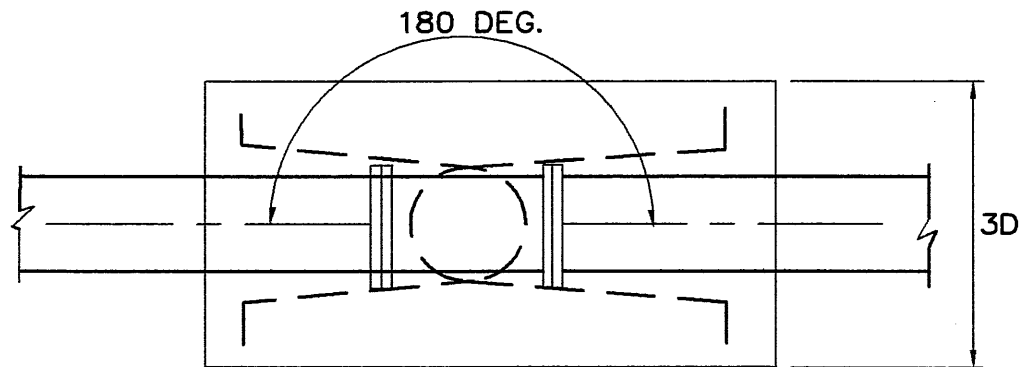
**STANDARD
DETAIL**

50-5



SIDE VIEW

NOTE: RETAINER GLANDS WILL BE USED ON ALL VERTICAL BENDS



TOP VIEW

NOTE: PRIOR TO PLACEMENT, SEE 50-4.

SPRING HILL, KANSAS

PUBLIC
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CITY ENGINEER

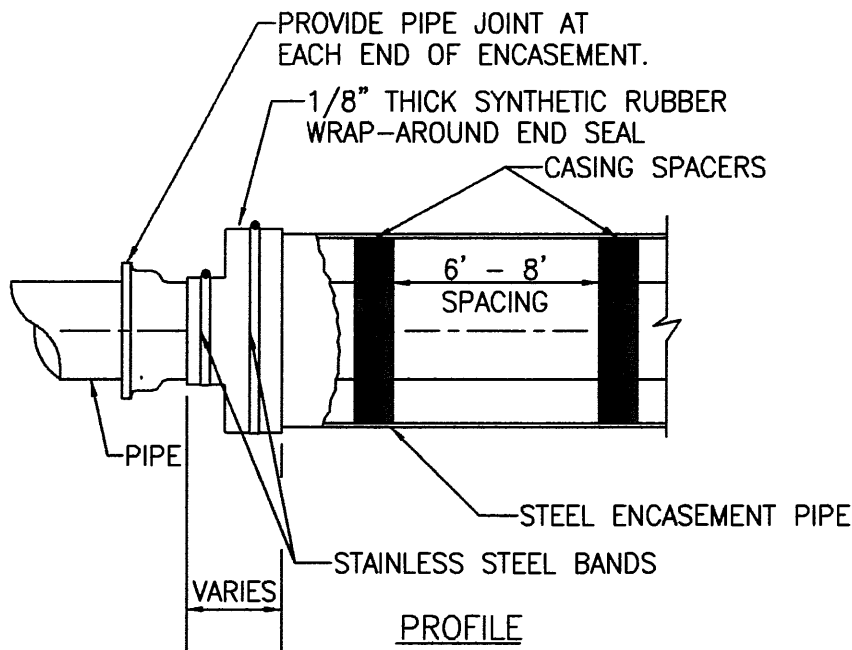
5-8-08
DATE

REVISED

VERTICAL BEND
BLOCKING
DETAIL

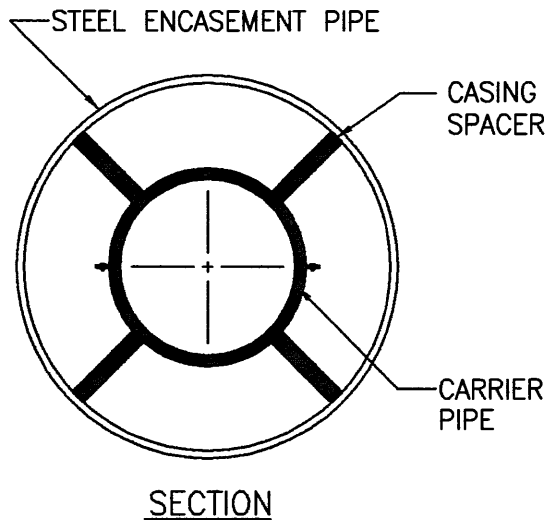
STANDARD
DETAIL

50-6



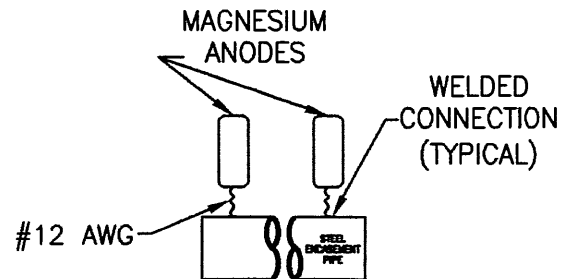
PIPE I.D. (Inches)	
CARRIER	CASING*
4	10-12
6	12-14
8	14-16
10	16-18
12	18-20
14	24-26
15	24-26
16	28-30
18	30-32
20	32-34
21	32-34
24	36-38
27	38-40
30	44-48
33	46-48
36	48-50
42	52-54
48	58-60

* CASING I.D. SHALL BE 2" GREATER THAN THE MAXIMUM O.D. OF THE PIPE BELL



NOTES:

1. FOR CASING THICKNESS FOR EACH SIZE REFER TO SECTIONS 3017 AND 5030 FOR SEWER & WATER CARRIER PIPE.
2. FILL ALL VOID SPACES OUTSIDE THE CASING PIPE WITH CONTROLLED LOW-STRENGTH MATERIAL (CLSM).
3. SACRIFICIAL ANODES ARE REQUIRED AT EACH END OF CASING THAT SHALL PROVIDE 25-YR LIFE. CONNECTIONS SHALL BE WITH #12 A.W.G. GROUNDING WIRE IN ANODE PACKAGE.



**CORROSION PROTECTION
DETAIL**

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

**JWB
CITY ENGINEER**

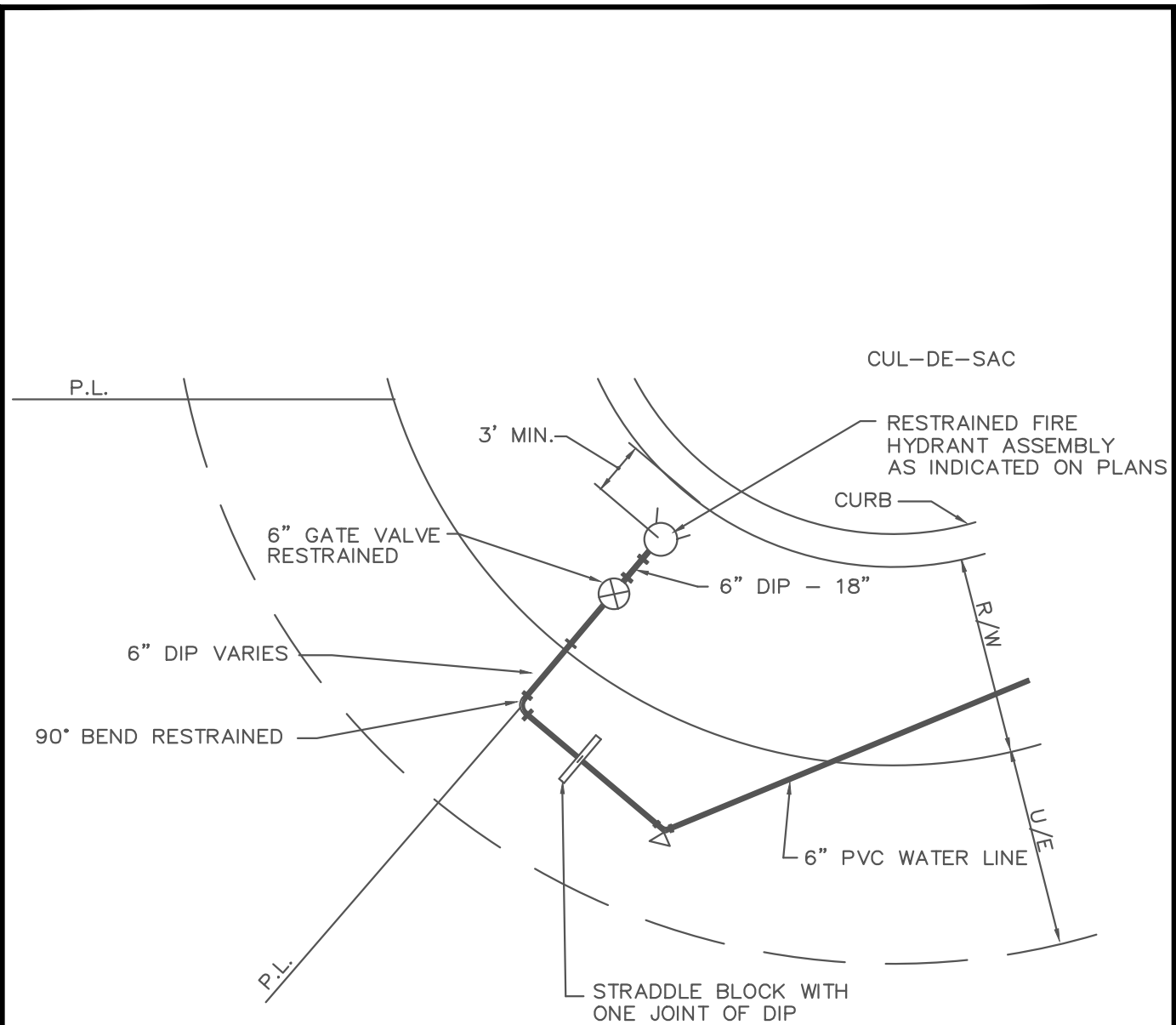
**5-8-08
DATE**

REVISED

**PIPE CASING
DETAIL**

**STANDARD
DETAIL**

50-7



NOTES:

1. ALIGNMENT OF WATER LINE AROUND CUL-DE-SAC VARIES TO MAINTAIN CLEARANCE FROM SAN. SEWER.
2. MAIN TO BE EXTENDED TO INSURE WATER LINE IS LOCATED ON PROPERTY LINE FOR FUTURE TAPPING PURPOSES.
3. FOR FIRE HYDRANT ASSEMBLY DETAILS SEE STD. DETAIL 50-2
4. FOR FLUSHING ASSEMBLY DETAILS SEE STD. DETAIL 50-3.

SPRING HILL, KANSAS <u>PUBLIC</u> <u>WORKS</u> <u>DEPARTMENT</u>	APPROVED JWB CITY ENGINEER 9-15-16 DATE	REVISED _____ _____ _____	END OF LINE ON CUL-DE-SAC	STANDARD DETAIL 50-8
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SECTION 5100 - TESTING

5101 GENERAL.

This section covers hydrostatic pressure testing and leakage testing of the pipelines. All pipelines installed under this contract shall be tested as specified herein.

All testing work shall be done in the presence of the City Engineer. The contractor shall notify the City Engineer at least 24 hours in advance of the times and places at which testing work is to be done.

Temporary discharge piping shall be provided for wasting test water at a suitable remote location where such water will drain away from the work. Discharge of test water into sanitary sewers will not be permitted.

5102 TESTING EQUIPMENT AND FACILITIES.

The contractor shall provide all necessary piping and piping connections between the pipeline to be tested and the nearest available source of water supply, together with test pumping equipment, pressure gauge, and other equipment, materials, and facilities required for the specified tests.

Test pressures shall be applied by means of a force pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test.

The pressure gauge used shall be tested, accurately calibrated, and acceptable to the City Engineer.

All pipe, fittings, valves, pipe joints, and other materials, which are found to be defective shall be removed immediately and replaced with new and acceptable material, by and at the expense of the contractor.

Materials shall be replaced as necessary and the test shall then be repeated until the line and all parts thereof withstand the test pressure in a satisfactory manner.

5103 PRESSURE AND LEAKAGE TEST.

The hydrostatic pressure during testing shall be at least 150 psi or 1.5 times the maximum static pressure at the lowest point of the line, whichever is greater. Maximum static pressure in PSI, shall be calculated by subtracting the lowest USGS elevation of the waterline from the maximum

hydraulic grade line and then dividing by 2.31 to convert to PSI.

$$\text{Maximum Static Pressure, PSI} = \frac{1200 \text{ ft} - \text{lowest elevation}}{2.31 \text{ ft/PSI}}$$

The selected pressure shall be maintained constant within a maximum variation of plus or minus 5 psi during the entire time that line leakage measurements are being made.

Leakage measurements shall not be started until a constant test pressure is established; compression of air trapped in un-vented pipes or fittings will give false leakage readings under changing pressure conditions. After the selected test pressure is stabilized, the line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the line side of the force pump. The water meter shall be furnished and installed by the contractor.

Line leakage shall be the total amount of water introduced into the line as measured by the meter during the leakage test.

Each leakage test shall have a minimum duration of one (1) hour plus whatever additional period is necessary to accurately determine leaking in the opinion of the City Engineer.

No pipeline or section thereof, will be acceptable if the leakage indicated by the test meter is in excess of that determined by the following formula or as indicated on Standard Detail 51-1.

Where $L = (S \cdot D \cdot P^{1/2}) / 148,000$
L = Allowable leakage, in gallons per hour
D = Nominal diameter of pipe in inches
S = Length of pipe tested, in feet
N = Average test pressure during leakage test, in psi

In the event that the line under test contains pipe of more than one size, the allowable leakage shall be calculated separately for each size and corresponding length of line and then added to obtain the total allowable leakage from the entire line.

5104 DEFECTS.

It is the intent of these Specifications and the contract based thereon that (a) all joints in piping shall be

watertight and free from visible leaks during the prescribed leakage test and (b) each and every leak which may be discovered at any time prior to the expiration of 2 years from and after the date of final acceptance of the work by the owner shall be located and repaired by and at the expense of the contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

If the specified leakage test is made after the pipeline has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. Where evidence of leaking joints does not appear on the ground surface above or near the leaks, the contractor shall prospect the line by sinking a hole, with an auger or otherwise, at the location of each joint and determine any undue saturation of the soil which would indicate a leak at such joint; such prospecting shall be done after pressure has been maintained in the line a sufficient time to provide adequate soil saturation for locating leaks by this method. Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket, and re-bolting. Under no circumstances shall gland bolts be tightened beyond the specified and allowable torque limits in an attempt to reduce or stop leakage from a defective joint or for any other purpose.

5105 TAPPING SLEEVES AND VALVES.

The tapping sleeve and valve will be tested in place with water. Test pressure must not exceed rated working pressure (150 psig on 16-inch, 200 psig on Sizes 4-inch through 12-inch). A hydro-static pressure test shall be conducted for one (1) hour and no leaks will be permitted. A city representative shall be on site to witness the test.

END OF SECTION

ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE* – gph

NOMINAL PIPE DIAMETER (INCHES)

AVERAGE TEST PRESSURE (psi)	4	6	8	10	12	14	16	18	20	24
300	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81
275	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69
250	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56
225	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43
200	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29
175	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15
150	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62

* FOR PIPE WITH 18-FOOT NOMINAL LENGTHS. TO OBTAIN THE RECOMMENDED ALLOWABLE LEAKAGE FOR PIPE WITH 20-FOOT LENGTHS, MULTIPLY THE LEAKAGE CALCULATED FROM THE TABLE BY 0.9. IF THE PIPELINE UNDER TEST CONTAINS SECTIONS OF VARIOUS DIAMETERS, THE ALLOWABLE LEAKAGE WILL BE THE SUM OF THE COMPUTED LEAKAGE FOR EACH SIZE.

SPRING HILL, KANSAS PUBLIC WORKS <u>DEPARTMENT</u>	APPROVED	REVISED	ALLOWABLE LEAKAGE FOR WATERLINES	STANDARD DETAIL 51-1
	JWB CITY ENGINEER	_____		
	6-26-13 DATE	_____		

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SECTION 5200 - DISINFECTION

5201 SCOPE.

This section covers the disinfection of all new water lines, valves, and appurtenant items.

5202 GENERAL.

Materials, methods, and procedures for disinfection work shall conform to the requirements of AWWA C651, "Standard for Disinfecting Water Mains" except as modified herein.

All disinfection work shall be acceptable to the Kansas Department of Health and Environment, and any and all requirements thereof, which may be in conflict with any provision of the specification, shall govern.

Water in reasonable amounts for proper completion of flushing or disinfection work will be furnished at existing fire hydrants by the owner without charge to the contractor.

The contractor shall furnish all necessary pipe, hose, nozzles, and tools and shall perform all necessary labor. Contractor shall make arrangements with the Department of Public Works (who will fix the time, rate, and duration of each withdrawal from the distribution system) as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose.

When required by the City Engineer, the contractor shall submit a detailed outline of the proposed procedure relative to sequence of operations, manner of filling and flushing disinfected lines, and the disposal of wasted water.

5203 FLUSHING.

Immediately prior to disinfection, the main to be disinfected shall be flushed at the maximum velocity, which can be developed. The flushing velocity shall be at least 2.5 feet per second. All flushing shall be performed after the hydrostatic test is completed and accepted.

All flushing work shall be done in the presence of the City Engineer. The contractor shall notify the City Engineer at least 24 hours in advance of the times and places at which flushing work is to be done.

5204 DISINFECTION.

Admission of disinfectant solution into or the flushing thereof through existing mains shall be held to a minimum possible, and then only after proper and adequate measures have been taken to effectively prevent any such solution or wastewater from entering branch service connections to water customers.

The pipelines shall be disinfected by either the continuous feed method.

In using the continuous feed method, chlorine feed shall be proportional to the rate of flow into the pipe so that the entering water contains at least 50 mg/l of available chlorine. Chlorine application shall be continuous until the entire pipeline is filled with the chlorine solution. The treated water shall be retained in the pipeline for at least 24 hours and the chlorine residual at the end of the period shall be at least 25 mg/l.

Prior to flushing the line free of chlorine, a test shall be conducted to verify the chlorine residual. Such test shall be performed by the City using the drop dilution method in accordance with AWWA C651. The contractor shall dispose of chlorine and flushing water in a proper manner at no additional cost to the owner.

Prior to flushing the pipe of chlorinated water, the discharge environment shall be inspected. If there is any possibility that the chlorinated discharge will damage the environment, sodium biosulfite or an equal, neutralizing chemical shall be applied to the water to assure the thorough neutralization of the chlorine residual. This work shall be in conformance with the latest revision of AWWA C651.

During disinfection, all valves and hydrants shall be operated to ensure that all appurtenances are disinfected. During final flushing operations, valves shall be manipulated in such a manner that the strong chlorine solution in the line being chlorinated will not flow back into the supply line.

5205 BACTERIOLOGICAL TESTS.

The contractor shall be responsible for collecting samples or a certified independent testing laboratory shall collect samples to confirm the presence or absence of coliform organisms. The samples shall be collected and tested in accordance with AWWA C651 and EPA sampling and preservation

techniques. Tests shall be made at the expense of the contractor. Results shall be provided to the City Inspector, City Water Superintendent and the City Engineer.

5206 REPETITION.

If initial disinfection fails to produce satisfactory bacteriological samples, the disinfection shall be repeated at the expense of the contractor until satisfactory bacteriological samples have been obtained.

END OF SECTION

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SECTION 5300 - WATER SERVICE RECONNECTIONS

5301 GENERAL.

The contractor shall supply all materials, labor and equipment necessary for water service reconnection as indicated on the plans. This shall include tapping of the main, boring of road crossings, compaction and resodding of the established lawns.

All other applicable sections of these Specifications shall also apply to water service reconnections.

The contractor shall notify the City of their intent to perform this work a minimum of 24 hours in advance and shall notify any customers that will be affected by such a minimum of 24 hours in advance.

5302 APPROVED MATERIALS.

- a. Meter Setter for a single service application - AY McDonald 722-218WX2233 or equivalent.
- b. Meter Tile - 18-inch x 30-inch PVC Meter Pit.
- c. Copper Pipe - Soft "K" copper, 3/4-inch and larger.
- d. Corporation Stop - AY McDonald 4701-22 3/4-inch Ball Corp Stop with cc thread or equivalent.
- e. Meter Tile Ring and Lid - Sigma 2210 Ring and Lid or approved equal.
- f. Service Saddles - 1½-inch to 2-inch Mueller (H105); Rockwell 313 or 317, and Ford 101N with stainless steel straps or approved equal.

5303 METER INSTALLATION.

All meter setters shall be located at the direction of the Public Works Department.

Water meter pits shall be placed at the property/right-of-way line of the service address and in the front yard. Alternate locations must have prior approval by the City Engineer or at the direction of the Public Works Department.

All meter setters shall be set in the meter tile so that the face of the meter is at least 12 inches, but not more than 18 inches, below the finished grade.

Meter pits shall not be located in driveways, walkways or cast-in concrete without prior approval from the Public Works Department. Traffic model rings and lids shall be installed when required for these instances.

All meter tiles shall be set plumb, backfilled and compacted with earth.

Each meter tile shall be centered directly over the meter that it serves.

The top of the tile cover shall be flush with the finished grade.

5304 SEWER ONLY METER INSTALLATION

- a. DEFINITION: The "sewer only" meter primarily measures water used for domestic purposes and any part of the process or manufacturing purposes for all non-residential facilities; these flows are discharged into the City's sanitary sewer collection system. The "sewer only" meter measures the "sewer billable" water used that enters the sanitary sewer collection system.
- b. All meter pits shall be located at the direction of the Public Works Department.
- c. Water meter pits shall be placed downstream of the customer's main meter and beyond any tee connection that serves lawn irrigation appurtenances at the property/right-of-way line of the service address, and/or alternate locations must have prior approval by the direction of the Public Works Department.
- d. OPTIONS
 - 1) Option 1: On existing water service that has tee connections to irrigation lawn sprinklers beyond the main water meter, the sewer only meter is installed beyond any tee connection that serves lawn irrigation or other non-sewer related appurtenance.
 - 2) Option 2: On new construction, a wye connection may be installed from one service which serves both domestic and other non-sewer related appurtenances. The sewer only meter and the meter that measures flow to other non-sewer related appurtenances that does not enter the sewer collection system shall be constructed so that both meters are in one meter pit.

- e. On all water services, design flows and water demand shall be considered and designed accordingly.
- f. All meter setters shall be set in the meter pit so that the face of the meter is at least 12-inches but not more than 18-inches below the finished grade; meter and service pipeline sizing and placement shall be determined by the direction of the Public Works Department.
- g. Meter pits shall not be located in driveways, walkways or cast in concrete without prior approval from the Public Works Department. Traffic model rings and lids shall be installed when required for these instances.
- h. All meter pits shall be set plumb, service piping bedded in clean rock, then backfilled and compacted with earth.
- i. Each meter pit shall be centered directly over the meter that it serves.
- j. The top of the meter ring and lid cover shall be flush with the finished grade.

5305 COPPER SERVICE LINES.

Copper service lines shall be composed of no more than one continuous length between the corporation stop and the meter connection.

All connections to the copper tubing shall be made with pack joint fittings or compression fittings. No field or shop soldered connection will be permitted. All soldered fittings shall be factory soldered using silver solder.

The water service line will be installed in a different ditch from the gas service line and must be at least ten (10) feet from the sewer ditch.

All service lines from the water main to water meter must be the same diameter or larger (3/4-inch minimum) than the water meter. Residential water service lines replaced between the water main and the water meter may be constructed with polyethylene plastic pipe by the direction of the Public Works Department.

5306 STREET AND DRIVE CROSSINGS.

All street and/or drive crossings shall be made by means of boring, pushing or tunneling. Unless otherwise approved by

the City Engineer, all street borings shall be 48 inches below the finished grade.

No fitting shall be installed under pavement unless approved by the City Engineer.

5307 TAPPING.

The contractor shall make all taps on the new water main.

The contractor shall expose the water main immediately prior to tapping.

Excavation and backfilling of the main must be done in the same 8-hour day between 8 A.M. and 5 P.M. It must be filled immediately after the tap is made and inspected.

All barricades and warning devices shall be provided and maintained by the contractor.

5308 SALVAGE MATERIALS.

All usable salvaged items including fittings, valves, meters, etc. shall be field cleaned and transported by the contractor to the City's designated storage yard and shall remain the property of the City.

5309 EXCAVATION.

a. Copper Piping.

- 1) Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated that the rough trench widths of approximately 12 inches maximum width and vertical sidewalls can be obtained at least from an elevation 1 foot above the top of the installed pipe to the bottom of the trench.
- 2) The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts or other existing property, utilities or structures above or below ground. In all such locations, hand excavating methods shall be used.
- 3) Cutting trench banks on slopes to reduce earth load to prevent sliding and caving will be permitted only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits. Slopes shall not extend lower than one foot above the top of the pipe.

- 4) Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 42 inches. This includes vertical backfill depths as well as horizontal backfill separation such as when the water pipe is constructed near a storm box or vault. In this case there shall be 42-inches of backfill between the outside edge of the pipe and the outside edge of the concrete storm box or vault. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades, but shall be limited to no more than 48 inches of cover. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation.

5310 BACKFILL, COMPACTION AND SODDING.

Compaction of backfill shall be done immediately after placement of backfill. Under no circumstances shall there be more than eight uncompacted meter locations at one time. Compacted backfill will be required for the full depth of the trench. All sections of this specification concerning backfill, compaction and sodding shall apply to the service line reconnections and replacements.

END OF SECTION

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SECTION 6000 - EXCAVATION, TRENCHING AND BACKFILLING (Pipeline Construction)

6001 SCOPE.

This section covers excavation and trenching work and shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent property, backfilling, pipe embedment, surfacing and grading, and other appurtenant work.

Attention is directed to the additional requirements set forth in the General Conditions, Supplemental General Conditions or Special Conditions.

6002 GENERAL REQUIREMENTS.

Excavation work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the work to be performed therein. In no case shall excavation faces be undercut for extended footings.

Sub-grade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

Excavations for manholes and similar structures shall have such horizontal dimensions that sufficient clearance is provided for outside work such as installation of piping or tape wrapping of manhole section joints.

Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the City Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

6003 CLASSIFICATION OF EXCAVATED MATERIALS.

When specifically indicated in the proposal and contract, classification of excavated materials will be made as follows:

- a. Rock. Rock excavation will be so classified when sandstone, limestone, blue shale or other similar material is encountered and, in the opinion of the City

Engineer, requires drilling or blasting to remove the material.

b. Earth. All material not classified as rock.

6004 CLEARING.

The contractor shall do all clearing necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures.

At the option of the contractor, all trees, underbrush, stumps, roots, and other combustible materials may be stacked and burned on the site at such locations as permitted by the Fire Marshall and City Engineer or removed entirely from the site and disposed of at such locations as determined by the contractor. All materials to be burned shall be piled neatly and, when in suitable condition, shall be burned completely. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk. All burning shall be so thorough that the materials are completely reduced to ashes. Great care shall be taken to prevent the spread of fire beyond the permanent site limits. Fireguards of adequate width shall be provided wherever there is surface vegetation around any brush pile.

No burning of trimmings or brush shall be done when the direction or velocity of the wind is such that there would be any danger of fire being carried into adjacent areas. All governmental requirements relative to burning, fire prevention, and air pollution shall be complied with. See Specification Paragraph 1005a.

6005 DEWATERING.

The contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until 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 trenches which extend down to or below ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations 12 inches or more 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.

6006 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, and 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. Sheet piling, 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 sheet piling shall not be pulled before backfilling unless the pipe strength is sufficient, in the opinion of the City Engineer, to carry trench loads based on trench width to the back of sheet piling; nor shall sheet piling be pulled after backfilling. When ordered by the City Engineer, sheet piling shall be left permanently in the trench. Payment for such sheet piling will be made in accordance with the contract provisions for extra work.

When trench sheet piling is left in place, such sheet piling 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 sheet piling may be removed after pipe embedment has been completed.

6007 ALIGNMENT AND GRADE.

The alignment and grade or elevation of each pipeline shall be maintained as shown on the contract drawings by overhead grade lines parallel to the pipe invert.

6008 MINIMUM COVER (Water Mains).

Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill covering the top of the pipe of 42 inches. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation and/or made horizontally from the outside edge of the pipe to the outside edge of the concrete storm box or vault, or other below ground appurtenance.

6009 STABILIZATION.

Trench bottoms which become soft, mucky, or otherwise unstable during construction operations shall be stabilized, by and at the expense of the contractor, with one or more layers of crushed rock or other suitable material, where and as necessary to provide a firm and stable base for granular fill pipe foundation material to be placed thereon. Not more than 1/2 inch depth of mud or muck shall be allowed to remain on the stabilized trench bottom when the granular fill pipe foundation material is installed.

6010 TRENCH EXCAVATION.

The contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or 400 feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction. The contractor shall backfill all open trench by the end of the day's work, except that which is necessary for inspection or immediate continuation of the following day's work.

Except where tunneling is shown on the drawings, is specified, or is permitted by the City Engineer, all trench excavations shall be open cut from the surface.

The alignment, depth, and grade of all trenches shall be maintained as shown on the drawings by overhead grade lines parallel to the pipe invert.

All open trenches shall be provided with adequate protective devices.

If any water line, storm sewer or sanitary sewer is proposed to be installed with the top of the pipe above existing grade, the contractor shall first install compacted fill. The compacted fill shall be installed to an elevation of 24" above the top of the proposed pipe and shall extend a minimum of 24" beyond the outside edge of the proposed line prior to trenching operations. The side slopes of the compacted fill shall be no greater than 4:1 to match existing grade. See Detail 60-4.

6011 LIMITING TRENCH WIDTHS.

Trenches shall be excavated to a width, which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and embedment. Ledge rock, boulders, and large stones shall be removed to provide a clearance of 6 inches below and on each side of all pipe. These distances are minimum clear distances, which will be permitted between any part of the pipe and appurtenances being laid on any part, projection, or point of such rock, boulder, or stone.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving will be permitted only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits. Slopes shall not extend lower than 1 foot above the top of the pipe.

Limiting trench widths below an elevation of 1 foot above the exterior top of the installed pipe shall be not less than 15 inches or more than 24 inches greater than the nominal outside diameter of the pipe.

6012 UNAUTHORIZED TRENCH WIDTHS.

Where, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted in Section 6011 of these Specifications, either special pipe embedment or arch concrete encasement (see Detail 60-1), as required by loading conditions and as determined by the Design Engineer, shall be furnished and installed by and at the expense of the contractor.

6013 MECHANICAL EXCAVATION.

The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground.

Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation 1 foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

If the contractor prefers to undercut the bottom of the trench and bring to grade with 1/2-inch-crushed rock, he may do so, provided the depth of undercut and backfill with crushed rock shall not exceed 4 inches. Where crushed rock is used, it shall be placed in the trench, spread uniformly, and graded prior to placing the pipe in the trench.

6014 ARTIFICIAL FOUNDATIONS IN TRENCHES.

Whenever so ordered by the City Engineer, the contractor shall excavate to such depth below grade as the City Engineer may direct and the trench bottom shall be brought to grade with such material as the City Engineer may order

installed. All concrete, or other foundations made necessary by unstable soil shall be installed as directed by the City Engineer. Compensation for extra excavation and timber, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

6015 PIPE BEDDING.

The pipe shall be laid in a flat-bottom trench that has been carefully graded and shaped so that the barrel of the pipe will have bearing for its full length. Blocking of the pipe will not be permitted.

- a. Water Mains. Bell holes shall be excavated in the bottom and sides of the trench to provide ample working space and ensure proper pipe support. No part of the bell shall be in contact with the trench bottom.

The contractor, at his option, may use granular embedment material in the trench bottom in lieu of bell holes. The granular material shall be spread and the surface graded to provide a uniform bearing and continuous support for each section of pipe along its entire length.

If rock is encountered in the trench foundation, granular bedding material is required and shall conform to the requirements of Standard Detail 60-1.

- b. Sanitary Sewers. Granular material shall be used for pipe embedment and shall conform to requirements of Standard Detail 60-1. Granular material is required for the embedment on PVC, DIP and RCP pipe installations.

Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the following supplementary requirements.

Embedment material shall contain no cinders or other material, which may cause pipe corrosion.

- 1) Class A Arch Encasement. Class A arch encasement shall be used where required by the drawings and where trench conditions require its use as determined by the City Engineer.

- 2) Class B Bedding. Class B bedding shall be used for all PVC sewer pipe. Granular embedment materials shall meet the requirements on Standard Detail 60-1 or meet the requirements in ASTM D2321. Granular embedment will extend from 6 inches below the pipe to 12 inches minimum above the top of the pipe.
- 3) Class C Bedding. Class C bedding shall be used for all reinforced concrete and ductile iron pipelines.

Granular embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Class C embedment shall be compacted to the top of the pipe in all areas where compacted backfill is specified.

Continuity of embedment material shall be interrupted by compacted soil around each manhole to impede passage of water through the embedment. Barrier material may be finely divided suitable job excavated material, free from stones, organic matter and debris, and compacted to 95% of maximum density.

- c. Storm Sewers. The pipe shall be laid in CA-5 or approved equal, which has been carefully graded and shaped so that the barrel of the pipe will have bearing for its full length. Blocking of the pipe will not be permitted. Granular backfill is then required to the spring line of the pipe unless the pipe is within four feet of either side of the curb requiring complete granular backfill of the trench. All HDPE storm sewer piping shall be bedded with Class B bedding extending 12 inches minimum above the top or crown of the pipe.

Where rock is encountered, either dug or shot, the pipe shall be bedded with a minimum of 6 inches of rock between the pipe and trench bottom. Granular embedment shall be used at locations directed by the City Engineer and shall be considered a subsidiary obligation unless specifically provided for as a bid item in the proposal.

6016 PIPE INSTALLATION.

All work shall be in accordance with the following standards or as specified herein.

- a. All Water, Sewer and HDPE lines shall be installed with 12-gauge stranded type TW copper tracer wire attached at each pipe joint.
- b. Flexible Thermoplastic Pipe; ASTM D2321.
- c. Ductile Iron Water Mains; AWWA C600.
- d. Reinforced Concrete Pipe.
 - 1) Joints for reinforced concrete pipe shall conform to Section 7 of ASTM C361, except that gaskets shall have a circular cross section and shall be confined in a groove in the pipe spigot. Pipe with collars in lieu of integral bells will not be acceptable.
 - 2) Core holes and handling holes in concrete pipe shall be repaired by cementing a properly-shaped concrete plug in place with epoxy cement or by other methods acceptable to the City Engineer.
- e. Corrugated Steel Pipe.
 - 1) Corrugated metal storm sewer pipe shall be laid with the separate sections joined firmly together, with the outside laps of the circumferential joints pointed upstream, and with the longitudinal laps on the side.

Lateral displacement of the pipe shall be prevented during embedment operations. Pipe shall not be laid in water, or under unsuitable weather or trench conditions.

All joint preparation and jointing operations shall comply with the instructions and recommendations of the pipe manufacturer.

Hooks shall not be permitted to contact joint surfaces. Care shall be exercised in handling all pipes to prevent

damage to pipe ends. Damaged pipe or pipe damaged in laying shall be replaced by and at the expense of the contractor.

6017 TRENCH BACKFILL.

All trench backfill above pipe embedment shall conform to the following requirements:

Compacted backfill shall be required for the full depth of the trench above the embedment where beneath structures, street, road, or highway right-of-way, driveways, walks, parking areas, and at all locations shown on the plans or as directed by the City Engineer during the progress of the work. The trench backfill shall consist of the follows and for street and road crossings shall extend from 4' back of curb to 4' back of curb:

Asphalt Pavement - Varies from 8"-12"

Stabilized Subgrade - 9"

Removable Flowable Fill (200 psi) - bottom of subgrade to 10' below bottom of subgrade or to top of bedding, whichever is less.

Granular Backfill - greater than 10' to top of pipe bedding

As an alternative to flowable fill under areas to be paved, the backfill material from the top of the pipe embedment to the bottom of the subgrade shall be compacted backfill. The backfill shall be compacted to at least 95% of maximum dry density at a moisture content within 2% of optimum moisture as determined by ASTM D-698. Required compaction and percentage of maximum density must be obtained before pavement is placed. Density tests representative of each three (3) feet of trench depth shall be taken at five hundred (500) linear foot intervals along the lines or at each street crossing. At least two tests shall be run.

Compaction tests shall be performed as specified below and at the frequency defined above. The upper most compaction test taken at each of the described locations shall be taken within a zone between two (2) to five (5) feet below the finished grade for that area. All compaction tests shall be performed by an independent testing laboratory approved by the City Engineer.

Maximum dry density shall be determined by the standard proctor analysis method as defined by AASHTO T99 or ASTM D-698. Standard proctor tests shall be taken at each change in material being excavated. It is estimated that the standard proctor tests will need to be taken on an average of one per 1,000 linear feet of the sewer line installed.

The density of soil in place shall be determined in accordance with ASTM D-1556, ASTM D-2167 or ASTM D-6938.

The soil moisture content of in place fill material shall be determined in accordance with ASTM D-2216 or D-6938

The top portion of the backfill beneath established sodden areas shall be finished with at least 12 inches of topsoil corresponding to, or better than, that underlying adjoining sodden areas. Topsoil shall be approved by the City Engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled for the purpose during excavating and grading operations. Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to dumping and spreading topsoil, the surface shall be loosened by disking or scarifying to a depth of 2 inches to permit bonding of the topsoil to the underlying surface.

Gravel for compacted backfill, other than for street crossings, shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
1-inch	100
3/4-inch	85-100
3/8-inch	50-80
No. 4	35-60
No. 40	15-30
No. 200	5-10

The gravel mixture shall contain no clay lumps or organic matter. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

The backfill shall be compacted by a suitable vibratory roller or platform vibrator to not less than 85% relative density as determined by ASTM D4253 and D4254.

Continuity of embedment material shall be interrupted by low-permeability groundwater barriers to impede passage of water through the embedment. Groundwater barriers for sewer lines shall be compacted soil consisting of one 4-foot long soil plug by the full width of the trench at approximately the half-way point between manholes where the distance between manholes exceeds 280 feet. The 4-foot soil plug shall extend the full depth of the trench to the bottom of the trench. Compacted soil shall be classified as CL, compacted to 90% of maximum density. Material may be finely divided, suitable job-excavated material, free from stones,

organic matter, and debris. Low-permeability groundwater barriers shall be required as follows:

Location	Dimensions	Material
Along sewer alignment, half-way between manholes for manholes 280 to 400 feet apart.	4-foot long x full trench width x grade to bottom of trench.	CL - Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays compacted to 90% of maximum density at optimum moisture.

The 4-foot soil plug shall not be located within a proposed street.

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.

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 densities as specified above.

Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction.

Backfill shall not contain waste material, organic material, or debris of any kind.

Trench backfill above pipe embedment in locations other than those specified shall be compacted to 90% of maximum density at optimum moisture content as determined by ASTM D698, unless otherwise permitted by the City Engineer.

Uncompacted earth backfill material to be placed above embedment shall be free of brush, roots more than 2 inches in diameter, debris, cinders, or other corrosive material, and junk, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth. Uncompacted backfill material above embedment may be placed by any method acceptable to the City Engineer which will not impose excessive concentrated or unbalanced loads, shock, or impact on and which will not result in displacement of installed pipe. Non-compacted backfill shall be placed to the extent necessary to prevent excessive future settlement.

Compact masses of stiff clay or other consolidated material more than 1 cubic foot in volume shall not be permitted to fall more than 5 feet into the trench unless cushioned by at least 2 feet of loose backfill above pipe embedment.

No non-compacted trench backfill material containing rocks, or rock excavation detritus, shall be placed in the upper 18

inches of the trench except with specific permission of the City Engineer, nor shall any stone larger than 8 inches in its greatest dimension be placed within 3 feet of the top of pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

6018 STRUCTURE BACKFILL.

Backfill around structures shall be compacted to the extent necessary to prevent future settlement by tamping or other means acceptable to the City Engineer.

Material for backfill shall be composed of earth only and shall contain no wood, grass, roots, broken concrete, stones, trash, or debris of any kind. No tamped or otherwise mechanically-compacted backfill shall be deposited or compacted in water.

6019 DENSITY TESTING.

At the option of the City Engineer, in-place field density testing to determine compliance with specified compaction requirements may be performed using a nuclear moisture-density-measuring device. If, as a result of this field-testing, the City Engineer determines that further compaction is required, the contractor shall revise his compaction procedures to obtain the results specified.

6020 BLANK SECTION.

6021 DRAINAGE MAINTENANCE.

Trenches across roadways, driveways, walks, or other traffic ways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the traffic way, to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially-filled trenches. All material deposited in roadway ditches or other watercourses crossed by the line of trench shall be removed immediately after backfilling is completed and the original section, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

6022 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES.

Where trenches are constructed in ditches or other watercourses, backfill shall be protected from surface erosion. When the grade of the ditch exceeds 1%, ditch

checks shall be installed. Unless otherwise shown on the drawings or directed by the City Engineer, ditch checks shall be concrete. Ditch checks shall extend not less than 2 feet below the original ditch or watercourse bottom for the full bottom width and at least 18 inches into the side slopes and shall be at least 12 inches thick.

6023 DISPOSAL OF EXCESS EXCAVATED MATERIALS.

Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of work by the contractor.

Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be and actually installed in trench backfill, junk, and debris encountered in excavation work and other similar waste materials shall be disposed of away from the site of the work.

Excess earth from excavations located in unimproved property shall be distributed directly over the pipe trench and within the pipeline right-of-way to a maximum depth of 6 inches above the original ground surface elevation at and across the trench and sloping uniformly. Drag with blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the line of trench crosses or is within a railroad, public road, or highway right-of-way. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing shall be a subsidiary obligation of the contractor and no separate payment will be made therefore.

6024 SETTLEMENT.

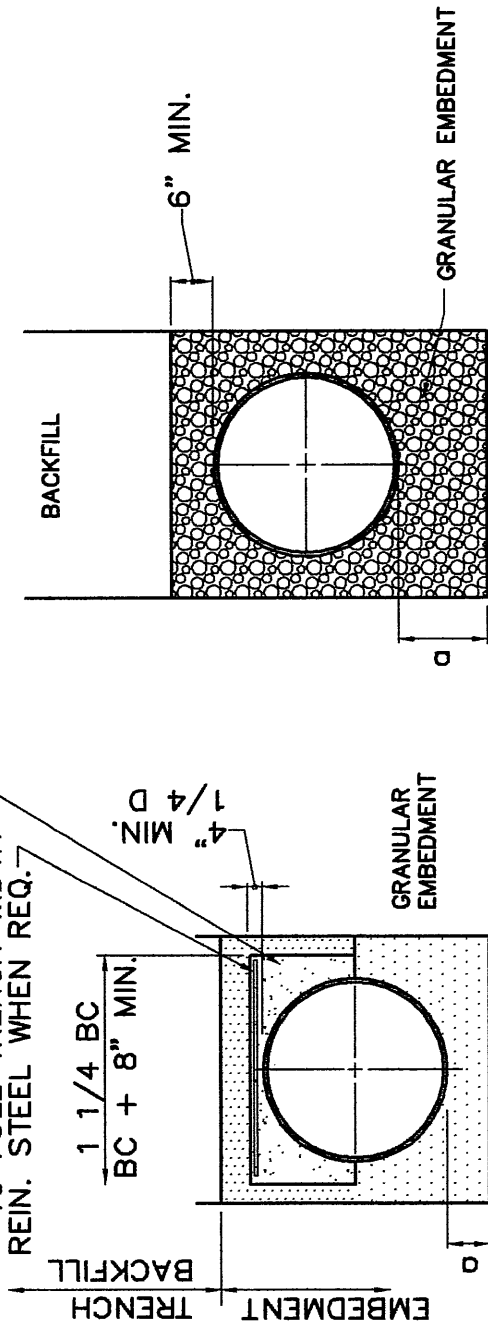
The contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within 2 years of time after final acceptance of the contract under which the work was performed.

A suitable maintenance bond in an amount approved by the City Engineer shall be furnished to the City of Spring Hill by the contractor guaranteeing the maintenance of the construction under which the contract was performed. Said bond shall remain in effect for the period mentioned above from the date of completion and acceptance of the work by the City.

The contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the City Engineer.

END OF SECTION

ENCASEMENT MAY BE PLACED TO FULL TRENCH WIDTH TO REIN. STEEL WHEN REQ.



CLASS A ARCH. ENCASEMENT

TRENCH CROSS SECTION

NOTES:

GRANULAR EMBEDMENT SHALL BE CRUSHED ROCK OR PEA GRAVEL WITH NOT LESS THAN 95% PASSING 1/2" (95% PASSING 3/4" FOR 30" AND LARGER PIPE) AND NOT LESS THAN 95% RETAINED ON A #4; TO BE PLACED IN NOT MORE THAN 6" LAYERS AND COMPACTED BY SLICING WITH A SHOVEL OR VIBRATING.

COMPACTED SOIL SHALL BE FINELY DIVIDED JOB EXCAVATED MATERIAL FREE FROM DEBRIS, ORGANIC MATERIAL, AND STONES, PLACED IN UNIFORM LAYERS NOT MORE THAN 8" THICK, AND COMPACTED TO THE REQUIREMENTS SPECIFIED IN SECTION 6018 "TRENCH BACKFILL" OF THIS SPEC. GRANULAR EMBEDMENT MAY BE SUBSTITUTED FOR ALL OR PART OF COMPACTED EMBEDMENT.

ALL HAUNCHING AND INITIAL BACKFILL SHALL BE HAND PLACED.

ALL WATERLINES (MAINS AND SERVICE LINES) ARE TO BE PLACED A MINIMUM OF 42" BELOW GRADE TO THE TOP OF THE CONDUIT.

TABLE OF EMBEDMENT DEPTH BELOW PIPE	MIN. SOIL		MIN. ROCK	
	27" AND SMALLER	30" TO 60"	66" AND LARGER	
	3"	4"	6"	

LEGEND

BC OUTSIDE DIA. OF PIPE

H COVER ABOVE TOP OF PIPE

D NOMINAL PIPE SIZE

a EMBEDMENT BELOW PIPE

SPRING HILL, KANSAS

PUBLIC
WORKS
DEPARTMENT

APPROVED

JWB

CITY ENGINEER

5-8-08

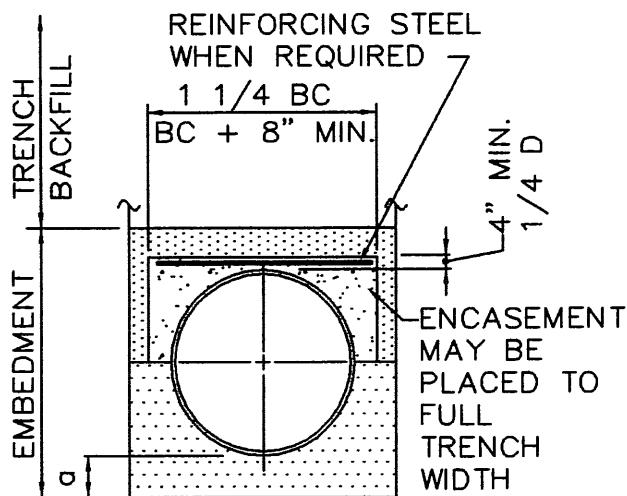
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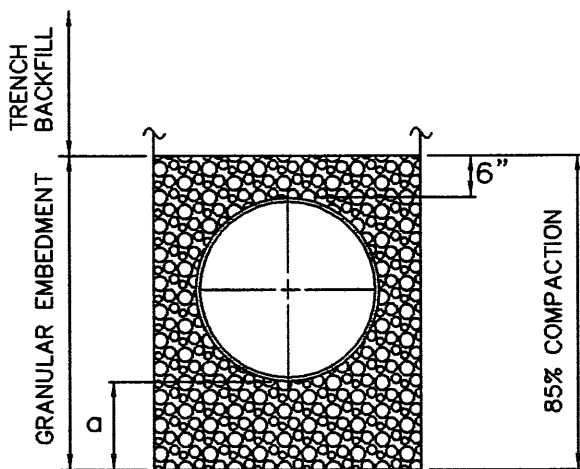
EMBEDMENTS
FOR CONDUITS

STANDARD
DETAIL

60-1



ARCH. ENCASEMENT



TRENCH CROSS SECTION

NOTES:

1. GRANULAR EMBEDMENT SHALL BE KDOT STD. SPEC. SECT. 1100, CA-5 COURSE AGGREGATE FOR CONCRETE, WASHED STONE OR GRAVEL, MEETING THE FOLLOWING CONDITIONS:

SIEVE SIZE	PERCENT RETAINED
1-INCH	0
3/4-INCH	0-5
3/8-INCH	40-60
No. 8	95-100

GRANULAR EMBEDMENT FROM THE TOP OF PIPE DOWN SHALL BE COMPACTED TO 85% MAXIMUM DENSITY AS DETERMINED BY ASTM D 698.

GRANULAR EMBEDMENT ABOVE TOP OF PIPE SHALL BE AN UN-COMPACTED LAYER FOR ALL INSTALLATIONS.

2. TRENCH OUTLINES DO NOT INDICATE ACTUAL TRENCH EXCAVATION SHAPE, SOIL CONDITIONS, OR PRESENCE OF SHEETING LEFT IN PLACE. EMBEDMENT MATERIAL SHALL EXTEND THE FULL WIDTH OF THE ACTUAL TRENCH EXCAVATION.

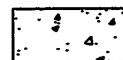
3. TRENCH WIDTHS SHALL BE LIMITED BELOW AN ELEVATION OF ONE (1) FOOT ABOVE THE TOP OF THE INSTALLED PIPE AS FOLLOWS: NOT LESS THAN FIFTEEN (15) INCHES NOR MORE THAN TWENTY-FOUR (24) INCHES GREATER THAN THE NOMINAL OUTSIDE DIAMETER OF THE PIPE.

LEGEND

BC OUTSIDE DIA. OF PIPE
H COVER ABOVE TOP OF PIPE
D NOMINAL PIPE SIZE
a EMBEDMENT BELOW PIPE



GRANULAR EMBEDMENT



CONCRETE

TABLE OF EMBEDMENT DEPTH BELOW PIPE		
D	a MIN. SOIL	a MIN. ROCK
27" AND SMALLER	4"	6"
30" TO 60"	6"	12"

SPRING HILL, KANSAS

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DEPARTMENT**

APPROVED

***JWB
CITY ENGINEER***

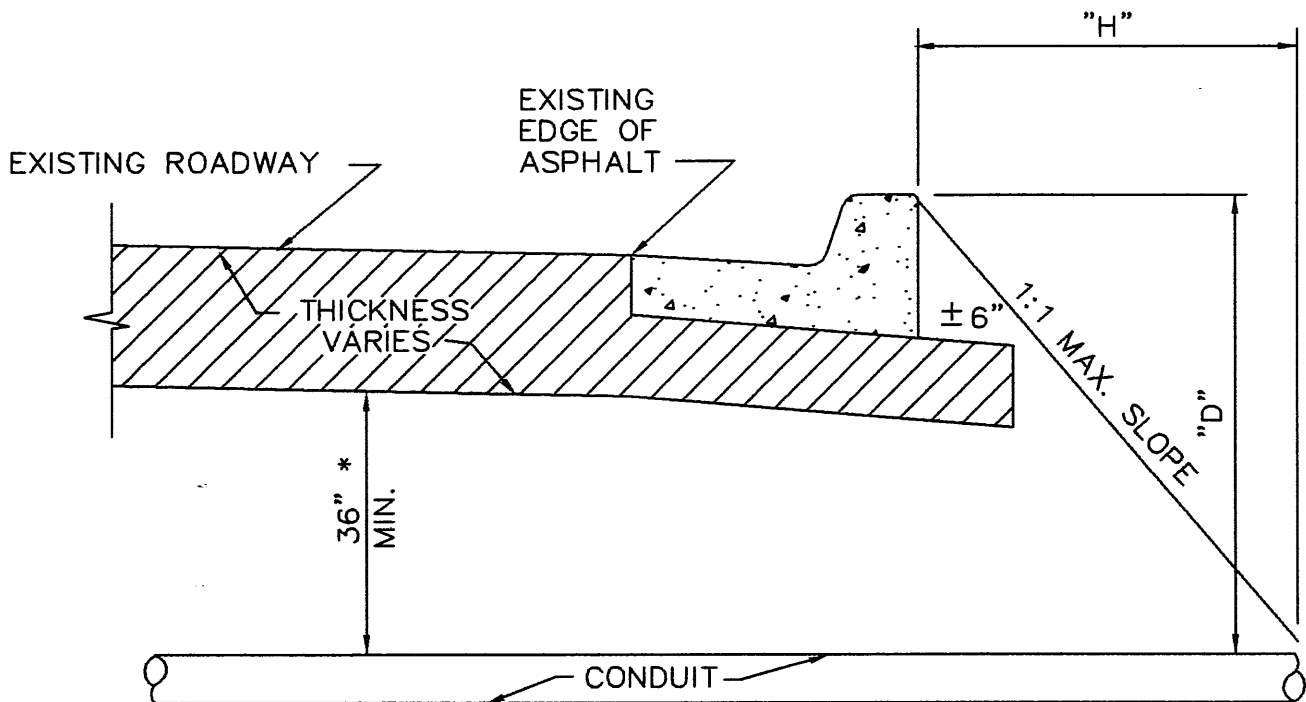
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DATE***

REVISED

**EMBEDMENTS FOR
WATER &
SANITARY SEWER
PIPE**

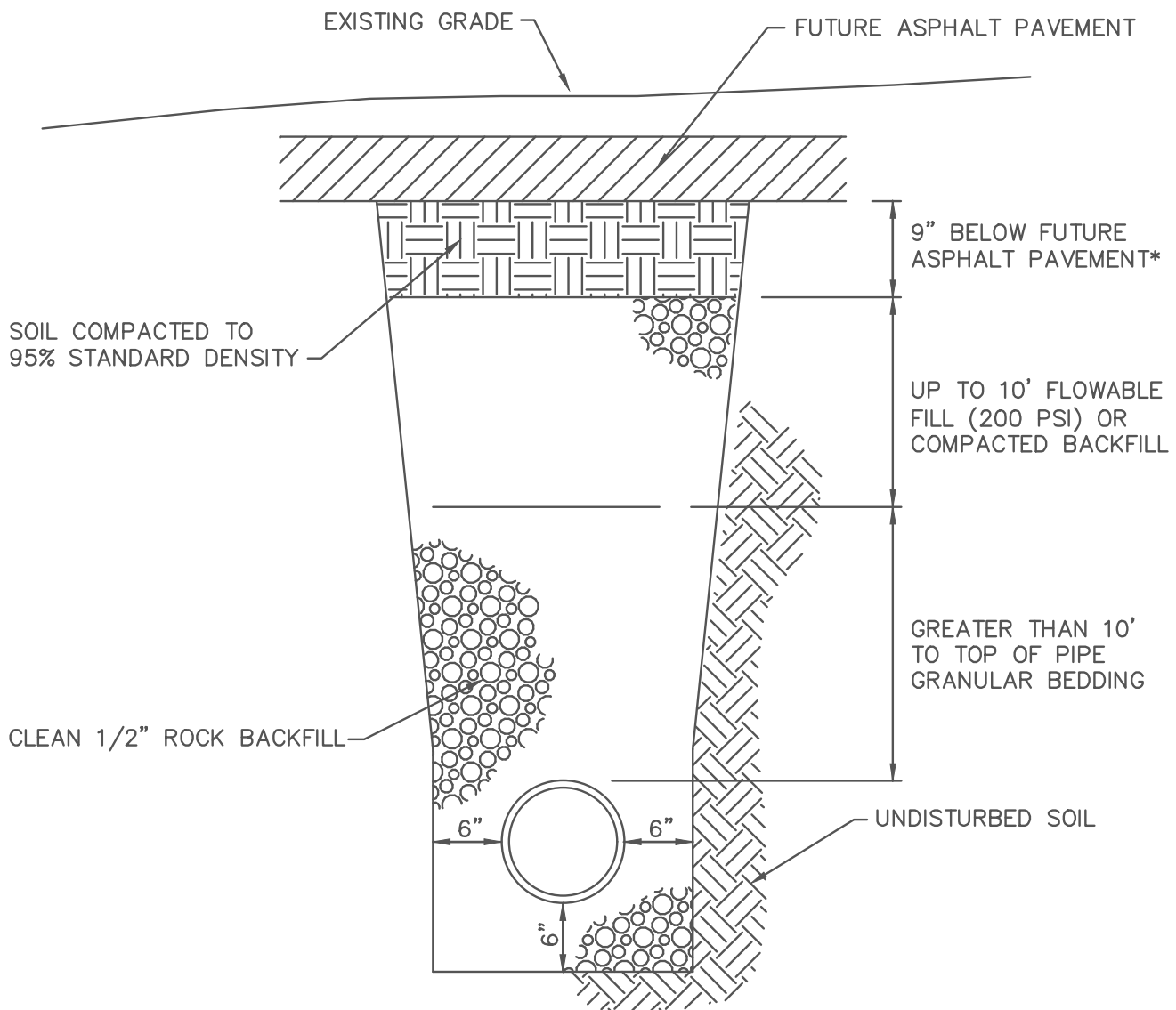
**STANDARD
DETAIL
60-1A**

"H" MIN. DISTANCE BEHIND CURB
TO START PUNCH OR BORE
"D"=TOTAL DEPTH FROM TOP OF
CURB TO TOP OF CONDUIT.
"H"="D"



* DISTANCE MAY BE REDUCED TO 30" FOR
RESIDENTIAL STREET CROSSINGS

SPRING HILL, KANSAS PUBLIC WORKS DEPARTMENT	APPROVED JWB <i>CITY ENGINEER</i> 5-8-08 <i>DATE</i>	REVISED _____ _____ _____	ROADWAY CONDUIT CROSSING DETAIL (BY PUNCH METHOD)	STANDARD DETAIL 60-2
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* IN FILL SITUATIONS, 12" BELOW EXISTING GRADE

SPRING HILL, KANSAS

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DEPARTMENT

APPROVED

JWB
CITY ENGINEER
7-12-18

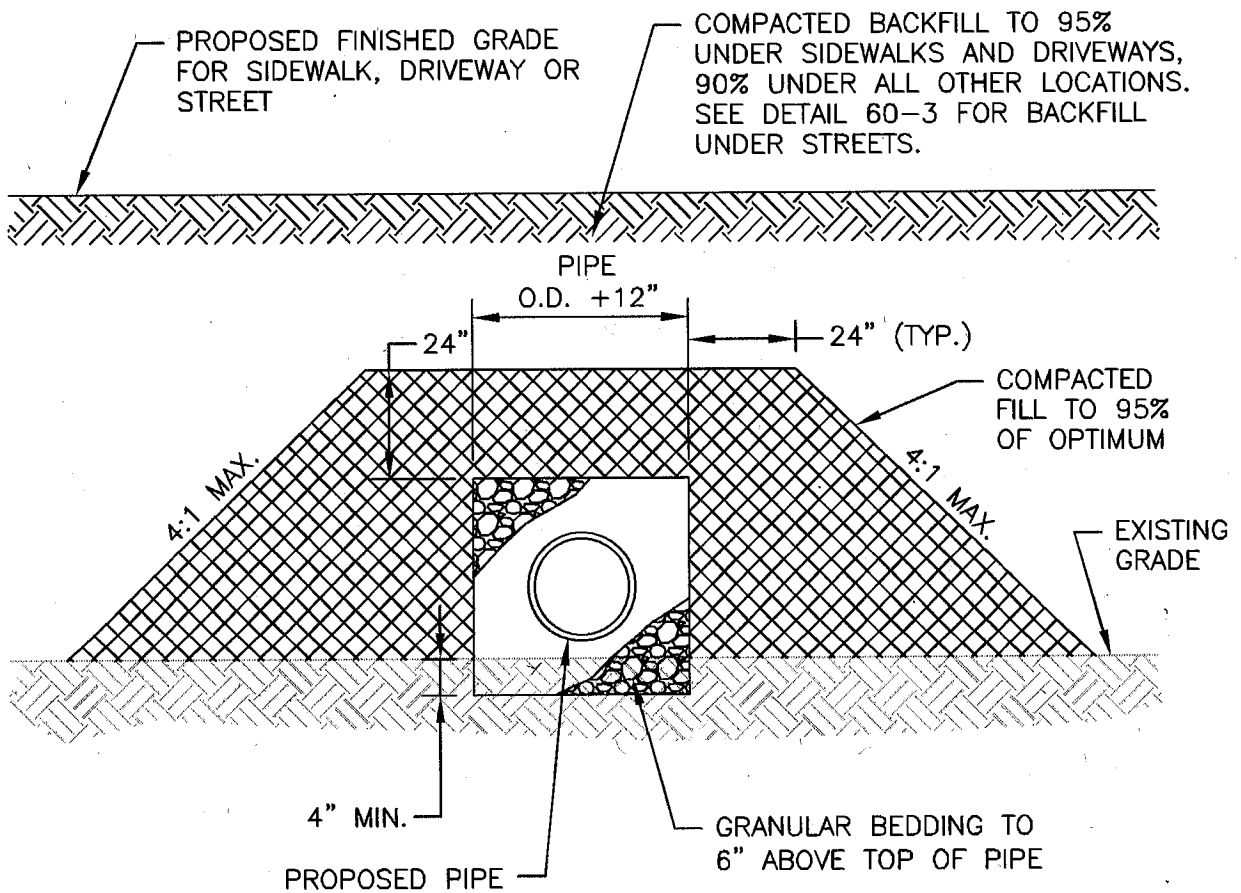
DATE

REVISED

TRENCHING
UNDER FUTURE
STREET

STANDARD
DETAIL

60-3



SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER
12-03-13
DATE

REVISED

**TRENCHING IN
FILL**

STANDARD
DETAIL

60-4

SECTION 6100 - BLASTING

6101 GENERAL.

- a. Blasting will be permitted. Blasting shall be done only by people experienced in the handling of explosives, and in accordance with the recommendations of the AGC Manual of Accident Prevention in Construction and OSHA regulations. In locations where flying rock may be present, additional overburden shall be ready for use and/or in place before denotation. All trenching operations utilizing explosives shall be suitably backfilled to prevent any fly rock endangerment to persons or property. The use of these procedures does not relieve the contractor of responsibility for damage to life and property but acts only as an added assurance to the owner that damage will not occur.
- b. The South Johnson County Fire Department, Fire Marshall's office will be known as the "authority having jurisdiction" regarding the storage, handling, use and control of explosives used in construction projects. All permits for this use will be issued by the Fire Marshall's office. The control of the right of way remains with the City Engineer.

Requirements of the Uniform Fire Code, Article 77 regarding explosives and blasting agents shall be considered part of these Specifications. All explosives and related material shall be in conformity with the requirements of the authority having jurisdiction and the specifications contained herewith whichever is more stringent. Blasting will not be permitted within 80 feet of any building structure.

All blasting operations shall be conducted under the direction of a Kansas certified blaster. Certificates of blaster certification shall be carried by blasters or shall be on file at the Fire Department during blasting operations. A blaster and at least one other person shall be present at the firing of a blast. Persons responsible for blasting operations at a blasting site shall, as a minimum, conform to the criteria as outlined.

The contractor shall be responsible for all damage caused by his blasting operations and shall be responsible for responding to all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with

backfill or embankment materials except as specified or directed.

All blasting by the contractor and his subcontractors shall be in conformity with the requirements having jurisdiction over the right-of-way, or the specifications contained herewith, under the Uniform Fire Code and Fire Marshall's office, whichever is more stringent.

The blast design shall be submitted to the Fire Marshall for review prior to any blasting operations. The blast design shall contain sketches of the drill patterns, delay periods, and decking and shall indicate the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected, as well as a discussion of design factors to be used, which protect the public and meet the applicable air blast and ground vibration standards. The blast design shall be prepared and signed by a certified blaster. The Fire Marshall may request changes to the design submitted.

6102 PREBLASTING SURVEY.

At least 30 days before initiation of blasting, the surveyor shall notify, in writing, all residents or owners of dwellings or other structures located within 600 feet of the blasting area of the intent to conduct a pre-blasting survey. The Fire Marshall may identify alternate pre-blast survey distances.

The surveyor shall promptly conduct a pre-blasting survey of the dwellings or structures and promptly prepare a written report of the survey. An updated survey of any additions, modifications, or renovations shall be performed by the surveyor if requested by the contractor or Fire Marshall.

The surveyor shall determine the condition of the dwelling or structure and shall document any existing damage and other physical factors that could reasonably be affected by the blasting. The surveyor shall examine the interior as well as the exterior structure and shall document any damage by means of photographic or digital recording methods. Structures such as pipelines, cables, transmission lines, cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data. The interior of the existing sanitary sewer shall be surveyed by means of a permanently recorded closed circuit video camera prior to blasting operations and after blasting has been concluded in the area of the existing sewer.

The written report of the survey shall be signed by the person who conducted the survey. Copies of the report shall be promptly provided to the contractor and to the Fire Marshall. All surveys shall be completed by the surveyor before the initiation of blasting. All surveys shall be conducted by a disinterested third party, regularly engaged in performing pre-blast surveys.

The contractor shall submit with the bid, a detailed pre-blast survey method to be reviewed by the Fire Marshall. The pre-blast survey shall not commence until the survey method has been reviewed by the Fire Marshall for completeness.

6103 PUBLIC NOTIFICATION.

Before blasting is started, the contractor shall inform all residents within a radius of 1,500 feet of the blasting location by means of printed information sheets, news releases and/or public meetings.

6104 WARNING SYSTEM.

The contractor shall provide suitable warning by siren or whistle prior to all blasts.

6105 OVER-BLASTING.

The requirements presented herein shall not relieve the contractor from responsibility to avoid disturbing earth or rock beyond indicated and specified lines and levels.

6106 NOTIFICATION.

The contractor shall notify the owner of all gas, water, and petroleum pipe lines in any area where blasting will be utilized. A representative of the pipeline owner shall be allowed to be present to observe preparations and blasting.

6107 TECHNICAL ASSISTANCE.

When necessary, the Fire Marshall's office can render technical assistance in controlling ground vibration and fly rock at the request of the blaster and/or the City Engineer.

6108 BLASTING SCHEDULE.

The contractor shall conduct blasting operations at times approved by the Fire Marshall and City Engineer, and announced in the blasting schedule.

All blasting shall be conducted between 8:30 a.m. and 4:30 p.m. The Fire Marshall or City Engineer may specify more restrictive time periods for blasting.

6109 BLASTING SIGNS, WARNINGS, AND ACCESS CONTROL.

Blasting signs shall meet the specifications of this section. The contractor shall:

- a. Conspicuously place signs reading "Blasting Area" along the edge of any blasting area that comes within 100 feet of any public road right-of-way, and at the point where any other road provides access to the blasting area; also, conspicuously place signs reading "Blasting Area - Turn Off Two-Way Radios" along the edge of any blasting area that comes within 500 feet of any public road right-of-way and 1000 feet on either end of the blasting area; and
- b. At all entrances to the permit area from public roads or highways, place conspicuous signs that state "Warning! Explosives In Use," which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.

Warnings and all-clear signals of different character or pattern that are audible within a range of 1000 feet from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within 1000 feet of the permit area shall be notified of the meaning of the signals.

Access within the blasting area shall be controlled to prevent presence of livestock or unauthorized persons during blasting and until an authorized representative of the contractor has reasonably determined that no unusual hazards, such as imminent slides or un-detonated charges, exist; and access to and travel within the blasting area can be safely resumed.

6110 CONTROL OF ADVERSE EFFECTS.

Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availability of surface or ground water outside the permit area.

- a. Air blast. Air blast shall not exceed the maximum limits listed on the next page at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area, except as provided in this section.

Lower Frequency Limit of Measuring System, in Hz (+3 dB)	Maximum Level, in dB
0.1 Hz or lower; flat response ⁽¹⁾	134 peak
2 hz or lower; flat response	133 peak
6 Hz or lower; flat response	129 peak
C-weighted; slow response	105 peak dbc

⁽¹⁾ Only when approved by the Fire Marshall.

If necessary to prevent damage, the Fire Marshall or City Engineer can specify lower maximum allowable air blast levels than those of listed in this section for use in the vicinity of a specific blasting operation.

The contractor shall conduct periodic monitoring to ensure compliance with the air blast standards. The measuring systems shall have an upper-end flat frequency response of at least 200 Hz.

- b. Ground Vibration. The maximum ground vibration for protected structures listed in this section shall be established in accordance with either the maximum peak-particle-velocity limits, the scaled-distance equation, the blasting level chart, or by the Fire Marshall. All structures in the vicinity of the blasting area, such as water towers, pipelines and other utilities, tunnels, dams, impoundments, and underground mines, shall be protected from damage by establishment of a maximum allowable limit on the ground vibration, 1.0 inches per second, the Fire Marshall may specify a more restrictive limit in the interest of the public safety, or the Fire Marshall may approve a higher limit if justified by the contractor.

The maximum ground vibration shall not exceed the following limits at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area.

Distance (D) From the Blasting Site (feet)	Maximum Allowable Particle Velocity (Vmax) for Ground Vibration (inches/second)¹	Scaled Peak Factor to be Applied Without Seismic Monitoring (Ds) ²
0 to 300	1.00	50
301 to 5,000	1.00	55
5,001 and beyond	0.75	6

¹ Ground vibration shall be measured as the particle velocity. Particle velocity shall be recorded in three mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the three measurements.

² Applicable to the scaled-distance equation.

A seismographic record shall be provided for each blast.

A contractor may use the scaled-distance equation, $W=(D/D_s)$, to determine the allowable charge weight of explosives to be detonated in any 8-millisecond period, without seismic monitoring; where W=the maximum weight of explosives, in pounds; D=the distance, in feet, from the blasting site to the nearest protected structure; and D_s=the scaled-distance factor, which may initially be approved by the City Engineer using the values for scaled-distance factor listed.

The contractor may use the ground-vibration limits in Figure 1 at the end of this Section. to determine the maximum allowable ground vibration.

If the Figure 1 limits are used, a seismographic record including both particle velocity and vibration-frequency levels shall be provided for each blast. The method for the analysis of the predominant frequency contained in the blasting records shall be approved by the Fire Marshall before application of this alternative blasting criterion.

The maximum allowable ground vibration can be reduced by the Fire Marshall beyond the limits otherwise provided by this section, if determined necessary to provide damage protection.

The contractor shall conduct seismic monitoring of all blasts.

6111 RECORDS OF BLASTING OPERATIONS.

The contractor shall retain a record of all blasts for at least 3 years. Upon request, copies of these records shall be made available to the City Engineer and to the public for inspection. Such records shall contain the following data:

- a. Name of the contractor conducting the blast.
- b. Location, date, and time of the blast.
- c. Name, signature, and certification number of the blaster conducting the blast.
- d. Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described herein.
- e. Weather conditions, including those which may cause possible adverse blasting effects.
- f. Type of material blasted.
- g. Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
- h. Diameter and depth of holes.
- i. Types of explosives used.
- j. Total weight of explosives used per hole.
- k. The maximum weight of explosives detonated in an 8-millisecond period.
- l. Initiation system.
- m. Type and length of stemming.
- n. Mats or other protections used.
- o. Seismographic and air blast records, shall include:
 - 1) Type of instrument, sensitivity, and calibration signal or certification of annual calibration;
 - 2) Exact location of instrument and the date, time and distance from the blast;
 - 3) Name of the person and firm taking the reading;

- 4) Name of the person and firm analyzing the seismographic record; and
- 5) The vibration and/or air blast level recorded.

6112 BLASTER.

The blaster shall be trained and be knowledgeable in the applications of all sections.

The blaster shall be responsible for:

- a. Explosives, including:
 - 1) Selection of the type of explosive to be used
 - 2) Determination of the properties of explosives which will produce desired results at an acceptable level of risk, and
 - 3) Handling, transportation, and storage;
- b. Blast designs, including:
 - 1) Geologic and topographic considerations
 - 2) Design of a blast hole, with critical dimensions;
 - 3) Pattern design, field layout, and timing of blast holes, and
 - 4) Field applications;
- c. Loading blast holes, including priming and boosting;
- d. Initiation systems and blasting machines;
- e. Blasting vibrations, air blast, and fly rock, including:
 - 1) Monitoring techniques, and
 - 2) Methods to control adverse effects;
- f. Secondary blasting applications;
- g. Current federal and state rules applicable to the use of explosives;
- h. Blast records;
- i. Schedules;
- j. Pre-blasting surveys, including

- 1) Availability
 - 2) Coverage, and
 - 3) Use of in blast design;
- k. Blast-plan requirements;
 - l. Certification and training;
 - m. Signs, warning signals, and site control;
 - n. Unpredictable hazards, including
 - 1) Lightning
 - 2) Stray currents
 - 3) Radio waves, and
 - 4) Misfires;

The blaster shall be licensed by the appropriate licensing authority. The blaster shall be responsible for obtaining all necessary permits required for blasting operations.

END OF SECTION

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SECTION 7000 - RESTORATION OF SURFACE CONSTRUCTION

7001 SCOPE.

This section covers restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during construction.

7002 GENERAL.

All pavements or other surface construction, which is removed or damaged during the progress of the work, shall be restored to its original or better condition by the contractor. All restoration work shall be subject to acceptance by the City Engineer and the owner or the agency having jurisdiction thereof. All materials used for restoration work shall be new.

7003 REFERENCE STANDARDS.

Materials and construction methods, as referred to herein, shall conform to the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation (Current Edition), and to applicable sections of these Technical Specifications.

7004 PAVEMENT REPLACEMENT.

The replacement of all street surfacing shall be in accordance with the pavement replacement detail shown on Standard Detail 70-1. The replacement concrete and asphalt pavement shall be composed of a concrete base course at least 7 inches thick and an asphalt concrete overlay at least 2 inches thick. Materials and workmanship shall conform to the following:

Concrete	As specified in Section 2000
Asphalt Aggregate	Type BM-2, Section 11-3, "Kansas Highway Specification"
Trench Backfill	Graded Gravel, Type CA-5, Section 1102, "Kansas Highway Specification"

All temporary surfacing placed on public streets will consist of cold mix asphalt at a minimum. Maintenance of the temporary patch is the responsibility of the contractor and is considered a subsidiary item unless noted otherwise in the contract documents.

All drives, parking areas, and other pavement or asphalt surfaces that are removed or damaged shall be replaced to at least their original thickness. Materials used shall be new and shall match the existing surfacing as closely as

possible in type, kind and quality, with the exception of drive approaches which shall be constructed of 4000 psi portland concrete as per Sections 2000 and 2100.

7005 CONCRETE WALKS.

Concrete walks removed in connection with, or damaged as a result of, construction operations shall be replaced with new construction. Such walks shall be constructed of concrete on a thoroughly compacted subgrade, shall have a vertical thickness at least as thick as the existing walks, but not less than 4 inches thick, shall be constructed with expansion joints spaced not exceeding 50 feet apart, and shall be sloped for drainage at right angles to the longitudinal centerline in the amount of approximately 1/4 inch per foot of walk width.

Concrete materials and workmanship shall conform to the applicable requirements of Section 2000 "Concrete" of these Specifications.

Surface finish of concrete walks replaced shall conform to, and shall match as closely as possible, that of existing concrete walk surfaces.

7006 CONCRETE CURBS AND GUTTERS.

Concrete curbs and gutters, which have been removed or damaged by reason of construction operations or any other cause, shall be replaced with new concrete construction. New curb and gutter sections shall be as designated on the drawings and detailed on Standard Details 21-1 and 21-2.

Concrete materials and workmanship shall conform to the applicable requirements of Section 2100 "Concrete Curb, Curb and Gutters, Sidewalk, and Driveway Entrances" of these Specifications.

Construction and expansion joints, dimensions, elevations and surface finish of curb and gutter replacements shall conform to, and shall match as closely as possible, that of adjacent existing concrete curbs and gutters.

7007 GRAVEL SURFACING.

Existing gravel drives, parking and surfacing which is removed or damaged during the progress of the work shall be replaced with an aggregate surfacing at least as thick as that removed, but in no case less than 4 inches.

New aggregate surfacing shall match existing surfacing as nearly as possible in size, gradation, color, and compaction.

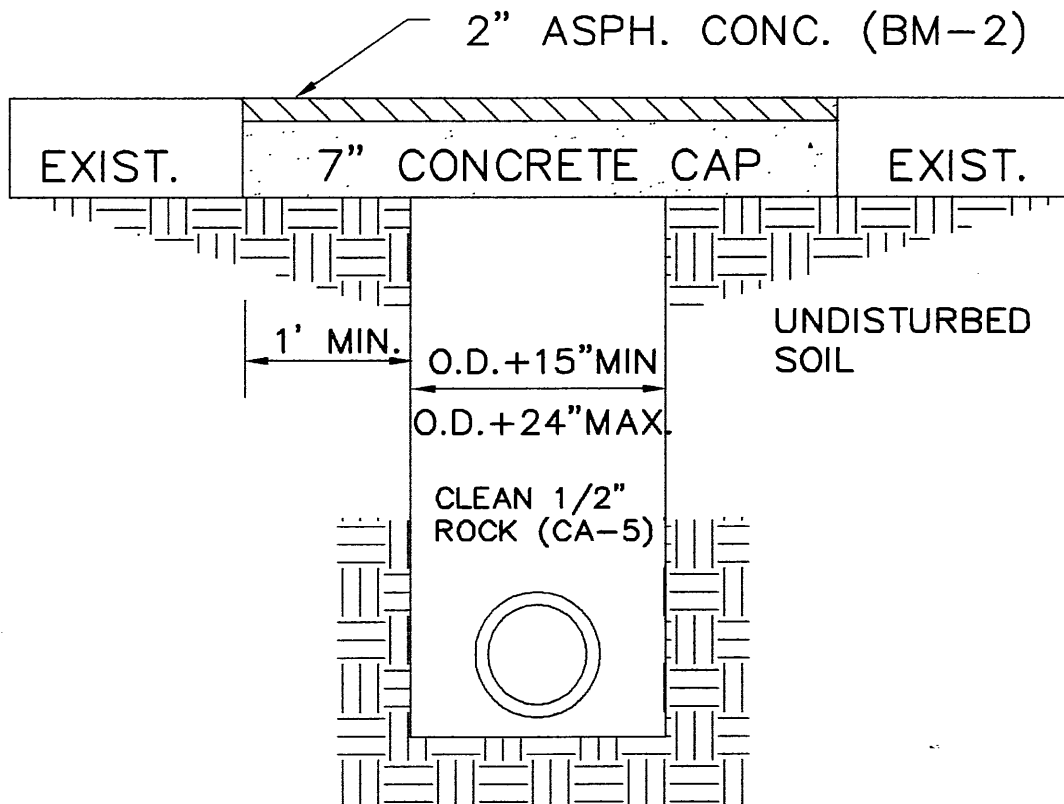
7008 MISCELLANEOUS REPAIR WORK.

All existing items and construction, whether or not indicated by the drawings but which are removed or damaged as a result of construction operations under this contract, shall be repaired or replaced unless otherwise required by the drawings.

Repair or replacement shall be with materials similar to those existing, and shall in each case restore the item to its original or better condition as acceptable to the City Engineer and the owner thereof.

END OF SECTION

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NOTE:

1. THE 1 FT. ON EITHER SIDE OF ACTUAL TRENCH WIDTH SHALL NOT BE REMOVED UNTIL THE TRENCH HAS BEEN FILLED AND COMPACTED.
2. ALL TEMPORARY SURFACING PLACED IN PUBLIC STREETS SHALL CONSIST OF COLD MIX ASPHALT AT A MINIMUM.

SPRING HILL, KANSAS

**PUBLIC
WORKS
DEPARTMENT**

APPROVED

JWB
CITY ENGINEER

5-8-08
DATE

REVISED

**STREET PATCH
DETAIL**

**STANDARD
DETAIL**

70-1

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SECTION 7100 - CHAIN LINK FENCING

7101 SCOPE.

This specification covers chain link fencing and gates.

7102 FENCE TYPE.

Fencing shall conform to the alignment and details shown on the drawings and shall consist of galvanized or aluminum-coated steel fabric, steel posts, top rail, and bottom rail or tension wire. Posts shall be set in concrete.

7103 MATERIALS.

All steel or malleable iron parts and accessories shall be hot-dip galvanized or aluminum coated after fabrication.

Fabric	9-gauge, 2-inch mesh; galvanized ASTM A392, Class II or aluminum-coated ASTM A491, Class II
Posts	Steel H-Section, 0.35% carbon; steel pipe, ASTM A120, standard weight (Schedule 40); or steel hollow structural tubing, ASTM A500 or A501
Line Posts For 6-foot Fencing For 42-inch Fencing	 H-Section, 4.10 pounds per foot; 2 $\frac{3}{8}$ -inch OD pipe, 3.65 pounds per foot; or 2-inch square, 3.85 pounds per foot H-Section, 2.70 pounds per foot; or 1 $\frac{7}{8}$ -inch OD pipe, 2.72 pounds per foot
Terminal Posts For 6-foot Fencing For 42-inch Fencing	 End, corner, and pull posts 2 $\frac{3}{8}$ -inch OD pipe, 5.79 pounds per foot; or 2 1/2-inch square, 5.59 pounds per foot. 2 3/8 inch OD pipe, 3.65 pounds per foot; or 2 inch square, 3.85 pounds per foot
Gate Posts	Gate or leaf 6-foot or less, 2 $\frac{3}{8}$ -inch OD pipe, 5.79 pounds per foot; or 2 $\frac{1}{2}$ -inch square, 5.59 pounds per foot; gate or leaf over 6 foot, 4-inch OD pipe, 9.10 pounds per foot; or 3-inch square, 9.10 pounds per foot

Top Rail	1 $\frac{5}{8}$ -inch OD steel tubing, 1.40 pounds per foot
Rail Couplings	Sleeve type, 6 inches long
Post Tops (when barbed wires are required at the top of the fence)	Pressed steel, malleable iron, with pressed steel extension arm, or hole for top rail; designed to prevent entry of moisture into tubular posts
Post Tops	Pressed steel, malleable iron, or cast aluminum; designed to prevent entry of moisture into tubular posts
Barbed Wire	Galvanized, ASTM A121, Class 2 or aluminum coated ASTM A585, Class II; two 12 $\frac{1}{2}$ -gauge steel wires with 4-point barbs
Stretcher Bars	Steel, 3/16-inch by 3/4-inch, or equivalent area
Fabric Ties	Aluminum bands or wires
Gate Frames	Steel tubing, 1 $\frac{7}{8}$ -inch OD, 2.09 pounds per foot; or 2-inch square, 2.10 pounds per foot
Tension Wire	Galvanized or aluminum coated coil spring wire, 7 gauge
Handrail-Setting Cement	Hallemite "Por-Rok Cement"

7104 GATES.

Gates shall be swing type, hinged to swing 90° from closed to open, complete with frames, latches, stops, keepers, hinges, and fabric. Gate leaves shall have intermediate members and diagonal truss rods as required for rigid construction. Joints between frame members shall be made by welding or by means of heavy fittings, and shall be rigid and water tight. Gate fabric shall be same as fence fabric and shall be attached to frame ends by stretcher bars, bolt hooks, or other mechanical means.

Hinges shall be heavy pattern with large bearing surfaces and shall not twist or turn under the action of the gate. Latches shall be plunger bar type, full gate height, and arranged to engage the gate stop, except single gates less than 10 feet wide may be provided with a forked latch. Latches shall be arranged for padlocking with the padlock accessible from both sides of the gate. Stops shall consist of a roadway plate with anchor set in concrete and arranged to engage the plunger. Keepers shall consist of mechanical devices for securing and supporting the free end of gates when in the full-open position.

Gates shall be installed so that they cannot be removed without disassembly of the hardware. Hardware attachment bolts shall be peened so that removal will be difficult.

7105 FENCE CONSTRUCTION.

The installed fence shall conform to the alignment and finish grade indicated. All posts shall be plumb and unless otherwise shown or required shall be spaced 10 feet apart for 6-foot fencing and 6 feet apart for 42-inch fencing. Where necessary, the fence grade shall be adjusted to fit the ground contour by slipping the fence fabric links. Ground surface irregularities shall be graded as required to maintain not more than a 2-inch clearance below the bottom of the fence fabric.

Where posts are set in earth, concrete foundations 36 inches deep shall be provided. If bedrock is encountered, post excavation shall be continued to the 36-inch depth or 18 inches into the rock, whichever is less. Concrete foundations shall be circular in horizontal section, not less than 10 inches in diameter for line posts, and with a diameter not less than the post OD plus 9 inches for terminal and gate posts, except that foundations in bedrock shall be a minimum of 6 inches larger than the outside dimension of the post. Foundations shall extend above the ground surface and shall be crowned approximately 1 inch. Concrete for foundations shall conform to the requirements of Section 2000 "Concrete." Each foundation shall be cured for at least 72 hours before further work is done on the post.

Top rails and bottom tension wires shall be installed before the fabric. Top rails shall be furnished in at least 18-foot lengths and shall be securely connected to gate and terminal posts. Tension wires shall be installed approximately 6 inches above grade and shall be attached to each post and securely anchored at terminal and gateposts. Straight runs between braced posts shall not exceed 1500 feet. A terminal post shall be provided at each change in slope.

Fabric shall be attached to the top rail, bottom rail, and bottom tension wire at 24-inch centers and to the line posts at 15-inch centers. Barbed wire shall be fastened to each extension arm by internal clips or external fabric ties. Each stretcher bar shall be threaded through the fabric and anchored to the post at 15-inch center by positive mechanical means.

Each gate and terminal post shall be braced by horizontal pipe brace and an adjustable truss extending to an adjacent line post. Corner posts shall be braced in both directions.

Fabrics shall be stretched taut and anchored so that a pull of 150 pounds at the middle of a panel will not lift the bottom of the fabric more than 6 inches.

END OF SECTION

SECTION 7200 - HYDROSEEDING AND SODDING

7201 SCOPE.

This section covers the furnishings of all labor, equipment, tools and materials, and the performance of all work for hydroseeding or sodding as designated on the contract drawings.

7202 GENERAL.

The hydroseeding work shall consist of furnishing and hydraulically applying seed, fertilizer, mulch and tackifiers by an experienced seeding contractor having approved equipment manufactured expressly for the purpose intended.

For public improvement projects hydroseeding shall be required at all non-residential locations shown on the plans and for all grass covered areas that are disturbed by construction operations, either by grading, parking of equipment, temporary roads, or any other operation that has destroyed the existing grasses of the original site, and that is not designated on the drawings to be replaced with sod. All residential locations disturbed by construction will be restored with sod.

For all other types of construction, including that work done under a work within right-of-way permit, sod shall be required where areas are disturbed by construction within the right-of-way in established yards or as directed by the City Engineer.

Sod work shall be performed by an experienced sod-laying contractor.

7203 MATERIAL.

The sod shall be densely-rooted Kentucky Bluegrass. The sod shall contain a growth of not more than 10% of other grasses and clovers, shall be free from all prohibited and noxious weeds, and shall be $\frac{3}{4}$ -inch to $1\frac{1}{4}$ -inch; each strip containing at least 1 square yard. Sod shall be cut in strips not less than 12 inches wide.

Commercial fertilizer for hydroseeded or sodden areas shall contain 12% (by weight) nitrogen, 12% (by weight) phosphoric acid, and 12% (by weight) potash. It shall be uniform in composition, free flowing, and delivered to the site in standard size bags, showing weight, analysis, and name of manufacturer. It shall be stored until use in a weatherproof storage place in such a manner that it will be kept dry and its effectiveness will not be impaired.

Seeds for cover crops shall be the kind and mixture of seeds specified herein. Seeds shall be free of prohibited weed seeds and shall not have more than 1% of noxious weed seeds.

Seeds shall be delivered to the site in convenient containers, each fully labeled, bearing the name, or trademark and a warranty of the producer and a certificate of the percentage of the purity and germination of each kind of seed specified. The tags shall be made available to the City Engineer for filing.

The following formula shall be used to determine the amount of commercial seed required to provide for each kind of seed the specified quantities of pure live seeds.

$$\text{Pounds of Commercial Seed Required} = \frac{10,000 \times \text{Rate of Pure Live Seed (lbs/acre)}}{\text{Purity \%} \times \text{Germination \%}}$$

Where hydroseeding is required in areas of shoulders and slopes in street right-of-way, and any other areas where a high-quality seeding is deemed necessary, the seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed, %	Rate of Pure Live Seed, Pounds/Acre
Perennial Rye (Derby or equivalent)	80	65
Turf-type Tall Fescue (Rebel II or equivalent)	80	175
Annual Rye	85	10
Total	250# / Acre	

Where hydroseeding is required in vegetation-covered medians, the seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed, %	Rate of Pure Live Seed, Pounds/Acre
Buffalo grass	85	90
Annual Rye	85	110
Total	200# / Acre	

Where hydroseeding is required in areas off street right-of-way that are not maintained periodically, the seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed, %	Rate of Pure Live Seed, Pounds/Acre
Alta Fescue or Kentucky 31 Fescue (Festuca Elatior Var. Arundinaces)	75	90
Rye Grass (Lolium Perenne or L. Multiflorum)	80	50
Total	140# / Acre	

Mulch for application in hydroseed mixtures shall consist of shredded paper fibers.

7204 TIME OF HYDROSEEDING OR SODDING.

Hydroseeding and fertilizing shall be performed between August 15 and October 15 for Fall planting and between February 15 and April 30 for Spring planting, unless otherwise acceptable to the City Engineer. Hydroseeding and fertilizing shall not be done during periods of such severe drought, high winds, or excessive moisture, as determined by the City Engineer, that satisfactory results are not likely to be obtained.

Sod shall not be placed between June 15 and September 15 or on frozen ground or during the period from October 15 to March 15, unless authorized by the City Engineer.

Any hydroseeding or sodding to be performed during periods other than those previously designated will require a written request to extend the permissible period for performing such work. Said request shall explain the reason for the variance and shall include a guarantee (by the general contractor) of satisfactory results by the end of the first four (4) weeks of the following growing season as previously defined, or the necessary re-hydroseeding or re-sodden work performed at that time. The request shall be initiated by the general contractor and directed to the City Engineer for consideration for approval.

7205 PREPARATION OF SOD BED.

The sod bed shall have a uniform surface free from washes and depressions and shall conform to the finished grade profile or cross section shown on the plans. The soil, except where fresh topsoil has just been applied and compacted, shall be thoroughly tilled to a depth of 2 inches. Freshly-graded areas, which have set long enough to become dry and crusted over, shall be tilled as specified above, preparatory to placing the sod.

Sod placed next to existing grassy areas, curbs, sidewalks or like boundaries shall be cut-in to match like grades.

7206 PLACEMENT OF SOD.

Sod shall be transplanted within 24 hours from the time it is harvested. All sod in stacks shall be kept moist and protected from exposure to the sun and from freezing.

The fertilized sod beds shall be in a firm but not too compacted condition with relatively fine texture at the time of sodding. Sod shall be moist when it is placed. The use of dry sod will not be permitted. Sod strips shall be laid along contour lines by hand, commencing at the lowest point of the area and working upward. The transverse joints of sod strips shall be staggered and the sod carefully placed to reduce tight joints. The sod shall be firmed, watered, and re-firmed immediately after it is placed. The "firming" shall be accomplished by application of a roller weighing not less than 60 nor more than 90 pounds per linear foot of roller. On steep slopes, the sod may be firmed by compacting with hand shovels. The firming process shall pack the sod roots firmly into the prepared soil.

The contractor shall water installed sod within 24 hours and shall water all sod twice daily for a minimum of 21 days from initial laying, except on those days where a minimum of 1/4-inch of rain falls in a 24-hour period.

7207 PREPARATION OF THE HYDROSEEDBED.

The area to be hydroseeded shall be thoroughly tilled to a depth of at least 3 inches by disking, harrowing or other approved methods until the soil is well pulverized. After completion of the tilling operation, the surface shall be cleared of all stones, stumps, or other objects larger than 1½ inches in thickness or diameter, and of roots, wire, grade stakes, and other objects that might be a hindrance to maintenance operations. Areas tilled shall then be brought to the desired line and grade and maintained until hydroseeding is complete to ensure a smooth area with no gullies or depressions.

Any objectionable undulations or irregularities in the surface resulting from tillage or other operations shall be removed before planting operations are begun. Hydroseedbed preparation shall be performed only during periods when satisfactory results are likely to be obtained. When results are not satisfactory because of drought, excessive moisture or other causes, the work shall be stopped until such conditions have been corrected to the satisfaction of the City Engineer.

7208 PLACEMENT OF HYDROSEED.

Hydroseeding may be accomplished by means of approved equipment.

Hydroseeding equipment shall include a pump capable of being operated at 100 gallons per minute and at 100 psi, unless otherwise directed. The equipment shall have an acceptable gauge and a nozzle adaptable to hydroseeding requirements. Storage tanks shall have a means of agitation and a means of estimation of the volume used, or remaining in the tank. Storage tank shall have a minimum capacity of 250 gallons. Hydroseeding equipment shall be equipped with suitable spray tips to ensure distribution of the material at the application rate of not less than 3,000 pounds/acre.

Hydros shall not be performed during windy weather or when the ground is frozen or otherwise not tillable.

7209 MAINTENANCE.

All hydroseeded areas shall be protected against damage by vehicle and pedestrian traffic by the use of barriers and appropriate warning signs. If at any time before completion and acceptance of the hydroseeding work any portion of the hydroseeded area becomes gullied or otherwise damaged, such damaged areas shall be repaired by filling with soil to original grade and re-hydroseeding. All costs of repair work shall be borne by the contractor.

Contractor shall be responsible for watering areas hydroseeded for a period of 5 weeks after the time of hydroseeding, except when thoroughly wetted by rain. Sprinkling of the hydroseeded areas shall be carefully done in such manner as to avoid standing water, surface wash, or scour.

All sodded areas shall be thoroughly watered twice daily for a period of 20 after placing, except when thoroughly wetted by rain of 1/4-inch or more in a 24-hour period.

7210 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 payment under the contract. During the guarantee period, all turf, which dies, shall be replaced, by and at the expense of the contractor, with like material.

END OF SECTION

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SECTION 7300 - EROSION CONTROL

7301 SCOPE.

This section covers all labor and materials for the construction of erosion control measures. It includes the installation of erosion control devices that result in the reduction of soils leaving the construction site. Measures shall address but are not limited to inlet protection, stream protection, adjacent property protection, and public right-of-way protection.

7302 GENERAL.

Erosion control measures will be required on all construction plans submitted to the City of Spring Hill Public Works Department. All projects which disturb an accumulative area of more than one acre will be temporarily hydroseeded and mulched to the requirements of Section 7200 "Hydroseeding and Sodding" immediately after street construction is complete. No other work will be allowed to begin until the seeding and mulching is complete unless approved by the City Engineer.

Erosion control measures will be required to be installed in accordance with the approved erosion control plan prior to any grading or construction activities. Erosion control methods include, but are not limited to, the following techniques: settling basins, sediment traps, rock entrance construction and perimeter controls.

During construction, the City Engineer or his representative may require, or the applicant may request, that the construction of the erosion control facilities and the associated designs be modified. Modifications to the erosion control plan shall be submitted to the City Engineer prior to any construction activities if physical conditions are discovered on the site that are inconsistent with the assumptions upon which the approval was based, including, but not limited to, unexpected soil conditions, runoff patterns, general weather generated problems, or changes in the design of the improved areas.

7303 MATERIALS.

Materials shall consist of waddles (as shown in Detail 73-1), rock ditch checks (as shown in Detail 73-2), inlet protection (as shown in Detail 73-3), rock construction entrance (as shown in Detail 73-4), OR any combination of methods as approved by the City Engineer or his representative.

Temporary seeding will be a combination of annual and perennial rye. Total seeding rate will be 200 lbs/acre and

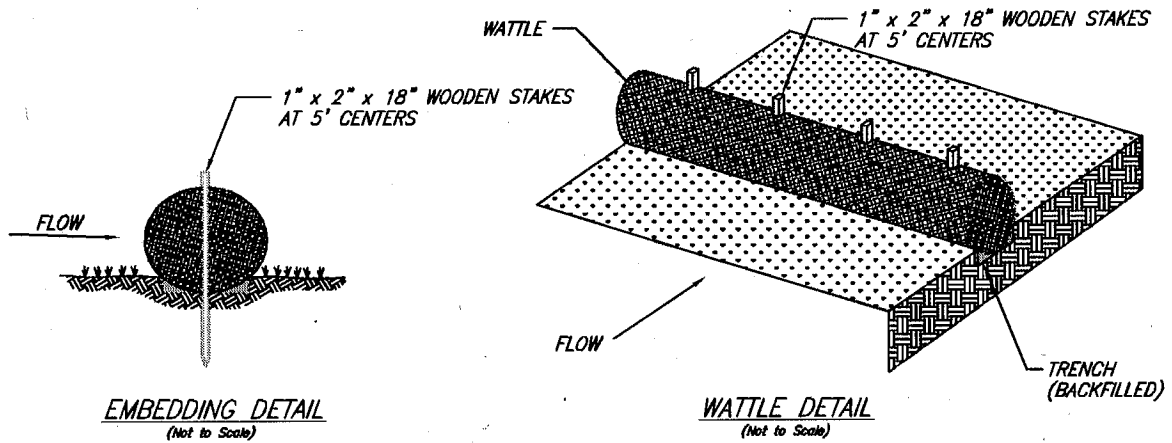
shall consist of 130 lbs/acre of annual rye and 70 lbs/acre of perennial rye. All seeding shall meet the requirements set forth in Section 7200 "Seeding and Sodding."

7304 MAINTENANCE.

On any property where grading or other work has been permitted, it shall be up to the permittee or owner to maintain and repair erosion control facilities. Whenever the City Engineer or his representative find that any existing grading, drainage, or ground condition is defective or deficient under the requirements of this division, all work shall cease until measures have been taken to meet the conditions of this division.

Failure to make repairs to erosion control facilities shall result in fines and penalties as outlined in Chapter XVIII, paragraph B, of the Spring Hill City Code.

END OF SECTION



CONSTRUCTION SPECIFICATIONS

1. Wooden stakes which support the wattle shall be installed on a slight angle toward the anticipated runoff source.
2. Wattle shall be trenched in with a spade or mechanical trencher so that the downslope face of the trench is flat and perpendicular to the line of flow.
3. The trench should be a minimum of 3"-4" deep and 12" wide to allow for the Wattle to be laid in the ground and backfilled.
4. Wattle should be secured in place using 1"x2"x18" wooden stakes at 5' spacing.
5. Inspection shall be frequent and repair or replacement shall be made promptly as needed.
6. Wattle shall be removed when it has served its usefulness so as not to block or impede storm flow or drainage.
7. Sediment trapped by this practice shall be uniformly distributed on the source area prior to topsoiling.

WATTLES (Not to Scale)

EROSION CONTROL NOTES:

1. The contractor shall provide all materials, tools, equipment and labor as necessary to install and maintain adequate erosion control to prevent soil from leaving the project site. It shall be the contractor's responsibility to insure that the methods utilized comply with the requirements of the governmental agencies having jurisdiction over the work.
2. The contractor shall control the grading operation so that the site is well drained at all times and shall schedule the work to minimize the erosion of material by the use of staked wattles and other acceptable methods to protect the abutting properties, streets, and all utilities.
3. Erosion control devices shall remain in place for the duration of the project.
4. The contractor shall seed/mulch and or sod all areas disturbed during the construction activities.

SPRING HILL, KANSAS

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CITY ENGINEER

5-14-09

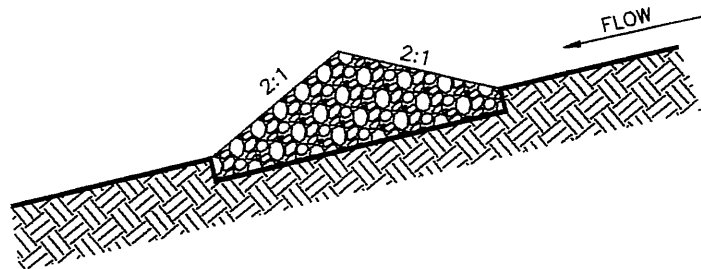
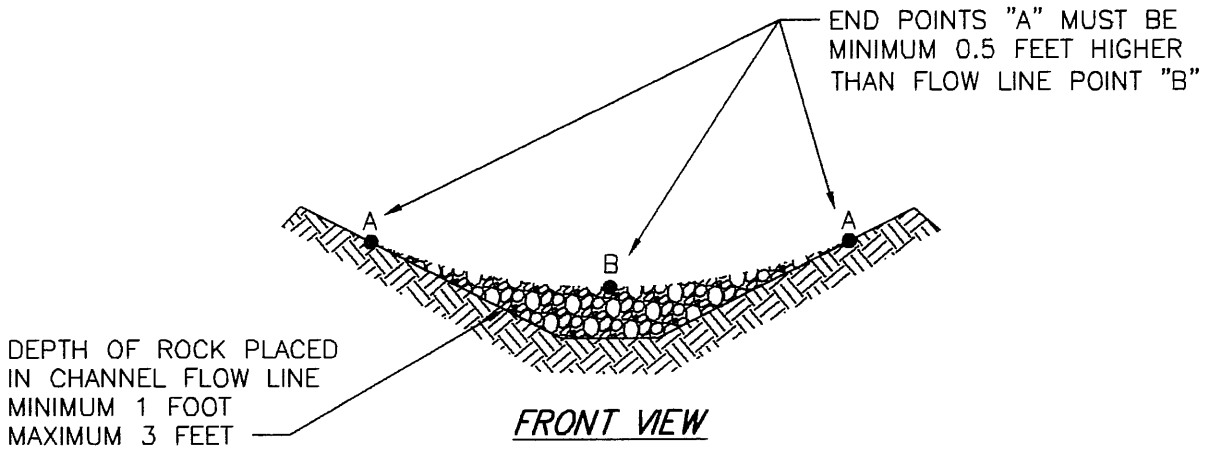
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REVISED

EROSION
CONTROL
WATTLE DETAIL

STANDARD
DETAIL

73-1



2 ACRES OR LESS DRAINAGE AREA

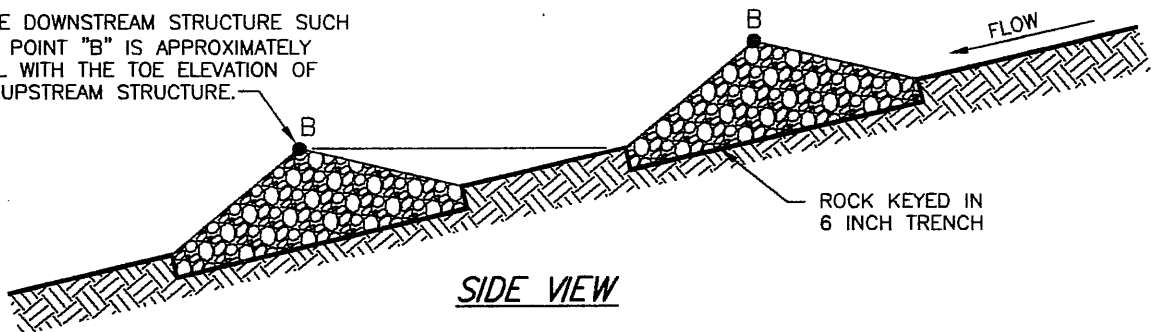
3 - 6 INCH AGGREGATE

2 - 10 ACRES DRAINAGE AREA

3 - 6 INCH AGGREGATE UPSTREAM

d_{50} - 12 INCH RIP-RAP DOWNSTREAM

PLACE DOWNSTREAM STRUCTURE SUCH THAT POINT "B" IS APPROXIMATELY LEVEL WITH THE TOE ELEVATION OF THE UPSTREAM STRUCTURE.



ROCK DITCH CHECK
(Not to Scale)

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DATE

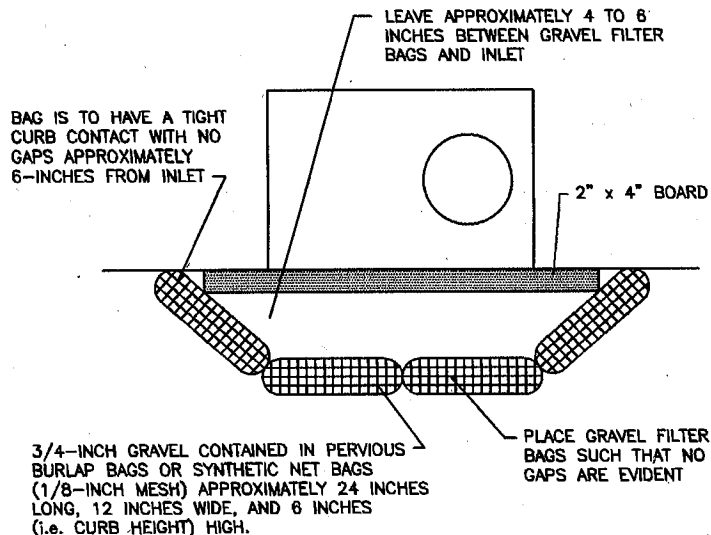
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**EROSION
CONTROL ROCK
DITCH CHECK
DETAIL**

**STANDARD
DETAIL**

73-2

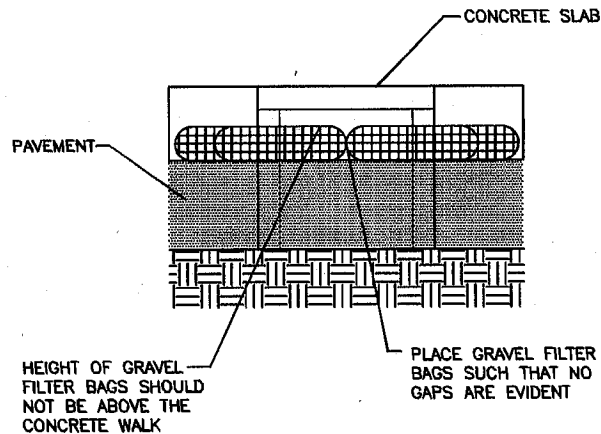
NOTE:
WATTLES LOCATED ALONG THE PROJECT BOUNDARIES
SHALL BE INSTALLED PRIOR TO GRADING OPERATIONS



TOP VIEW

GRAVEL FILTER BAGS

(Typical At Every Inlet)
(Not to Scale)



FRONT VIEW

NOTE:
AFTER CONSTRUCTION OF INLETS, FILTER BAGS SHALL BE PLACED
AROUND PROPOSED INLETS.

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CITY ENGINEER

5-14-19

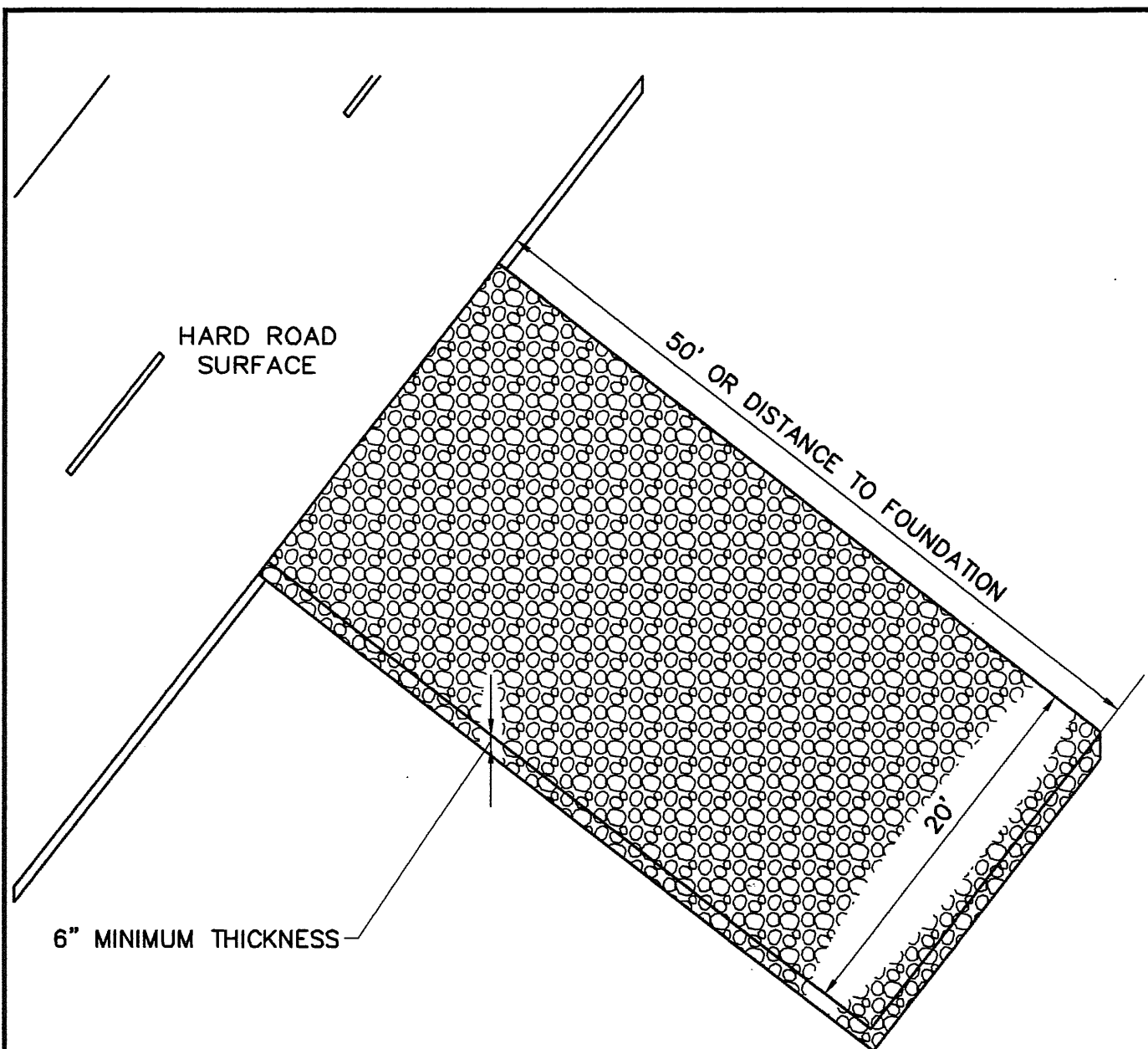
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REVISED

EROSION
CONTROL GRAVEL
FILTER BAG

STANDARD
DETAIL

73-3



NOTES:

1. INSTALL AS SOON AS POSSIBLE AFTER START OF GRADING.
2. USE 2 TO 3 INCH AGGREGATE STONE.
3. DRIVE MUST BE AT LEAST 20 FEET WIDE AND 50 FEET LONG OR THE DISTANCE TO THE FOUNDATION, WHICHEVER IS LESS.
4. REPLACE AS NEEDED TO MAINTAIN 6 INCH DEPTH.

<i>SPRING HILL, KANSAS</i> <u>PUBLIC</u> <u>WORKS</u> <u>DEPARTMENT</u>	<i>APPROVED</i> JWB <i>CITY ENGINEER</i> 5-8-08 <i>DATE</i>	<i>REVISED</i> _____ _____ _____	GRAVEL CONSTRUCTION ENTRANCE	STANDARD DETAIL 73-4
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SECTION 7400 - DUST CONTROL

7401 SCOPE.

This section covers all labor and materials for the application of dust control additives as needed to control dust at the construction site and along any existing gravel roads adjacent to the construction activity. Measures includes but is not limited to the addition of water at the construction site and water to existing gravel roads adjacent to the construction site. If the application of water is not sufficient to control the dust problem, the use of chemical additives to the construction site and/or existing gravel roads will be required.

7402 GENERAL.

In areas where adjacent residents will be affected by construction activities, the contractor shall make every attempt to limit the construction traffic on existing gravel roads. If this is not practical the contractor shall take the appropriate measures to minimize dust.

The contractor shall also take the appropriate measures required to minimize dust within the construction area.

7403 MATERIALS.

Dust control for existing gravel roads will require the use of water and/or magnesium chloride. The rate of application and number of daily application for water will be weather dependent. Rate of application for magnesium chloride shall be as recommended by the manufacturer or local vendor.

Dust control for disturbed construction area will require, as a minimum, the use of water. The rate of application and the number of daily application will be weather dependent.

7404 APPLICATION.

Before application of water or magnesium chloride to an existing gravel road, the existing road bed shall be properly prepared. The existing roadbed shall be graded to make sure it has a proper crown for drainage and make sure the shoulders are also graded for proper drainage. The grading operations shall eliminate any low spots in the road as this will lead to subgrade damage. Before the application of magnesium chloride, the contractor shall also loosen the top 1" to 2" of the existing gravel roadbed and leave it loose at a uniform depth across the roadbed. Do not compact the roadbed at all prior to applying the magnesium chloride.

The gravel shall also be close to optimum moisture content prior to application of magnesium chloride.

Equipment required for the dust control shall have accurate calibration that will allow for even application of the magnesium chloride.

Application of magnesium chloride shall not be made if rain is in the immediate forecast. Rain on a freshly treated surface will leach out and dilute the chloride causing it to run off the road. This will result in very poor performance of the dust control.

Rolling of the surface can be helpful in stabilizing the road surface but is not required.

Any failure of the dust control measures will be corrected by the contractor as needed throughout the course of the project.

SECTION 8000 - MATERIALS TESTING

8001 SCOPE.

This section shall apply to all required testing services for soils, asphalt and concrete.

8002 GENERAL.

All materials testing shall be conducted by a testing laboratory qualified and approved by the City to perform the required sampling, analysis, testing and report writing services. Reports shall be prepared by or under the supervision of and bear the seal and signature of a professional engineer licensed in the State of Kansas. Improperly completed or certified reports will not be accepted.

8003 RESPONSIBILITIES OF THE CONTRACTOR OR DEVELOPER.

The contractor or developer shall provide all the required tests as herein specified at his expense. The contractor shall allow the testing agency access to the job site as may be required and shall furnish any labor as may be required by the testing agency to obtain and handle samples at the source of the material and at the site of the work. Adequate facilities shall be provided at the project site for the safe storage and proper curing of specimens requiring such facilities. The use of a testing agency's service does not relieve the contractor of the responsibility to furnish the required materials and to perform the required construction in full compliance with the City of Spring Hill Technical Specifications. The successful passing of a test does not constitute acceptance of the work or materials represented by the test or any portion of the work or materials. Final acceptance of the project shall be granted only through the issuance of a Project Completion Certificate by the City of Spring Hill and the expiration of the 2-year maintenance period as established in these Specifications.

8004 RESPONSIBILITIES OF THE TESTING AGENCY.

All testing agencies shall meet the requirements of ASTM E329. A representative shall inspect, sample and test the materials and work as required by the City Engineer. Any material furnished or work performed by the contractor failing to conform to the specification requirements shall be immediately brought to the attention of the City Engineer and the contractor. Preliminary written field reports of all tests and inspection results shall be given to the contractor immediately after they are performed. A copy of all reports shall be forwarded to the City Engineer as they are made available. Results of all tests taken, including

failing tests, shall be reported. The testing agency and its representative are not authorized to revoke, alter, relax, enlarge or release any requirement of the specifications, nor to approve or accept any portion of the work.

8005 ASPHALT TESTING.

Sampling and testing of the asphalt mix shall be required on all asphalt paving projects constructed in the City of Spring Hill.

Samples of the actual asphalt mix being used on a paving project shall be acquired by a qualified testing laboratory technician at either the construction site or the batching plant per ASTM Standards D979 and D3665. These samples shall be used to perform an aggregate gradation test (ASTM C136), asphalt extraction test (ASTM D2172), stability and flow test (ASTM D1559) and bulk specific gravity test (ASTM D2726). One complete group of tests shall be conducted on both the base material and the surface material for each paving project.

In-place density tests shall be conducted with a nuclear testing device during the course of the work. Density tests shall be performed by the testing agency to verify that the performance specifications in Section 1309 "Density and Surface Requirements" of this Specifications manual have been achieved. The number of tests to be taken and the locations thereof shall be determined by the inspector based upon his observation of the paving process. A minimum of two tests per 1500 feet of street improvement shall be taken unless otherwise directed by the City Engineer. Tests performed with a nuclear device shall be conducted as per the requirements of ASTM D2950.

8006 CONCRETE TESTING.

Sampling and testing shall be required on all concrete work including curb and gutter, sidewalk, slope paving, retaining walls, inlets, manholes or any other structures.

During the progress of the work, compression tests of the concrete used shall be made as directed by the City Engineer in accordance with the requirements of ASTM C31, C143, and C172. At least one sample, consisting of four cylinders minimum, shall be taken from each 100 cubic yards of concrete placed or fraction thereof. In the event that the total amount of concrete on a project does not exceed 200 cubic yards, a minimum of four specimens (consisting of four cylinders each) shall be submitted for the project. In the case of a reinforced concrete box, a minimum of one sample shall be taken for each day's pour. The cylinders shall be cast in the field and transported to the laboratory 24 hours

after the concrete was placed. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders taken was placed, the delivery truck or batch number, the air content, and the slump. From each sample consisting of four cylinders, one shall be broken at 7 days, one at 14 days and two at 28 days noting the compressive strength of each break.

Slump tests (ASTM C143) and air tests (ASTM C231) shall be made for each 25 cubic yards of concrete placed or fraction thereof. A minimum of two slump and air tests shall be taken per day. Slump and air tests shall be taken with each cylinder series.

If samples of fresh concrete have not been obtained and tested, a minimum of three cores shall be taken per ASTM C42 and broken as directed by the City Engineer. Air content (ASTM D457) and cement content (ASTM C85) shall also be determined. Concrete in the portion of the structure from which the core was taken will be considered adequate if the average strength of the cores is equal to a minimum of 95% of the specified strength (f'_c) and if the strength of any single core is not less than 80% of f'_c . All core holes shall be completely filled with a low-slump, high strength concrete at the expense of the contractor.

All reports by testing laboratories shall include the type of structure and information on obtaining, transporting, storing, curing, time between obtaining and casting cylinders (when applicable), supplier, finisher and batch as well as the specific test data.

8007 SOIL TESTING.

Sampling and testing shall be required on all subgrade preparation for street construction and all trench backfilling operations within the City of Spring Hill.

Prior to the contractor commencing subgrade compaction for any street improvement project, the City Engineer shall designate the locations and depths at which a qualified technician shall acquire samples of soil for performing a moisture density test (ASTM D698 for cohesive soils and ASTM D2049 for non-cohesive soils). A minimum of one density test and maximum of two density tests shall be performed for every 1000 feet of street construction.

Reports for moisture-density tests shall include the date, the location of the tests, the elevation or depth at which the test was taken, the maximum dry density, and the optimum moisture content as well as properly constructed moisture-density curves for each sample. Also included

shall be a determination of the soils plastic index (PI) and liquid limit and classification in accordance with ASTM D2487.

During the progress of the subgrade preparation, in-place density tests shall be performed with a nuclear density tester by a qualified technician approved by the City of Spring Hill. The number of tests to be taken and the location thereof shall be determined by the inspector based upon his observation of the subgrade preparation. A minimum of two tests per lift per 1500 feet of street improvement shall be taken unless otherwise directed by the City Engineer. Results of these tests shall indicate whether or not the performance specifications stated in Section 1205 "Compaction Requirements" of this specification manual have been achieved.

If the tests indicate the compaction is not sufficient, the contractor shall increase the compaction effort on all such inadequately compacted areas. Tests performed with a nuclear device shall be conducted as per the requirements of ASTM D2922.

During the progress of the work of trench backfilling, in-place density tests shall be performed with a nuclear density tester by the testing agency. The number of tests to be taken and the locations thereof shall be determined by the inspector based upon his observation of the backfilling process. A minimum of two tests per 1000 feet of trench shall be taken unless otherwise directed by the City Engineer. Results of these tests shall indicate whether or not the performance specifications stated in Section 6017 "Trench Backfill" of this Specification manual have been achieved. If the tests indicate the compaction is not sufficient, the contractor shall increase the compaction effort on all such inadequately compacted areas.

END OF SECTION

SECTION 9000 - STREET LIGHTS

9001 SCOPE.

This work shall consist of furnishing all labor, materials and equipment to complete in place the street lighting system as shown on the plans and as specified in the following specifications, as directed by the City Engineer, and in those sections of the standard specifications of the City of Spring Hill, Kansas, and the Kansas Department of Transportation, that are either directly, or by reference, included herewith.

9002 GENERAL.

All incidental parts which are not shown on the plans or specified herein and which are necessary to complete the street lighting system shall be furnished and installed as though such parts were shown on the plans or specified herein. All systems shall be complete and in operation to the satisfaction of the City Engineer at the time of acceptance of the work.

All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). In addition to the requirement of these Specifications, the plans, and the lighting specifications, all material and work shall conform to the requirements of the National Electric Code, the Standards of the American Society for Testing Materials (ASTM), the American Standards Association (ASA), and local ordinances.

Wherever reference is made in these Specifications or in the standard 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 advertising of these Specifications.

All existing signal conduit/conductor runs and other utility information were obtained from existing office records. It shall be the contractor's responsibility to locate all utilities, whether above, on or below the ground, and to protect the City against any and all damages arising from work under this project.

9003 MATERIALS.

- A. Shaft: The shaft shall be spun from one piece of seamless tubing: Aluminum Association Alloy 6063; and after fabrication, it shall have 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. The shaft shall have no

longitudinal or circumferential welds, except at the lower end joining the shaft to the base.

Poles for single arm, 40-foot luminaire mounting height shall have a minimum nominal wall thickness of .219 inch, 37- to 38-foot shaft length, 8-inch minimum diameter at the base and an 11- to 12-inch bolt circle.

Poles for twin arm, 40-foot luminaire mounting height shall have a minimal nominal wall thickness of .219 inch, 37- to 38-foot shaft length, 10-inch minimum diameter at the base and a 14- to 15-inch bolt circle.

Poles for 30-foot luminaire mounting height shall have a minimum nominal wall thickness of .188 inch, 27- to 28-foot shaft length, 7-inch minimum diameter at the base and a 10- to 11-inch bolt circle.

An opening shall be furnished near the top of the shaft to provide a cable entrance from the shaft into the bracket arm. Bracket arms shall be securely fastened to the pole with stainless steel bolts and rivnuts. The top of the shaft shall be equipped with a cast aluminum removable pole top held securely in place by means of setscrews. Lighting standards shall have a minimum 4-inch x 6-inch hand hole with frame and a cover and a grounding lug opposite the hand hole. Standards shall have internally-mounted vibration dampers. The pole and arm, when equipped with the specified luminaire and installed on a standard foundation, shall withstand an 80 mph wind with gusts to 104 mph while covered with 1/2 inch of ice. The manufacturer, supplier and contractor shall guarantee that the poles and arms provided on this project shall remain without defect for a period of 5 years.

- B. Base: A one-piece cast aluminum, Aluminum Association Alloy 356-T6, anchor base of adequate strength, shape and size shall be secured to the lower end of the shaft by two continuous welds. 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 two welds shall develop the design strength of the pole assembly. The base shall be a safety-type, which will fracture upon vehicle impact, causing no greater momentum change than 1100 lb-sec. to a vehicle or 400 lb-sec. to a standard rigid mass. The base shall be provided with four slotted holes to receive the anchor bolts and eight tapped holes for attaching the four removable bolt covers provided with each pole, which shall attach to the upright portion of the body of the

base. The bolt covers (and hand holes) will be secured to the pole by means of 300-series stainless steel, Allen head fasteners. A grounding lug capable of accommodating up to a No. 6 A.W.G. ground wire shall be provided on the inside of the shaft adjacent and accessible to the pole hand hole.

- C. Mastarm: Single member-type mastarms shall consist of a tapered aluminum arm, ovaliptic in shape at the pole end and tapering to 2-3/8 inch O.D. at the luminaire end, made of Aluminum Association Alloy 6063-T6 tubing.

Truss-type mast arms shall consist of an upper and lower member securely joined by means of vertical struts. The lower member shall be 2-inch IPS aluminum pipe, Aluminum Association Alloy 6063-T6. The upper member shall be tapered aluminum, ovaliptic in shape at the pole end and tapering to 2³/₈-inch O.D. at the luminaire end.

- D. Finish: All hardware (bolts, nuts, washers, but not including anchor bolts) not otherwise specifically designated in these Specifications shall be aluminum or stainless steel. All materials shall be furnished in natural aluminum color. The pole shaft shall be furnished with a polished surface. The pole shall have a factory-applied protective paper wrapper conforming to the manufacturer's standard practice, and shall not be removed until after erection. Pole shall be kept dry and out of the weather until time for erection.
- E. Cobra Head Luminaire: Cobra head style luminaries shall have a housing of single piece aluminum alloy casting with integral slip fitter for 2-inch bracket mounting. The mounting device shall allow the luminaire to be mounted absolutely level and shall have no more than two fasteners serving both the leveling and clamping functions. It shall allow one person to install the luminaire by simultaneously holding it in position and tightening the fasteners, such that the luminaire will be properly level at the first attempt.

The reflector shall be secured to the top housing. The luminaire is to be integral ballast type with shielded optical system and a heat and impact resistant flat or refractive style glass lens. The luminaire shall provide I.E.S. Medium Distribution. The luminaire shall be pre-wired, requiring only connection of service wires to a terminal board. The entire ballast, including condensers, shall be easily removable and replaceable with gloved hands and without tools through the use of quick disconnecting mechanical devices and electrical plugs. The ballast shall be a regulator type, high power factor, for high-pressure sodium at a

voltage of 120/240 volts. The ballast shall be capable of reliably operating the lamp with a line voltage varying +10% from normal.

F. Lamps:

- 1) 400 watt lamps shall be high-pressure sodium (HPS), rated 50,000 lumens, with a 24,000-hour rated life;
- 2) 310 watt lamps shall be HPS, rated 37,000 lumens, with a 24,000-hour rated life;
- 3) 250 watt lamps shall be HPS, rated 30,000 lumens, with a 24,000-hour rated life;
- 4) 200 watt lamps shall be HPS, rated 22,000 lumens, with a 24,000-hour rated life;
- 5) 150 watt lamps shall be HPS, rated 16,000 lumens, with a 24,000-hour rated life;
- 6) 100 watt lamps shall be HPS, rated 9,500 lumens, with a 24,000-hour rated life; and
- 7) 70 watt lamps shall be HPS, rated 5,800 lumens, with a 24,000-hour rated life;

G. Secondary Cable: Secondary cable shall be #4 A.W.G. stranded annealed copper, single conductor cable for operation at 600 volts maximum. Material shall meet the applicable requirements of I.P.C.E.A. Standard S-19-81, with thermoplastic insulation of GRS-Rubber base meeting Appendix K (A) of I.P.C.E.A. and listed by Underwriters Laboratory (U.L.) as Type U.S.E. for direct burial; or material shall meet the applicable requirements of I.P.C.E.A. Standard S-66-524, interim standard #2, with thermo setting insulation of cross link polyethylene meeting requirements of Column "A" of I.P.C.E.A. and listed by U.L. as Type U.S.E. RHW-750C.

H. Pole and Bracket Cable: Pole and bracket cable above hand hole in pole to luminaire(s) shall be single conductor with minimum 600 volt rating, No. 10 A.W.G. Type THHN/THWN. Conductor shall be stranded annealed copper.

I. Service Pedestal: Service pedestal shall be an underground service type, rated for 100 A, 240 volts. Pedestal shall be heavy gauge steel, rain tight construction with individual meter, panel, contractor, and rear service pull "compartments." Meter and panel compartments shall have piano-hinged doors with

padlocking provisions. Meter base shall be of the type used by the local utility.

Panel board shall have copper buss and shall accept twelve 1-inch, plug-in breakers manufactured by G.E., Westinghouse, ITE, or equal. Panel board compartment shall contain convenience receptacle, and test switch. All factory-installed wire shall be copper. Service pedestal shall be U.L. listed. Pedestal finish shall be environmental green baked enamel conforming to ASTM-B17 Specifications over corrosion-resistant primer. Service pedestal shall be Meyers #MEUGQ-M100-OPK or approved equal. Pole mounted service panels shall be Myers #ME-MP100-OPK or approved equal.

J. Metallic Conduit: Rigid metallic conduit shall be hot-dip galvanized and all threads shall be galvanized after cutting. The conduit shall bear a U.L. label and shall conform to Federal Specification WWC-581 (latest version) and American National Standards Institute (ANSI) Specification C80.1.

K. Nonmetallic Conduit: Rigid nonmetallic conduit shall be Schedule 40 polyvinyl chloride (PVC) conduit. The conduit shall bear a U.L. label and shall conform to Federal Specification WC-1094A (latest version).

9004 REPLACING DAMAGED IMPROVEMENTS.

Improvements such as sidewalks, curbs, gutters, portland cement concrete and asphalted concrete pavement, bituminous surfacing base material and any other improvements removed, broken or damaged by the contractor shall be replace or reconstructed with the same kind of material as found on the work or with materials of equal quality. The new work shall be left in a serviceable condition satisfactory to the City Engineer. 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 the concrete reconstructed as above specified.

9005 FOUNDATIONS.

The bottom of the concrete foundations shall rest on firm ground; foundations shall be poured monolithic. The exposed portions shall be formed to present a neat appearance. 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 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. 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 control center foundations shall be 4,000 psi, air entrained, 28-day compressive strength portland cement concrete. Aggregate shall be Kansas Class 1 or Class 6.

Concrete shall not be placed until forms and reinforcing steel have been checked and approved by the City Engineer. Placement of concrete shall be witnessed by the City Engineer.

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 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.

9006 CONDUIT.

Conduit, when used, shall be of a rigid type conforming to the provisions specified in and on the plans. Installation shall conform to the appropriate articles of the National Electric Safety Code. The size of the conduit used 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.

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. Slip joints or running threads will not be permitted for coupling conduit. All couplings shall be fitted and tightened until the ends of the conduits are brought together. Where coating on conduit has been injured in handling or installing, such injured places shall be thoroughly painted with rust preventative paint. All conduit ends shall be provided with approved conduit bushings.

Conduit bends, except factory bends, shall have a radius of not less than six times 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 practicable.

Conduit shall be jacked under pavement sections at a depth not less than 24 inches below the top of pavement for 2-inch or smaller conduit or at a depth not less than 48 inches below top of pavement for conduit sizes larger than 2 inches in diameter; and where laid in trenches on shoulders and in park areas, conduit shall be laid to a depth of not less than 24 inches below natural ground level.

Conduit shall be placed under existing pavement by approved jacking or drilling methods. Pavement shall not be disturbed without the written permission of the City Engineer and then only in the event insurmountable obstructions are encountered. Jacking or drilling pits shall be kept 2 feet clear of the edge of any type of pavement whenever possible. Excessive use of water such that pavement might be undermined or subgrade softened will not be permitted.

Conduit set in standard bases shall extend approximately 3 inches above the foundation vertically. Conduit entering through the bottom of a pull box shall be located near the ends to leave the major portion of the box clear. Conduit entering concrete pull boxes shall terminate 2 inches inside the box wall and not less than 2 inches above the bottom and shall be sloped to facilitate pulling of cable. At all outlets, conduit shall enter from the direction of the run.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

9007 PULL AND SPLICE BOXES.

Pull and splice boxes shall be installed at the locations shown on the plans. The contractor may install, at his own expense, such additional boxes as may be desired to facilitate the work upon approval of the City Engineer.

Pull and splice boxes shall be installed on crushed rock as shown on the plans or as directed by the City Engineer. Boxes shall be installed so that the covers are level with the curb or sidewalk grade, or level with the surrounding ground with no grade is established.

9008 WIRING.

The roadway lighting conductor system shall generally be direct burial cables, wired and installed as a 240-volt system where indicated and as required. Wiring shall conform to the appropriate articles of the National Electric

Code. Cable shall be laid to a depth of 24 inches and be installed in continuous lengths. No splices of cable will be permitted in or out of conduit or outside of pull boxes, splice boxes or pole bases.

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 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 splice boxes and pull boxes shall be made with appropriate compression "C" type connectors and two-way connectors. Such splices shall be carefully wrapped with successive layers of Scotch No. 23 "Electrical Tape," and then wrapped with three layers of Scotch No. 88 "All Weather Electrical Tape." The total diameter of the taped splice shall be approximately 1-1/2 times the diameter of the spliced conductor covering.

One foot of slack shall be left at all control centers, splice 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 splices in light pole bases shall be made with Fargo No. G0-32 multiple tap connectors. Slip-over plastic boots shall be provided for the hot leads. The contractor shall install in-line fused disconnects in each pole base. Fuse holders in 30 and 40-foot poles shall be Buss Tron-type HEB-AW-RLC-C for the hot leads and HET-AW-RLC-C for the ground. Fuses shall be type KTK 8 amp, high interrupting fuses. Fuse holders in 14-foot poles shall be Buss-type HRK with 5 amp fuses. The multiple tap connectors and fuse holders shall be installed convenient to the hand hole at the base of the pole. One foot of surplus cable shall be coiled at the line side of the multiple tap connector, between the multiple tap connector and the fused disconnect, and on the load side of the fused disconnect.

9009 GROUNDING.

All poles shall be bonded to form a continuous system. At each multiple service point, a ground electrode shall be installed. The electrode shall be a copper rod not less than 1/2-inch in diameter and 10 feet in length, unless otherwise noted on the plans, driven to a depth so the top is 6 inches below the surface of the ground. The service

equipment shall be bonded to the driven ground rod by a No. 6 A.W.G. copper wire enclosed in a 1-inch diameter conduit.

9010 TESTING.

The contractor shall contact the City for an electrical inspection as soon as the control center is ready. The power company should be notified in advance as to when the system would need to be energized.

All street lighting system elements shall function properly as a complete system for a minimum period of 15 days before acceptance by the City. The 15-day test period shall be continuous. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction, and the test period shall not resume until all components are satisfactorily operating.

END OF SECTION

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