

PUBLIC WORKS - CONSTRUCTION SPECIFICATIONS

SECTION 1

DEFINITIONS

1. City hereafter refers to River Heights City.
2. City Engineer means the approved River Heights City Engineer.
3. Construction means any work or product which will become the property of the City: i.e., roads, curb and gutter, sidewalk, water works, sewer works, culverts, bridges, fencing, etc
4. Contractor is defined as the person in charge of construction. He/she could be the Subdivider.
5. Improvement District is as defined by Utah State Law and as modified by the City Ordinance.
6. Inspector means the authorized inspector or representative of the City Council.
7. Master Plan refers to any adopted plan, be it water, growth, etc., on record at the River Heights City Office.
8. May is permissive
9. Person is any individual, firm, partnership, associate, entity, institution, or corporation and their heirs, assigns, or agents.
10. Planning Commission means River Heights City Planning and Zoning Commission.
11. Shall is mandatory.
12. Specifications are to be interpreted as rules and regulations.
13. Subdivision is as defined in the City Subdivision Ordinance.
14. Survey Monument A mark affixed to a permanent or semi-permanent object along a line of survey to furnish a datum level.
15. Zoning is defined as, the most recent Zoning Ordinances as adopted by River Heights City.

SECTION 2

GENERAL REQUIREMENTS

1. **Scope.** This Section defines the general requirements for improvements to be built by the Subdivider.

The improvements shall include all street improvements in front of all lots and along all dedicated streets to a connection with existing improvements or to the boundary of the subdivision nearest existing improvements. Layout must provide for future extension to adjacent development and be compatible with the contour of the ground for proper drainage. All water lines, sewer lines, and any other buried conduit shall be installed to the boundary lines of the subdivision.

All construction work shall be accomplished by contractor(s) that are licensed to perform construction work in the State of Utah.

2. **Standards for Construction Drawings.** The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size, and style.

Two (2) sets of the construction plans shall be submitted, with one (1) set to be retained by the City Engineer and one (1) set returned to the Subdivider with an approval mark of the City Engineer. One (1) reproducible set of approved drawings shall also be provided to the City. The approved set shall be kept available at the construction site.

These plans and designs shall meet the standards defined in the Specifications and Drawings, hereinafter outlined. The minimum information required on drawings for improvements are as follows:

All drawings and/or prints shall be clear and legible and conform to good engineering and drafting practice. Size of drawings shall be 24" x 36" (trim line) with 1/2" border on top, bottom and right sides. Left side border shall be 1-1/2".

- a. In general, the following shall be included on drawings:
 1. North arrow (on plan drawings).
 2. Scale and elevations referenced to City datum.
 3. Stationing and elevations for profiles.
 4. Title block, located in lower right corner of sheet or along the right hand margin, to include:
 - (a) Name of City.

- (b) Project title (subdivision, etc.)
- (c) Specific type and location of work.
- (d) Space for approval signature of City Engineer and date.
- (e) Name of engineering firm, preparing drawings.
- (f) Signed and dated stamp of professional engineer responsible for the design.

b. Curb and gutter, drains and drainage structures, signage, lighting, sidewalks, and street surfacing shall show:

1. Scale: 1" = 20' or 50' horizontal; 1" = 2' or 5' vertical.
2. Both plan view and profile. Street centerline.
3. Flow direction and type of cross drainage structures at intersections with adequate flow line elevations.
4. Bench Mark location and elevation (use City datum).
5. Type of curb and gutter and distance from back-to-back of curb.
6. Width and location of the sidewalk(s) within the right-of-way.

c. Sewer drawings shall show:

1. Scale: 1" = 20' or 50' horizontal; 1" = 2' or 5' vertical.
2. Location, size, and grade of all lines.
3. Manhole details, size, location, and flowline elevation.
4. Type of pipe.
5. Bench Mark location and elevation (use City datum).
6. Bedding Details.

d. Culinary water drawings shall show:

1. Scale (not specified).
2. Size and location of water mains, valves, hydrants, tees and etc.
3. Type of pipe (ductile iron class 51 required).
4. Minimum cover.
5. Bedding Details.
6. Standard details for hydrants, valves, water meters, etc.

e. Each set of plans shall be accompanied by a separate sheet of details for structures which are to be constructed. All structures shall be designed in accordance with minimum requirements established by the Providence City Subdivision Standards.

1. Drawing size: 24" x 36" (trim line).
2. Scale of each detail.
3. Title block in lower right hand corner or along the right-hand margin (same format on all sheets), including the name of the subdivision.

4. Completely dimensioned and described.
3. **Inspection.** All construction work involving the installation of improvements in subdivisions shall be subject to inspection by the City. Certain types of construction shall have continuous inspection, while others may have only periodic inspections.
4. **Requests for Inspection.** Requests for inspections shall be made to the City by the person responsible for the construction. Requests for inspection of work requiring continuous inspection shall be made three (3) days prior to the commencing of the work. Notice shall also be given one (1) day in advance of the starting of work requiring periodic inspection.
 - a. Continuous inspection may occur on the following types of work:
 1. Preparation of street subgrade and compacted fill.
 2. Laying of street surfacing.
 3. Pouring of concrete for curb and gutter, sidewalks, and other structures.
 4. Laying of sewer pipe, drainage pipe, water pipe, valves, hydrants, and testing.
 5. Waterline work for which pressure testing and disinfection requirements have been waived.
 - b. Periodic inspections shall be required on the following:
 1. Street grading and gravel base.
 2. Excavations for curb and gutter and sidewalks.
 3. Excavations for structures.
 4. Trenches for laying pipe.
 5. Forms for curb and gutter, sidewalks, and structures.

On construction requiring continuous inspection, no work shall be done except in the presence of the City Inspector and/or the City Engineer.

5. **Construction Completion Inspection.** An inspection shall be made by the City Engineer after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work within a period of thirty (30) days of the date of the City Engineer's Inspection Report citing the faulty or defective work.
6. **Guarantee of Work.** The Subdivider shall warrant and guarantee (and post bond or other security) that the improvements provided for hereunder, and every part thereof, will remain in good condition for a period of one (1) year after the date of the Construction Completion Inspection Report by the City Engineer and shall agree to make all repairs to and maintain the improvements and every part thereof in good condition during the time with no cost to the City. The City may hold ten percent (5%) of the security posted by the Subdivider until one (1) year following final inspection, or such other period of time less than one (1) year as the

City deems necessary, to insure compliance as set forth in the River Heights City Subdivision Ordinance.

It is further agreed and understood that the determination for necessity of repairs and maintenance of the work during the Guarantee of Work rests with the City Engineer. His/her decision upon the matter shall be final and binding upon the Subdivider, and the guarantee hereby stipulated shall extend to and include, but shall not be limited to, the entire street base and all pipes, joints, valves, backfill and compaction, as well as the working surface, curbs, gutters, sidewalks, and other accessories that are, or may be affected by the construction operations, and whenever, in the judgment of the City Engineer, said work shall be in need of repairs, maintenance, or rebuilding, he/she shall cause a written notice to be served the Subdivider, and thereupon, the Subdivider shall undertake and complete such repairs, maintenance, or rebuilding. If the Subdivider fails to take action within ten (10) days from the date of service of such notice, the City Engineer shall have such repairs made, and the cost of such repairs shall be paid by the Subdivider, together with twenty-five (25%) per-cent in addition thereto as and for stipulated damages for such failure on the part of the Subdivider to make the repairs.

7. General.

- a. Specifications and plans approved by the City Engineer shall be valid for a period of two (2) years. If project specifications and plans are not completed within the (2) years, said plans must be re-submitted and become subject to re-approval under the most recent regulations.
- b. Final acceptance of all work is contingent upon (1) an onsite inspection as work progresses, (2) reproducible "As-Built" plans submitted; and (3) a final site inspection.
- c. All utilities shall be underground, and shall be so placed prior to road improvements, installation of curb and gutter, sidewalks and other such improvements.
- d. It shall be the sole responsibility of the contractor to:
 1. Secure any and all permits required for completion of the project.
 2. Provide for the safety and protection of all those engaged in the project, preventing unsafe conditions.
 3. Acquisition of materials and production of workmanship contrary to City Standards and Specifications. Sub-standard installations and materials shall be subject to removal and replacement at the **Contractors' expense.**
 4. Notify City Engineer within twenty-four (24) hours of readiness for inspection.

- e. No project shall receive final approval until the workmanship and materials are in compliance with City Standards and Construction Specifications. This includes accurate and proper placement of Survey Monuments and acceptable clean-up of area.
- f. Subdivider shall guarantee the Contractor's work against defective materials or workmanship for a period of one (1) year from the date of final acceptance of each contract.
- g. All items not mentioned within these Standards and Specifications related to road work will be performed in accordance with the most recent edition of "State of Utah Standard Specifications for Road and Bridge Construction".
- h. The burden of proof to justify any variance to the Standards and Specifications contained herein shall be at the expense of the Contractor/Subdivider.
- i. Adoption of these Standards and Specifications shall not eliminate the responsibility upon of the Subdivider or Contractor to practice sound engineering and construction practices in all phases of work. It is the intent of these Standards and Specifications to provide uniformity and continuity to the development process.
- j. Where these Standards and Specifications are in conflict with adopted City Ordinances, the City Ordinance shall govern.
- k. These Standards and Specifications are subject to revision, modification, additions or changes without notice, by reference to the Subdivision Ordinance and approval by the City Council.

**ALL WORK CONTAINED UNDER SECTIONS 3-12 IS SUBJECT TO DESIGNATION
AND/OR APPROVED OF CITY AND/OR THE CITY ENGINEER**

SECTION 3

EARTHWORK

- 1. **General Description.** Excavation for street pavement and/or curb and gutter shall consist of the removal of all materials within lines, grades and slopes shown on Construction Plans, including all earth, stone, loose rock, sand, clay, shale, hard-pan, boulders, solid rock, stone blocks, roots, brush, trees, rubbish and other materials of whatever nature that may be encountered within the lines, grades, and slopes above described or that may be required in

grading approaches to intersection ways and flumes.

2. **Stripping.** On all portions of the work, where filling is required, the entire area shall first be stripped of all undesirable materials. The resulting surface, after the removal of all undesirable material, shall be scarified twelve (12") additional inches deep, minimum, and brought to a uniform surface by means of graders or other suitable equipment, and shall be compacted as provided in these specifications, before any embankment material is placed. Alternate subgrade preparation may be acceptable, prior approval must be obtained from the City.
3. **Disposal of Excess Material.** All excess or undesirable materials that may be encountered in the work shall be disposed of by the Contractor, in a manner approved by the City, but shall not be placed on other street or alleys without the City's approval nor on private property without the approval of the owner, which approval shall be obtained by the Contractor in writing.
4. **Embankment.** All excavated material, that has been approved for embankment purposes and that is needed for that purpose, shall be used at the points designated in the following manner:
 - a. The embankment shall be built by depositing approved material, in approximately level uniform layers, not exceeding six inches in thickness after compacting.
 - b. The material in place at both ends of the embankment, or where new material is placed against material in place, shall be plowed into the new material as the work progresses and shall be thoroughly scarified and worked into the new material and brought to the proper elevation before rolling of the layer being placed is commenced.
 - c. If the material as found in excavation is too wet then it shall be permitted to dry out to the extent required, before being used in the embankment; or the material may be placed to the proper thickness on the embankment and worked with satisfactory equipment until the quantity of moisture in the material has been reduced to that required for maximum compaction. If the material as found in excavation is too dry then it shall be moistened to the extent required and worked with harrows or other suitable equipment until the moisture throughout the material is uniform and contains the proper percentage of moisture for proper compaction. The moisture content of all material to be compacted shall be within plus or minus two percent (2% + -) of optimum.
 - d. The embankment shall be built to the lines, grades, and slopes shown on the plans.
 - e. All embankments shall be compacted to ninety-five (95%) per cent of maximum density as determined by ASTM D-1557, (modified proctor method of compaction).
5. **Excavation below Sub-Grade.** If soft or otherwise undesirable material is found to exist at and below the sub-grade elevation, then such material shall be removed and replaced with

acceptable granular material as specified above.

6. **Removal of, Building or and/or Rebuilding of Existing Structures.** Should it be necessary to remove, build and/or rebuild existing pipe lines, flumes, monuments, manholes or other structures, or to reset metal covers and frames, etc., then said work shall be done as shown on the approved plans.
7. **Preparation of Sub-Grade.** In excavating the required material, the work shall be so handled as to leave in place sufficient material above the finished sub-grade elevation, to provide for compaction in building the sub-grade to the prescribed elevation.

After the materials have been excavated, as above described, then the sub-grade shall be scarified, after which the material shall be accurately graded to the required form of the finished sub-grade and rolled with approved rollers to the compaction required. If additional moisture is required, in order to produce the compaction required, then the proper quantity shall be applied uniformly, either before or after scarifying. If necessary, the material shall be scarified after the water is applied, in order to obtain uniform distribution of moisture and bring the material to a suitable condition. All rocks, boulders, or other unsuitable material shall be removed. The quantity of material, and its distribution, before rolling, shall be such that when compacted the required form and elevation will be secured. All sub-grade shall be compacted to ninety-five (95%) per cent of maximum dry density as determined by ASTM D-1557, (modified proctor method of compaction).

8. **Completed Sub-Grade.** The completed sub-grade shall accurately conform to the lines, grades and slopes shown on the plans and shall be maintained in suitable condition by the Contractor.
9. **Sub-Base.** The depth of sub-base material shall be determined by soil exploration and load requirements. Such soil analysis shall be in accordance with acceptable Engineering practices.

SECTION 4

SURFACING AND PAVING

1. **General:** This Section covers the requirements for bituminous surface paving on roads. Unless an alternate pavement section is approved by the City, all streets shall be surfaced in accordance with the following:
 - a. Twelve inch (12"). Well graded, compacted granular borrow conforming to AASHTO classification A-1 with 2" max material size over prepared sub-grade.
 - b. Four inch (4") minimum crushed gravel base course (after compaction) over compacted granular borrow.

c. Three inch (3") minimum compacted thickness plant mix asphalt surfacing on all streets.

2. **Base Course.** Base for all streets shall consist of select material, either natural or crushed, and shall be graded as follows:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
3/4 inch	70-100
1/2 inch	55-75
No. 4 Sieve	35-60
No. 40 Sieve	15-30
No. 200 Sieve	5-15

The material shall be deposited and spread in a uniform layer at optimum moisture content, without segregation of size, with such depth that when compacted layer will have the required thickness.

Each layer shall be compacted for the full width and depth by rolling with a pneumatic roller weighing at least ten (10) tons. Alternate blading and rolling will be required to provide a smooth even and uniformly compacted course true to cross section and grade. Places inaccessible to rolling shall be compacted with mechanically operated hand tampers.

The gravel base shall be compacted to not less than 95% maximum dry density as determined by ASTM D-1557 (modified proctor). Surfaces shall be true to the established grade within plus or minus 1/4 inch from the required layer thickness and with the surface elevation varying not more than 3/8 inch in ten (10) feet from the true profile and cross section.

3. **Bituminous Surface Course:** Over the dry dust free compacted course the Contractor shall place and compact a bituminous surface course. The surface course shall consist of a mixture of mineral aggregate and binder. Gradation of aggregate shall conform to the following:

<u>Sieve Size</u>	<u>Percent Passing</u>
1/2 inch	100
No. 4	50-70
No. 10	30-50
No. 200	5-10

The Contractor shall establish a mix gradation and the amount of bituminous material shall be subject to approval and shall meet the requirements of the gradation selected. Regardless of the bituminous content there shall not be more than three (3%) percent voids in the aggregate.

The asphaltic cement for the surface course shall be AC-10 penetration asphalt cement

conforming to the requirements of ASTM M-226.

The bituminous surface course shall be mixed at a mixing plant and spread and compacted on the prepared base in conformance with the lines and dimensions shown on the plans and in accordance with these Specifications.

4. **Construction Methods and Equipment.** The methods employed in performing the work, all equipment, tools and machinery and other appliances used in handling the materials and executing the work shall be the responsibility of the Contractor. The Contractor shall make such changes in the methods employed and in the equipment used as are necessary whenever the bituminous mix being produced does not meet the specifications herein established.
5. **Spreading and Compaction.** The bituminous mixtures shall be spread with self propelled mechanical spreading and conditioning equipment capable of distributing at least a 12-foot width. The mixture shall be spread and struck off in such a manner that the finished surface shall result in a uniform smooth surface. The longitudinal joints in succeeding courses shall be off-set at least six (6") inches transversely to avoid a vertical joint through more than one course.

The temperature of the bituminous mix shall be between 250 degrees F and 325 degrees F when placing.

After the mixture has been spread the surface shall be rolled in the longitudinal direction commencing at the outside edge or lower side and preceding to the inner or higher side. Each pass of the roller shall overlap the preceding pass at least one-half the width of the roller. Tolling shall continue until 95% of the laboratory density as determined in accordance with ASTM Designation D-1559 for the bituminous mixture being used has been obtained. Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller.

The surface of the pavement, after compaction, shall be uniform and true to the established crown and grade. When tested with a ten (10') foot straight edge placed parallel to the center line of the pavement the surface of the pavement at any point shall not deviate from the lower edge of the straight edge by more than 1/8 inch. All high and low spots shall be remedied immediately by removing the wearing course material over the affected areas and replacing it with fresh, hot wearing course and surface finish material and immediately compacting it to conform with the surrounding area.

All traffic shall be kept off the completed surface for a minimum period of twenty-four (24) hours.

6. **Weather Limitations.** No bituminous surface shall be placed when the temperature of the air or road bed is 50 degrees F or below, during rainy weather, when the base is wet or during other unfavorable weather conditions. The air temperature shall be measured in the shade.

7. **Restoring Pavements.**

- a. **Cutting and Removing.** The pavement shall be cut vertically in neat lines with necessary tools by the Contractor in such manner as not to damage the adjacent pavement. It shall be cut along straight lines forming the edges of the trench. The portion to be removed shall be broken up in such manner as not to damage the pavement outside the lines of the trench. If any pavement outside the lines of the trench is damaged, it shall be removed and restored as hereinafter provided at the Contractor's expense. Concrete driveways, sidewalks and curb and gutter shall be removed in a similar manner. All waste material resulting from the above operations shall be immediately removed from the site of and all costs to the Contractor for removing and disposing of said material shall be included in the unit prices bid under the appropriate items in the schedule.
- b. **Temporary Pavement.** Between or at street intersections backfilling shall be built up slightly above the surface of the pavement, oiled and maintained in good condition until the Contractor is ready to place the new pavement, when the backfilling shall be removed to the subgrade elevation or bottom of the pavement. This work shall be done accurately to the proper elevation and all loose material removed. If any material is removed below the established subgrade elevation, said space shall be filled with similar material to that used for pavement base, at the Contractor's expense; after which the new pavement shall be placed according to the City's specifications for the type of pavement that was removed, or such other type as may have been ordered to replace it.

Such temporary bridges as may be required to properly handle the traffic during the progress of the construction shall be built, maintained and removed at the Contractor's expense.

- c. **Driveways, Sidewalk or Curb and Gutter.** Where a trench is located under private driveways, sidewalk or curb and gutter, the subgrade shall be prepared in the same manner as described for pavement, and the concrete driveway, sidewalk or curb and gutter shall be rebuilt according to the City's specifications.
- d. **Repairing Damaged Pavement, Driveway, Sidewalk or Curb and Gutter.** If any pavement, concrete driveway, sidewalk, or curb and gutter has been damaged outside the lines of the trench, while trenching, damaged areas shall be removed along straight lines and at right angles, all cut surfaces shall be vertical. Removal and rebuilding of the damaged portions shall be done by the Contractor, at his own expense.

SECTION 5

PORTLAND CEMENT CONCRETE

1. Portland Cement shall conform to the "Standard Specifications for Portland Cement". ASTM Designation C-150-56 and subsequent revisions or addendum and shall be Type II. In areas where there is no exposure to sulfates in the soil or ground water, Type I cement is permissible.
2. A certified analysis of the cement shall be presented to the City Engineer upon request.
3. Cement content shall not be decreased because of the addition of certain admixtures.
4. Fine and course aggregates shall conform to the specifications for concrete aggregates, ASTM Designation C-33-57, and subsequent revisions or addendum.
5. The maximum size of the aggregate shall not be larger than 1/5 of the narrowest dimension between forms of the member for which the concrete is to be used, nor larger than 3/4 of the minimum clear spacing between reinforcing.
6. Water used in mixing concrete shall be clean and free from strong acids, alkalies, oils, salts, organic materials, or other deleterious materials.
7. The concrete shall contain a minimum of 6 bags (94#/bag) cement per cubic yard, and have a minimum compressive strength at 28 days of 4000 p.s.i.
8. Not less than one test shall be made for each 250 cubic yards of concrete, nor less than one test for each day's concreting.
9. Proper mixing shall be accomplished either by truck or by stationary mixers.
10. The place of deposit shall be prepared by adequate forming, proper compaction, necessary drainage, and sufficiently moistened to minimize loss from the freshly placed concrete.
11. Forms may be removed when the concrete has sufficient strength to carry its own weight and the loads the concrete is intended to bear. (approximately 75% of design strength).
12. Finishing shall provide a pleasant appearing surface, as well as a protective coat against weathering effects.
13. All concrete surfaces shall be cured for a period of seven (7) days by maintaining the surface continually visibly moist. An acceptable curing compound may be substituted for water, where approved.
14. In all cases, the contractor shall assume responsibility arising from preparing, placing, and the

removal of forms, and shall assure himself/herself that the concrete is properly cured to sustain loads before forms are removed.

15. No frozen materials or materials containing ice shall be used. All concrete materials, forms, fillers and ground with which the concrete is to come in contact shall be free from frost. Whenever the temperature of the surrounding air is below 45 degrees F. and falling, all concrete, when placed in forms, shall have a minimum temperature of 50 degrees F., and shall be maintained at a temperature of not less than 40 degrees F, for at least seventy-two (72) hours.
16. The City or the City Engineer reserves the right to forbid the use of material from any plant, pit or source when the character of material, equipment in use or the method of operation is such as to make it doubtful that a reasonable uniform class of material will be furnished.
17. Transporting, Placing, and Compaction. The transporting equipment shall be such as to deliver the concrete to the place of use without segregation and without undue loss of moisture. If the concrete is being placed in walls or structures more than five (5') feet high, it shall be deposited into final position by means of elephant trunks, tremies or similar equipment, and the maximum lateral movement of the concrete from any point of deposit shall not be more than five (5') feet. It shall be deposited in even layers, not more than eighteen (18") inches in depth, and each layer shall be thoroughly puddled and worked with appropriate tools into the preceding lift and next to the forms to insure a smooth surface and the removal of air pockets. Particular attention shall also be given to working of the concrete around reinforcing steel and embedded fixtures in such manner as to produce a continuous homogeneous mass filling of all corners and eliminating segregation of aggregate and air pockets. An internal vibrator shall be inserted vertically at intervals of from eighteen (18") to thirty (30") inches, depending on the thickness of the concrete. It shall be held in position and gradually withdrawn when air bubbles no longer come to the surface. All concrete shall be vibrated within fifteen (15) minutes after being placed in the forms. The vibrator shall not be permitted to come in contact with the forms, the reinforcing steel or embedded fixtures, or to over-vibrated the concrete at any point. Concrete shall not be transported laterally by means of vibrators.
18. Joining New Concrete to Old. In joining new concrete to old, the old concrete shall be thoroughly soaked with water for seventy-two (72) hours immediately preceding the placing of the new concrete. All surface film shall be removed from the old concrete, the surface roughened and thoroughly washed to remove loose particles. The methods employed to prepare the surface of the old concrete shall be approved by the City Engineer in advance. A layer of mortar of the same proportions and consistency as the mortar used in the new concrete shall be thoroughly broomed into the surface of the old concrete, immediately before the new concrete is placed, but no pools of water shall be permitted on the surface of the old concrete when the mortar is placed.

SECTION 6

STEEL REINFORCEMENT

1. **General Description.** All steel bars used for concrete reinforcement shall conform to all the requirements of the "Standard Specifications for Billet-Steel Bars for Concrete Reinforcement" ASTM Designation A615, Grade 60.
2. **Cutting and Bending.** All cutting and bending shall be done at the mill or shop unless satisfactory provisions are made for handling this work in the field. The radius of curvature of the bends shall not be less than four (4) diameters. All bending shall be done cold. Heating preparatory to bending shall not be permitted. All steel shall conform accurately to the dimensions shown on the plans.
3. **Surface Condition.** All steel shall be clean and free from mill scale, flakes of loose rust, cement, concrete, paint, oil, grease or any other foreign material, except that a thin layer of tightly adhering rust may be permitted if approved.
4. **Placing.** All reinforcement bars shall be placed accurately, as shown on the plans, wired at intersections and spaced and supported by means of metal chairs, spacers, hangers or other devices approved. The placing of bars on layers of fresh concrete as the work progresses will not be permitted. The reinforcement shall be securely bound together and rigidly held in the required position. Where splices are made, the bars shall be lapped forty (40) diameters or a minimum of twenty-four (24") inches and tightly wired together.
5. **Inspection.** No concrete shall be placed in any reinforced concrete structure until the steel and its placement has been inspected and approved and the Inspector has given permission to proceed with the placing of concrete. Any concrete placed in violation may be rejected and shall be removed by the Contractor at his/her own expense.
6. **Storage and Protection.** All reinforcement steel shall be stored in such manner as to be protected from the elements. It shall be stored on skids or other supports and shall be protected against physical damage. No bars that are bent, twisted, kinked or warped shall be used in the work. No bars that have been bent shall be straightened and used in the work.
7. **Welded Steel Wire Fabric** shall conform to ASTM A-185.

SECTION 7

SIDEWALKS

1. **Excavation.** All excavation required for concrete sidewalks and preparation of sub-grade shall be made as provided within these specifications. If the sidewalk under construction does not cover the entire area between the curb and the property line, then after the forms have been removed the depressions along the edges of the sidewalk pavement shall be backfilled with approved material, properly moistened and hand tamped and the areas between the sidewalk and the curb and between the sidewalk and the property line shall be finished to a uniform slope, as shown on the plans, with fine material, free from stones and large lumps, and then neatly surfaced with hand rakes. Where the excavation extends into lawns, the sod shall be taken up, carefully preserved and relaid by the Contractor.
2. **Sub-Grade.** After having prepared the sub-grade as described in Paragraph 1 of this Section, it shall be checked immediately in advance of placing the concrete and shall be maintained in a suitably moist condition.
3. **Forms.** The forms shall comply with all applicable requirements of these specifications. The width of the material shall be equal to the full depth of the sidewalk pavement and the upper edge shall be set accurately to the required elevation of the finished surface.
4. **Resetting Frames and Cover, etc.** Where there are existing structures within the area of the sidewalk being constructed, such as valve boxes, meter boxes, hydrant boxes, sewer manholes, etc., that require resetting of frames and covers, or the building up or cutting down of the structure to fit the grade of the sidewalk, then this work shall be done by and at the expense of the Contractor unless otherwise provided in these specifications.
5. **Class of Concrete to be used.** In the construction of concrete sidewalks air entrained "Class A" concrete type II Portland Cement shall be used.

The concrete materials and the proportioning, mixing, transporting, placing, protection and curing of the same shall conform to all the applicable requirements of Section 3.5 of these specifications. Vibration will not be required.

6. **One Course Sidewalk.** The concrete shall be placed on the sub-grade, prepared as above described, to the full depth of the sidewalk, as shown on the plans, in one course. The full quantity of concrete required shall be deposited in as near its final position as practicable in one operation, and the placing shall be completed with shovels. Spades shall be used along the edges to bring the concrete into uniform and complete contact with the forms. Approved hand tampers shall be used for compacting. A heavy iron shod straight edge shall be used for striking off the concrete at the proper elevation. Wood floats shall be used for bringing the material to a uniform surface, and after the surface has partially set, all edges shall be finished

with an approved edging tool having a 3/8 inch radius, and the surface shall then be finished with a wood float or by floating with a steel trowel. On steep grades the surface shall be roughened.

7. **Sidewalk Pavement.** All concrete sidewalks shall be constructed to the lines, grades and dimensions as shown on the prepared plans. It shall be built four (4") inches thick except at and through driveways. Concrete sidewalks built at and through resident driveways which are used generally for passenger car traffic shall be six (6") inches in thickness through the entire width of the driveway. At driveways, other than resident driveways, such as service stations and all driveways used for commercial and industrial traffic, the thickness of the sidewalk through the entire driveway shall be as shown on the drawing, but in no case shall the thickness of the concrete walk be less than seven (7") inches.

8. **Joints.** Transverse expansion joints shall be constructed in all concrete sidewalk at intervals of approximately thirty-two (32') feet. These joints shall be ½ inch in thickness and shall run the full width and depth of the sidewalk pavement. Expansion joints shall also be constructed between the sidewalk and curb, between the sidewalk and buildings abutting said sidewalk, around all poles, hydrants, manhole frames and/or other structures coming within or immediately adjacent to the sidewalk area, and at such other points as shown on the plans. The width of expansion joint at the above mentioned locations shall be as shown on the drawings except that the expansion joint abutting curb shall be a special joint one (1") inch wide by eight (8") inches deep. All expansion joints shall extend the full depth of the sidewalk pavement being constructed, and shall be constructed at right angles to the center line and surface of the sidewalk pavement. A metal holder shall be used to hold the expansion joint rigidly and securely in place during the sidewalk construction.
 - a. The expansion joint filler to be used shall be prepared resilient, non-extruding joint filler conforming to the requirements of ASTM Specifications, designation D-544-52 T, or as last revised, cut or molded to proper dimensions, and it shall be so placed in relation to surface of sidewalk pavement to allow for pouring of joint sealer compound.

 - b. In addition to the expansion joint all concrete sidewalks shall be marked transversely with a marking tool, at intervals equal to the width of the sidewalk being built, and every third marking shall be finished with an edging tool and shall be cut to a depth of one-quarter (1/4) of the sidewalk slab thickness. Additional contraction joints shall be provided as and where shown on the drawings or as further described in the "Detail Specifications." Ordinary markings shall not be more than 1/4 inch in depth.

 - c. All above joint filler and sealer shall be furnished and properly placed at the expense of the contractor, unless otherwise provided in these specifications.

9. **Wasted Concrete.** Retempering concrete that has partly set will not be permitted. Concrete that for any reason has been mixed too wet shall be wasted. Concrete that is partly set shall not be used in the work. Waste concrete shall be disposed of by the Contractor in a satisfactory manner.

a. All concrete surfaces not coming in direct contact with the forms shall be struck off with a straight edge to the exact form and elevation required. The surface shall then be finished with a wood float or steel trowel as shown on the plans and the edges shall be finished with an approved edging tool.

b. If any special type of finish is required on any of the concrete included in this contract, then detailed requirements will be found in the "Detail Specifications" attached hereto.

10. **Curing.** All Portland Cement concrete shall be cured by acceptable means and as approved. The work shall be done in an efficient and systematic manner. The curing period for reservoir lining shall not be less than fourteen (14) days, for formed structures and concrete paving not less than seven (7) days.

11. **Curing in Cold Weather.** If the Contractor desires to place concrete in cold weather he shall assume all responsibility for damage that may be caused by freezing or by any other cause, even though permission to proceed may have been given by the City Engineer. In no case, however, shall concrete be placed when the temperature is 45 degrees F and falling, unless the Contractor has complied with the following requirements and such additional precautions as he/she may consider to be necessary or advisable:

a. Provision shall be made for heating the water and, if necessary, the aggregates also. If the aggregates are heated, it shall preferably be done with steam by means of closed steam coils.

b. The temperature of the mixed concrete when placed in the forms shall be between 50 degrees F and 70 degrees F, depending on the temperature of the air.

c. When the concrete has been placed, the forms and concrete shall be covered with tarpaulins or other approved covering and a sufficient number of perforated steam pipes provided under the coverings to maintain the temperature at a minimum of 40 degrees F for at least seventy-two (72) hours, or as much time as is needed to insure proper curing.

d. The Contractor shall provide and use a sufficient number of maximum and minimum self-recording thermometers to adequately indicate the temperature that is being maintained around the concrete. The thermometers shall be placed against the surfaces of the concrete.

e. The use of any admixture to lower the freezing point of the concrete is forbidden.

f. No concrete shall be placed upon a frozen sub-grade and no frozen materials shall be used in the concrete.

g. Salamanders shall not be used without approval. If the use of salamanders is permitted, then each salamander shall have a vessel containing water placed on it, in order to maintain the necessary humidity to prevent drying of the concrete. Water shall be

maintained continuously in the vessel.

- h. The material shall be free from ice, snow and frozen lumps when introduced into the mixer.
12. **Concreting in Hot and/or Dry Weather.** Whenever the ambient temperature is above 80 degrees F or the humidity is below ten (10%) percent, trial batches to determine the period of initial set may be required. If weather conditions are such that the initial set is accelerated, the maximum period specified for mixing, placement and compaction shall be reduced to allow at least 10 minutes time before initial set. The term "Initial Set" shall be construed as the time at which the concrete is no longer workable. Necessary steps shall be taken to protect the concrete from undesirable effects of heat. These steps may include:
- a. Spraying forms, reinforcing steel and sub-grade to prevent absorption of water from mix.
 - b. Erecting sun shades and wind breaks.
 - c. Protect slabs before final finishing by covering with waterproof or visqueen.
 - d. Spraying outside of forms to cool concrete.
 - e. Cooling mixing water.
 - f. Spraying coarse aggregate to reduce temperature.
13. **Temporary Stoppage of Work.** If, for any reason, work is discontinued for a period long enough for the concrete to become set or partially set, then a construction joint shall be provided, preferably at a transverse expansion joint, or if that is impracticable, then at a transverse contraction joint. A bulkhead shall be placed between and at right angles to the side forms and at right angles to the surface of the pavement. It shall extend through the full depth of the pavement and the upper edge shall be set flush with the upper edge of the forms. The concrete shall be finished against this bulkhead to the full depth of the pavement and any excess concrete shall be wasted. All work shall be done satisfactorily before work is stopped.

SECTION 8

CURB AND GUTTER

- 1. **Excavation for Curb and Gutter; Preparation of Sub-grade Backfilling.** All excavation and preparation of sub-grade required for construction of concrete curb and gutter and reinforced concrete drain gutter shall be done as provided in all applicable provisions of Section 3.4 of these specifications. Embankment required under the concrete shall be with approved material compacted to 95% of maximum density per ASTM 1557 (modified

proctor)..

2. **Construction.** Concrete curb and gutter and reinforced concrete drain gutter shall be constructed in conformity with the lines, grades, slopes, form and dimensions shown on the plans. In the construction of combined curb and gutter, the entire structure shall be built simultaneously and no joint or line of cleavage shall be made between the curb and the gutter.
3. **Class of Concrete.** The concrete used for the construction of reinforced concrete drain gutter and concrete curb and gutter shall be "Class A," air entrained using type II cement. The curb and gutter shall be constructed monolithically.
4. **Joints.** At intervals of ten (10') feet, joints shall be made by inserting iron plates 1/8 inch in thickness and shaped to the exact form and dimension of the curb and gutter. Plates must be smooth and clean. They shall be oiled with mineral oil immediately before using. Any plate that has become warped or damaged shall not be used. They shall be carefully removed after the concrete has set, and any concrete broken out shall be repaired.
 - a. Expansion joints 1/2 inch thick shall be provided at approximately fifty (50') foot intervals. The expansion joint filler shall be shaped to the exact form and dimension of the curb and gutter, shall be 1/2 inch in thickness and shall conform to ASTM Designation D544-52T, or as last revised.
 - b. At the Contractors option, plates a minimum of 2 inches deep may be substituted for the full depth plates at contraction joint only. A full plate must be used at expansion joints and ends of the constructed section, such as at driveways, curved sections, etc.
 - c. After division plates have been removed and expansion joints have been properly set, then all joints shall be sealed in a manner and with material approved.
5. **Placing, Compacting and Curing.** The method of mixing, placing, compacting, finishing and curing, etc., of the concrete shall conform to all applicable requirements of Section 3.7 of these specifications.

- a. **Curb and gutter may be placed by an approved slip form method.** The slip form machine equipment shall spread, consolidate, screed and float finish the freshly placed concrete in such a manner that a minimum of hand float finishing will be required to provide a dense and homogeneous concrete section.

The concrete shall be distributed uniformly into final position by the machine without delay and competently placed true to line and grade.

The contraction joints every ten (10') feet may be provided by cutting into the fresh concrete to a minimum depth of 1-1/2 inches to create a weakened vertical plane. The edges or such joints shall be tooled with an edger so as to provide a neat workmanlike appearance. Expansion joints will not be required except at adjacent pavement, walk or

structure.

This option shall be so noted in the bid schedule, by the contractor when this alternate is used in bidding this item.

6. **Reinforced Concrete Drain Gutter.** The reinforced concrete drain gutter shall be constructed simultaneously with the adjoining gutters and shall consist of concrete minimum eight (8") inches in thickness, unless otherwise shown, and reinforced longitudinally, and shall be built to conform to dimensions, form and elevations as shown on the plans.

The concrete used shall be "Class A," the same as provided in paragraph 3 of this Section 3.8 of the specifications. The methods of placing, spading, compacting, finishing and curing, as provided in paragraph 5 of this Section 3.8 of the specifications shall apply to the construction of the drain gutter.

Where necessary, gravel shall be placed and thoroughly compacted to form a base for the drain gutter.

7. **Protection.** The Contractor shall protect all curb and gutter and drain gutter from damage from traffic and all other causes until accepted by the City. Should the curb and gutter or drain gutter become damaged by weather, traffic, or during the rolling of the street, or from any other cause, it shall be repaired by reconstructing an entire section, by and at the expense of the Contractor.

SECTION 9

EXCAVATION AND BACKFILL FOR PIPELINES

1. **Description.** Excavation of trenches for pipe lines shall include the excavation of all materials, of whatever nature, except pavement, coming within the designated lines of the trenches, as hereinafter described. It shall include the excavation of all materials required for the construction of manholes, flush tanks, cleanout boxes, meters, pressure regulators and other appurtenances as shown on the drawings. It shall include all excavation required for the removal or lowering of existing pipe lines or appurtenances and shall include all necessary clearing and grubbing, all necessary draining, pumping, timbering, sheeting and subsequent removal of these materials. It shall include the disposal of all material excavated and the backfilling of the trenches and appurtenant structures as hereinafter provided.
2. **Subgrade.** The subgrade for all pipe line trenches is hereby defined to be the bottom of the trench at the elevation of the outside bottom of the pipe.
3. **Limits of Excavation.** The trench shall be excavated eighteen (18") inches wider than the inside diameter of the pipe, except for concrete pipe, for which it shall be excavated twenty

(20") inches wider. The sides of the trench shall be vertical and the depth of the trench shall be measured from the existing ground surface to the subgrade of the trench, provided that on paved streets the depth shall be measured from the bottom of the pavement to the subgrade of the trench. All excavation required for manholes, flush tanks, cleanout boxes, meter boxes, valve boxes, pressure regulators and other appurtenances shall be made and measured as described under "Excavation for Structures"; provided, however, that such measurements shall include only such additional material as is excavated outside the designated lines of the trench.

4. Excavation in Rock. If the bottom of the trench for any pipe is in rock or in material too hard to permit the bed to be properly formed for the pipes, the excavation shall be made not less than four (4") inches below the established subgrade, and the bottom of the trench shall be brought to subgrade with approved material compacted into place.
5. Excavation other than Rock. Where the bottom of the trench is composed of material other than rock, care shall be exercised to prevent any disturbance of the material beyond the prescribed lines, and if any material is so disturbed, it shall be tamped back into place in a satisfactory manner.
6. Undesirable Material. If any undesirable material is encountered in the bottom of the trench, the Contractor shall make such additional excavation and shall replace it with gravel of a quality that will pack, and said gravel shall be tamped into place in four (4") inch layers.
7. Bridging. The Contractor shall construct suitable bridging over the trench at all street intersections and at driveways to property abutting the line of the work, and at such other points as may be required. The bridging shall be of sufficient strength to carry the loads required. For public vehicle crossings it shall be capable of supporting a fifteen (15) ton truck.
8. Disposal of Seepage, Storm Water or Sewage. The Contractor shall remove all seepage, storm water or sewage that may be found or may accumulate in the excavation during the progress of the work. He/she shall furnish all labor, pumps and other equipment and appliances necessary and shall keep all excavations entirely free from water at all times during the construction of the work and until instructions are given to cease pumping.
9. Tunneling. No tunneling shall be permitted unless permission is given in writing by the City.
10. Protection of Pipes. All water, gas, sewer or other pipes encountered in excavating for the trench or appurtenances shall be supported and protected from injury, in a satisfactory manner.
11. Parking, Lawns, etc. Where the pipe line or structure is located on, along or across sodded parking, lawns or grass plots, the Contractor shall in advance of making the excavation, remove the lawn or sod and give it proper care and attention, and shall replace the same in as nearly the original location and condition as is reasonably possible after the excavation has

been backfilled and compacted. Where it is necessary to deposit the excavated material on lawns or parking during the process of construction, the Contractor shall first spread canvas or similar material of suitable size upon the grass to prevent any of the excavated material from coming in contact with the sod. The excavated material shall be removed as soon as possible in order to avoid injury to the grass and the Contractor shall replace, at his/her own expense, any sod that is damaged.

12. Trench in Unpaved Street. Where the trench is in an unpaved street, the backfilling shall be slightly rounded over the compacted trench and left to settle, at which time it shall be thoroughly rolled with a five (5) ton truck loaded to capacity. The entire area of the trench shall be covered at least three times by the tread of the tires, after which any depression or irregularities shall be smoothed up to the proper elevation and re-rolled. The surface over the trench shall be left in a uniformly smooth condition, conforming to the street surface and all excess material removed. Contractor shall maintain said surface in good condition until finally completed and accepted.
13. All backfill operations shall be completed as soon as possible from the start of excavating. In no case shall backfill operations exceed five (5) working days from the start of excavation.
14. All backfill material shall be free from cinders, ashes, refuse, organic and frozen material, boulders, stones, or other material that is unsuitable.
15. Backfill material under, around, and to one (1') foot over the pipe shall consist of select earth, sand or fine gravel, free from clods, lumps or stones larger than 1-1/2 inches to their maximum dimensions, compacted to 95% of the maximum dry density per ASTM D-1557, (modified proctor). This shall be limited to 3/4 inch maximum around PVC, ABS or polyethylene lines. In wet or unstable conditions, material in this zone shall be free draining, non-plastic material.
16. Bell holes of ample dimensions shall be dug in the bottom of the trench for each pipe. Uniform bearing for each pipe barrel shall be provided for the full length of each pipe. All layers throughout backfill zones will be compacted to not less than ninety-five (95%) percent of the maximum dry density per ASTM D-1557, (modified proctor). Adequate testing by the Contractor shall be required to satisfy compaction requirements. In no case shall the compacted lift height exceed 8".
17. All subsequent settling of backfill areas will become the sole responsibility of the Contractor for a period of not less than one (1) year following the final approval of the entire project.
18. Impervious backfill shall be required at irrigation canal crossings or other waterway interferences.
19. All areas disturbed by excavation and backfilling construction shall be restored to its original or better condition at the **Contractors' expense**.

SECTION 10

WATERWORKS

1. Materials

- a. Fire Hydrants: Fire hydrants shall meet the requirements of AWWA-Standard Specification C502 64 for fire hydrants for ordinary water works service with the following supplementary qualifications:
 1. Length for depth of trench to be as specified.
 2. Two hose nozzles 2-1/2 inch diameter with national standard fire hose thread.
 3. One pumper nozzle 4-1/2 inch diameter, with national standard fire hose thread.
 4. Counter clockwise to open.
 5. Operating nut pentagon, 1-1/2 inch point to flat.
 6. All internal parts to be removable from top of hydrant without the use of special tools.
- b. Flanged Fittings: All flanged fittings shall be in accordance with AWWA C110-65 cast iron fittings.
- c. Check Valves: Standard iron body swing check valves for 150 pound working pressure Crane, Ludlow or equal.
- d. Dresser Couplings: Latest standard style with rubber gasket for water. For diameters four (4") inches to fourteen (14") inches middle ring to be a minimum of 1/4 inch thick and five (5") inches long with 4-5/8 inch bolts for four (4") inch diameters; 6-5/8 inch bolts for six (6") and eight (8") inch diameters and 8-5/8 inch bolts for ten (10"), twelve (12"), and fourteen (14") inch diameters.
- e. Certification of all tests required by the American Water Works Association shall be provided by the manufacturer. The three-edge bearing test will be required.
- f. All pipe shall be standard lengths except for making connections to valves, fittings, and other such closures.
- g. Ductile Iron Pressure Pipe. Ductile iron pipe shall be centrifugal spun ductile iron, Class 51. Ductile iron pipe shall have a standard thickness cement liner and shall conform to all requirements for AWWA Standard C151-76 for centrifugal spun ductile iron pipe with "push-on" or bell and spigot type joints. Required glands, gaskets, bolts and nuts shall be furnished. Pipe shall be coated with bituminous coal-tar base, approximately one (1) mil. thick. The nominal laying length of the pipe shall be eighteen (18') feet. The maximum allowable pipe deflection shall be three (3) degrees per joint with a recommended deflection of two (2) degrees or less per joint. Pipe deflection shall be limited to two (2)

degrees at crosses, valves, couplings, and fire hydrants. Except where specifically noted on the plans, ductile iron pipe shall have bell and spigot ends. Joints shall comply with AWWA Standard C111-72.

- h. Replacement of Damaged Material. Any material furnished by the owner that becomes damaged after acceptance by the Contractor, shall be replaced by the Contractor at his/her own expense.
- i. Responsibility for Safe Storage. The Contractor shall be responsible for the safe storage of material furnished by or to him/her, and accepted by him/her, and intended for the work, until it has been incorporated in the completed project.
- j. Handling Pipe and Accessories. Pipe, fittings, valves, hydrants, and other accessories shall, at all times, be handled with care to avoid damage. In loading and unloading they shall be lifted by hoists or slid, or rolled on skidways in such manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of derrick, ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Pipe shall be handled in such manner that a minimum amount of damage to the coating will result. Damaged coating shall be repaired in a satisfactory manner.
- k. Gate Valves shall be iron body, bronze mounted, double disc with non-rising stems with design construction to AWWA C-500, and modifications herein. Stem seals shall be double O-ring seals, valves shall open counter-clockwise. Provide two (2") inch square wrench nut for key operation. Provide mechanical joint ends, except gate valves for use with fire hydrants or as otherwise noted on approved drawings.
- l. Valve Boxes shall be buffalo, sliding type with base as required for the valve size used and of sufficient length for the specified pipe bury. Valve box lids shall have the word "water" stamped thereon.

2. Laying Pipe.

- a. General: All pipe shall be laid and maintained to the required lines and grades, with fittings, valves and hydrants at the required locations, and with joints centered and spigots home, and with all valve and hydrant stems plumb. No deviation shall be made from the required line or grade except with written consent.
- b. Permissible Deflections at Joints: Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, to plumb stems, or where long radius curves are permitted, the degree of deflection shall be approved.
- c. Protecting Underground and Surface Structures: Temporary support, adequate protection

and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his/her own expense.

- d. Deviations Occasioned by other Utility Structures: Wherever existing utility infrastructure obstructs the grade and alignment of the pipe, the existing utility shall be relocated or reconstructed by the Contractor through cooperation with the owner of the utility, structure or structure involved. In those instances where their relocation or reconstruction is impracticable, a deviation from line and grade will be ordered. Where existing utilities are exposed during construction but do not obstruct the new pipe installation the existing utilities shall be adequately supported to prevent damage to the utility while it is exposed.
- e. Pipe Kept Clean: All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.
- f. Bell Ends to Face Direction of Laying: Unless otherwise directed, pipe shall be laid with bell ends facing the direction of laying, and for lines on an appreciable slope, bells shall face upgrade.
- g. Preventing Trench Water from Entering Pipe: At times when pipe laying is not in progress, the open ends of pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe.
- h. Cutting Pipe: Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe.
- i. Jointing of all pipe shall be as recommended by the manufacturer. All pipes shall be handled in such a way so as to prevent damage to the coating and lining. Refer to backfilling specifications for proper bedding and compaction. Thrust blocking shall be applied at all tees, plugs, caps and at bends deflecting 22 ½ degrees or more.

3. Setting Valve, Hydrant & Fitting

- a. Location: Gate valves, hydrants and fittings shall be located as shown on the plans.
- b. Valve Boxes and Valve Pits: Cast iron valve boxes shall be firmly supported, and maintained centered and plumb over the wrench nut of the gate valve, with box cover or barrel lid flush with the surface of the finished pavement or at such other approved level.
- c. Hydrants: Hydrants shall be located in a manner to provide complete accessibility, and in such a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized. All hydrants must be set to grade of finished road level. Unless otherwise directed, the setting of any hydrant shall conform to the following:

1. Position of Nozzles: All hydrants shall stand plumb, and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle pointing normal to the curb. They shall conform to the established grade, with nozzles at least twelve (12") inches above the ground.
2. Drainage at Hydrant: A drainage pit two (2') feet in diameter and two (2') feet deep shall be excavated below each hydrant and filled compactly with coarse gravel or broken stone, mixed with coarse sand, under and around the bowl of the hydrant and to a level of six (6") inches above the waste opening. No hydrant drainage pit shall be connected to a sewer.
3. Anchorage for Hydrant: The bowl of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing, or it shall be tied to the pipe with suitable rods or clamps. Do not obstruct the hydrant drain opening.
4. Cleaning: Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.
5. Plugging Dead Ends: Standard plugs shall be inserted into the bells of all dead ends of pipe. Tees, crosses, and spigot ends shall be capped.
6. Anchorage of Tees, Tees, and Plugs: Reaction or thrust backing shall be applied on all pipe lines eight (8") inches in diameter or larger at all tees, plugs, caps and at bends deflecting 22-1/2 degrees or more, or movement shall be prevented by attaching suitable metal rods or straps as directed.
7. Material for Reaction Backing: Reaction or thrust backing shall be of concrete or a mix not leaner than 1 cement, 2-12 sand, 5 stone, having compressive strength of not less than 2,000 psi. Backing shall be placed between solid ground and the fitting to be anchored, the area of bearing on the pipe and on ground in each instance shall be that required. The backing shall, unless otherwise directed, be so placed that the pipe and fitting joints will be accessible for repair.

4. Water Line Testing.

Testing of new lines shall be completed by the Contractor prior to connection to the existing River Heights City water system in accordance with ANSI/AWWA C651 and specifications found herein. The Contractor shall pay the costs for all tests; including all bacteriological tests, and all such costs shall be paid before the system is put in operation, or before the final payment on projects is made. The Contractor shall furnish all pumping apparatus, labor tools, pressure gauges and other equipment for making the tests. Temporary thrust blocking shall also be provided when necessary. A visual inspection shall be made of each and every connection made to an existing main when, in the determination of the City Engineer, the test procedure specified in this section cannot be accomplished.

Where the City has water available for testing, it may be furnished without charge upon arrangement with the Director of Public Works. All costs of tapping and piping shall be borne by the Contractor unless otherwise specified in the Special Conditions. Where water is not available from the City, the Contractor shall provide water from an approved source for testing.

- a. It is suggested that water line testing follow this sequence: Apply chlorination before or concurrent with filling the water main, vent off all air to allow contact time for chlorinating agent. After time allowed for disinfection flush the line and take bacteriological tests. Following satisfactory bacteriological test results complete the pressure test. If bacteria test results are not acceptable the water line shall be re-chlorinated, flushed, and new bacteriological tests shall be taken until acceptable results are obtained.
- b. All culinary water lines shall be disinfected by chlorination as outlined and prescribed in AWWA Standard C651. Provide a minimum contact time of 60 minutes. Chlorination shall provide a minimum of 25 ppm residual after 24 hours contact in the pipeline. This may be expected with an application of 50 ppm, although some conditions may require more. Chlorine in the form of a 1% slurry of high-test calcium hypochlorite (HTH, Pittchlor, etc. which are 70% available chlorine by weight) shall be fed into the pipeline in the presence of the City Engineer or his representative, in such a manner as to mix with the water flowing in the pipeline. (A 1% slurry -10,000 ppm -result from mixing one pound of calcium hypochlorite with 8.40 gallons of water.)

All valves shall be operated several times to provide sufficient contact with the chlorinating agent. Following chlorination, the water line shall be drained and flushed according to this Specification and, if necessary, rechlorinated until a satisfactory bacteriological test is obtained.

- c. Bacteriological tests shall be run and recorded by the Engineer or City Public Works Director or an authorized representative. Two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main prior to completing the pressure test. At least one set of samples shall be collected from every 1200 linear feet of new water main, plus one set from the end of the line and at least one set from each branch.
- d. Pressure tests shall be made between successive valves in the system, or as deemed necessary by the Engineer or his representatives. The valves on the section to be tested shall be closed and remain closed until successful bacteriological test results are achieved.

Lines shall be slowly filled with water, venting off all air. If required, taps shall be provided at line high points to bleed off the air, and after testing these taps shall be plugged. The duration of the test shall be for not less than 2 hours, and during the test, and piping shall be subjected to a minimum hydrostatic pressure 50% higher than the

highest working pressure of the pipe, but not less than 200 psi, based on the elevation of the highest point of the section of pipe line under test and corrected to the elevation of the test gauge. Tests shall be made against fire hydrants with hydrant valves opened and closed and also against the existing system where possible.

Where any section of pipe is provided with concrete thrust blocking, the pressure test shall not be made until at least (5) days have elapsed after the concrete thrust blocking is installed. If high/early cement is used for the concrete thrust blocking, the time may be cut to two (2) days instead of the five (5) previously specified.

e. Meter Placement

Meters are to be placed one foot inside the property line and to conform with one-inch (1") or two-inch (2") pipes, as appropriate, as specified in the manual of Standard Plans and Manual of Standard Specifications.

f. Back Flow Preventer Required

All sprinkling systems and outside faucets must have back flow Preventer's to conform to the Manual of Standard Plans and Manual of Standard Specifications.

SECTION 11

SANITARY SEWERS

1. Poly (Vinylchloride) Sewer Pipe (PVC)

- a. General. This specification covers requirements for PVC pipe and fittings to be furnished for sanitary sewer.

Pipe and fittings produced to the standards below should be installed in accordance with ASTM recommended practice D-2321, underground installation of flexible thermoplastic sewer pipe. The plastics nomenclature used in the specifications is in accordance with the definitions given in nomenclature D-883, unless otherwise indicated.

- b. Applicable Documents. PVC sewer pipe furnished under this specification shall meet the

following ASTM standards: D-256, Impact Strength. D-638, Tensile Strength and Modulus of Elasticity, D-648, Deflection temperature under load of 264 psi, D-1784, Specifications for rigid Poly(Vinylchloride) compounds and chlorinated Poly(Vinylchloride) compounds, D-3034 (SDR 35) type PSP Poly(Vinylchloride) (PVC) sewer pipe and fittings. The requirements of this specification are intended to provide pipe fittings suitable for non-pressure drainage of sewage.

- c. Materials; Basic materials of the pipe and fittings shall be PVC plastic having a self-classification of 12454-B and shall meet the minimum physical properties and chemical resistance of the PVC compound as defined in ASTM D-1784.
- d. Connection Joints. All sizes and classification of PVC gravity sewer pipe shall have bell and spigot joints utilizing rubber gasket for sealing conforming to ASTM C-443. The gasket shall be confined in a groove on the spigot so that pipe movement or hydrostatic pressure cannot displace the gasket.
- e. Workmanship. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, density, and other physical properties.
- f. Requirements. All materials, dimensions, strengths, qualities, and test requirements shall meet the applicable ASTM requirements. All material used shall be new and shall be protected from any long exposure to the sun.
- g. Inspections. Inspection of the material shall be made as agreed upon by the purchaser and the seller as part of the purchase contract.
- h. Certification. When agreed upon in writing by the purchaser and the seller the certification shall be made upon the basis of the acceptance of the material. This shall consist of a copy of the manufacturers test report or a statement by the seller, accompanied by a copy of the test results, that the material has been sampled, tested, and inspected in accordance with the provisions of the specification. Each certification so furnished shall be signed by an authorized agent of the seller or manufacturer. Copies will be furnished to the City and/or to the City Engineer.
- i. Marking. Pipes in compliance with this standard shall be clearly marked at intervals of five

(5') feet or less. The marking on SDR-35 shall be:

1. Mfg's Quality
2. Nominal Pipe Size
3. PVC 12454-B
4. SDR-35
5. PVC Sewer Pipe
6. ASTM D3034

2. Concrete Sewer Pipe

- a. Description: Sanitary sewers shall include the performance of all operations necessary to lay sewer pipe mains, wye branches, individual sewer mains to manholes, test mains for leaks and all incidental work necessary to complete the work in a satisfactory manner.
- b. Sewer Pipe: All pipe for the sanitary sewer mains shall be bell and spigot. The type of pipe the Contractor proposes to install shall have approval before work is commenced. No interchanging of type of pipe will be allowed.
- c. Non-Reinforced Concrete Sewer Pipe: Non-Reinforced concrete sewer pipe shall conform to Concrete Sewer Pipe ASTM Designation C-14.
- d. Reinforced Concrete Sewer Pipe: Reinforced concrete sewer pipe shall conform to the requirements for "Reinforced Concrete Sewer Pipe: ASTM Designation C-73. Cement used in the pipe shall conform to Type 11A, (the air entraining agent shall be inter-ground at the mill), low alkali cement, conforming to Federal Specifications, 192a, of ASTM Designation C-15.
- e. Length of Pipe: Pipe thirty-six (36") inches in diameter and under shall be at least thirty-six (36") inches long, except specials. Pipe over thirty-six (36") inches in diameter shall be at least as long as the inside diameter. The maximum length of pipe shall be twenty-four (24') feet.
- f. Testing: Random samples of pipe and all fittings and specials such as short radius bands, wyes and tees shall be tested as specified for the type of pipe being used.

g. Laying: No pipe shall be laid under any circumstances until the pipe has been tested, and the samples selected have satisfactorily passed the requirements. All pipe shall be laid up-grade from structure with the bell end of the pipe up-grade. All pipe shall be laid true to line and grade, with a uniform bearing under the full length of the barrel of the pipe, and suitable excavation shall be made to receive the bell of the pipe. All adjustments to grade shall be made by scraping away or tamping earth under the pipe. Wedging or blocking under the hub will not be permitted. As each unit of pipe is laid a sufficient amount of selected backfill materials shall be carefully placed and thoroughly tamped about the lower portion of the pipe to hold it firmly in position. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and rejoined as for a new pipe. When laying is not in progress the ends of the pipe lines shall be kept closed to prevent the entrance of foreign material.

h. Rubber Gasket Joints: Pipe for rubber gasket joints shall be of the bell and spigot type, detail of the type the Contractor proposes to use shall be furnished with the bid and must have the approval of the Owners Engineer before the work is to be commenced. The joint shall be so designed as to provide for self-centering and when assembled, to compress the gasket to form a water tight seal. The pipe design and gasket shall be such that movement of the pipe or hydrostatic pressure cannot displace the gasket. In order to assure watertightness the clearance between the inner surface of the bell and the outer surface of the spigot, as well as the dimensional tolerances of this annular space, shall be such that the gasket residual deformation is neither less than twenty (20%) percent nor more than forty-five (45%) percent when the spigot is seated to the full depth of the bell socket.

i. Rubber Gaskets: The rubber gasket for use on pipe shall be cured in such a manner that any cross section will be dense, homogeneous, and free from porosity and other imperfections. The gasket shall be extruded or molded to the specific size within a tolerance of plus or minus 1/32 inch at any cross section of the gasket. The gasket shall be fabricated from a high-grade tread-type compound. The basic polymer shall be natural rubber, or a copolymer of butadiene-styrene synthetic. The compound shall have the following characteristics:

Tensile strength, PSI, minimum.....2,300
Elongation at break, percent, minimum.....425
Shore Durometer (Type A).....40 to 65
Absorption of Water, by weight 2 days at

70 degree C, percent maximum.....	5
Compression set (constant deflection), percent of original deflection maximum.....	20
Tensile strength after oxygen bomb aging (48 hours, 158 degrees F, 300 per square inch), percent of tensile strength before aging, minimum....	80
Increase in Shore Durometer hardness after oxygen bomb aging, maximum increase over original Shore Durometer.....	8
Acetone, extract percent, maximum.....	15

The physical properties of the rubber compound shall be determined by test performed in accordance with appropriate section of Federal Specifications ZZ-R-601a, except for Shore Durometer and compression set. All tests for compression set shall be made in accordance with method B, ASTM Designation D395 for compression set of vulcanized rubber under constant deflection. Tests for Shore Durometer shall be made in accordance with ASTM designation D676. The Contractor shall furnish certified copies of test reports as evidence of the rubber compound used in all rubber gaskets before any gaskets are used to join pipes. All rubber shall be stored in as cool a place as practicable, preferably at 70 degrees F. or less, and in no case shall the rubber for joints be stored exposed to the direct rays of the sun. All rubber gaskets shall be stored so as to permit free circulation of air about the rubber.

In all cases during the laying of the pipe extreme care must be taken to see that the rubber gaskets are properly fitted in place and at all times are free from twisting and unusual displacement.

3. Sewer Appurtenances

a. Manholes:

1. General: This item shall consist of the construction or installation of concrete manholes of the various types and diameters shown on the plans and at the designated locations. The item shall include: Ring and cover, steps, and all other incidentals necessary to fully complete the manholes.

2. Precast Manholes: Precast manholes shall consist of sections of rings of tongue and grooved reinforced concrete pipe on a cast in place foundation. Both circular and conical sections shall meet the requirements of "Reinforced Concrete Sewer Pipe (ASTM Specifications C 75-56)."

Approved eccentric manholes with rungs will be accepted. Concentric manholes will not be accepted.

The precast base sections shall be recessed on the bottom edge to receive the pipe entering the manhole. The base section shall extend at least two (2") inches into the concrete of the floor. When practical the base section shall be set in position before the floor is poured; in any case the base section shall be imbedded in the floor before the concrete has taken its initial set.

Joints between sections shall be set in (a) cement grout, or (b) asphaltic sewer joint compound. Joints shall be water tight.

3. Manhole covers: The Contractor will furnish and install the cast iron frame and cover shown on the plans as a part of the manhole.
4. Castings, Quality of Metal: All castings shall be made of good quality cast iron, strong, tough, straight grained and free from flaws, cracks, blow holes or other defects and of exact form and dimensions shown on the plans. They shall be evenly and firmly set and imbedded as to afford the chance of any movement. The seats and bearings of all frames and covers shall be machine faced and shall fit evenly and firmly and so made as to be interchangeable. Iron shall conform to "Standard Specifications for Gray Iron Castings" ASTM Specification A 48-48 or Class 30.
5. Grade: Necessary adjustment to bring the cover to finished street grade shall be required.
6. Manhole Ladders: Manhole ladder steps as shown on manhole plans shall be formed from 3/4 inch mild steel bar coated with polyethylene or cast iron rungs.
7. Split Pipe and Stubs in Manholes: The Contractor will be required to furnish and

place, where plans may require, split pipe in the bottom of the manhole and inlets of the size and shape shown on the plans. The inlets, when required shall be fitted with a cap of the same description as specified for Wye Branches.

8. Revisions to Existing Manholes: All work required to revise or modify existing manholes as shown on the plans necessary to complete the project shall be done by the contractor and no extra compensation shall be allowed for this work. This work shall include such incidentals as raising manhole floors, providing drop type inverts, new invert openings, etc.

b. Sewer Laterals: Any lateral connections into new sewer mains shall be through pre-formed wye's or tees. All connections into existing sewer mains shall be done with a sewer tapping machine and tapping saddle as shown on the City Standard Drawings, or by other approved means. Minimum slope for four inch (4") lateral is two percent (2%) unless otherwise approved by the City Engineer. Lateral sizes other than four inch (4") shall be approved by the City Engineer. Cementing of joints is allowed.

4. Separation of Water Mains from Sewer Lines: horizontal distance between water mains and sanitary sewer lines shall be at least ten feet (10'). Where a water main and a sewer line cross, the water main shall be at least eighteen inches (18") above the sewer line. Measure separation distances from the nearest edge of the facilities. Water and sewer lines shall not be installed in the same trench. Any exceptions shall be approved by the City Engineer. See State of Utah Administrative Rules for Drinking Water Systems for special provisions and approval of exceptions as applicable.

5. Tests on Sewer Lines: The Contractor will be required to conduct an air test and television inspection test on all sewer main lines in the presence of the City Engineer or his representative. Sewer laterals are to be tested with the sewer main line. Television inspection of laterals is not required. In addition, any or all of the following other required tests may be conducted on sewer mains in the presence of the City Engineer or his representative as requested. Tests shall be performed as follows:

a. Displacement Test: In conducting the displacement test a light will be flashed between manholes or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe shows broken, misaligned, or displaced pipe or other

defects, the defects designated by the City Engineer shall be remedied at the Contractor's expense.

b. Infiltration Test: The Contractor shall furnish labor, equipment and materials, including pumps, and shall conduct infiltration tests on the completed sewer in the presence of the Engineer or his designated representative before it can be placed into service. The Contractor shall furnish and install the measuring weirs or other measuring devices. The length of line to be tested at any time shall be subject to the approval of the City Engineer. The maximum allowable infiltration shall not exceed 150 gallons per inch diameter per mile per 24 hours for all installed sewer pipe. If the quantity of infiltration is in excess of the maximum allowable, the leaking joint shall be repaired to the satisfaction of the City Engineer at the expense of the Contractor.

c. Ex filtration Test: In areas where groundwater does not exist, ex filtration tests may be required in lieu of infiltration tests.

1. Each section of the sewer shall be tested between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers. The pipe and manhole shall be filled with water to a point approximately four feet above the invert of the sewer at the center of the upper manhole.

2. The allowable leakage will be computed by the formula:

$$E = 0.25 D H$$

Where: E is the allowable leakage in gallons per minute per 1000 feet of sewer tested

D is the internal diameter of the pipe in inches

H is the difference in elevation in the water surface in the upper manhole and the invert of the pipe at the lower manhole (feet)

3. If the leakage from the sewer, as shown by the test, exceeds that allowed by the formula, the Contractor shall make the necessary corrections to reduce the ex filtration to within permissible limits as determined by additional testing.

4. Where the difference in elevation between inverts of adjacent manholes exceeds 10 feet, no ex filtration leakage tests will be required.

5. House service laterals shall be considered part of the main line sewer to which they are

connected and shall be tested with the main line sewer.

- d. Air Test: The Contractor or his representative (a qualified firm or individual approved by the City Engineer) shall furnish labor, equipment, and materials, including pumps and compressors, and shall perform, in the presence of the City Engineer, air tests of the completed pipe before it can be placed in service each section of sanitary sewer pipeline between manholes shall be tested after all the service laterals (and plugs) have been installed. Each test section shall be pressurized to 4.0 psi. For the purpose of stabilizing the air pressure in each test section, the 4.0 psi pressure shall be maintained for a two-minute period. Each test section shall then be re-pressurized to 4.0 psi for a period of four minutes. The test section shall be accepted if, after four minutes, the pressure gauge indicated 3.5 psi or greater. Failure of the Contractor's testing equipment to properly function shall render the test unacceptable. All faulty sections of pipeline shall be repaired and re-tested until the minimum air testing requirements have been met.
- e. Television Check: After any or all of the above tests are completed and passed satisfactorily and before the sewer main line is placed in service, the Contractor shall arrange for a television inspection of the entire main sewer line. A video tape of the television inspection shall be made, and the tape will be presented to the City Engineer for review and approval before the sewer main line is placed in service. Any problems noticed or any debris identified shall be removed and/or corrected and approved by the Engineer before the sewer main is placed in service. This video tape shall be correlated by manhole number, station, etc., so that exact lines and locations in the lines can be determined.

SECTION 12

STORM SEWERS

1. Culvert Pipe and Incidental Construction.

- a. Material: Pipe allowed for the Storm Sewer shall be include reinforced and non-reinforced concrete pipe, corrugated metal (steel or aluminum), and polyethylene pipe as approved by the City Engineer. All pipe must conform to national

standards as applicable for the type of pipe selected and approved for use. Install the storm drain pipe per the manufacturer's recommendations, and applicable City Standards and Specifications.

2. Structures.

a. Definition: All items including but not limited to cleanout boxes, inlet and junction boxes, box culverts, and flumes shall be designated as structures.

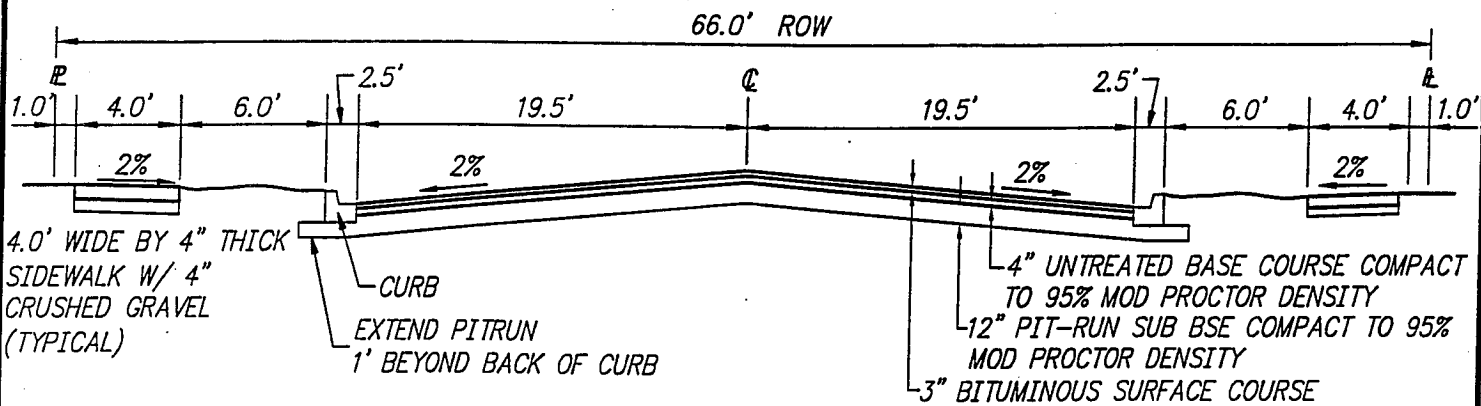
b. Concrete: Concrete for all structures shall be Class "A" and mortar used for finishing shall be Class "J".

c. Finishing: Upon removal of the forms, all the tie wire holding the forms shall be cut flush with concrete face and any rough or irregular surfaces found to exist shall immediately be repaired. Surface not exposed to view need not be finished, unless otherwise shown on the plans. Unless otherwise shown on the plans, exposed surfaces of structures shall be finished to conform to the finish of the adjacent concrete. Surfaces over which asphalt paving is to be placed shall be rodded off to neat lines. Surfaces exposed in concrete paving shall be given a float finish and surfaces exposed in curb and gutter areas shall be finished as prescribed for curb and gutter. An edging tool shall be used on all exposed corners to properly shape and finish the concrete.

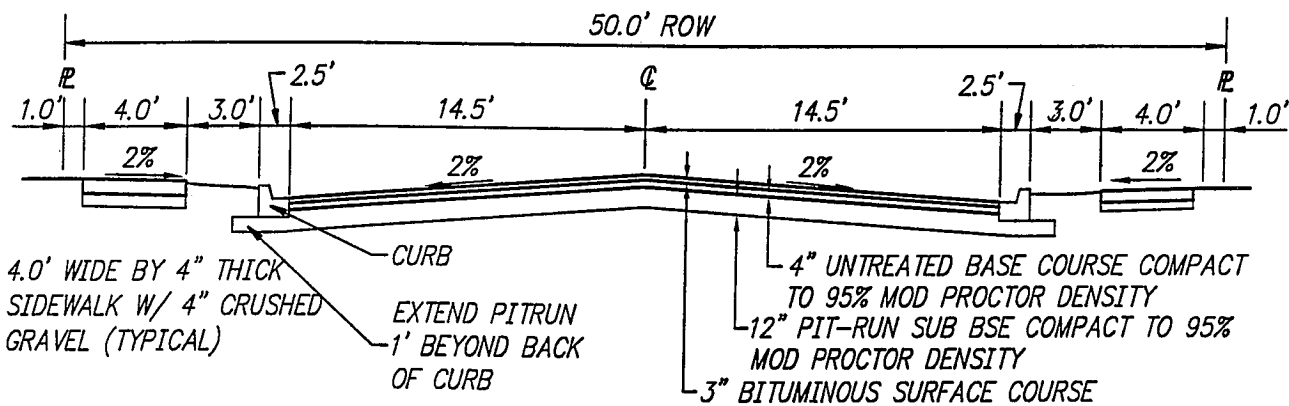
d. Precast Concrete Structures: Precast concrete structures may be installed as shown and detailed on approved construction drawings.

e. Cleanout Frames and Covers: Cleanout frames and covers shall be furnished and installed at the various locations shown on the plans. Frames and covers shall be bicycle safe. Covers and grates in traffic areas are to be designed per HS20 load requirements.

3. Concrete Curb and Gutter: Concrete curb and gutter shall be "Type A" Curb and gutter. Low profile curbing where required shall be approved by the City Engineer.



TYPICAL 66' ROW SECTION
NOT TO SCALE



TYPICAL 50' ROW SECTION
NOT TO SCALE

Last Detailer: _____
Time: _____
Plot Date: _____

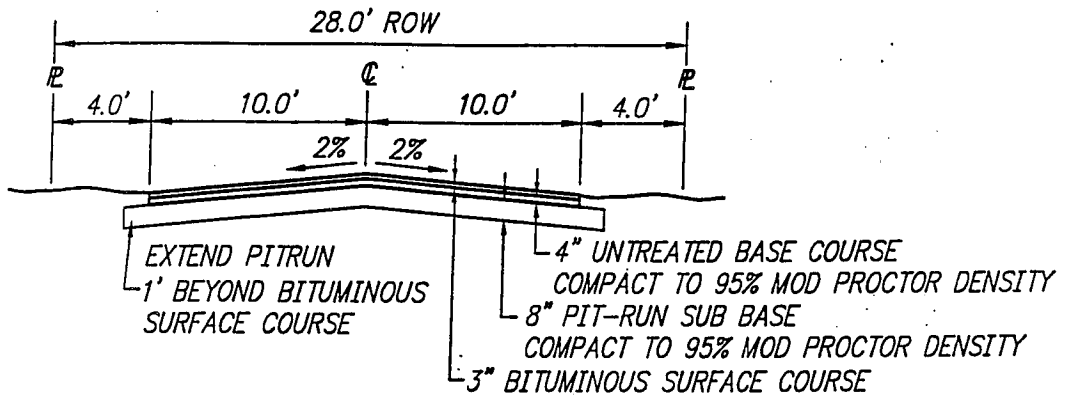
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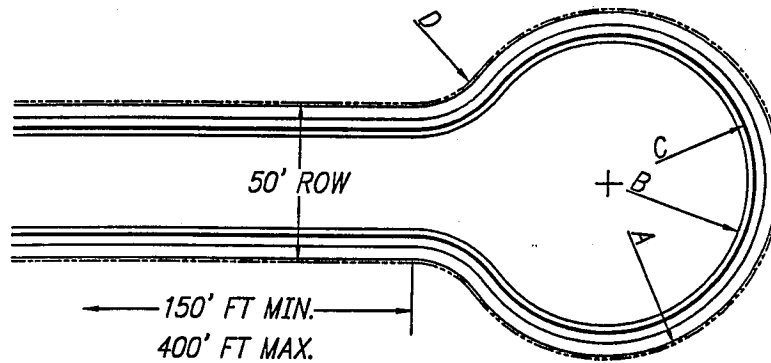
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Checker: CLR	SEI Job No. B95101.46
Drafter: .	
Issue Date: July 2003	



TYPICAL 28' ROW SECTION

NOT TO SCALE

CULDESAC DIMENSIONS			
A	55'	RAD.	RIGHT OF WAY
B	44.5'	RAD.	ASPHALT
C	47'	RAD.	BACK OF CURB
D	25'	RAD.	RIGHT OF WAY



TYPICAL CULDESAC PLAN

NOT TO SCALE

Last Detailer:

Time:

Plot P:

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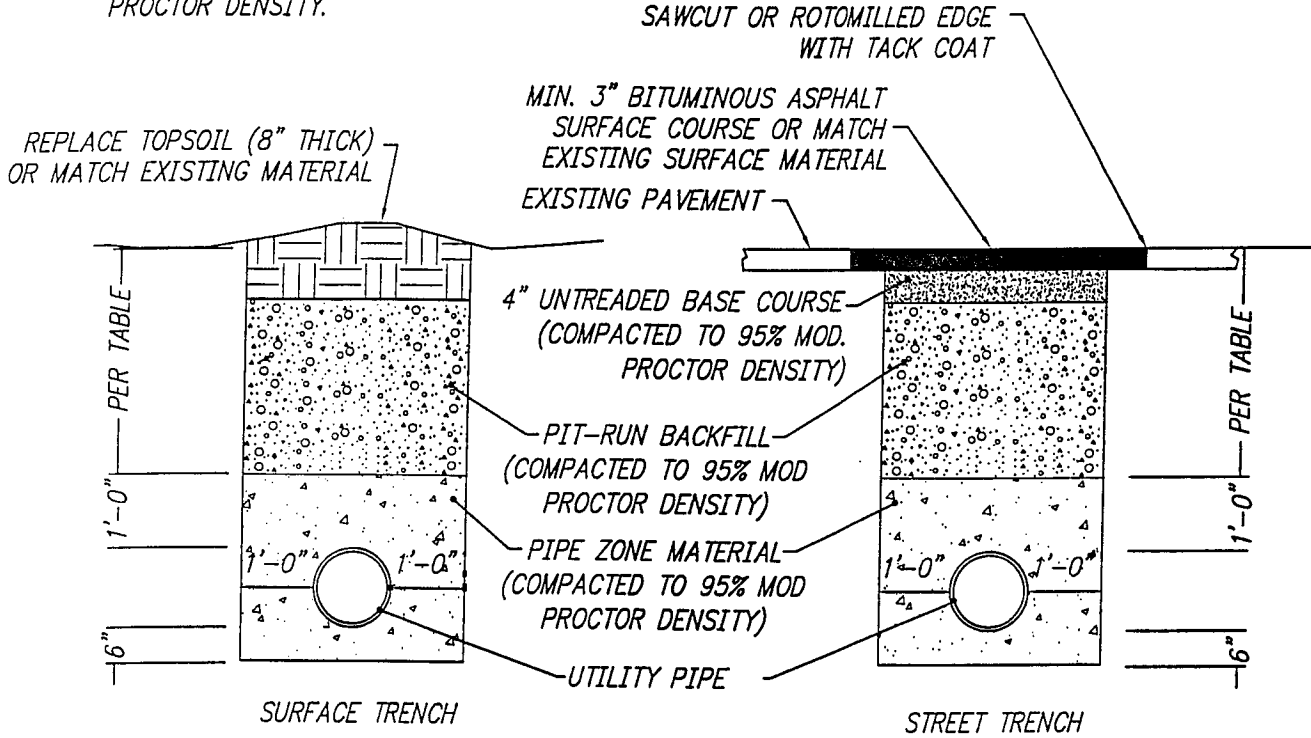
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NOTE:
 SUITABLE NATIVE MATERIAL MAY BE
 SUBSTITUTED FOR PITRUN BACKFILL WHEN
 APPROVED BY THE CITY ENGINEER. COMPACT
 NATIVE MATERIAL TO 95% MODIFIED
 PROCTOR DENSITY.



DEPTH TABLE	
LINE TYPE	DEPTH
SEWER	VARIABLE PER PLAN
WATER MAIN	4' MINIMUM
WATER SERVICE	3' MINIMUM

TYPICAL TRENCH CROSS SECTION

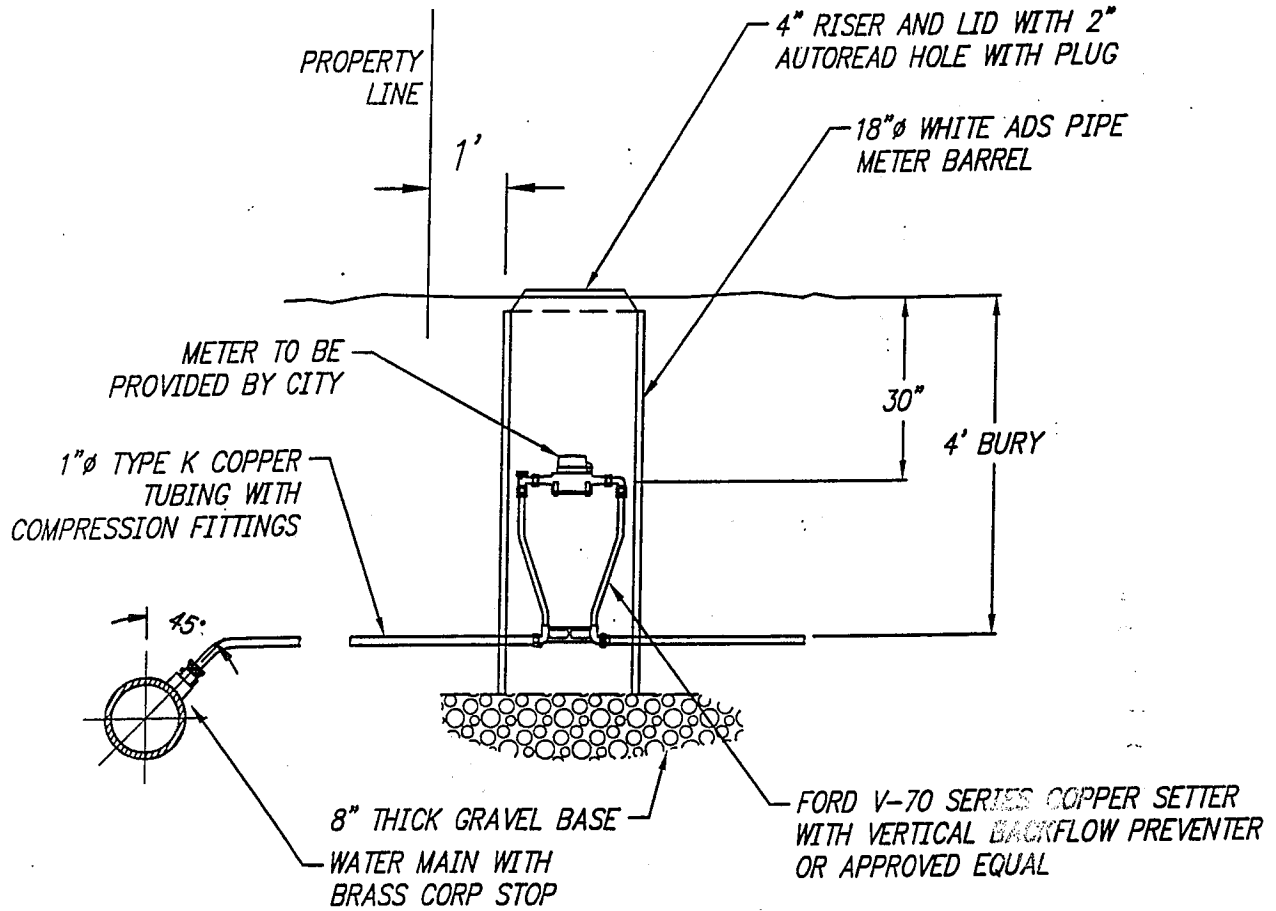
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NOTE:
ALL SPRINKLING SYSTEMS AND
OUTSIDE FAUCETS MUST BE EQUIPPED
WITH APPROVED BACKFLOW
PREVENTORS.

TYPICAL WATER SERVICE

NOT TO SCALE

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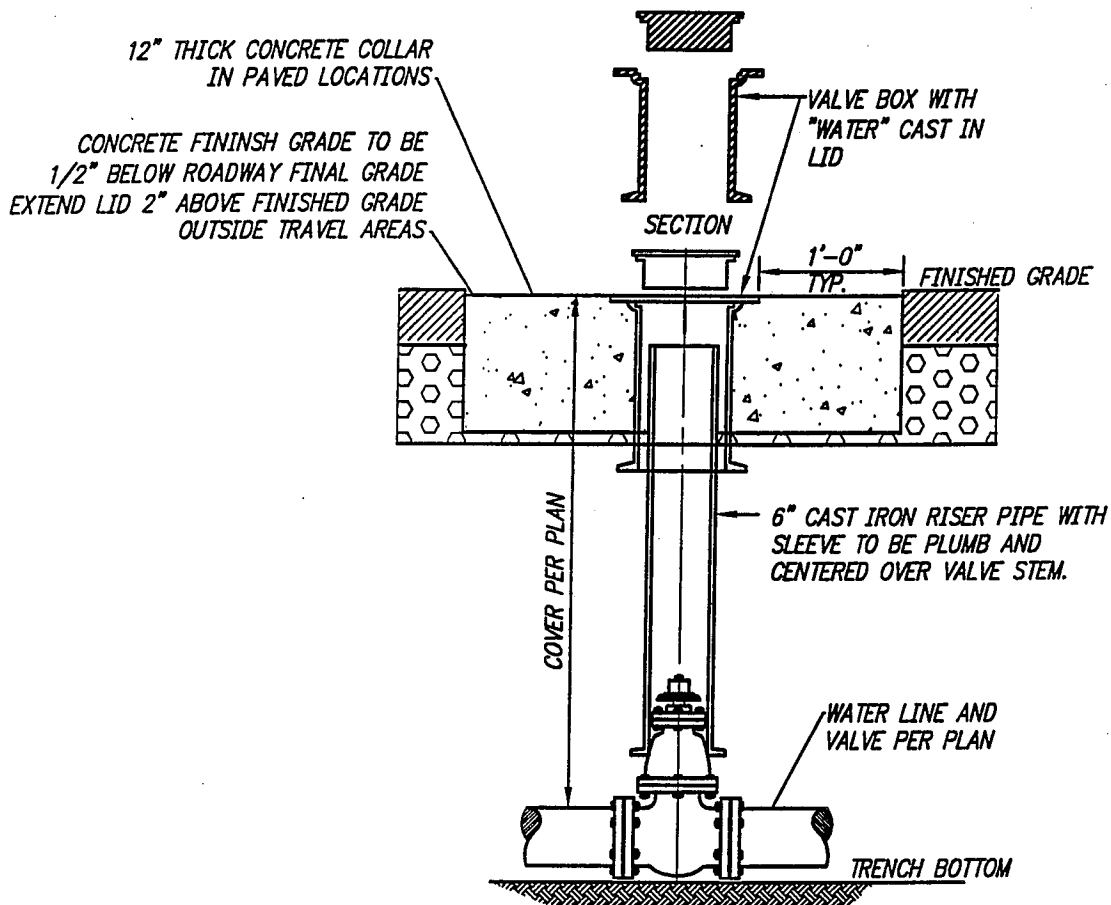
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TYPICAL WATER VALVE

NOT TO SCALE

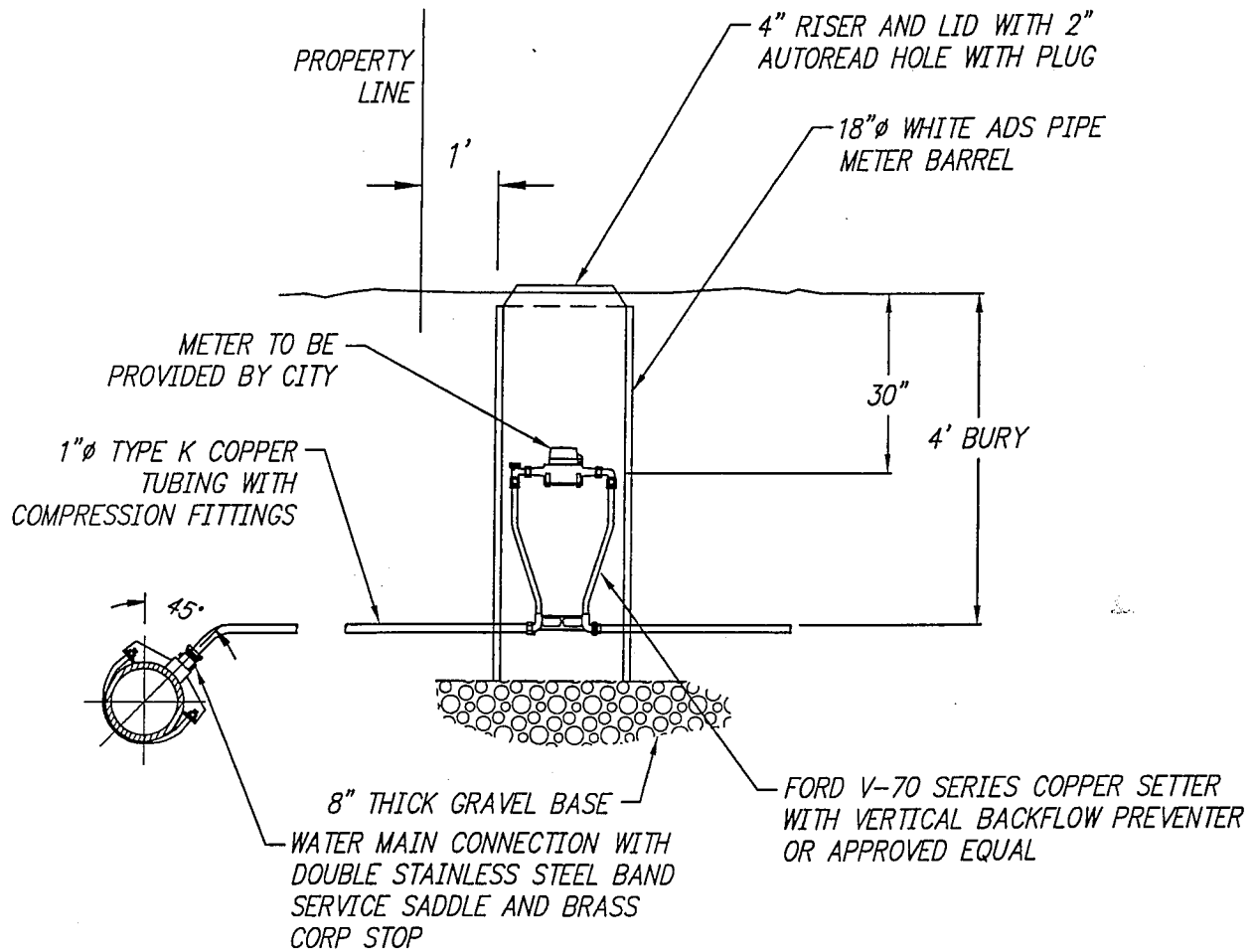
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NOTE:
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 WITH APPROVED BACKFLOW
 PREVENTORS.

TYPICAL WATER SERVICE

NOT TO SCALE

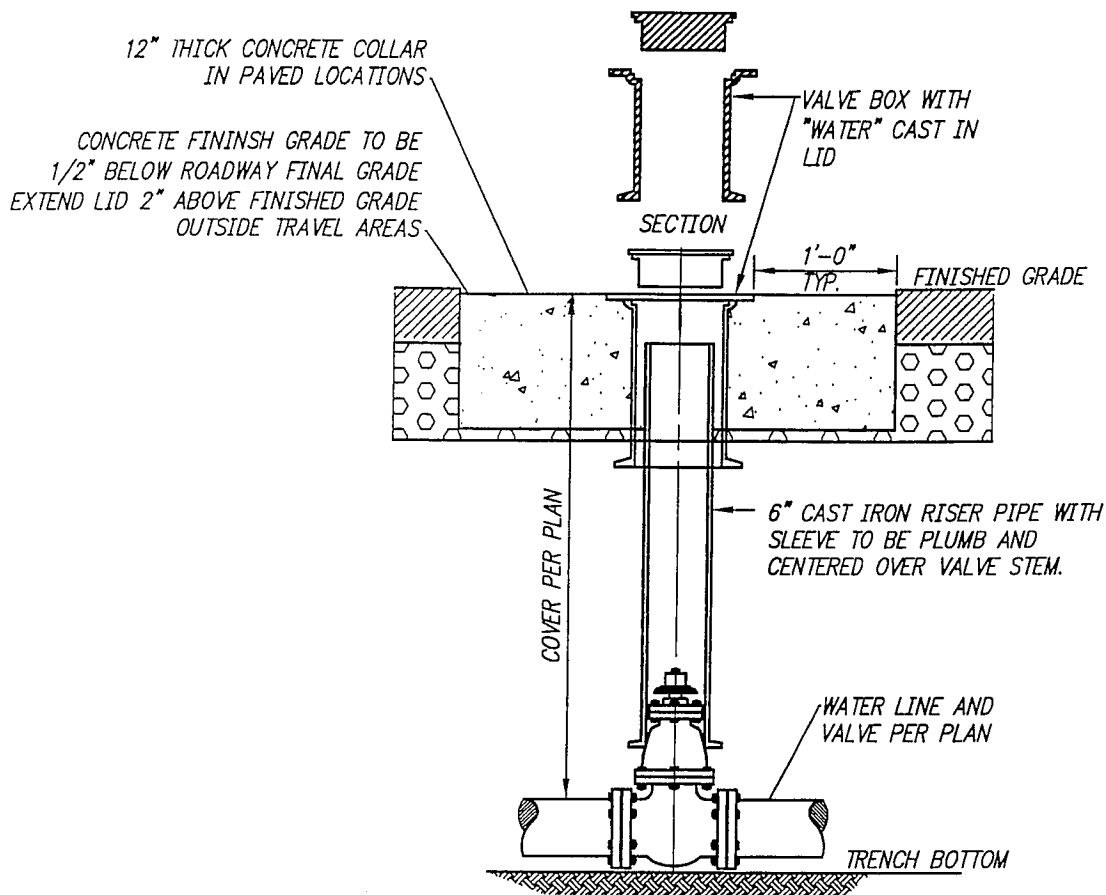
1	10/24/03	CLR	ADD SERVICE SADDLE TO WATER MAIN CONNECTION
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TYPICAL WATER VALVE

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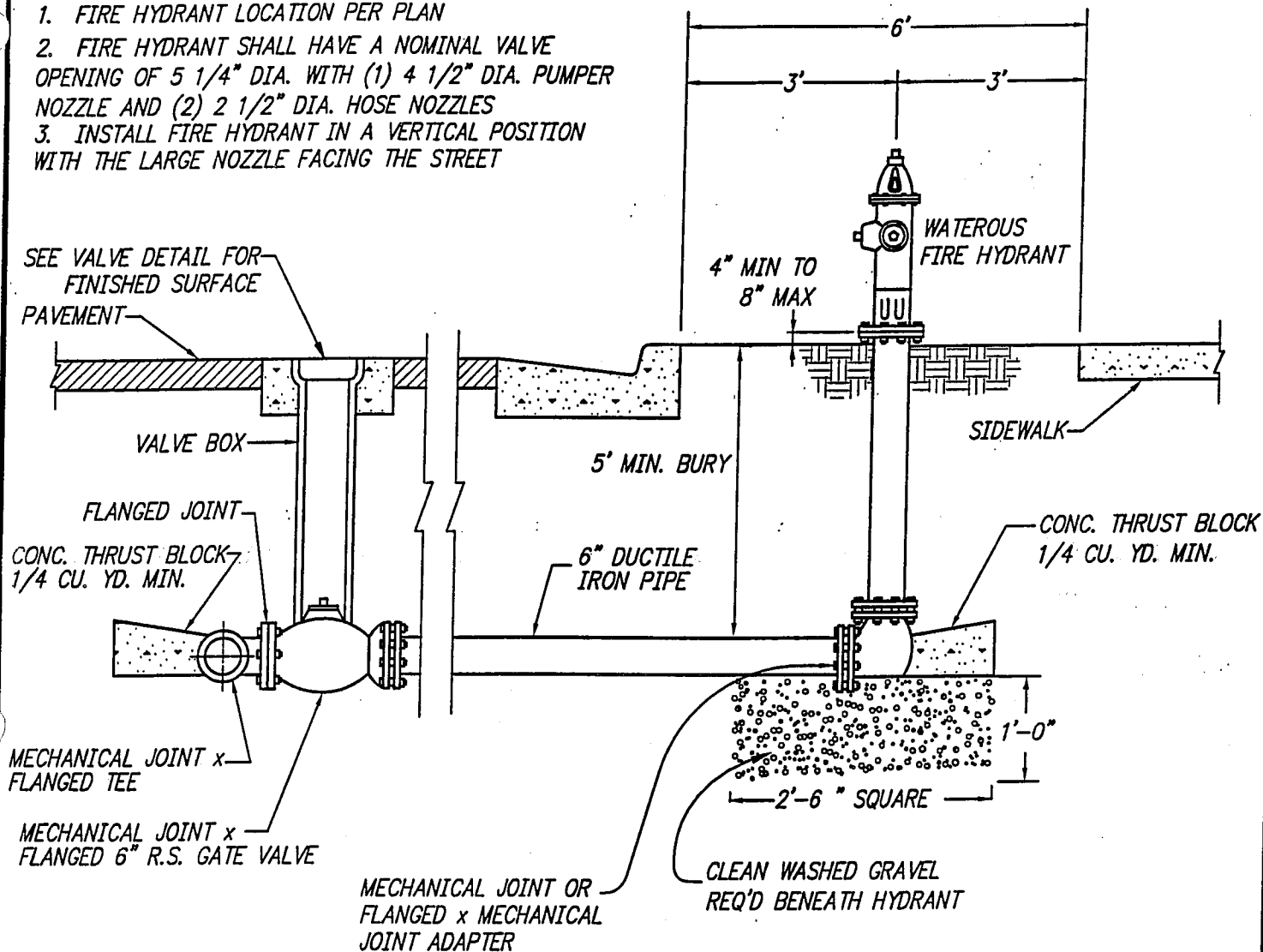
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Drafter:

Issue Date: July 2003

NOTES:

1. FIRE HYDRANT LOCATION PER PLAN
2. FIRE HYDRANT SHALL HAVE A NOMINAL VALVE OPENING OF 5 1/4" DIA. WITH (1) 4 1/2" DIA. PUMPER NOZZLE AND (2) 2 1/2" DIA. HOSE NOZZLES
3. INSTALL FIRE HYDRANT IN A VERTICAL POSITION WITH THE LARGE NOZZLE FACING THE STREET



TYPICAL FIRE HYDRANT ASSEMBLY

NOT TO SCALE

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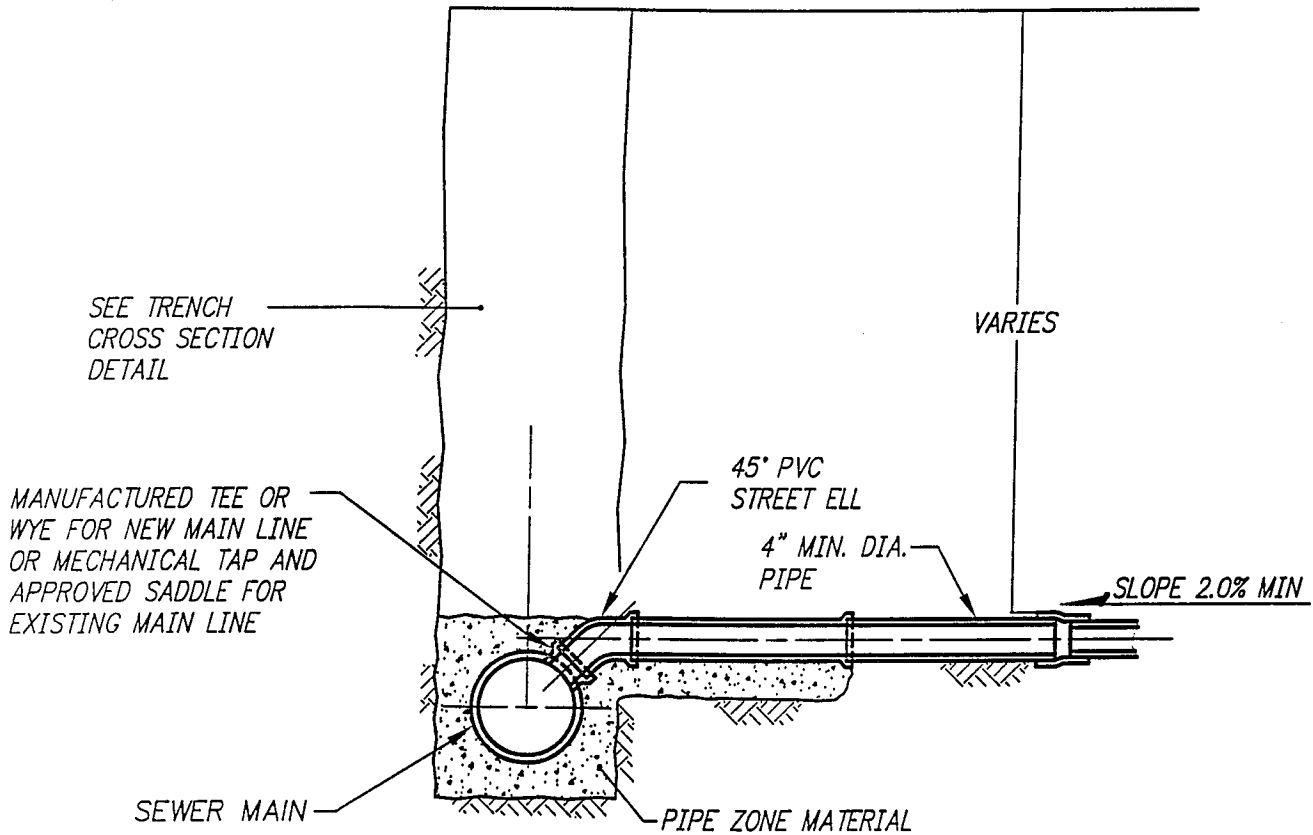
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NOTES:

1. PVC PIPE AND FITTINGS TO CONFORM TO ASTM D-3034 WITH SDR 35.
2. PLACE 4" SERVICE AT MIN 2% SLOPE. LARGER SERVICES AND/OR FLATTER SLOPES FOR SPECIAL CASES SHALL BE APPROVED BY THE CITY ENGINEER PRIOR TO INSTALLATION.
3. USE A PREFORMED WYE OR TEE FOR ALL SANITARY SEWER LATERAL CONNECTIONS IN NEW SUBDIVISIONS UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
4. EXTEND SEWER SERVICE 5' MIN BEYOND PROPERTY LINE, PLUG WITH WATER TIGHT PLUG, AND MARK WITH WOOD POST OR MARKER EXTENDING 2 FT ABOVE GRADE.



TYPICAL SEWER SERVICE LATERAL

NOT TO SCALE

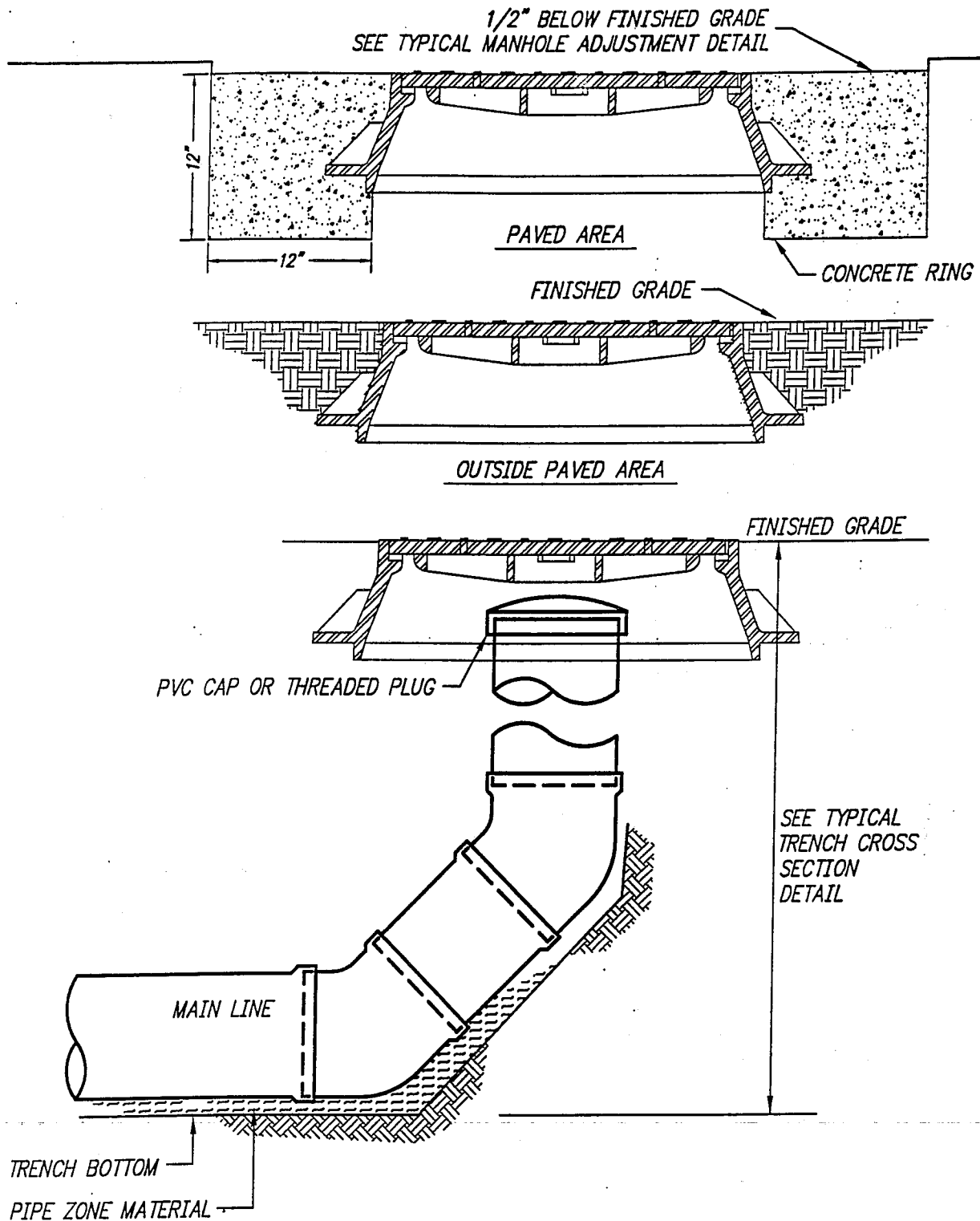
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TYPICAL MAIN LINE SEWER CLEANOUT

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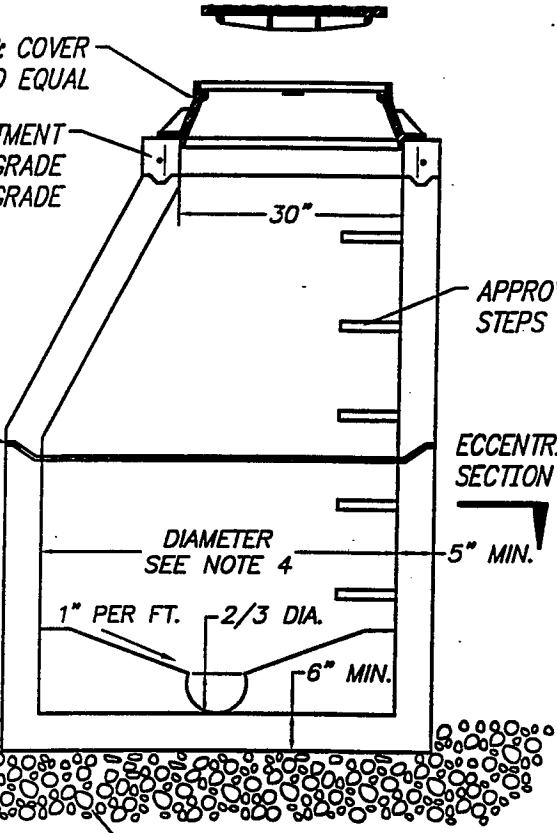
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Issue Date: July 2003

D&L A-1180 RING & COVER
OR APPROVED EQUAL

SEE MANHOLE ADJUSTMENT
DETAIL TO MATCH GRADE
RINGS TO FINAL GRADE

GROUT JOINTS
WATER TIGHT



APPROVED MANHOLE
STEPS REQUIRED

ECCENTRIC CONE
SECTION REQUIRED

DIAMETER
SEE NOTE 4

1" PER FT. 2/3 DIA.

6" MIN.

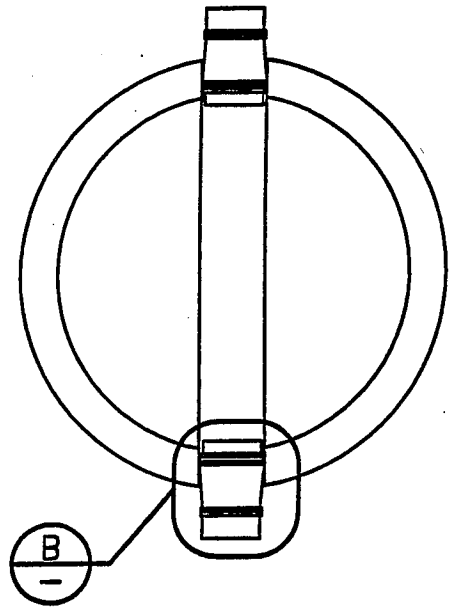
8" COMPACTED GRAVEL TO COVER
ENTIRE BOTTOM OF EXCAVATION,
1-1/2" MAX. AGREGATE SIZE.

NOTE:

1. FLOWLINE, RING AND COVER ARE TO MATCH FINAL GRADE.
2. MANHOLE AND CONE SECTIONS ARE TO REMAIN LEVEL.
3. RUBBER BOOT TYPE CONNECTION TYPICAL ON ALL NEW MANHOLES WHERE PIPES ENTER AND EXIT.
4. USE 5' DIAMETER MANHOLES WITH 3 OR MORE PIPES ENTERING THE MANHOLE OR WITH PIPES 12" OR GREATER. ALL OTHER MANHOLES TO BE 4' DIAMETER.

TYPICAL SEWER MANHOLE

NOT TO SCALE



SECTION A

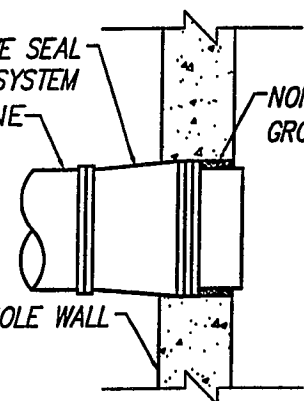
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POSITIVE SEAL
GASKETING SYSTEM
PIPELINE

NON-SHRINK
GROUT (TYP.)

MANHOLE WALL



SECTION B

NOT TO SCALE



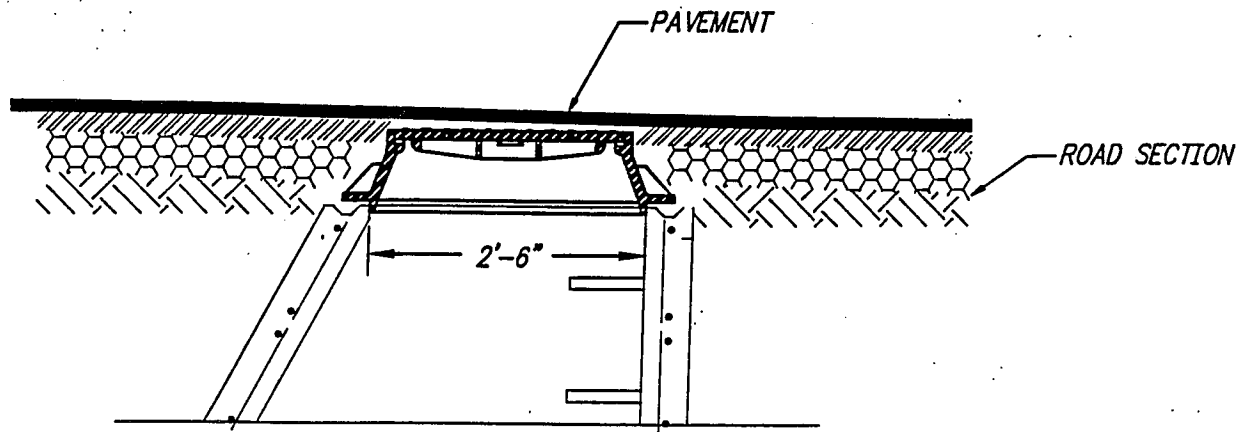
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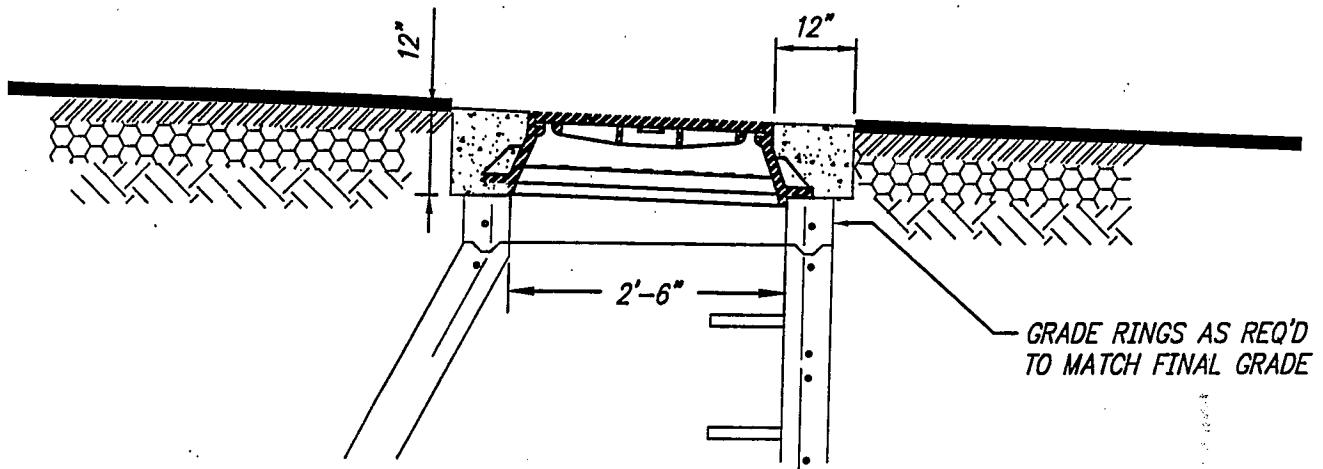
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NOTE:
INITIAL POSITION OF MANHOLE SHALL
FALL BELOW ASPHALT GRADE.



PROCEDURE:

ADJUST ELEVATION OF EXISTING MANHOLES BY ADDING OR REMOVING ELEVATION RINGS AS REQUIRED TO MATCH DESIGN ELEVATION. ASPHALT SHALL BE CUT 12" WIDE AROUND SEWER MANHOLE RING AND COVER SHALL THEN BE RAISED AND BLOCKED PRIOR TO PLACING CAST-IN-PLACE CONCRETE RING TO SECURE ADJUSTMENT. RING AND COVER ARE TO FALL 0.5" BELOW FINAL GRADE AND PARALLEL WITH THE ROAD SURFACE.

TYPICAL MANHOLE ADJUSTMENT

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