

CITY OF LAGRANGE, GA
SEWER SYSTEM SPECIFICATIONS
REVISED: August 13, 2008

SECTION 02732

SITE SANTITARY SEWERAGE SYSTEMS

1. DESCRIPTION OF WORK:

(a) The work includes furnishing all material, equipment, and performing all labor to construct sewer mains and laterals as indicated on the plans or as instructed, connecting to existing sewers, manholes, and other appurtenances as may be required to complete the work ready for operation. The lines shall be laid in the locations and to the grades shown on the drawings.

(b) The Contractor shall clear and grub as necessary, remove as much of the pavement as may be necessary; excavate the trenches and pits to the required dimensions; excavate the bell holes; construct and maintain all bridges required for traffic control; sheet, brace, and support the adjoining ground or structures where necessary; handle all drainage or groundwater, guard the site; unload, haul, distribute, and lay the pipe and fittings; connect intercepted laterals to the new sewer and plug dead ends, or rearrange other conduits, ducts, or pipes where necessary; replace all damaged drains, sewers, or other structures; backfill the trench and pits; restore the roadway surfaces; remove surplus excavated material and clean the site of the work.

(c) **The Contractor shall be responsible for turning into the Sewer Dept. all asbuilts pertaining to the sewer mains and laterals of said jobs, before the job is approved by the Sewer Department.**

2. DUCTILE IRON PIPE FOR GRAVITY SEWERS:

(a) Where specifically designated on the plans or at locations determined in the field, ductile, iron pipe shall be used for gravity sewers. Ductile iron pipe and fittings shall be as hereinafter specified except that the nominal thickness for various depths of cut and "Type 2" laying condition shall be as follows except where indicated otherwise on the drawings or in the proposal:

PIPE DIAMETER	DEPTH OF CUT						
	0'- 8'	8'-10'	10'-12'	12'-14'	14'-16'	16'-18'	18'-20'
6"	0.31"	0.31"	0.31"	0.31"	0.31"	0.31"	0.31"
8"	0.33"	0.33"	0.33"	0.33"	0.33"	0.33"	0.33"
10"	0.35"	0.35"	0.35"	0.35"	0.35"	0.35"	0.35"
12"	0.37"	0.37"	0.37"	0.37"	0.37"	0.37"	0.37"
14"	0.39"	0.39"	0.39"	0.39"	0.39"	0.39"	0.39"
16"	0.40"	0.40"	0.40"	0.40"	0.40"	0.40"	0.40"
18"	0.41"	0.41"	0.41"	0.41"	0.41"	0.41"	0.41"
24"	0.44"	0.44"	0.44"	0.44"	0.44"	0.47"	0.50"
30"	0.47"	0.47"	0.47"	0.47"	0.51"	0.55"	0.59"
36"	0.53"	0.53"	0.53"	0.53"	0.58"	0.63"	0.63"

(b) Ductile Iron Pipe for gravity sewers shall be by Type II or Type III joint, unless specified otherwise, conforming to ASA Specification A21.51 with grade of iron 60-42-10. The wall thickness shall be as hereinbefore specified.

(c) Ductile Iron Lock Joint Pipe: Lock joint pipe shall meet the requirements of ANSI A21.51 for ductile iron pipe and may be of the bolted or boltless type suitable for 150 psi working pressure. If bolted type pipe is used, all bolts shall be Corten Steel. All pipe and fittings shall meet the applicable requirements of Federal Specification WW-P-421. The interior and exterior of all pipe and fittings shall receive an approved bituminous coating.

(d) Ductile iron fittings shall be designed for pressure rating of 250 psi and shall be in accordance with ASA Specification A21.10. Fittings shall be mechanical joint.

(e) The interior and exterior of all ductile iron pipe and fittings shall be coated with an approved bituminous coating. At the Contractor's option, the interior of the pipe may be cement lined in accordance with ASA A21.4 in lieu of bituminous coating.

(f) If it is necessary to cut ductile iron pipe, in no case shall it be cut by burning, but shall be cut by saw, cutter, abrasion or other approved means.

(g) The pressure rating, metal thickness, net weight of pipe without lining, length of pipe, name of manufacturer, and letters "DI" shall be clearly marked on each length of pipe.

3. **PVC PIPE FOR GRAVITY SEWER LINES:**

(a) Plastic gravity sewer pipe and fittings shall be unplasticized polyvinylchloride (PVC), meeting or exceeding ASTM Specification D-3034, latest edition Classification SDR 26.

(b) Pipe lengths shall not exceed 20 feet and provisions shall be made at each joint to accommodate expansion and contraction.

(c) All pipe and fittings shall be joined by means of an integral wall bell and spigot and sealed with a rubber gasket. This joint shall be capable of withstanding all internal hydrostatic pressure of 25 psi for one hour with no leakage.

(d) In every instance where pipe enters or leaves manhole, a fitting shall be provided which will accommodate expansion and contraction of the pipe, release strain on the pipe (caused by differential settlement between pipe and manhole) and provide a rubber ring water seal between pipe and manhole. Where indicated, fittings shall also be provided for stub-outs for future connections and stub-out shall be sealed with PVC plug. Fittings shall be included in the price of the manholes.

(e) Gravel shall be placed around SDR 26 and Sch. 40 sewer mains to a minimum of spring load of said pipe.

(f) Pipe shall be retained in shipping cradles when stored along the right-of-way until pipe is ready to be laid. In no case will removal of pipe from cradles be permitted more than 24 hours in advance of placing in trench.

(g) PVC pipe shall be installed in accordance with ASTM-2321, latest edition. If there is a conflict between the provisions of ASTM-2321 and the project specifications, the project specifications shall govern as to this conflict. Deflection of PVC pipe after installation and backfill shall not exceed 5%. Pipe found to be deflected more than 5% shall be replaced at the Contractor's expense.

(h) All PVC sewer lines shall be tested by the Contractor and at his expense for diametric deflection using a GO-NO-GO type mandrel or other approved method. The mandrel shall have an outside diameter of not less than 95% of the PVC pipe inside diameter. This testing shall be accomplished prior to final acceptance, but at least 90 days after the pipe has been backfilled completely.

4. **Laterals (Connections between Main and Property line).**

- (i) All laterals between the sewer main and the property line shall be Schedule 40 or SDR 26 with a minimum diameter of 4-inches. **A sweep 90 shall be placed at the property line to facilitate cleaning between that point and the sewer main.**
- (j) **All services shall be connected at the main by means of a combination fitting so that the service is perpendicular from the main to the property being served, any exceptions to this must be approved by the City of LaGrange Sewer Division.**
- (k) All service lines from the dwelling may be connected at any point on the clean-out stack that will allow proper fall from the dwelling.
- (l) **The clean-out at the property line will be housed in a utility box with a cast iron lid with the word "sewer" embossed for locating purposes. The box shall be installed at finish grade of the lawn. This process will be the responsibility of the developer or builder.**

5. **COUPLING OF DISSIMILAR PIPES:**

Transitions from ductile iron pipe to V.C. pipe shall be made using approved adapters specifically designed for this purpose. Joining of dissimilar pipes with concrete collars will be permitted only at such places where specifically approved.

6. **CAST IRON AND DUCTILE IRON PIPE:**

(a) Cast iron pipe for gravity sewers shall be Type II joint, unless specified otherwise, conforming to Federal Specifications WW-P-421C, "Class 150" , with minimum wall thickness as specified for 18/40 iron with "Type 2" bedding, and for depth of cover over pipe as shown on the drawings or indicated in the proposal.

(b) Ductile iron pipe for gravity sewers shall be type II joint, unless specified otherwise, conforming with A.S.A.

Specification A21.51 with grade of iron 60-42-10. The wall thickness shall be for "Type 2" bedding and for depth of cover over the pipe with nominal wall thickness as shown on the drawings or indicated in the proposal.

(c) Cast iron fittings shall be mechanical joint and shall conform to A.S.A. Specification A-21.10 for sizes 3 inches through 12 inches and shall be Class 250. Fittings 14 inches and larger shall be Class 150 and shall be of the dimensions and metal thicknesses as shown in the Handbook of Cast Iron Pipe as published by the Cast Iron Pipe Research Association. Cast iron fittings may be used in ductile iron or cast iron lines.

(d) Ductile Iron Fittings shall be designed for pressure rating of 250 psi and shall be in accordance with A.S.A. Specification A21.10. Fittings shall be mechanical joint. Ductile iron fittings may be used in ductile iron or case iron lines.

(e) The exterior and interior of all cast iron and ductile iron pipe and fittings for gravity sewers shall be coated with an approved bituminous coating. The interior of all cast iron and ductile iron pipe, and fittings, may at the Contractor's option, be cement mortar lined in accordance with A.S.A. Specification A21.4.

(f) In general, this pipe will be used at locations determined in the field and at points specifically designated on the plans.

(g) If it is necessary to cut ductile iron pipe, in no case shall it be cut by burning, but shall be cut by saw, cutter, abrasion or other approved means.

(h) The pressure rating, metal thickness, net weight of pipe without lining, length of pipe, name of manufacturer, and letters "DI" or "CI" shall be clearly marked on each length of pipe.

7. **MANHOLE STEPS:**

Manhole steps shall be steel rods encased in polypropylene plastic and shall be of the type as manufactured by M.A. Industries, Inc., or approved equal. Steps may be type PS-1 or PS-2, for precast manholes and type PS-1-B or PS-2-B for brick manholes. Steps shall conform to the requirements of A.S.T.M. C-478.

8. **BRICK:**

Brick shall be hardburned common brick meeting A.S.T.M. Specification Number C-32, Grade NA or concrete brick meeting A.S.T.M. Specification Number C-55, Grade A. Brick shall be nominal 2" x 4" x 8" size.

9. **CASTINGS:**

Covers and frames shall be manufactured from ductile iron in accordance with ISO 1083. Covers shall be hinged and incorporate a 90 degree blocking system to prevent accidental closure. Covers shall be one man operable using standard tools and shall be capable of withstanding a test load of 120,000 lbs. Frames shall be circular with a 24" clear opening and shall incorporate a 360 degree, mechanically attached elastomer seating gasket for infiltration control and traffic shock. The Hinge box shall include a self-cleaning, dual wiper infiltration plug. The frame depth shall not exceed 4 inches, and the flange shall incorporate bedding slots, bolt holes and lifting eyes. All components shall be black coated. Frame weight: 73 lbs. Cover weight: 122 lbs. Total weight 195 lbs.

On paved streets, the frame and cover shall be set flush with and in the plane of the paved surface. In other locations, they shall be set to the grades determined in the field.

10. **CONCRETE:**

The minimum compressive strength required at twenty-eight days is 3,000 pounds per square inch. Field specimens and laboratory tests shall be made in accordance with the standards of the American Society of Testing Materials. The minimum amount of water shall be used to produce a workable mix and shall not exceed six (6) U.S. Gallons per sack of cement. Slump shall range between 2"-5"

11. **GRAVEL, SLAG OR STONE:**

Gravel, slag or stone shall be screened, washed and shall be 100 percent retained by a 1/4" screen. 100 percent shall pass a one inch (1") opening and shall be uniformly graded from maximum size to minimum size. Foreign matter shall not exceed three percent (3%) by weight when dry.

12. **MORTAR FOR SEWER STRUCTURES:**

Mortar for masonry in sewer structures shall be a 1:3 Portland Cement sand mix, provided that hydrated lime or mortar

mix may be substituted for, not to exceed ten percent (10%) by weight of the cement.

13. **CLEARING AND GRUBBING:**

The Contractor shall clear and grub lines. Clearing and grubbing shall be confined to the limits of the easements and to the minimum width required for installation of the pipe. All trees, stumps, roots and debris shall be disposed of in an approved manner by the Contractor in accordance with Local, State and Federal Regulations. Burying of stumps and other debris on the site will not be permitted. Where trees within the easements are indicated on the drawing or designated in the field to be retained, such trees shall be protected from damage at all times. Should, by accident or otherwise, such trees be damaged, they shall be repaired at the Contractor's expense, by personnel trained in this type of work.

14. **RIGHT-OF-WAYS AND EASEMENTS:**

All Right-of-ways and Easements shall be maintained accessible for trucks and jet trucks. Access shall not be covered over, built on or blocked. Such as fences, utility buildings, or any other structures or fill.

15. **GRADE:**

The grade as shown on the plans is that of the invert and to which the work must conform. Any variation from the grade will be deemed sufficient reason to cause the work to be rejected and rebuilt at the Contractor's expense. The Owner reserves the right to make adjustments to the grades and slopes to fit actual field conditions.

- (a) Manhole cover rim elevation shall be set to level grade in road so entry can be obtained.
- (b) Manhole cover rim elevation on easements shall be above ground level and a marker set so as to locate manhole at all times.

16. **EXCAVATION**

(a) The Contractor shall perform all excavation of every description and of whatever substance encountered to the depth specified on the plans or as staked in the field.

(b) All excavated material not required for filling shall be removed from the site or otherwise satisfactorily disposed of.

(c) The trench width may vary with and depend upon the

depth of trench and the nature of the excavated material encountered; but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The width of trench shall be at least one (1) foot greater than the nominal diameter of the pipe; the maximum clear width of trench at top of pipe shall be not more than 16 inches greater than the pipe diameter. Based on this maximum trench width, the maximum depths at which the various sizes of standard strength V.C. pipe may be laid are as follows.

Pipe Size (inches)	8	10	12	15	18	21	24	30	36	48
Cut Depth (feet)	10	10	10	10	12	12	12	14	14	14

If actual trench widths at these depths exceed the specified maximum, then the Contractor shall at his expense substitute extra strength for standard vitrified clay pipe.

(d) The bottom of the trench shall be carefully graded, formed and aligned before any sewers are laid therein.

(e) Where the natural soil at the bottom of the trench makes a satisfactory foundation for the sewer, it shall be shaped to the bottom quadrant of the pipe and slightly hollowed under each bell to allow the body of the pipe to have uniform contact and support throughout its entire length.

(f) Where the bottom of the trench does not make a suitable foundation for the sewer, the trench shall be deepened and backfilled with stone, gravel, or slag and shaped as above, or the pipe shall be placed on running boards.

(g) The Contractor shall have a berm at least two (2) feet in width between the trench and the excavated material.

(h) The trench shall be dug to the alignment and depth required and only a minimum distance in advance of the pipe laying. The trench shall be so drained that workmen may work therein efficiently. It is essential that the discharge from pumps be led to natural drainage channels, to drains, or to sewers.

(I) In excavating streets that have been surfaced with shell, sand-clay, clay gravel or other base course, such base material shall be either stockpiled and kept separate from the earth excavated or the contractor shall at his expense provide new base of like kind and equal quality.

(j) Excavation for manholes or other structures shall be of sufficient size to leave at least one (1) foot in the clear

between their outer surfaces and the embankment, or sheeting which may protect it.

(k) Overcut in depths of manholes shall be backfilled with concrete; overcut in sewer trench shall be backfilled with stone, gravel or slag. Backfill shall be at the Contractor's expense.

(l) The trench width, type of bedding, and method of backfill for sewer pipe shall be controlled by the contractor so that the resultant loads on the pipe, after complete backfilling, does not exceed the maximum allowable loading on the sewer pipe as recommended by the pipe; manufacturer and/or appropriate ASTM Standards for the pipe being installed.

17. **LAYING SEWER PIPE:**

(a) The pipes and specials shall be so laid in the trench that after the sewer is completed, the interior surface of the bottom thereof shall conform accurately to grade and alignment. Sewers shall be laid in the direction opposite to the direction of flow with spigot ends of pipe pointing down grade.

(b) All sewer mains shall be laid with a laser to make sure pipe is straight and has accurate fall.

(c) Before being set in place, each pipe must be thoroughly cleaned and freed of all dirt.

(d) The joints between the individual pipes shall in all cases be made as nearly watertight as possible.

(e) Any debris or dirt which may find entrance into the pipe in making the joint shall be removed by a suitable scraper or other approved means.

(f) The smoothness of the interior joint shall be determined by some suitable device, and no pipe shall be finally set until the inverts coincide. Maximum size spigots permitted by A.S.T.M. Specifications shall not be joined with the minimum size sockets permitted.

(g) Wyes and tees will be inserted or proper opening provided in the sewer lines wherever designated. All branches thus inserted, unless connected with a lateral, shall be closed by means of vitrified stoneware covers or plugs. The covers or plugs shall have a factory moulded joint of the same type used in the main line.

A magnetic marker as manufactured by Aqua Survey and Instrumentation Co., Inc., Cincinnati, Ohio, or approved equal, shall be placed at the end of each sewer lateral. Markers shall

not be buried more than twelve (12) inches below the finished surface of the ground. Magnetic marker shall be attached to a 5/8" diameter steel rod extending from end of each sewer lateral.

(h) In sewers over eight (8) feet in depth or whenever instructed, vitrified clay or PVC stacks shall be carried up from the tee or wye connection at an angle of 45 degrees with the vertical, and the end shall terminate within four (4) feet of the ground surface. Where laterals are called for on the plans, or instructed by the Owner, they shall be laid to the right-of-way line or as the Owner may direct. The ends of the stacks or laterals shall be closed with covers as specified for wye branches.

(I) Whenever pipe laying is stopped for the night or for any other cause, the end of the pipe shall be securely closed with a stopper to prevent the entrance of water, mud, or other obstructing matter, and shall be secured in such manner as to prevent the end pipe from being dislodged by sliding or other movement of the backfilling.

(j) The Contractor shall pump, bail, or otherwise remove any water which may be found or may accumulate in the trenches and shall perform all work necessary to keep them clear of water while the foundations are being laid, the masonry being constructed, or pipe laying is in progress.

(k) Wherever house laterals are intercepted by the excavation for the new sewer connection shall be maintained temporarily to the old sewer until the particular section of new sewer is completed and tested, then the house lateral shall be broken and reconnected to the new sewer through a wye, tee or opening which shall have been placed in the sewer for that purpose.

(l) The dead end of the house lateral shall be capped with a vitrified stoneware plug and jointing compound as close as is practical to the side of the excavation from which it emerges. If necessary, special concrete support shall be placed for these new house connections. The method of support will be determined in the field, and concrete so placed will be paid for at the unit price bid per cubic yard.

(m) After each pipe is laid, it shall be partly backfilled and made secure before the next joint is laid.

(n) Workmen shall not walk or stand upon the newly laid pipe until the necessary backfill has been placed and tamped to prevent the displacement of the pipe.

(o) All **Sewer Locates** will be responsibility of **Contractor or Developer**, until all utilities are installed and lots graded.

18. **TRENCH RESTRAINT:**

The Contractor shall install a restraint system to contain the sides of the trench excavation during construction. The restrain system shall be constructed in a substantial manner, capable of resisting all loads applied without appreciable displacement or distortion. All sheeting, shoring, and bracing shall be adequately designed by the Contractor for the purpose intended, with a plan of the proposed restraint furnished before starting work on the project. After the pipe has been backfilled, the Contractor shall remove all material used for trench restraint.

19. **BACKFILLING:**

(a) Before backfilling any trench, the Contractor's foreman shall examine the completed line and all joints and shall correct any deficiencies that exist.

(b) No trenches or excavations shall be backfilled until concrete in the structures placed therein has acquired a suitable degree of hardness, and the work shall be prosecuted expeditiously after it has commenced.

(c) Undercutting of trench bottom shall be backfilled at the Contractor's expense with select material from the excavations and compacted to not less than 95% maximum density as determined by AASHTO T-99 prior to placing of pipe. Select material shall be granular soil free from rock, grass, wood or other deleterious material. If in the opinion of the Engineer, the material from the excavation is not considered to be satisfactory for backfill, the undercut shall be backfilled with gravel, slag or stone and separate payment will be made therefor, except where undercut is caused by the Contractor's operations or for his convenience.

(d) After the pipe has been installed, selected material from the excavation shall be placed along side the pipe in layers not exceeding four (4) inches in depth to a depth of at least two (2) feet above the top of the pipe. Select material shall be as specified above for filling undercut. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by hand tamping with iron tampers, the tamping face area of which shall not exceed 50 square inches, to not less than 90% maximum density as determined by AASHTO T-99. All material shall be deposited carefully in the trench to avoid damaging the sewer. The

operation of heavy equipment shall be conducted so that no damage to sewer will result.

(e) The remainder of the trench above an elevation of two (2) feet higher than the top of pipe shall be backfilled with material from the excavation. Mechanical backfilling will be permitted providing material being placed with drag-line or crane has a free fall of not greater than one (1) foot from the bucket. The manner of placing and the degree of compaction shall be as specified hereinafter:

(1) Fields and Open Country: The backfill above a point two (2) feet above top of pipe shall be placed in trench until full. The remaining earth shall be placed on top of the trench and dressed by the Contractor until it settles. At the completion of the job, all excess dirt shall be leveled and disposed of by the Contractor.

(2) Backfill Under Pavement Other Than State Highways: Backfill under all existing or proposed pavement for streets, sidewalks, or roadways except pavement under the jurisdiction of the State Highway Department or State Department of Transportation shall be backfilled as hereinafter specified. After the pipe has been backfilled to a point two (2) feet above the top of the pipe, the remainder of the trench shall be backfilled to the ground surface with material from the excavation. Backfill shall be placed in uniform layers not exceeding six (6) inches in thickness except that material may be placed in thicker layers where the Contractor can demonstrate that the procedures used can produce the required compaction results.

The trench from the (2) feet above the top of the pipe to within two (2) feet of the top of the trench shall be compacted to not less than 90% maximum density as determined by AASHTO T-99. The remainder of the trench to within eight (8) inches of the finish grade shall be compacted to not less than 95% maximum density as determined by AASHTO T-99.

The top eight (8) inches of the trench shall be compacted to not less than 100% maximum density as determined by AASHTO T-99. Where pavement is not replaced the top six (6) inches of backfill shall be of a select granular material from the excavation.

(3) Backfill Under Pavement of State Highways:

Backfill under all existing or proposed pavement under the jurisdiction of the State Highway Department or State Department of Transportation shall be backfilled with material from the excavation. The backfill procedures and degree of compaction shall be in accordance with applicable

portions of the latest edition of the Standard Specifications of the State Highway Department or State Department of Transportation having jurisdiction except for compensation which shall be as specified herein. Where pavement is not to be replaced, the top six (6) inches of backfill shall be of a select granular material from the excavation. No flooding or jetting will be permitted.

20. DUST CONTROL:

The Contractor shall at all times provide for the control of dust within residential areas and such other areas where dust is a nuisance to the public by sprinkling with water or other approved means. Water shall be provided by the Contractor at his own expense.

21. BRICK MANHOLES:

(a) Every manhole is to be fully and completely built as the work progresses and as each is reached.

(b) Manholes shall be neatly and accurately built, according to the plans, of proper materials and in a workmanlike manner. The walls shall be brick and shall be plastered on the inside and outside 1/2 inch thick.

(c) The invert and bottom curves of all manholes shall be neatly and accurately built and so formed as to facilitate the entrance and flow of sewage over them.

(d) Steps shall be placed in manholes and shall be spaced not more than 15 inches vertically and shall be so arranged that the lowest step shall not be more than two (2) feet above the bench. The top step shall not be more than one course below the manhole frame.

(e) The Contractor shall furnish and properly set in mortar to line and grade all cast iron covers and frames.

(f) When required, single lengths of pipe of required size shall be built into manholes to receive either present or future branch lines. To relieve the pressure, the brick is to be arched over all such pipe. Where it is not intended to construct the branch lines at once, the pipes thus inserted must be securely closed with plugs in such a manner that future connections can be made without breaking the pipe.

(g) Where manholes intercept existing laterals connected to existing manholes, the Contractor shall keep the lateral service

to the existing manhole intact until the next adjacent section of new sewer is completed and approved. The laterals shall then be broken and fed to the new sewer and the dead end of the laterals plugged at the manhole wall with a stoneware stopper and mortar.

22. PRECAST MANHOLES:

Precast concrete manholes may be used in lieu of brick manholes, and shall conform to the requirements of ASTM C-478, latest edition, subject to approval in writing from the Owner. Precast manholes used where drop connections are required shall have proper anchors installed to tie the drop structure to the precast manhole sections. Every manhole is to be fully and completely built as the work progresses and as each is reached and shall meet the following requirements.

(a) Manholes shall be neatly and accurately built, of proper materials and in a workmanlike manner. Care shall be taken not to damage the manhole sections during handling and installation.

(b) The invert and bottom curves of all manholes shall be neatly and accurately built and so formed as to facilitate the entrance and flow of sewage over them.

(c) When required, single lengths of pipe of required size shall be built into manholes to receive either present or future branch lines. Where it is not intended to construct the branch lines at once, the pipes thus inserted must be securely closed in such a manner that future connections can be made without breaching the pipe.

(d) The cone shaped top section shall be eccentric and the cone and riser sections shall conform to the requirements of ASTM C-478 latest edition and as hereinafter specified. The top section of manholes less than six (6) feet in depth shall be flat concrete slabs.

(e) The minimum nominal diameter of manholes shall be 48 inches for pipe sizes 24" and smaller. Where larger manholes are required, eccentric transition sections may be installed not less than six (6) feet above the invert, except where total depth of the manhole will not permit.

(f) Pipe cutouts shall be sealed with non-shrink grout or an approved equal after pipe stubouts are in place.

(g) The Contractor shall furnish and properly set in mortar to line and grade all cast iron covers and frames. Brick stacks not more than 12 inches in total height shall be used to adjust

manhole covers and frames to the proper grade.

(h) Joints in riser and cone sections shall have rubber gaskets or an approved equal.

(I) Manhole steps shall be driven into the wet wall during manufacture such that they will not work loose or pull out.

(j) Steps shall be spaced not more than 16 inches vertically and shall be so arranged that the lowest step shall not be more than two (2) feet above the bench. The top step shall not be more than three (3) inches below the manhole frame.

(k) Manhole bottoms shall be either 8 inches thick cast in place concrete or integral with the lower section of riser walls as hereinafter specified.

(1) Poured in place bottoms shall be 8" thick and shall be not less than 12 inches in diameter larger than the outside of the riser section. The top of the manhole bottom shall be not less than three (3) inches below the lowest pipe invert. The invert shall be built up with cement grout. Special care shall be taken to assure good seal around the manhole bottom. The joint between the bottom and walls shall be sealed on the outside with grout.

(2) Bottoms integral with side walls shall be set on a prepared bed of not less than two (2) inches of washed gravel. The gravel bed shall be accurately shaped to fit the manhole bottom to assure uniform bearing over the entire manhole bottom. The invert of the manhole shall be built up with cement grout as shown.

(3) Backfill of undercut shall not be permitted. Any undercut shall be filled with concrete.

(l) Testing of manhole sections shall be performed in accordance with ASTM C-478, latest edition. Testing shall be performed by an approved independent testing laboratory. The results of these tests shall be submitted to the Engineer. Each approved section shall be stamped by the testing laboratory. The cost of testing shall be borne by the supplier or Contractor.

(m) Before installation of any precast manholes, the following information shall be submitted and approved by the Owner:

- (1) Manufacturer of manholes
- (2) Shop drawing on manholes
- (3) Testing laboratory
- (4) Manufacturer of and specifications for gaskets

(n) Failure to comply with any part of these specifications shall be reason for rejection of the entire manhole. Any defects shall be remedied immediately. Any manhole section which does not meet these specifications shall be removed from the job site.

Refusal to comply with any part of these specifications shall be reason for denial or revocation of permission to install precast manholes.

(o) Where manholes intercept existing laterals connected to existing manholes, the Contractor shall keep the lateral service to the existing manhole intact until the next adjacent section of new sewer and approved. The laterals shall then be broken and fed to the new sewer and the dead end of the laterals plugged at the manhole wall with a stoneware stopper and mortar.

23. INFILTRATION:

Leakage into the sewer shall not exceed 100 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours to any section between successive manholes. The amount of leakage shall be measured by a suitable weir or other device. All equipment and labor for measuring the infiltration shall be furnished by the Contractor.

If the infiltration exceeds the above specified amount, the Contractor shall make the necessary corrections to bring it within the acceptable limits. All visible leaks or points of infiltration shall be repaired even though the infiltration is below the maximum specified.

24. TESTING OF SEWERS:

(a) General: On all sanitary sewer lines, the Contractor shall conduct a line acceptance test using low pressure air. **The air test shall be done after all utilities are installed. If the contractor chooses to he may do the air test after the pipe is laid and final inspection or just at final inspection.** The air test shall be conducted after the pipe has been backfilled and the cost of air testing shall be included in other items of work.

Equipment to be used in making the test shall be specifically designed for this purpose and shall be Cherne Air-Loc Equipment or approved equal. The Engineer shall be advised at least 48 hours before tests are conducted.

(b) Procedures: All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5

psig. The plugs shall hold against the pressure without bracing and without movement of the plugs out of the pipe.

After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The test of that portion of line being tested air shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that be over the pipe) shall not be less than the time shown for the given diameters in the following table:

<u>Pipe Dia. In Inches</u>	<u>Minutes</u>
4.....	2.0
6.....	3.0
8.....	4.0
10.....	5.0
12.....	5.5
15.....	7.5
18.....	8.5
21.....	10.0
24.....	11.5

In areas where groundwater is known to exist, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" long through the manhole wall on top of one of the sewer liens entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same.) Other methods for determining groundwater level may be used if approved in advance and if results are expected to be accurate in

determining the groundwater level. Should the line fail the pressure test, the Contractor shall, at his expense, determine the source of leakage and make repairs as necessary to eliminate leakage. Air testing shall be in addition to infiltration tests specified in Paragraph 11.25.

(c) Television Inspection:

All mains and laterals shall be inspected with television equipment by an inspection contractor and recorded on tape to be submitted to the City of LaGrange sewer division Superintendent.

(d) All taps from the property line cleanout to the main shall be tved by the contractor or inspection contractor after all utilities have been installed and approved by Sewer Division.

25. CLEAN UP:

Where these operations are on City, County or private property, the job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the street, sidewalks, or ditches. The Owner reserves the right to demand that the Contractor's forces be diverted to this clean-up at any time the Owner rules that condition of streets, sidewalks, or private property warrants such diversion. Such diversion of the Contractor's forces will not entitle the Contractor to any extension of time or additional compensation.

26. GRASSING AND MULCHING:

The trench lines and other areas disturbed by construction of water and sewer lines shall be grassed and mulched as hereinafter specified where indicated on the drawings or where directed. These items are to be considered as special erosion control measures to be utilized only where specifically required and payment will be made only when these items are shown on the proposal or where special authorization is granted.

(a) General: After pipe trenches have been backfilled, the area to be grassed shall be graded to the final grade and roots, stumps, or other materials which might be harmful to grass growth shall be removed and disposed of. Care shall be taken to spread topsoil over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.

(b) Fertilizer: After the surface has been prepared for

grassing and before any grass or seeds are planted, the soil shall be loosened by harrowing or other approved methods, and the areas specified to be grassed shall be fertilized at a uniform rate of 1,500 pounds per acre with a standard commercial 8:8:8 fertilizer and 3,000 pounds of agricultural lime per acre.

(c) Seeding - All areas disturbed by the construction shall be stabilized with temporary vegetation for erosion control as specified on the standard details for erosion and sedimentation control. Permanent vegetation shall be as shown on the landscaping plan and details.

(d) Mulching: In areas directed by the Owner, the surface of sprigged and overseeded slopes of the roadway or embankments shall be protected by the application of a mulch. The mulch shall be spread uniformly in a continuous blanket by hand or by suitable approved equipment, at a rate of 2 tons to the acre. Mulching material which, in the opinion of the Engineer, is too coarse or too short for proper securing in the surface soil will be rejected. Mulching shall be started at the windward side of relatively flat areas or at the upper part of a steep slope and continued uniformly over the entire area. The mulch material shall be anchored to the soil by spraying a light coating of emulsified asphalt over the straw or hay after these materials have been placed. The asphalt shall be applied by hand sprayers attached by hoses to an asphalt spreader or other approved methods. The asphalt adhesive shall be applied to the mulch at a rate of 150 gallons of undiluted (straight emulsion) asphalt per ton of straw or hay (300 gallons per acre). If the straight emulsion is further diluted with water in the ratio of 60 (straight emulsion) to 40 (water), the application rate shall be 250 gallons of asphalt emulsion per ton of straw or hay (500 gallons per acre). This will secure the mulch on the ground to form a soil binding mulch and prevent loss or bunching by wind or water.

(e) Maintenance: The Contractor shall maintain all grassed areas until acceptance of the entire contract and for a period of three months thereafter. Areas upon which an established stand of grass is not obtained, the Contractor shall reseed and remulch as hereinafter specified. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger, than 12 inches do not occur at the time of acceptance. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area until final acceptance.

If the grassing operation is accomplished after the month of August or before the month of March, in addition to the seeding as outlined above, the entire grassed areas shall also be over seeded with Italian Rye Grass Seed at the uniform rate of forty (40) pounds per acre at no additional cost to the Owner.

(f) Asphaltic Adhesive: Asphalt shall be a bituminous soil cover suitable for mulching of seeded areas and shall contain no petroleum solvents or other diluents which would be toxic to plant growth. It shall be a homogeneous emulsification of especially refined petroleum asphalt suitable for spray application with or without dilution with water. Laykoid Soil Cover, manufactured by American Bitumuls and Asphalt Company, or other commercial types of asphalt specifically designed for mulching of seeded areas for erosion protection against rain or wind, will be acceptable. Cost of the item shall be included in unit price bid for mulching.

27. REMOVING AND REPLACING PAVEMENT:

Pavement removal and replacement shall conform to the requirements of Section 02575 of these specifications.

28. MAINTENANCE OF SURFACES:

Following the certification of completion by the Engineer, the Contractor shall maintain the surface of the unpaved trenches, adjacent curbs, sidewalks, gutters, shrubbery, fences, sod and other surfaces disturbed for a period of three (3) months thereafter; and shall maintain the repaved areas (if paved by Contractor) and adjacent curbs, gutters and sidewalks for (1) year after said certification. All material and labor required for the maintenance of the trenches and adjacent structures shall be supplied by the Contractor and the work shall be done in a satisfactory manner.

29. BRANDS OF EQUIPMENT AND MATERIALS

The name of a certain brand, make or manufacturer is to denote the quality standard of the equipment or material, and is to convey the general style, type, character and quality. Whenever a material or article required is specified or shown on the plans by using the proprietary product or of a particular manufacturer or vendor, any material or article which will meet the design criteria and is equal in function and durability as determined by the Engineer will be considered.

END OF SECTION 02732