NOTICE:

All Landowners, Developers and Contractors

FAILURE TO COMPLY WITH THE CONSTRUCTION PROCEDURE REQUIREMENTS LISTED BELOW MAY RESULT IN THE COSTLY REMOVAL OF STRUCTURES, TIME DELAYS, OR THE ISSUANCE OF A STOP WORK ORDER.

CONSTRUCTION PROCEDURE REQUIREMENTS

1. City Inspections: To ensure the coordination of timely and proper inspections, a preconstruction conference shall be initiated by the contractor with the Planning and Community Development. Call 703-981-2250 to arrange a conference at least three (3) days prior to anticipated construction.

2. Street opening permit: Prior to the commencement of any digging, alteration, or construction within the public right-of-way (streets, alleys, public easements) a street opening permit shall be applied for and obtained by the contractor from the City of Roanoke.

3. Plans and permits: A copy of the plans approved by the City (signed by the proper City officials) and all permits issued by the City shall be available at the construction site at all times of ongoing construction.

4. Location of utilities: The contractor shall verify the location of all existing utilities prior to the commencement of any construction.

5. Construction entrance: The contractor shall install an adequate construction entrance for all construction-related egress from the site. Size and composition of construction entrance shall be determined by the City site plan inspector.

6. Streets to remain clean: It shall be the responsibility of the contractor to insure that the public street adjacent to the construction entrance remains free of mud, dirt, dust, and/or any type of construction materials or litter at all times.

7. Barricades/ditches: The contractor shall maintain the integrity of all excavated ditches and shall furnish and ensure that all barricades proper and necessary for the safety of the public are in place.

8. Sewer and pavement replacement: Construction of sanitary sewers and the replacement of pavement shall be in accordance with approved standards and specifications of the City of Roanoke.

9. Approved plans/construction changes: Any change or variation from construction design as shown on the officially approved plans shall be approved by the City Engineer prior to said changes or variations in construction being made.

10. Final acceptance/city: The developer or contractor shall furnish the city of Roanoke engineering department with a final correct set of as-built plans prior to final acceptance by the City.

GENERAL NOTES

1. THE PROPERTY SHOWN ON THESE PLANS IS LOCATED AT ROANOKE CITY TAX ASSESSMENT MAP 4280701 AND 4280725 AND IS ZONED RS-2 RESIDENTIAL MULTI FAMILY DISTRICT.
2. DEVELOPER: FRALIN & WALDRON, INC.
3. THE SITE AREA IS APPROXIMATELY 18.26 ACRES.
4. PLANIMETRIC DATA IS A RESULT OF AERIAL MAPPING. INTERVAL = 2'.
5. THESE PLANES HAVE BEEN PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT.
6. THE PROPERTY SHOWN HEREON DOES NOT FALL WITHIN THE FEMA FLOOD PLAIN.

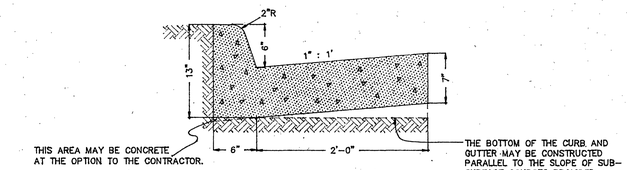
SITE AND ZONING TABULATIONS

- TAX MAP - 4280701 AND 4280725
- ZONING - RS-2
- MINIMUM LOT AREA - 7,000 SQ. FT.
- MIN. LOT FRONTAGE - 6.0'
- MAX. LOT COVERAGE FOR STRUCTURES = 30%
- MAXIMUM HEIGHT OF STRUCTURE - 35'

MINIMUM REQUIRED YARDS:
FRONT - 30'
SIDE - 20% OF LOT FRONTAGE OR 14'(WHICH EVER IS LEAST), 5' MINIMUM.
REAR - 25'

CONSTRUCTION NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE CURRENT CITY OF ROANOKE STANDARDS AND SPECIFICATIONS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE OWNER AND THE ENGINEER OF ANY CHANGES OR CONDITIONS ATTACHED TO PERMITS OBTAINED FROM ANY AUTHORITY ISSUING PERMITS.
3. NO SUBSOIL INVESTIGATIONS HAVE BEEN MADE BY THE DESIGNING ENGINEER.
4. THE CONTRACTOR SHALL VISIT THE SITE AND VERIFY EXISTING CONDITIONS PRIOR TO STARTING CONSTRUCTION.
5. LUMSDEN ASSOCIATES, P.C. DOES NOT CERTIFY TO THE LOCATION OF OR TO THE EXISTENCE OF ANY EXISTING UNDERGROUND UTILITIES. THE UNDERGROUND UTILITIES SHOWN ARE FROM RECORDS. THIS DOES NOT CONSTITUTE A GUARANTEE OF THEIR ACTUAL LOCATION OR THAT THEY HAVE ALL BEEN SHOWN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DIGGING OF TEST HOLES PRIOR TO THE BEGINNING OF ANY CONSTRUCTION. THESE TEST HOLES WILL BE MADE TO VERIFY ALL CROSSINGS BETWEEN NEW AND EXISTING FACILITIES AND AT CRITICAL GRADE CHANGES. IF CONDITIONS ARE FOUND IN THE FIELD WHICH ARE MATERIALLY DIFFERENT FROM THE PLANS, THE CONTRACTOR SHALL NOTIFY LUMSDEN ASSOCIATES, P.C. SO THAT APPROPRIATE REVISIONS WILL BE MADE TO THE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO STARTING CONSTRUCTION.



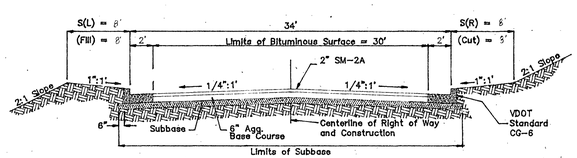
NOTE: COMBINATION CURB AND GUTTER HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS RADIAL COMBINATION CURB AND GUTTER.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

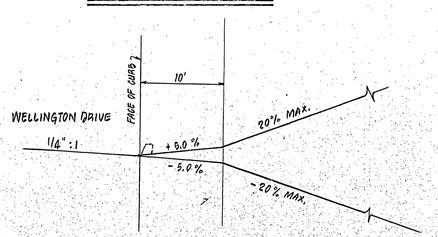
CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

THIS CURB IS TO BE USED WHEN DESIGN SPEED IS 40 MPH OR LESS ON RURAL HIGHWAYS AND 45 MPH OR LESS IN DEVELOPED URBAN & SUBURBAN AREAS.

CONCRETE CURB & GUTTER (CG-6)



TYPICAL STREET SECTION



ENTRANCE GRADING DETAIL

SPECIAL CONDITIONS

1. A minimum cover of three (3) feet over the proposed lines is required.
2. The contractor is responsible for obtaining any and all necessary permits.
3. No work shall begin without written approval of construction plans.
4. All existing utilities may be shown or may not be shown in the exact location. The contractor shall comply with the State Water Works regulations, Section 12.05.03 where water and sewer lines cross.
5. All lines to be staked prior to construction.
6. All construction shall be in accordance to approved construction practices of the applicable trades.

EXCAVATION, STABILIZATION AND BEDDING

A. TRENCHING

1. Excavation for trenches shall include the removal of all material encountered regardless of classification in accordance with the elevations and grades at the locations and stations indicated on the plans or specified herein.
2. Excavation, unless otherwise specified, shall be open cut. The Contractor shall open no more than two hundred (200) feet of trench at one time during the laying of pipe, unless approved by the Engineer.
3. Trenches shall be excavated in straight lines and shall be accurately graded in order to establish a true elevation for the invert of the pipe.
4. The width of trenches, from existing grade to one (1) above the top of the pipe shall be of sufficient width to permit the proper installation of bracing, shoring or sheeting.
5. The sides of the trenches shall be as vertical as practical.
6. excavation for structures shall allow a minimum of twelve (12) inches clear between the structure and the sides of the trench or any required bracing, shoring or sheeting.
7. Excavated materials suitable for backfill shall be stockpiles in an orderly manner at a sufficient distance from the sides of the trench in order to avoid overloading the banks of the trench and to prevent slides or cave-ins.
8. Excavated materials which are not required or approved for backfill shall be removed from the site and disposed of by the Contractor, at his expense.
9. Contractor to adhere to all local, state and federal construction laws, including OSHA Trench Safety Regulations.

B. TRENCH STABILIZATION

1. Trench stabilization material shall be coarse aggregate size number 2 and shall conform with VDOT Section 203 and/or ASTM C 33.
2. Whenever excessively wet or unstable material is encountered in the bottom of the trench, which in the opinion of the Engineer is incapable of properly supporting the pipe or structures, such material shall be removed and backfilled with trench stabilization material and shall be graded to allow for the compacted bedding material.
3. All unauthorized overdepths of excavation shall be backfilled, at the Contractor's expense, with trench stabilization material and shall be graded to allow for the compacted bedding material.

C. COMPACTED BEDDING MATERIAL

1. Bedding material shall be coarse aggregate size Number 57 and shall conform with VDOT Section 203 and/or ASTM C 33.
2. The bottom of the pipe trench shall be excavated to a minimum overdepth of six (6) inches below the bottom of the pipe to provide for the compacted bedding material. Bedding material shall be placed, shaped and compacted.
3. Bell holes and depressions required for the jointing of the pipe shall be dug after the compacted bedding material has been graded and shaped and shall be only of the length, depth and width required to make the joint properly.

PIPE, JOINTS AND FITTINGS

A. SCOPE OF WORK

1. All materials and appurtenances required for the work shall be new, or first class quality and shall be furnished, delivered, erected, connected and finished in every detail as specified or indicated. All materials found defective, regardless of the circumstances, shall be replaces with new material at the expense of the Contractor.
2. The materials specified for the construction shall comply with the latest revisions of the applicable American Society for Testing Materials (ASTM), American National Standards Institute (ANSI) and/or the Virginia Department of Transportation (VDOT) standards.

B. OPTIONAL PIPE SELECTIONS

1. The Contractor shall install only one (1) type of pipe between structures except where ductile iron pipe is specified or indicated. Where existing pipe is to be replaced or extended the same type of pipe shall be installed, unless specified or indicated otherwise.
2. Sanitary sewers with an inside diameter less than or equal to twelve (12) inches shall be either polyvinyl chloride.

C. TYPES OF PIPE

1. PVC sewer pipe and fittings shall be SDR 35 (ASTM D 3034).

D. JOINTS COUPLINGS AND APPURTENANCES

1. PVC pipe and fittings shall be bell and spigot type joints. The bell and spigot joint shall be sealed with elastomeric gaskets conforming to ASTM D 3212. The joints shall be made in strict accordance with the recommendation of the pipe manufacturer.
2. All other materials and appurtenances to be in accordance with details shown on plans.

E. MANHOLES

1. Sanitary sewer manholes shall be precast concrete with cast iron frame and cover. Connections to manholes shall be made with a watertight boot or gasket. Manholes shall be equipped with steps and a shaped invert.

PIPE INSTALLATION

A. GENERAL

1. The Contractor shall not lay pipe or place manholes until all water has been removed from the trench, or when in the opinion of the Engineer, the trench or the weather conditions are unsuitable for work.
2. Pipe that may require field cutting shall be done so in a neat and workmanlike manner, so as to leave a smooth end at right angles to the axis of the pipe. Care shall be taken to avoid damaging the pipe and any coating or linings. Ductile iron pipe shall not be cut with an oxyacetylene torch.
3. The materials shall be visually inspected for defects before lowering the pipe or placing the manholes into the trench. During the laying operation no tools, clothing or other material shall be placed in the pipe or manhole. The interior of the pipe shall be clear of all soil, debris and superfluous materials prior to and during the installation.
4. The Contractor shall exercise every precaution to prevent foreign material from entering the pipe while it is being placed in the trench. Failure by the contractor to take such precautions may result in the Engineer requiring a heavy, tightly woven canvas bag of suitable size be placed over each end of the pipe and removed only when the joint can be made properly.
5. The pipe and manholes shall be lowered carefully into the trench by suitable means and handled with care at all times to avoid damage. Under no circumstances shall the materials be dropped or dumped into the trenches.
6. When work is not in progress, the Contractor shall plug the open ends of the pipe to prevent trench water or other substances from entering the pipe. The plug shall be watertight and shall remain in place until any required dewatering has been completed.
7. Parallel Installation - Water lines shall be laid at least ten feet horizontally from a sewer or sewer manhole whenever possible. When local conditions prevent a horizontal separation of ten feet, the water line may be laid closer to a sewer or sewer manhole provided that:

   I. The invert of the water main shall be at least 18 inches above the crown of the sewer.

   II. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfilling.

   III. The sewer manhole shall be of watertight construction and tested in place.

   Crossing - Water lines crossing sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of the sewer whenever possible. When local conditions prevent this vertical separation, the following construction shall be used:

   I. Sewers passing over or under water lines shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfilling.

   II. Water lines passing under sewers shall, in addition, be protected by providing:

   (a) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line,

   (b) Adequate structural support for the sewers to prevent excessive defection of the joints and the settling on and breaking of the waterline, and

   (c) That the length of the water line be centered at the point of the crossing so that joints shall be equal distance and as far as possible from the sewer.

8. Before joints are made the pipe shall be well bedded on a firm foundation and no pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. Any defects due to settlement shall be made good by the Contractor at his expense. Bell holes shall be dug sufficiently large to insure the making of proper joints.
9. Pipe shall be jointed in full accordance with manufacturer's recommendations. Push-on joints shall be thoroughly cleaned, the rubber gasket inserted in the bell socket, a thin film of approved gasket lubricant applied, the spigot end of the pipe centered into the socket and the joint completed by forcing the spigot end to the bottom of the socket by a jack-type tool or other device approved by the Engineer. Mechanical joints shall be thoroughly cleaned, the gland slipped over the spigot end of the pipe, the rubber gasket painted with soap solution and placed on the spigot end, the spigot end of the pipe seated in the bell, the gasket pressed into position, and bolts and nuts assembled by hand and tightened with an approved torque-limiting wrench.

D. INSTALLING SEWER PIPE AND MANHOLES

1. The installation of the sanitary sewer system shall begin at the downstream manhole and proceed upstream. The downstream sections shall be completed, tested and approved prior to allowing sanitary sewage to enter the system.
2. The pipe shall be installed in accordance with the pipe manufacturer's recommendations and as directed by the Engineer. The pipe shall be laid in true straight lines with the bell ends upstream and with the invert of the pipe being the true elevation and grade of the system.
3. The Contractor shall be responsible for establishing and maintaining the horizontal alignment and vertical elevation and grade of the system in accordance with the survey information indicated on the plans.
4. The horizontal alignment of the pipe shall be maintained by a transit or theodolite plumbed over the center of the downstream manhole. The vertical elevation and grade shall be maintained by not less than three (3) batter boards placed between manholes or by an adjustable laser level mounted at the invert of the downstream manhole with target(s) placed in the bell and of the pipe being laid.
5. Sewer pipe shall be installed in 4 inch gravel bedding extending to the springline of pipe and in accordance with manufacturers recommendations.
6. The sanitary sewer system shall be laid and joined complete-in-place so that each length and section of pipe between the manholes shall have a smooth and uniform invert.
7. The pipe shall be connected to manholes through precast openings and joined with either a flexible boot adaptor or a pipe seal gasket.

E. CONNECTION TO EXISTING SYSTEMS

1. The new pipe connection to be made to an existing manhole where no stub or opening exists, shall be made through an opening of maximum diameter cut into the manhole wall at the required location and elevation.
2. The existing invert channels and benches shall be reworked as required to form a new flow channel from the new connection to the existing flow channel.
3. The new pipe connected to an existing manhole shall be secured in position and the remaining opening shall be filled and sealed with brick and mortar. The outer surface of the connection shall be given a coat of heavy bitumastic waterproofing compound.

F. SERVICE CONNECTIONS

1. The Contractor shall make all service connections to the sewer pipe and from manholes where shown on the plans and/or where located in the field. The service connections to the sewer pipe shall be made with a wye or tee wye branch fitting.
2. The wye and tee wye branch fittings for service connections shall be commercially manufactured and installed in strict accordance with the recommendations of the pipe manufacturer.
3. The sewer pipe shall not be cut or tapped for service connections except when and where permitted by the Engineer.
4. All service connections shall be made with four (4) inch pipe as a minimum, unless the size of an existing service connection dictates otherwise, and shall be installed on a minimum grade of one-quarter (1/4) inch per one (1) foot from the sewer pipe or manhole to the property or easement line.

SANITARY SEWER SPECIFICATIONS

BACKFILLING

A. JOB CONDITIONS

1. Prior to placing backfill, all organic, rubbish debris or other unsuitable or objectionable material within the trench shall be removed. All concrete forms shall be removed. All shoring or sheeting shall be removed or cut off at the depth stipulated by the Engineer.
2. Prior to placing backfill, the trench box shall be removed. All concrete forms shall be removed. All shoring or sheeting shall be removed or cut off at the depth stipulated by the Engineer.
3. Backfill material shall be placed in uniform horizontal layers and thoroughly compacted with proper mechanical or hand operated tampers or other equipment as approved by the Engineer to perform such work.
4. Backfill material shall be placed and compacted so as to not unnecessarily damage or displace the alignment of the pipe or structures.
5. Backfill shall not be placed or compacted against cast-in-place concrete until it has obtained sufficient strength to withstand the backfilled pressure placed upon it.
6. Upon the completion of backfilling, all excess soil, stones and debris shall be removed from the site and disposed of by the Contractor.

B. BACKFILL MATERIAL

1. Materials for backfill shall be approved excavated material or approved suitable material obtained from other sources. All material shall be approved by a Soils Engineer.
2. Material shall consist of durable natural granular material or granular aggregates free of organic material, loam, debris, or other objectionable material which cannot be thoroughly compacted.
3. Material shall not contain stones larger in diameter than those specified herein, granite, broken concrete, masonry rubble or other material which in the opinion of the Engineer is unsuitable for backfill.
4. Excessively wet excavated material shall not be used as backfill. Frozen material shall not be placed in the trench, nor shall approved backfill be placed upon frozen material. However, backfilling may be allowed in freezing weather with prior approval of the Engineer.

C. BACKFILL

1. Backfill from the top of the pipe bedding or bottom of the pipe trench to one (1) foot above the top of the pipe shall be free of stones larger than one (1) inches in diameter and shall be placed in layers not to exceed six (6) inches and compacted with hand tampers.
2. Backfill from one (1) foot above the top of the pipe to the pavement subgrade shall be free of stones larger than four (4) inches in diameter and shall be placed in layers not to exceed eight (8) inches and compacted with mechanical tampers.

INSPECTION AND TESTS

A. TESTING OF SANITARY SEWER

1. The Contractor shall prove the watertightness of the sewer system or portions thereof by one of the following tests, at such times as the Engineer may direct. Tests shall be made only in the presence of the Engineer. The Contractor shall furnish all labor and equipment required for the test and shall make repairs necessary until test results are satisfactory. Roanoke City Engineer shall be notified of all tests 48 hours prior to conducting such tests. All tests shall be coordinated with the Design Engineer for his attendance and observation.

B. AIR TEST

The testing equipment, procedure, and results will all be subject to the strict approval of the Engineer. Results of the air test will be reviewed for compliance with ASTM designation C-828, current revision. The air test is to be conducted between two (2) consecutive manholes. The test equipment shall consist of two (2) plugs (one tapped and equipped for air inlet connection), a shut-off valve, a pressure regulating valve, a pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0 to 5 psi, graduated in 0.10 psi with an accuracy of plus/minus .04 psi. The test equipment shall be set up outside the manhole for easy access and reading. Air shall be supplied to the test slowly and shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig. The pipeline shall be filled until a constant internal pressure of 3.5 psig is maintained. The internal pressure shall be maintained at 3.5 psig or slightly above for a five (5) minute stabilization period, after which time the internal pressure will be adjusted to 3.5 psig, the air supply shut off and the test begun. No person shall remain in the manhole while pipe is being pressurized or throughout the test for safety purposes. A pressure drop of 1.0 psi from 3.5 to 2.5 psig shall be allowed for the test times specified in the following table, based upon the designated pipe size and test segment length.

AIR TEST TABLE

BASED ON EQUATIONS FROM ASTM C-828-30 SPECIFICATIONS TIME (MIN:SEC) REQUIRED FOR PRESSURE DROP FROM 3.5 TO 2.5 PSI WHEN TESTING ONE PIPE DIAMETER ONLY.

PIPE DIAMETER, INCHES							
LENGTH OF TEST SEGMENT	4"	6"	8"	10"	12"	15"	18"
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27
100	0:181	0:40	1:10	1:50	2:38	4:08	5:56
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30
175	0:31	1:09	2:03	3:13	4:37	7:05	
200	0:35	1:19	2:21	3:40	5:17		
225	0:40	1:29	2:38	4:08	5:40		
250	0:44	1:39	2:56	4:35			8:21
275	0:48	1:49	3:14	4:43			9:21
300	0:53	1:58	3:31				10:12
350	1:02	2:19	3:47			8:16	11:54
400	1:10	2:38				6:03	9:27 13:36
450	1:19	2:50				6:48	10:38 15:19
500	1:28				5:14	7:34	11:49 17:01

Should the 1.0 psi drop occur in less time than that specified in the table, the sewer segment shall have failed. If the time required for the pressure to drop 1.0 psi is greater than that shown in the table, the sewer segment shall have passed.

For a more detailed description of the air test method refer to ASTM designation C-828, current revision. An air pressure correction shall be required when the prevailing ground water is above the sewer line being tested and shall be calculated as follows:

Ground Water Depth (ft) + 3.5 = Starting Test Pressure
2.31
Ending Test Pressure = Starting Pressure - 1.0 psi

There is no change from time requirements established for the basic air test.

Manholes shall be tested by exfiltration by plugging lines with inflatable stoppers and filling the manhole with water for 12 hour soak period. Leakage shall not exceed one-quarter (1/4) gallon per hour in the two hour test period following the soak period. An approved air test for manholes will also be considered. Ex-filtration tests performed by approved vacuum tests procedures shall be acceptable.

C. MANDREL TEST

All sewer lines shall be tested by pulling a standard test mandrel between test sections.

REVISION	DATE	DESCRIPTION

DESIGNED PAM
DRAWN PAC
CHECKED MSW

NOTES & DETAILS FOR SECTION No. 2 "WELLINGTON" PREPARED FOR FRALIN & WALDRON, INC. ROANOKE, VIRGINIA

COMMONWEALTH OF VIRGINIA — MICHAEL S. WEBB — No. 012656 — 3-2-95 — PROFESSIONAL ENGINEER

LUMSDEN ASSOCIATES, P.C.
ENGINEERS-SURVEYORS-PLANNERS
ROANOKE, VIRGINIA

SCALE: NONE | COMM: #89-175-2
DATE: 24 FEB. 1995 | SHEET 8 of 11