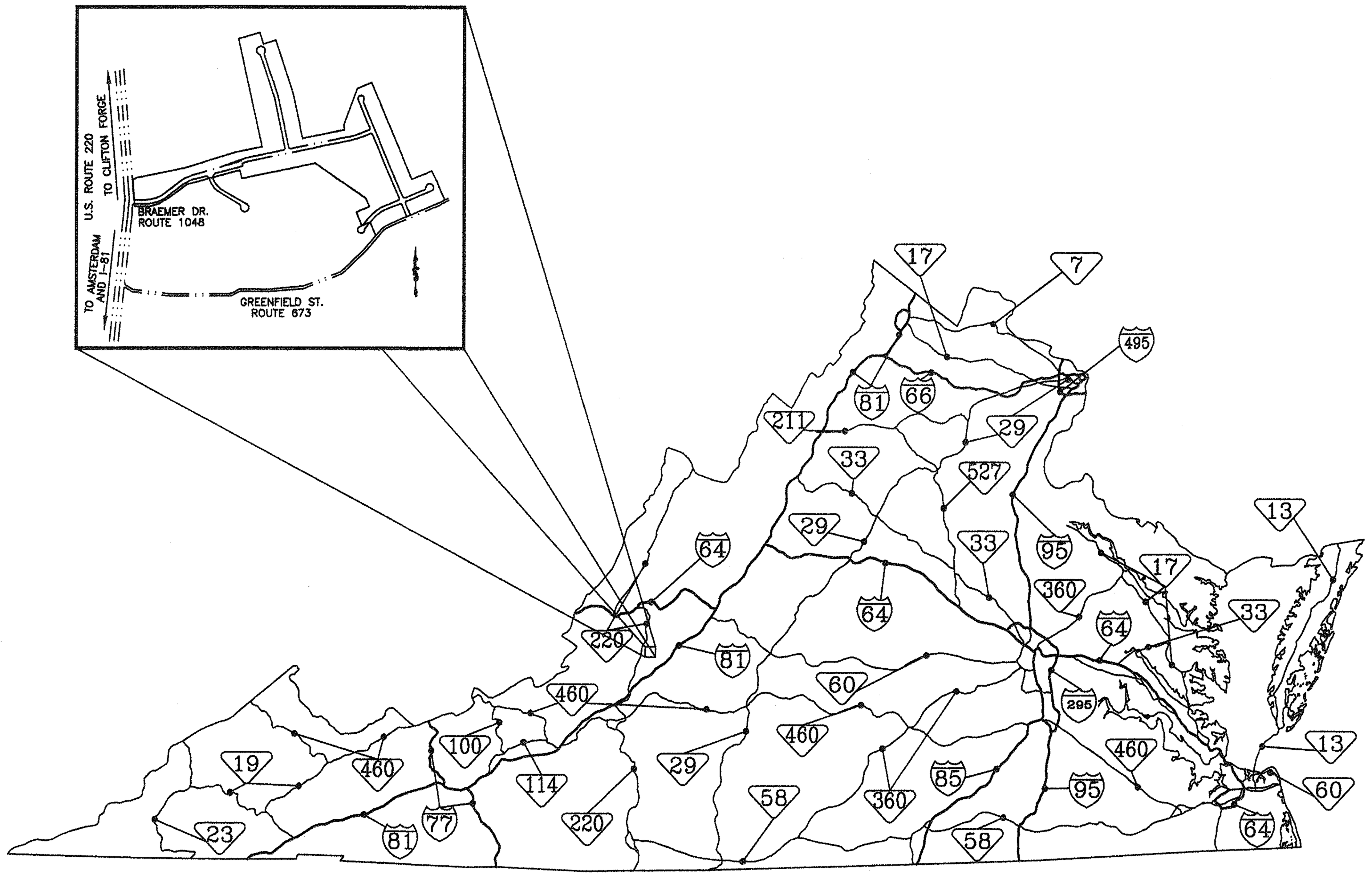
ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

MR. A.R. OVERBAY
3705 WINESAP ROAD
ROANOKE, VIRGINIA 24019
PHONE: 540-992-6600

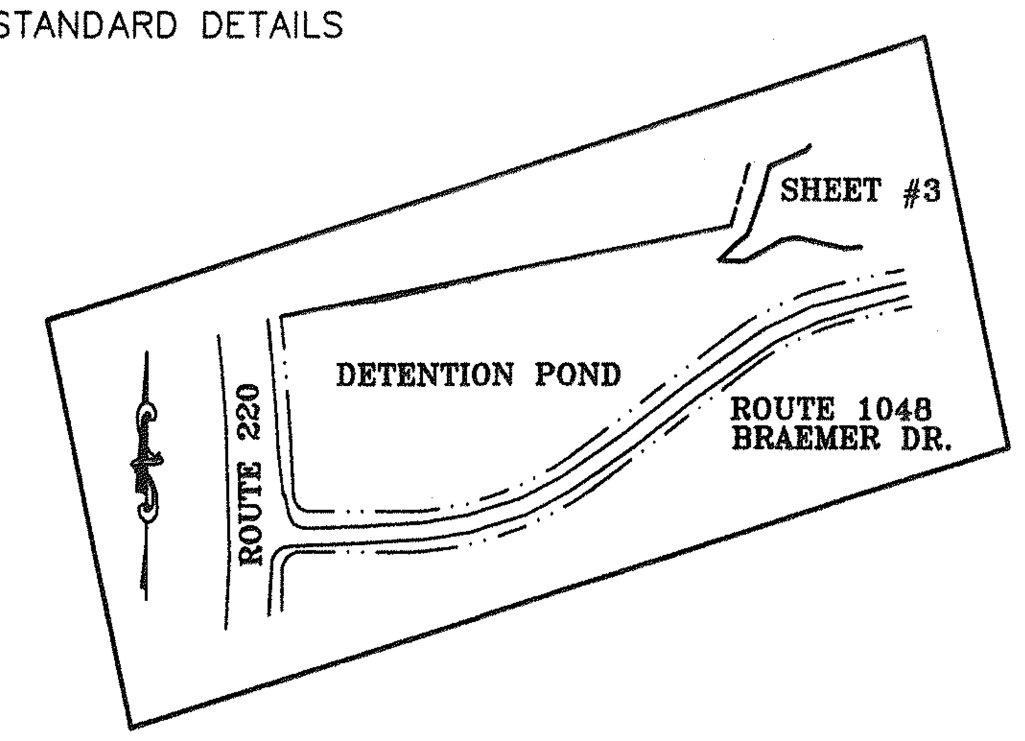
VICINITY MAP
NO SCALE



LOCATION MAP
NO SCALE

INDEX OF SHEETS
NO SCALE

1. COVER SHEET
2. ABBREVIATION, LEGEND, & GENERAL NOTES
3. PLAN & PROFILE LINE S-220
4. EROSION & SEDIMENT CONTROL
5. UTILITY SPECIFICATIONS
6. STANDARD DETAILS



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ROANOKE, VIRGINIA 24013

ROUTE 220
SANITARY SEWER
EXTENSION

COMM. NO. 1070K

DATE: 04/14/98

SET NO.

COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
No. 020021
4-24-98
PROFESSIONAL ENGINEER

PROJECT NAME: Ashley Plantation Rte 220 SS Extension
DATE: 4-28-98
TYPE: Sewer
LOCATION: Rte 220
TOTAL # SHEETS: 6
A/E FIRM: LMW
OF SETS: 1

C:\DWGS\1070K\CVR.DWG PLOT DATE: 04/14/98

ABBREVIATIONS

ABAN	ABANDON, ABANDONED
ABUT	ABUTMENT
ADJ	ADJACENT
AGGR	AGGREGATE
ANC	ANCHOR
APPROX	APPROXIMATE
BIT	BITUMINOUS
BJ	BELL JOINT
BL	BASE LINE
BEG	BEGIN, BEGINNING
BLDG	BUILDING
BM	BENCH MARK
BSP	BLACK STEEL PIPE
BV	BUTTERFLY VALVE
C & G	CURB AND GUTTER
CI	CAST IRON
CL	CENTER LINE
CONST	CONSTRUCTION
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNITS
CND	CONDUIT
CO	CLEANOUT
COMB	COMBINATION
CONC	CONCRETE (PORTLAND CEMENT)
CONN	CONNECT, CONNECTION
CONTR	CONTRACTOR
CONV	CONVEYOR
COR	CORNER
CR STONE	CRUSHED STONE
CTR	CENTER
CULV	CULVERT
D	DEPTH OR DEGREE OF CURVE
DE	DRAINAGE EASEMENT
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DMH	DROP MANHOLE
DN	DOWN
DTL	DETAIL
DW, D/W	DRIVEWAY
DWL	DWELLING
DWG	DRAWING
EA	EACH
E.B.L.	EASTBOUND LANE
EL. ELEV	ELEVATION
ELEC	ELECTRICAL
ENGR	ENGINEER
ENTR	ENTRANCE
EOL	END OF LINE
EP	EDGE OF PAVEMENT
EQ	EQUAL
EQPT	EQUIPMENT
EW	EACH WAY, ENDWALL
EXIST	EXISTING
FES	FLARED END SECTION
FF	FINISH FLOOR
FFE	FINISHED FLOOR ELEVATION
FIG	FIGURE
FL	FLOOR
FLEX	FLEXIBLE
FLG	FLANGE
FT	FOOT
FTG	FOOTING
FUT	FUTURE
GAL	GALLON
GALV	GALVANIZED
GAR	GARAGE
GND	GROUND
GR	GRAVEL
GOVT	GOVERNMENT
GPM	GALLONS PER MINUTE
GRTG	GRATING
GV	GATE VALVE
H&T	HUB AND TAC
HORIZ	HORIZONTAL
HPT	HIGH POINT
HYD	HYDRANT
ID	INSIDE DIAMETER
IN	INCH
INSUL	INSULATION
INV	INVERT
IP	IRON PIN (FOUND OR SET NOTED)
L	LENGTH, LONG
LF	LINEAL FOOT
LG	LONG
LP	LIGHT POLE
LR	LONG RADIUS
LT	LEFT
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MB	MAIL BOX
MBL	MINIMUM BUILDING LINE
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MON	MONUMENT
MTL	METAL
N & C	NAIL AND CAP
NIC	NOT IN CONTRACT
NO	NUMBER
NPW	NON POTABLE WATER
NTS	NOT TO SCALE
OC	ON CENTERS
OD	OUTSIDE DIAMETER
PVMT	PAVEMENT
PC	POINT OF CURVE
PCC	POINT OF COMPOUND CURVE
PER	PERIMETER
PERF	PERFORATED
PERP	PERPENDICULAR
PI	POINT OF INTERSECTION
PL	PLATE, PROPERTY LINE
POL	POINT ON LINE
PT	POINT OF TANGENCY
POT	POINT ON TANGENT
PP	POWER POLE
PRC	POINT OF REVERSE CURVE
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENT
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS, RISER
RR	RAILROAD
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDCR	REDUCER
REINF	REINFORCE, REINFORCEMENT
REF	REFERENCE
REL	RELOCATED
REQD	REQUIRED
REV	REVISION
RTE	ROUTE
RT	RIGHT
R/W	RIGHT OF WAY
SS	SANITARY SEWER
SAN	SANITARY
S/W	SIDEWALK
SD	STORM DRAIN
SE	SLOPE EASEMENT
SECT	SECTION
SER	SERVICE
SH	SHEET
SPEC	SPECIFICATION
SPECS	SPECIFICATIONS
SQ	SQUARE
SSTL	STAINLESS STEEL
STR	STREET
STA	STATION
STD	STANDARD
STL	STEEL
STRUCT	STRUCTURAL
SUR	SURVEY
T & B	TOP AND BOTTOM
TELE	TELEPHONE
TEMP	TEMPORARY
THK	THICK
TP	TELEPHONE POLE
TRTD	TREATED
TV	TELEVISION
TW	TOP OF WALL
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
U.S.C.&G.S	UNITED STATES COAST AND GEODETIC SURVEY
V. VAL	VALVE, VENT
VC	VERTICAL CURVE
VERT	VERTICAL
VESCR	VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS
VOL	VOLUME
VDOT	VIRGINIA DEPARTMENT OF TRANSPORTATION
V.S.D.	VERTICAL SIGHT DISTANCE
W.B.L.	WESTBOUND LANE
W	WIDE FLANGE, WIDE, WASTE, WATER
W/	WITH
WL	WATER LINE
W/O	WITHOUT
WS	WATER SURFACE
WT	WATERTIGHT, WEIGHT
WVDH	WEST VIRGINIA DEPARTMENT OF HIGHWAYS

LEGEND / SYMBOLS

EXISTING	NEW	DESCRIPTION
		BUILDING WITH PORCH OR STOOP
		FOUNDATION ONLY
35	35	CONTOUR, CONTOUR WITH ELEVATION
20.0 E OR +1025.00 E	20.0 E OR X 1025	SPOT ELEVATION
		CONCRETE CURB
		CONCRETE CURB & GUTTER
		CONCRETE WALK OR SLAB
		PAVEMENT
		UNPAVED OR GRAVEL ROAD
		CONSTRUCTION EASEMENT
		PERMANENT EASEMENT
		TREE LINE
OR	OR	TREE OR SHRUB
x x	x x	FENCE (EXISTING OR PROPOSED NOTED)
		CENTERLINE CREEK, SWALE, DITCH
℄	℄	PROPERTY LINE
℄ ℄	℄ ℄	CENTERLINE OR BASELINE
△	△	FIELD SURVEY TRAVERSE POINT
○	○	P.C. OR P.T.
⊕	⊕	GEOLOGIC BORE HOLE
⊕	⊕	BENCH MARK (EXISTING OR SET NOTED)
SD	SD	STORM DRAIN AND ENDWALL
S	S	SANITARY SEWER
FM	FM	FORCE MAIN
G	G	GAS MAIN OR SERVICE LINE
W	W	WATER MAIN OR SERVICE LINE
E	E	ELECTRICAL LINE
UT	UT	UNDERGROUND TELEPHONE LINE
UE	UE	UNDERGROUND ELECTRICAL LINE
		PIPE FITTINGS
		FIRE HYDRANT
		GATE VALVE
CO	CO	CLEANOUT
S		MANHOLE
		DROP INLET (CURB AND GRATING TYPES)
		WM – WATER METER DWM – DOUBLE WATER METER
		TELEPHONE POLE, GUY AND ANCHOR
		POWER POLE, GUY AND ANCHOR
		LIGHT POLE
T	T	TELEPHONE PEDESTAL
T	T	BURIED TELEPHONE VAULT
		PAVED DITCH
		STORM PIPE (SIZE / TYPE NOTED)
		CULVERT WITH FLARED END SECTION
PROFILE PLAN	PROFILE PLAN	AIR RELEASE VALVE / VAULT ASSEMBLY
PROFILE PLAN	PROFILE PLAN	BLOW OFF VALVE / VAULT ASSEMBLY
		STEEL ENCASEMENT
		CONCRETE ENCASEMENT
		ABANDON OR REMOVE
		LIMITS OF CONSTRUCTION

GENERAL NOTES

THE LOCATION OF EXISTING UTILITIES, INCLUDING UNDERGROUND UTILITIES, IS INDICATED ON THE DRAWINGS IN SO FAR AS THEIR EXISTENCE AND LOCATION WERE KNOWN AT THE TIME OF PREPARATION OF THESE DRAWINGS, HOWEVER, NOTHING IN THESE CONTRACT DOCUMENTS SHALL BE CONSTRUED AS A GUARANTEE THAT SUCH UTILITIES ARE IN THE LOCATION INDICATED OR THAT THEY ACTUALLY EXIST OR THAT OTHER UTILITIES ARE NOT WITHIN THE AREA OF OPERATIONS. THE CONTRACTOR SHALL MAKE ALL NECESSARY INVESTIGATIONS TO DETERMINE THE EXISTENCE AND LOCATIONS OF SUCH UTILITIES. THE CONTRACTOR SHALL PAY FOR ANY DAMAGE TO AND FOR MAINTENANCE AND PROTECTION OF EXISTING UTILITIES AND STRUCTURES.

EXISTING WATER LINE LOCATIONS BOTH HORIZONTAL AND VERTICAL ARE APPROXIMATE. THE LOCATION IS NOT THE RESULT OF A FIELD SURVEY.

THE CONTRACTOR IS DIRECTED TO DIG AND LOCATE ALL UTILITIES IN ADVANCE OF PIPELAYING TO ALLOW FOR ADJUSTMENTS DUE TO CONFLICTS WITH EXISTING UTILITIES. SHOULD A CONFLICT ARISE THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY.

THE CONTRACTOR IS REQUIRED TO NOTIFY "MISS UTILITY" AT 1-800-552-7001 AT LEAST TWO, BUT NOT MORE THAN TEN, WORKING DAYS IN ADVANCE OF CONSTRUCTION.

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ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

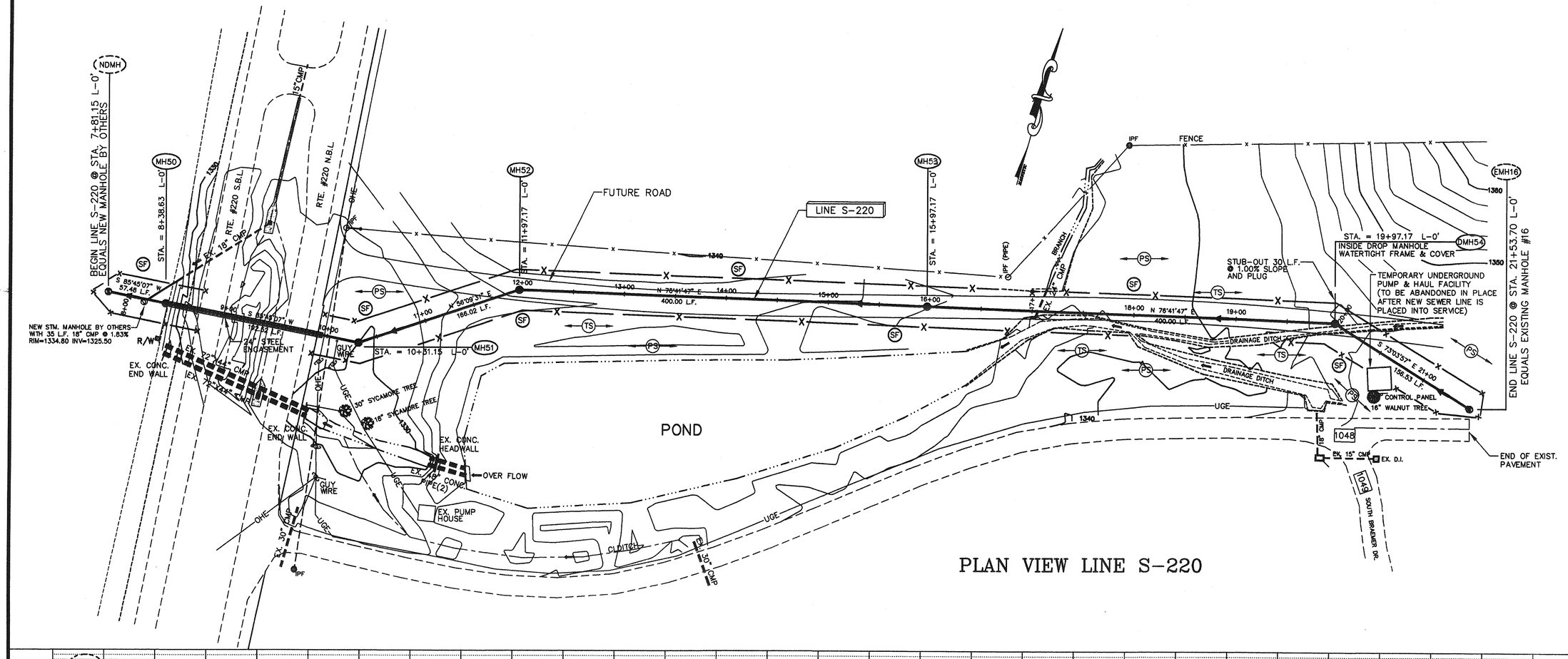
NO.	DATE	DESCRIPTION	BY

ABBREVIATIONS, LEGEND, & GENERAL NOTES

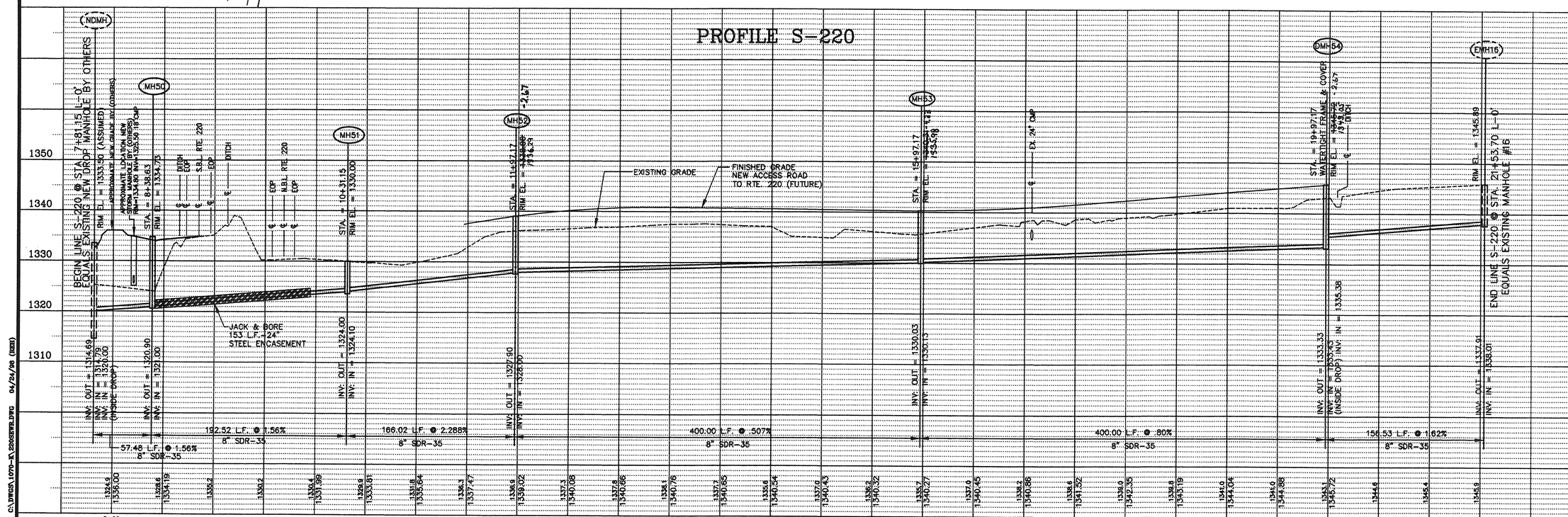
COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
NO. 020021
4-24-98
PROFESSIONAL ENGINEER

Designed By	RCW
Drawn By	REH
Checked By	DRM
Approved By	RCW
Submitted By	RCW
Drawing	ABRV.DWG
Date	04/14/98
Scale	NONE
Commission No.	1070K
Sheet	2 of 6

C:\DWGS\1070K\ABRV.DWG PLOT DATE: 04/14/98



PLAN VIEW LINE S-220



PROFILE S-220

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ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION	BY
		PLAN & PROFILE SEWER LINE EXTENSION LINE S-220	

COMMONWEALTH OF VIRGINIA
RICHARD E. WHITE
NO. 020021
4-24-98
PROFESSIONAL ENGINEER

Designed By	REH
Drawn By	REH
Checked By	DRM
Approved By	RCW
Submitted By	RCW
Drawing	220SEWR.DWG
Date	04/24/98
Scale	H: 1"=50' V: 1"=10'
Commission No.	1070K
Sheet	3 of 6

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EROSION & SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION

The purpose of this project is to construct approximatly 1.363 l.f. of new sanitary sewer extension line, from Ashley Plantation subdivision to join with the new Greenfield parkway sanitary sewer system by others.

EXISTING SITE CONDITIONS

The proposed development is located along Route 220, in the Blue Ridge District of Botetourt County. The existing site is a grass area with a detention pond and well house located there on.

ADJACENT AREAS

The site is bordered on the north and east by undeveloped open land, that is mostly open pastures and fields. It is bordering to the west by U.S. Route 220 and U.S. 673 on the south.

SOILS

Soils found at this site are common to the area. None of these soils have high erosion tendencies.

CRITICAL EROSION AREAS

The potential critical erosion areas are:
1. Steep roadside ditch slopes along proposed roads.
2. The outlet of all culverts.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all vegetative and structural erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the handbook. The minimum standards of the VESCR shall be adhered to unless otherwise waived or approved by a variance.

STRUCTURAL PRACTICES

1. Temporary Construction Entrance (Section 3.02)
   One temporary construction entrance will be installed. Vehicles will be washed to limit tracking onto public roads. Should tracking occur the road will be immediately cleaned. Temporary straw bale barriers will be placed and entrenched and anchored as indicated on the site plan.
2. Straw Bale Barrier (Section 3.04)
3. Silt Fence (Section 3.05)
   Temporary silt fences will be installed as indicated on the site plan.
4. Outlet Protection (Section 3.18)
   Outlet protection will be placed at all discharge points from controlled flow to open flow. All outlet protection will be permanently designed and installed.
5. Surface Roughening (Section 3.29)
   Surface roughening will be employed on all slopes exceeding 2:1.
6. Temporary Seeding (Section 3.31)
   Temporary seeding will be placed on all disturbed areas that will not be brought to final grade within one year or less. Temporary seeding will aid in the reduction of dust and sediment. Temporary seeding will be Annual Ryegrass (100 #/ac), Feb 16 – April 30, German Millet (60 #/ac), May 1 – Aug. 31.
7. Permanent Seeding (Section 3.32)
   After final grading permanent seeding will be employed to reduce erosion and sediment yield.

   Seeding Specifications:

   Permanent seeding will be Kentucky Bluegrass, blended to contain 4 or more varieties, with no one variety exceeding 30%. The seeding will be applied at 140 lb. per acre. On slopes 2:1 or greater a mixture of Crown Vetch (50%), Perennial Ryegrass (40%), and Redtop (10%) will be used.

   All seeding, with required associated practices, will be in accordance with all applicable sections of the Virginia Erosion and Sediment Control
8. Dust Control (Section 3.39)
   If arid conditions prevail dust control practices will be employed as required.
9. Construction Road Stabilization (Section 3.03)
   All roads and parking areas on the site shall be stabilized with gravel immediately after grading. Traffic is prohibited from entering drainage swales or streams unless absolutely necessary.
10. Temporary Sediment Basin (Section 3.14)
11. Riprap (Section 3.19)
    Riprap shall be placed at the outlet of all pipes in accordance with VDOT standard EC–2 as indicated on the plans. Riprap along the ditches shall be VDOT Class 1 riprap installed over a six inch filter consisting of #57 stone.
12. Check Dams (Section 3.20)

MANAGEMENT

1. Construction should be sequenced so that grading operations can begin and end as quickly as possible.
2. Erosion and Sediment control devices shall be installed as the first step of construction.
3. Areas which are not to be disturbed shall be clearly marked by flags, signs, etc.
4. The grading contractor shall be responsible for the installation and maintenance of all erosion and sediment control practices. Inspections are to be made periodically and after every significant rainfall.
5. After achieving adequate stabilization, the temporary E&S controls will be cleaned up and removed, and the sediment basins will be cleaned out and converted to permanent stormwater management basins.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be done with Kentucky 31 Tall Fescue according to Std. & Spec. 3.32, PERMANENT SEEDING, of the handbook. Erosion control blankets will be installed over fill slopes which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

MAINTENANCE OF DENTENTION FACILITIES

The applicant shall obtain approval from the locality of a plan for maintenance of the dentention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.

STORMWATER MANAGEMENT

Calculation of runoff before and after development indicates that there will be a net increase in peak runoff as a result of project development. Consequently, stormwater management basins have been designed to detain and release the runoff at the 2–year pre–developed rate. (See attached calculations)

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. Any items not found in accordance with the Virginia Erosion and Sediment Control Handbook will be immediately replaced and/or repaired. The following items will be checked in particular:

1. The sediment basin will be cleaned out when the level of sediment buildup reaches the cleanout point indicated on the riser pipe.
2. The gravel outlets will be checked regularly for sediment buildup which will prevent drainage. If the gravel is clogged by sediment, it shall be removed and cleaned or replaced.
3. The silt fence barrier will be checked regularly for undermining or deterioration of the fabric. Sediment shall be removed when the level of sediment deposition reaches half way to the top of the barrier.
4. The seeded areas will be checked regularly to ensure that a good stand is maintained. Areas should be fertilized and re–seeded as needed.

GENERAL

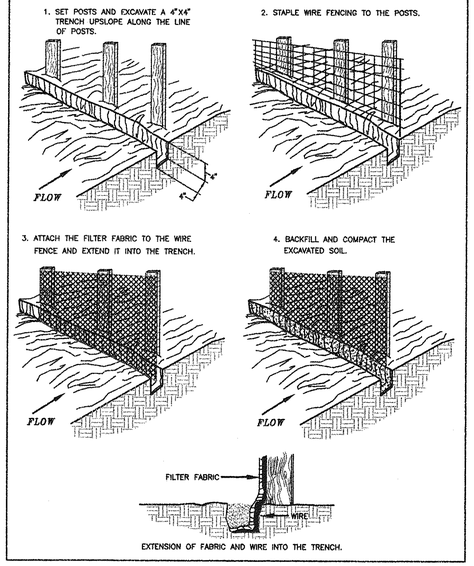
The erosion and sediment control measures shown on the construction plans are the minimum measures required. Due to construction phasing and other considerations all measures can not be shown. The owner, through his contractor, will employ whatever measures which may be required to assure that sediment laden runoff does not leave the site.

All materials and measures employed for erosion and sediment control will be in accordance with the Virginia Erosion and Sediment Control Handbook, latest edition.

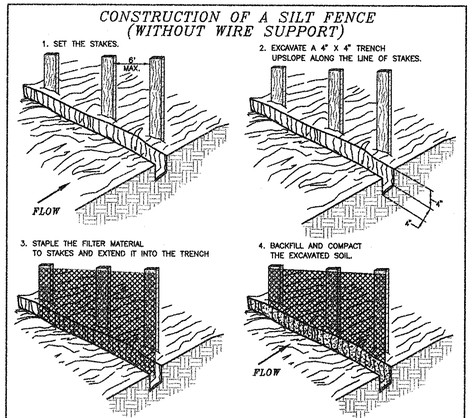
If, during construction, additional Erosion and Sediment Control measures are deemed necessary, they shall be installed as directed by the Owner, Engineer or County agent.

This project is to be constructed consistent with the 1992 Virginia Erosion And Sediment Control Regulations.

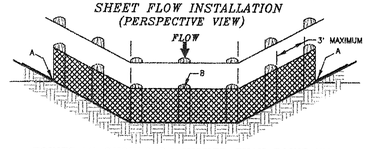
CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

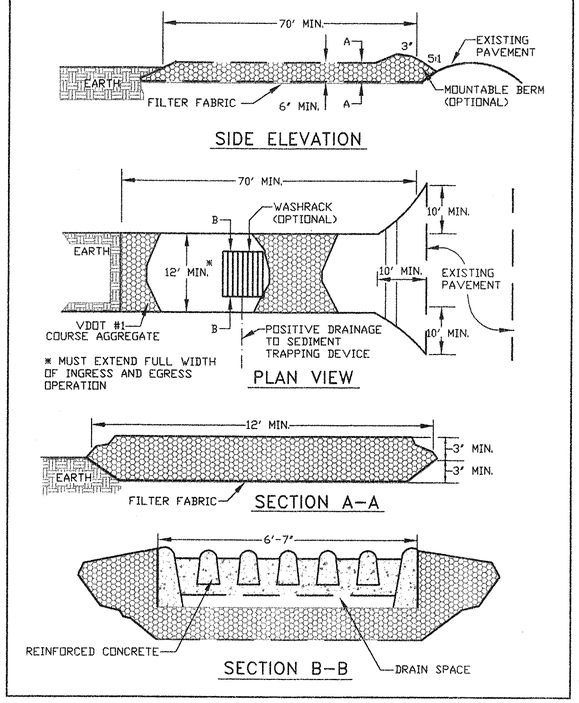


SHEET FLOW INSTALLATION (PERSPECTIVE VIEW)



POINTS 'A' SHOULD BE HIGHER THAN POINT 'B'
DRAINAGEWAY INSTALLATION
(FRONT ELEVATION)

STONE CONSTRUCTION ENTRANCE



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ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION	BY

EROSION AND SEDIMENT CONTROL
STANDARD DETAILS

COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
NO. 020021
4-24-98
PROFESSIONAL ENGINEER

Designed By	DME
Drawn By	REH
Checked By	RCW
Approved By	DRM
Submitted By	DRM
Drawing	EROS.DWG
Date	04/14/98
Scale	NONE
Commission No.	1070K
Sheet	4 of 6

C:\DWGS\1070K\EROS.DWG PLOT DATE: 04/14/98 1"=1'

SPECIAL CONDITIONS

1. A MINIMUM COVER OF THREE AND ONE HALF (3.5) FEET OVER THE PROPOSED LINES IS REQUIRED.

1A. A PRECONSTRUCTION CONFERENCE SHALL BE SCHEDULED WITH BOTETOURT COUNTY PRIOR TO COMMENCING WITH CONSTRUCTION.

2. NO WORK SHALL BEGIN WITHOUT NOTIFYING BOTETOURT COUNTY 24 HOURS IN ADVANCE. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY AND ALL NECESSARY PERMITS.

3. NO WORK SHALL BEGIN WITHOUT WRITTEN APPROVAL OF CONSTRUCTION PLANS.

4. WORK SHALL BE SUBJECT TO INSPECTION BY THE COUNTY INSPECTORS AND DESIGN ENGINEER. SANITARY SEWER CUT SHEETS SHALL BE SUBMITTED TO THE BOTETOURT COUNTY ENGINEER.

5. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND UNCOVERING ALL VALVE BOXES AFTER SURFACE TREATMENT OF ROADS AND ADJUSTING BOXES TO FINAL ROAD GRADES, IF NECESSARY.

6. 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 LINES CROSS.

7. THE CONTRACTOR SHALL NOTIFY THE COUNTY AND OBTAIN COUNTY APPROVAL OF ANY FIELD CORRECTION TO THE APPROVED PLANS PRIOR TO SUCH CONSTRUCTION.

8. ALL TRENCHES WITHIN THE EXISTING OR FUTURE VIRGINIA STATE DEPARTMENT OF HIGHWAYS AND TRANSPORTATION RIGHT-OF-WAY MUST BE COMPACTED IN SIX INCH LAYERS.

9. ALL LINES TO BE STAKED PRIOR TO CONSTRUCTION.

10. CONTRACTOR TO COORDINATE WITH THE ENGINEER TO PROVIDE AS-BUILT PLANS CONTRACTOR SHALL MAINTAIN A SET OF RED-LINE PLANS SHOWING AS-BUILT LOCATION OF ALL STRUCTURES. AS-BUILT INFORMATION TO BE SUBMITTED TO DESIGN ENGINEER FOR PREPARATION OF RECORD AS-BUILT PLANS. SUCH AS-BUILT PLANS SHALL BE SUBMITTED TO BOTETOURT COUNTY PRIOR TO COUNTY ACCEPTANCE.

11. ALL CONSTRUCTION SHALL BE IN ACCORDANCE TO APPROVED CONSTRUCTION PRACTICES OF THE APPLICABLE TRADES.

12. UNLESS NOTED OTHERWISE HEREIN ALL CONSTRUCTION SHALL BE IN ACCORDANCE TO THE LATEST EDITION OF AWWA STANDARDS.

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) FOOT 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 STOCKPILED 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 REPLACED 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. WATER LINE SHALL BE EITHER PVC OR DUCTILE IRON.~~

3. SANITARY SEWERS WITH AN INSIDE DIAMETER LESS THAN OR EQUAL TO TWELVE (12) INCHES SHALL BE EITHER POLYVINYL CHLORIDE OR DUCTILE IRON PIPE, AT THE CONTRACTOR'S OPTION, UNLESS SPECIFIED OR INDICATED OTHERWISE. CONTRACTOR SHALL OBTAIN APPROVAL OF PIPE MATERIAL BY BOTETOURT COUNTY ENGINEER PRIOR TO BEGINNING CONSTRUCTION.

~~4. SERVICE LATERALS SHALL BE SCHEDULE 40 POLYVINYL CHLORIDE.~~

C. TYPES OF PIPE

~~1. POLYVINYL CHLORIDE (PVC) WATER PIPE SHALL BE AWWA C900 DR 18 MINIMUM, UNLESS SPECIFIED OR INDICATED OTHERWISE.~~

2. DUCTILE IRON PIPE SHALL CONFORM WITH AWWA C 151/ANSI 21.51 AND FITTINGS SHALL CONFORM WITH AWWA C 110/ANSI 21.10. THE PIPE AND FITTINGS SHALL BE BITUMINOUS COATED AND CEMENT LINED IN ACCORDANCE WITH AWWA C 104/ANSI 21.40. THE PIPE THICKNESS SHALL CONFORM WITH AWWA C 150/ANSI 21.50 AND SHALL BE CLASS 50, AS A MINIMUM, UNLESS SPECIFIED OR INDICATED OTHERWISE.

3. 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. DUCTILE IRON PIPE AND FITTINGS SHALL BE EITHER MECHANICAL OR BELL AND SPIGOT TYPE JOINTS AS SPECIFIED OR INDICATED. JOINTS SHALL BE MADE WITH A SINGLE WATERTIGHT RUBBER GASKET MANUFACTURED IN ACCORDANCE WITH AWWA C 111/ANSI 21.11. THE JOINTS SHALL BE MADE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE PIPE MANUFACTURER.~~

3. GATE VALVES SHALL BE IRON-BODY, BRONZE-MOUNTED, DOUBLE-DISC, PARALLEL-SEAL, O-RING SEALED, INSIDE-SCREW, NON-RISING STEM, FITTING WITH 2 INCH SQUARE OPERATING NUT FOR VALVE VAULT SERVICE, ALL IN ACCORDANCE WITH AVVA STANDARD C500 (LATEST REVISION). CONNECTIONS SHALL BE SUITABLE FOR THE PIPE WITH WHICH IT IS USED. THE VALVES SHALL BE SUITABLE FOR 200 P.S.I. WATER WORKING PRESSURE AND SHALL BE TESTED AT TWICE THE RATED WORKING PRESSURE. ALL GATE VALVES SHALL BE INSTALLED IN VALVE VAULTS AND EQUIPPED WITH A 2-INCH SQUARE OPERATING NUT. THE NUT SHALL BE MARKED WITH AN ARROW AND THE WORD "OPEN" AND SHALL OPEN BY TURNING TO THE RIGHT (CLOCKWISE).

4. ALL OTHER MATERIALS AND APPURTENCES TO BE IN ACCORDANCE WITH DETAILS SHOWN ON PLANS.
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 SMOTTH END AT RIGHT ANGLES TO THE AXIS OF THE PIPE. CARE SHALL BE TAKEN TO AVOID DAMAGING THE PIPE AND ANY COATINGS 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 WATER-TIGHT CONSTRUCTIN 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 DEFLECTION 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.

NO WATER PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SANITARY SEWER MANHOLE. ALL SANITARY SEWER MANHOLES SHALL BE PLACED A MINIMUM OF 10 FEET HORIZONTALLY FROM ALL WATER MAINS WHENEVER POSSIBLE. WHEN THIS HORIZONTAL SEPERATION CAN NOT BE MAINTAINED, THE MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE.

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 THOUROUGHLY 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 SPLIPPED 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 PLACE WITHIN THE BELL, THE GASKET PRESSED INTO PLACE WITHIN THE BELL, THE GLAND MOVED INTO POSITION, AND BOLTS AND NUTS ASSEMBLED BY HAND AND TIGHTENED WITH AN APPROVED TORQUE-LIMITING WRENCH.

B. INSTALLING WATER MAINS

1. THE WATER MAIN SHALL BE LAID AND MAINTAINED AT THE REQUIRED LINES AND GRADES WITH FITTINGS AND VALVES AT THE REQUIRED LOCATIONS.

2. DEFLECTION OF THE LINE OF PIPE, IN EITHER THE VERTICAL OR HORIZONTAL PLANE TO AVOID OBSTRUCTIONS, OR IN LOCATIONS WHERE LONG-RADIUS CURVES ARE REQUIRED, THE AMOUNT OF DEFLECTION SHALL NOT EXCEED APPROVED AWWA STANDARDS. ALIGNMENTS THAT MAY REQUIRE FEFLECTIONS IN EXCESS OF THE RECOMMENDED LIMITATIONS, SPECIAL BENDS, OR A SUFFICIENT NUMBER OF SHORTER LENGTHS OF PIPE TO PROVIDE THE ANGULAR DEFLECTIONS WITHIN THE LIMITS AS SET FORTH, SHALL BE APPROVED BY THE ;ENGINEER.

3. ALL PLUGS, EXCEPT MECHANICAL JOINT PLUGS AT CONNECTIONS FOR FUTURE LINES, ALL TEES, AND ALL BENDS IN WATER MAINS UNDER PRESSURE SHALL BE PROVIDED WITH REACTION BACKING CONSISTING OF CONCRETE THRUST BLOCKS. VALVES FOR CONNECTIONS TO FUTURE LINES AND FIRE HYDRANTS SHALL BE ANCHORED TO THE WATER MAIN WITH THE RODS.

4. DETECTION TAPE TO BE INSTALLED 12"-18" ABOVE ALL NEW PVC WATER LINES.

C. DISINFECTION OF WATER MAINS

ALL PIPE SHALL BE DISINFECTED, TESTED AND FLUSHED IN ACCORDANCE WITH AWWA STANDARD C601 (LATES REVISION).

2. CONTRACTOR SHALL PROVIDE ALL MATERIALS, EQUIPMENT, NECESSARY TAPS AND PERFORM ALL WORK REQUIRED FOR THE STERILIZATION, TESTING AND FLUSHING OF THE WATER MAIN.

3. NO TESTED SECTION OF WATER LINE SHALL BE APPROVED TO DELIVER WATER SERVICE UNTIL A FAVORABLE LABORATORY REPORT HAS BEEN ACHIEVED. ANY TESTED SECTION OF WATER LINE FAILING TO MEET THE REQUIREMENTS SPECIFIED SHALL BE REPAIRED BY THE CONTRACTOR AND RETESTED UNTIL THE RESULTS ARE WITHIN THE LIMITS SPECIFIED.

4. THE WATER MAIN OR VALVED OFF SECTION THAT HAS BEEN COMPLETED SHALL BE FILLED, TESTED AND FLUSHED. TEST LOCATIONS SHALL BE SUBJECT TO THE DISCRETION OF THE ENGINEER AND AS VALVES AND BLOW-OFFS PERMIT.

5. AFTER TESTING AND BEFORE FINAL INSPECTION OF THE COMPLETED SYSTEMS, WATER MAINS AND SERVICE LATERALS SHALL BE FLUSHED AND DISINFECTED IN ACCORDANCE WITH AWWA SPECIFICATIONS C601(LATEST REVISION). FLUSHING SHALL BE ACCOMPLISHED AT A FLOW VELOCITY OF NOT LESS THAT 2.5 FEET PER SECOND.

DISINFECTION AS DESCRIBED IN AWWA C651 - "PLACING OF CALCIUM HYPOCHLORITE TABLETS" SHALL BE USED. 5 GRAM CALCIUM HYPOCHLORITE TABLETS WITH 3.25 GRAM AVAILABLE CHLORINE PER TABLET SHALL BE ATTACHED AT THE INSIDE TOP OF THE PIPE BY AN ADHESIVE SUCH AS PERMATEX NO. 1 OR EQUAL. THE FOLLOWING NUMBER OF TABLETS FOR THE GIVEN PIPE SIZE SHALL BE USED FOR AN INITIAL DOSE OF 25 MG/1 (PPM) CHLORINE:

PIPE DIAMETER	NUMBER TABLETS PER 18-20 FT. PIPE SECTION
6"	1
8"	2
10"	3
12"	4
16"	7

OR THE NUMBER OF TABLETS EQUAL TO 0.0012D2L ROUNDED TO THE NEXT HIGHER INTEGER, WHERE D IS THE INSIDE DIAMETER, IN INCHES AND L IS THE LENGTH OF THE PIPE SECTION, IN FEET. USE OF THE CONTINUOUS FEED OR SLUG METHOD OF DISINFECTING MAY ONLY BE USED TO RE-CHLORINATE A WATER PIPE AFTER THE INITIAL DISINFECTION OR IN OTHER SPECIFIC CASES APPROVED BY THE DESIGN ENGINEER. WHEN FILLING THE PIPELINE FOR DISINFECTION, THE RATE OF FILLING MUST RESULT IN A VELOCITY OF LESS THAN 1 FT./SEC.

THE DISINFECTION SOLUTION SHALL REMAIN IN THE PIPE LINE FOR NOT LESS THAN TWENTY-FOUR (24) HOURS, AFTER WHICH TIME A CHLORINE RESIDUAL OF 10 PPM AT ALL PARTS OF THE LINE SHALL BE REQUIRED.

FOLLOWING CHLORINATION, THE PIPING SHALL BE THOROUGHLY FLUSHED. THE VIRGINIA WATERWORKS REGULATIONS REQUIRE AT LEAST TWO CONSECUTIVE SATISFACTORY BACTERIOLOGICAL SAMPLES AT 24 HOUR INTERVALS FROM THE DISTRIBUTION SYSTEM AT MAXIMUM SPACING OF 2000 FEET BEFORE THE SYSTEM CAN BE PLACED IN SERVICE. IF THE INITIAL TESTING IS NOT SATISFACTORY THE NEW LINES WILL BE RETESTED UNTIL SATISFACTORY RESULTS ARE ACHIEVED. THE CONTRACTOR SHALL PAY ALL COSTS ASSOCIATED WITH DISINFECTION AND TESTING OF INSTALLED FACILITIES INCLUDING ANY BACTERIOLOGICAL SAMPLES AND RETESTING IF REQUIRED. SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH THE VIRGINIA WATERWORKS REGULATIONS.

D. INSTALLING SEWER PIPE & 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 END 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 ADAPTER OR A PIPE SEAL GASKET.

8. DETECTION TAPE TO BE INSTALLED 12" TO 18" ABOVE ALL NEW SEWER PIPE MAINS AND SEWER SERVICE LATERALS.

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.

5. FUTURE SERVICE CONNECTIONS SHALL EXTEND TO THE PROPERTY OR EASEMENT LINE WITH CLEANOUT AND BE PROPERLY CAPPED WITH A WATERTIGHT FITTING TO PREVENT INFILTRATION INTO THE SEWERAGE SYSTEM. THE FITTING SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE PIPE MANUFACTURER.

6. FUTURE SERVICE CONNECTIONS SHALL BE FIELD MARKED BY A TREATED, SOLID WOODEN (2 X 4) MARKER THREE (3) FEET LONG SET VERTICALLY PLUMB WITH THE END OF THE CAPPED EXTENSION. THE TOPS OF THE MARKERS SHALL BE PAINTED YELLOW AND SET 24" ABOVE THE FINISHED GRADE. THE LOCATION AND INVERT DEPTH OF THE SERVICE CONNECTION SHALL BE SHOWN ON THE AS-BUILT PLANS.

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 UNEVENLY SUPPORT, 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.
ZOOM

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 BELOW UNPAVED AREAS

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) INCH IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED SIX (6) INCHES AND COMPACTED WITH HAND OPERATED TAMPERS.

2. BACKFILL FROM ONE (1) FOOT ABOVE THE TOP OF THE PIPE TO THE TOPSOIL SUBGRADE SHALL BE FREE OF STONES LARGER THAN FIVE (5) INCHES IN DIAMETER AND SHALL BE PLACED IN LAYERS NOT TO EXCEED TWELVE (12) INCHES AND COMPACTED WITH MECHANICAL TAMPERS.

3. DRAINAGE CHANNELS TO BE CONSTRUCTED OF FILL MATERIAL SHALL BE GRADED AND SHAPED TO THE TOPSOIL SUBGRADE WITH MATERIAL 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.

D. BACKFILL BELOW EXISTING OR NEW PAVED AREAS AND SIDEWALKS

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) INCH 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 WATERTIGHNESS 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. BOTETOURT COUNTY 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 EQUPMENT, 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 NAINTAINED 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-828-80 SPECIFICATIONS TIME (MIN:SEC) REQUIRED FOR PRESSURE DROP FROM 3.5 TO 2.5 PSI WHEN TESTING ONE PIPE DIAMETER ONLY.

LENGTH OF TEST SEGMENT	PIPE DIAMETER, INCHES 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	0:18	0:40	1:10	1:50	2:28	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			8:31
275	0:48	1:49	3:14	4:43			9:21
300	0:53	1:59	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. IT 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.

C. MANHOLE VACUUM TESTS

1. MANHOLES SHALL BE TESTED BY VACUUM TEST, AFTER ASSEMBLY BUT PRIOR TO BACKFILLLING. TEST SHALL COMPLY WITH ASTM STANDARDS OR DIVISION OF WATER PROGRAMS WORKING MEMO #550, DATED NOVEMBER 4, 1987. MANHOLES SHALL BE TESTED BY VACUUM ONLY IF CONSTRUCTED OF PRECAST CONCRETE. TESTING SHALL INCLUDE ALL CONCRETE RISER, INCLUDING SPACER RINGS, AND THE JOINT BETWEEN THE CONCRETE AND THE MANHOLE.

2. STUBOUTS, MANHOLE BOOTS AND PIPE PLUGS SHALL BE SECURED TO PREVENT MOVEMENT WHILE THE VACUUM IS DRAWN.

3. INSTALLATION AND OPERATION OF VACUUM EQUIPMENT AND INDICATING DEVICES SHALL BE IN ACCORDANCE WITH EQUIPMENT SPECIFICATIONS FOR WHICH PERFORMANCE INFORMATION HAS BEEN PROVIDED BY THE MANUFACTURER AND APPROVED BY THE VIRGINIA STATE DEPARTMENT OF HEALTH.

4. A MEASURABLE VACUUM OF 10 INCHES OF MERCURY SHALL BE ESTABLISHED IN THE MANHOLE. THE TIME FOR THE VACUUM TO DROP TO NINE INCHES OF MERCURY SHALL BE RECORDED.

5. ACCEPTANCE STANDARDS FOR LEAKAGE SHALL BE ESTABLISHED FROM THE ELAPSED TIME FOR A NEGATIVE PRESSURE CHANGE FROM 10 INCHES TO NINE INCHES OF MERCURY. THE MAXIMUM ALLOWABLE LEAKAGE RATE FOR FOUR-FOOT DIAMETER MANHOLE SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

MANHOLE DEPTH	MINIMUM ELAPSED TIME FOR A PRESSURE CHANGE OF 1 INCH HG
10 FT. OR LESS	60 SECONDS
> 10 FT. BUT < 15 FT.	75 SECONDS
> 15 FT. BUT < 25 FT.	90 SECONDS

FOR MANHOLES FIVE FEET IN DIAMETER, ADD AN ADDITIONAL 30 SECONDS TO THE TIME REQUIREMENTS FOR FOUR-FOOT DIAMETER MANHOLES.

6. IF THE MANHOLE FAILS THE TEST, NECESSARY REPAIRS SHALL BE MADE, AND THE VACUUM TEST AND REPAIRS SHALL BE REPEATED UNTIL THE MANHOLE PASSES THE TEST.
7. IF A MANHOLE JOINT MASTIC IS COMPLETELY PULLED OUT DURING THE TEST, THE MANHOLE SHALL BE DISASSEMBLED AND THE MASTIC REPLACED.

D. MANDREL TEST

ALL SEWER LINES SHALL BE TESTED BY PULLING A STANDARD TEST MANDREL BETWEEN TEST SECTIONS.

E. TESTING OF WATER LINES

1. AFTER PLACING ALL HARNESSING AND ALL VALVE SUPPORT CONCRETE, SUFFICIENT BACKFILL SHALL BE PLACED PRIOR TO FILLING THE PIPE WITH WATER AND FIELD TESTING TO PREVENT LIFTING OF THE PIPE. WHEN LOCAL CONDITIONS REQUIRE THAT THE TRENCHES BE BACKFILLED IMMEDIATELY AFTER THE PIPE HAS BEEN LAID, THE TESTING SHALL BE CARRIED OUT AFTER BACKFILLING HAS BEEN COMPLETED BUT PRIOR TO PLACEMENT OF THE PERMANENT SURFACE. AT LEAST FOURTEEN (14) DAYS SHALL ELAPSE AFTER THE LAST VALVE SUPPORT OR HYDRANT BLOCK HAS BEEN CAST (TYPE 1 PORTLAND CEMENT) PRIOR TO TESTING, UNLESS HIGH EARLY STRENGTH CONCRETE (TYPE III) IS USED, IN WHICH CASE THREE (3) DAYS SHALL ELAPSE.

2. ALL TESTING WILL BE PERFORMED IN ACCORDANCE WITH THE AWWA C600-82 OR CURRENT REVISION.

3. PRESSURE TEST: AFTER THE PIPE HAS BEEN LAID, ALL NEWLY LAID PIPE OR ANY VALVED SECTION THEREOF SHALL BE SUBJECTED TO A HYDROSTATIC PRESSURE OF AT LEAST 1.5 TIMES THE WORKING PRESSURE AT THE POINT OF TESTING. TEST PRESSURE RESTRICTIONS. TEST PRESSURES SHALL:

   A. NOT BE LESS THAN 1.50 TIMES THE WORKING PRESSURE AT THE HIGHEST POINT ALONG THE TEST SECTION:
   B. NOT EXCEED PIPE OR THRUST RESTRAINT DESIGN PRESSURES:
   C. BE OF AT LEAST 2-HOUR DURATION:
   D. NOT VARY BY MORE THAN + 5 PSI
   E. NOT EXCEED TWICE THE RATED PRESSURE OF THE VALVES OR HYDRANTS WHEN THE PRESSURE BOUNDARY OF THE TEST SECTION INCLUDES CLOSED GATE VALVES OR HYDRANTS:
   F. NOT EXCEED THE RATED PRESSURE OF THE VALVE.

EACH VALVED SECTION OF PIPE SHALL BE FILLED WITH PROPERLY DISINFECTED WATER SLOWLY AND THE SPECIFIED TEST PRESSURE SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A MANNER SATISFACTORY TO THE ENGINEER.

BEFORE APPLYING THE SPECIFIED TEST PRESSURE, AIR SHALL BE EXPELLED COMPLETELY FROM THE PIPE, VALVES, AND HYDRANTS.

ALL EXPOSED PIPE, FITTINGS, VALVES, HYDRANTS AND JOINTS SHALL BE EXAMINED CAREFULLY DURING THE TEST. ANY DAMAGED OR DEFECTIVE PIPE, FITTINGS, VALVES, OR HYDRANTS THAT ARE DISCOVERED FOLLOWING THE PRESSURE TEST SHALL BE REPEATED UNTIL IT IS SATISFACTORY TO THE ENGINEER.

4. A LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. LEAKAGE SHALL BE DEFINED AS THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE NEWLY LAID PIPE, OR ANY VALVED SECTION THEREOF, TO MAINTAIN PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE AFTER THE AIR IN THE PIPELINE HAS BEEN EXPELLED AND THE PIPE HAS BEEN FILLED WITH WATER. NO PIPE INSTALLATION WILL BE ACCEPTED IF THE LEAKAGE IS GREATER THAN THAT DETERMINED BY THE FOLLOWING FORMULA:

$$L = \frac{S\,D\,V(P)}{133{,}200}$$

IN WHICH L IS THE ALLOWABLE LEAKAGE, IN GALLONS PER HOUR; S IS THE LENGTH OF PIPELINE TESTED IN FEET; D IS THE NOMINAL DIAMETER OF THE PIPE, IN INCHES; AND P IS THE AVERAGE TEST PRESSURE DURING THE LEAKAGE TEST, IN POUNDS PER SQUARE INCH GAUGE. WHEN TESTING AGAINST CLOSED METAL-SEATED VALVES, AN ADDITIONAL LEAKAGE PER ENCLOSED VALVE OF 0.0078 GAL/HR/IN, OF NOMINAL VALVE SIZE SHALL BE ALLOWED. WHEN HYDRANTS ARE IN THE TEST SECTION, THE TEST SHALL BE MADE ON THE BASIS OF ALLOWABLE LEAKAGE. IF ANY TEST OF PIPE LAID DISCLOSES LEAKAGE GREATER THAN THE ALLOWABLE AMOUNT, THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE AND REPAIR THE DEFECTIVE MATERIAL UNTIL THE LEAKAGE IS WITHIN THE SPECIFIED ALLOWANCE. ALL VISIBLE LEAKS ARE TO BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE.

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ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION	BY

UTILITY SPECIFICATIONS

COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
NO. 020021
4-24-98
PROFESSIONAL ENGINEER

Designed By	REH
Drawn By	REH
Checked By	RCW
Approved By	DRM
Submitted By	RCW
Drawing	UTIL.DWG
Date	04/14/98
Scale	NONE
Commission No.	1070K
Sheet	5 of 6

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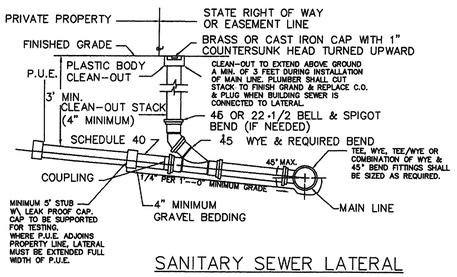
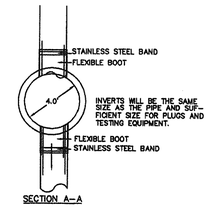
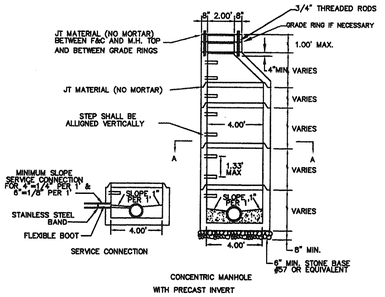


SANITARY SEWER LATERAL

GENERAL NOTES:

1. TRAFFIC BEARING BOX REQUIRED IN TRAFFIC AREAS.
2. ALL PIPE AND FITTINGS SHALL BE OF SIMILAR MATERIAL.
3. ALL PIPE SHALL BE OF SAME SIZE.
4. NO BENDS ARE ALLOWED IN THE LATERAL FROM THE MAIN TO THE CLEAN-OUT STACK WYE. (EXCEPT AS NOTED)
5. ALL MAIN LINE TAPS ON ACTIVE MAINS WILL BE PERFORMED BY ROANOKE COUNTY UTILITY DEPT.
6. PIPING BEHIND CLEANOUT TO BE INSTALLED PER BOCA CODE.
7. MINIMUM LATERAL SIZE: 4" FOR RESIDENTIAL SERVICE 6" FOR NON-RESIDENTIAL SERVICE
8. MINIMUM COVER FOR ALL SEWER LATERALS SHALL BE THREE (3') FEET

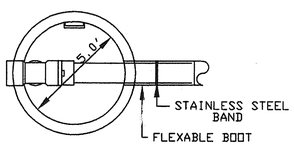




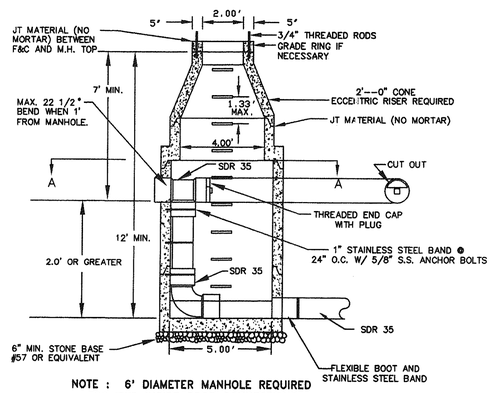
4' STANDARD MANHOLE FOR PIPE 15" OR SMALLER

NOTES:

1. ALL MANHOLE FRAMES AND COVERS SHALL BE DEWEY BROTHERS, INC. MH-RCR-3000W IN NON-PAVED AREAS REQUIRING WATERTIGHT FRAME & COVERS AND MH-RCR-3000EC-WT IN PAVED AREAS, OR APPROVED EQUAL.
2. STEPS TO BE VERTICALLY ALIGNED.
3. THE FRAME AND COVER SHALL BE PROPERLY ALIGNED WITH THE 2 FOOT OPENING OF THE MANHOLE STRUCTURE AND BOLTED IN PLACE.
4. MANHOLE UNIT JOINTS SHALL BE MADE WITH EITHER FLEXIBLE BUTYL SEALANTS OR GASKETS, AT THE CONTRACTOR'S OPTION. FLEXIBLE BUTYL SEALANTS SHALL BE MANUFACTURED BY CONCRETE SEALANTS, INC. (CS-302) OR EQUAL AND FLEXIBLE BUTYL GASKETS SHALL BE MANUFACTURED BY CONCRETE PRODUCTS SUPPLY COMPANY (C-Z STICK) OR EQUAL. THE GASKETS OR SEALANTS SHALL BE INSTALLED AND THE JOINT MADE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER(S).
5. ALL MANHOLES DEEPER THAN 10' SHALL BE PROVIDED WITH A SAFETY SLAB.

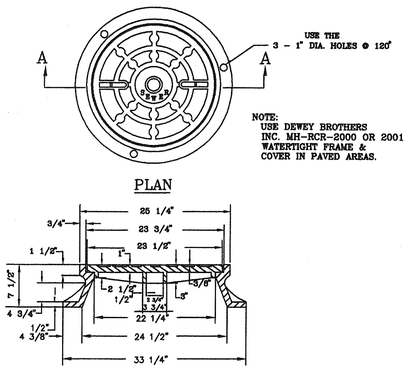


SECTION A-A



NOTE : 6' DIAMETER MANHOLE REQUIRED FOR TWO INSIDE DROP CONNECTIONS (MAIN LINE OR LATERAL)

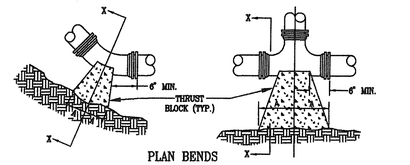
MAINLINE OR LATERAL DROP MANHOLE (FOR USE WITH PVC PIPE)

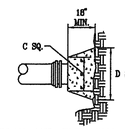


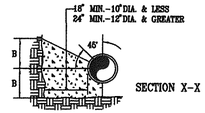
NOTE: USE DEWEY BROTHERS INC. MH-RCR-2000 OR 2001 WATERTIGHT FRAME & COVER IN PAVED AREAS.

MANHOLE FRAME AND COVER

PAVED 2001EC
UNPAVED 2001(ABOVE)



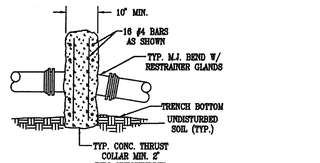




PIPE SIZE	90° BEND A	90° BEND B	45° BEND A	45° BEND B	22 1/2° BEND A	22 1/2° BEND B	11 1/4° BEND A	11 1/4° BEND B	TEE A	TEE B	PLUG C	PLUG D
4"	8"	12"	8"	8"	6"	6"	6"	6"	11"	9"	10"	6"
6"	18"	12"	8"	10"	8"	8"	8"	8"	11"	10"	12"	18"
8"	18"	13"	10"	10"	8"	8"	8"	8"	11"	12"	12"	24"
10"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"
12"	20"	16"	12"	14"	8"	12"	8"	12"	14"	16"	16"	30"
16"	26"	20"	16"	18"	11"	13"	11"	13"	18"	20"	20"	36"
24"	82"	42"	62"	30"	44"	22"	22"	16"	82"	42"	82"	42"
30"	185"	42"	100"	42"	52"	42"	40"	30"	185"	42"	185"	42"

THRUST BLOCK CONSTRUCTION

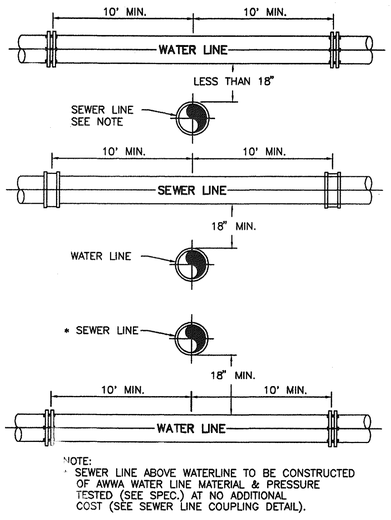
NO SCALE



NOTES:

1. FOR VERT. BEND DOWN IN EXCESS OF 11 1/4° BEND, ANCHORAGE SHALL BE DESIGNED BY ENGINEER.
2. FOR VERT. BEND UPWARD, BLOCKING TO BE SIMILAR TO THAT FOR HORIZ. BEND.
3. GLANDS & BOLTS SHALL BE PROTECTED FROM CONC. BY PLASTIC SHEETING WHEN POURING THRUST BLOCKS.
4. ALL THRUST BLOCK & SUPPORT CONC. SHALL BE 3000 PSI READY MIX CONC.
5. THRUST BLOCKS WITH "S" DIMENSION GREATER THAN 30" SHALL HAVE THE RESTRAINED PIPE INSTALLED WITH A MINIMUM OF 4' OF COVER.

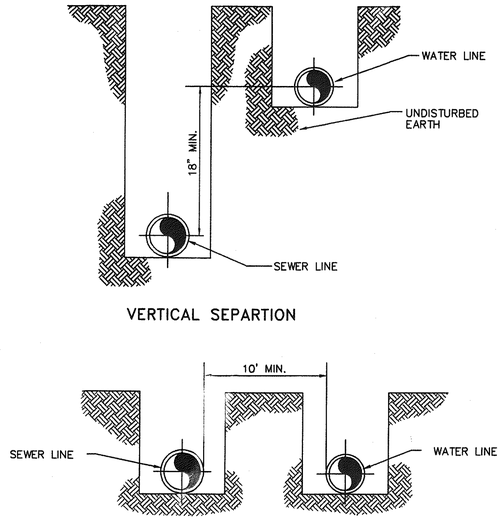
PRESSURE = 200 psi
BEARING = 2000 psf
FACTOR OF SAFETY = 1.5



NOTE:
* SEWER LINE ABOVE WATERLINE TO BE CONSTRUCTED OF AWWA WATER LINE MATERIAL & PRESSURE TESTED (SEE SPEC.) AT NO ADDITIONAL COST (SEE SEWER LINE COUPLING DETAIL).

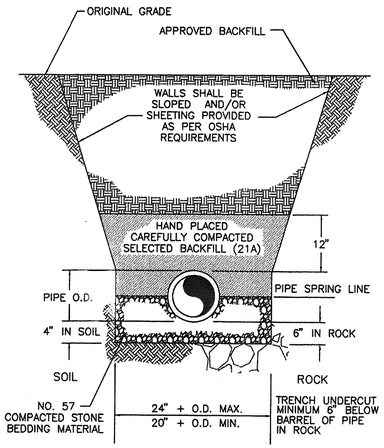
WATER and SEWER CROSSING DETAIL

NTS



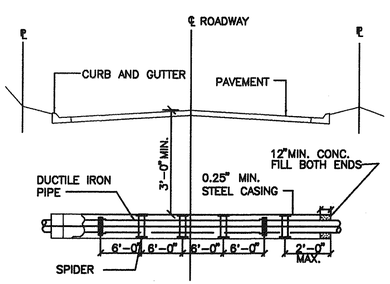
WATER and SEWER SEPARATION DETAIL

NTS



PIPE LAYING CONDITION for GRAVITY SEWER

NTS



NOTE:
STEEL CASING TO EXTEND TO BACK OF CURB OR MIN. 3'-0" BEYOND EDGE OF PAVEMENT

ALL JOINTS IN CASING PIPES SHALL HAVE RESTRAINED JOINTS

TYPICAL STEEL SLEEVE INSTALLATION UNDER ROADWAY

NTS

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ASHLEY PLANTATION
ROUTE 220 SANITARY SEWER EXTENSION
BOTETOURT COUNTY, VIRGINIA

NO.	DATE	DESCRIPTION	BY

STANDARD DETAILS

COMMONWEALTH OF VIRGINIA
RICHARD C. WHITE
NO. 020021
4-24-98
PROFESSIONAL ENGINEER

Designed By	REH
Drawn By	REH
Checked By	RCW
Approved By	RCW
Submitted By	RCW
Drawing	SWR-WTR1.DWG
Date	04/14/98
Scale	NONE
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Sheet	6 of 6

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