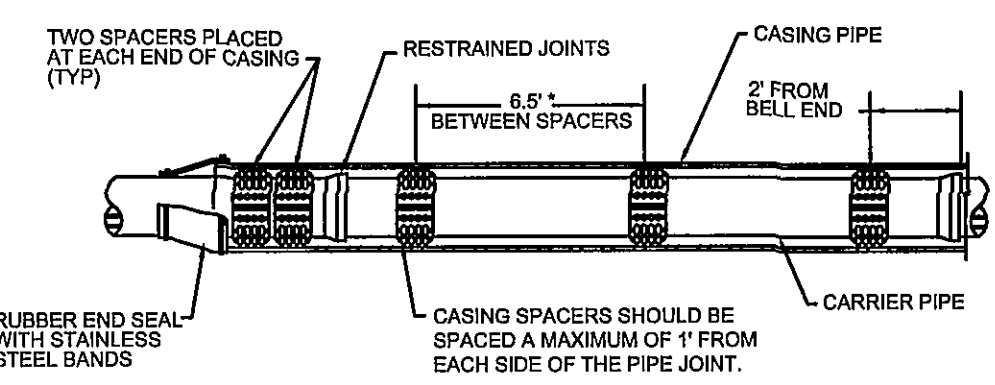
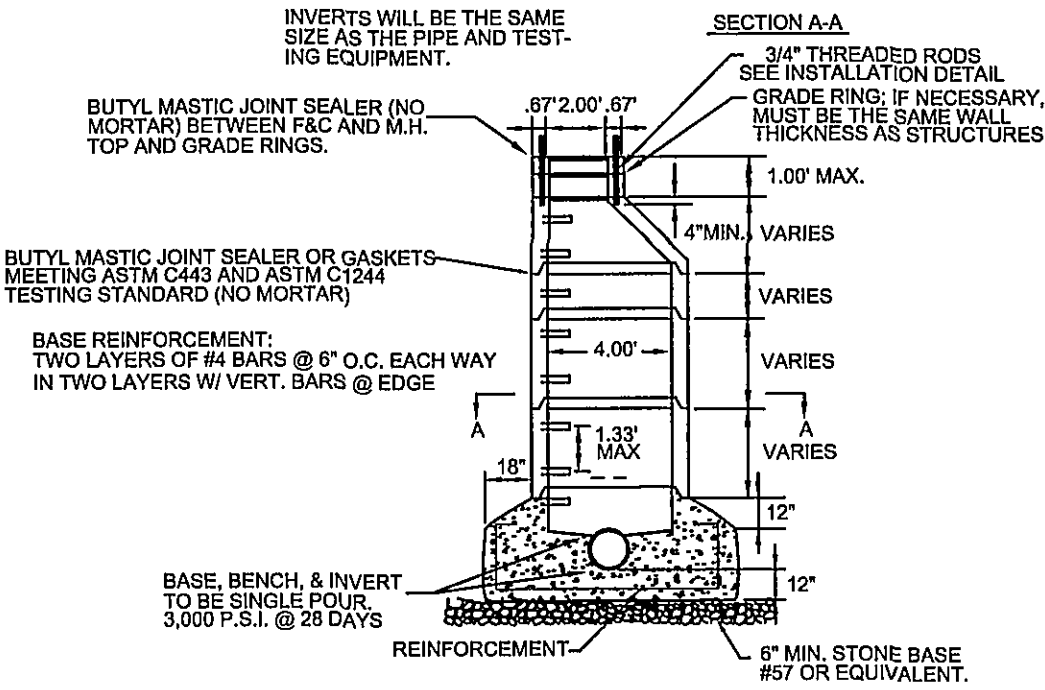
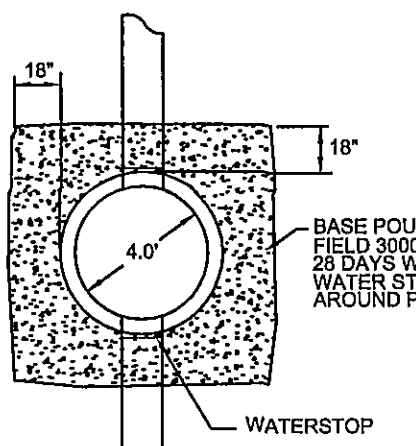
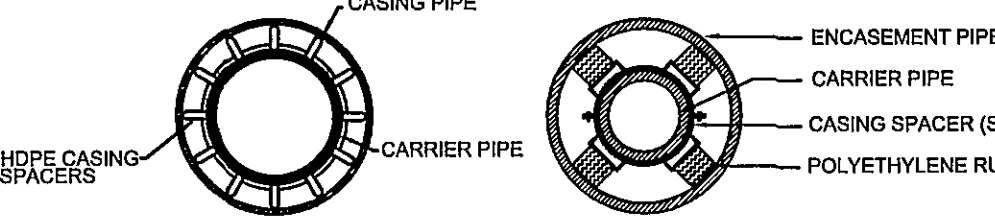


NOTES:

1. ALL MANHOLE FRAMES AND COVERS SHALL BE EAST JORDAN IRON WORKS, INC. WATERTIGHT MANHOLE FRAME MODEL #1045Z, WATERTIGHT COVER MODEL #1046KS AND BOLT-DOWN MANHOLE COVER MODEL #1046CLS, OR APPROVED EQUAL BOLT-DOWN MODEL. TO BE USED IN AREAS SUBJECT TO FLOODING OR AS DIRECTED BY THE AUTHORITY.
2. STEPS TO BE VERTICALLY ALIGNED.
3. THE ENTIRE MANHOLE STRUCTURE INCLUDING FRAME AND COVER SHALL BE INSTALLED BEFORE CUTTING THE TOP OF THE SEWER PIPE IN THE MANHOLE. AUTHORITY INSPECTOR TO BE PRESENT DURING INSTALLATION.
4. THE FRAME AND COVER SHALL BE PROPERLY ALIGNED WITH THE 2 FOOT OPENING OF THE MANHOLE STRUCTURE AND BOLTED IN PLACE.
5. RISER AND OTHER SECTIONS SHALL NOT BE INSTALLED FOR A MINIMUM OF 24 HOURS AFTER POURING OF BASE BENCH, & INVERT.
6. GROUT ANNUAL SPACE BETWEEN PIPE AND PRECAST MANHOLE ON INSIDE OF MANHOLE.



* ADDITIONAL SPACING ALLOWED AS RECOMMENDED BY PIPE MANUFACTURER.



- NOTES:
1. A 1" DRAIN WILL BE REQUIRED ON THE LOWER END OF THE CASING IF THE CASING ENDS ARE SEALED WITH MORTAR AND BRICK.
 2. SPACERS SHALL BE RAC HOPE SPIDER OR EQUIVALENT.
 3. SPACERS SHALL BE SPACED 6 1/2" ON SEWER PIPE.
 4. CARRIER PIPE SHALL BE DUCTILE OR HDPE IN ACCORDANCE WITH THE AUTHORITY STANDARDS.

WESTERN VIRGINIA WATER AUTHORITY - CONSTRUCTION STANDARDS

REVISION DATE	DESCRIPTION	REVISION DATE	DESCRIPTION
07/01/04		07/01/04	
03/01/06		03/01/06	

STRADDLE MANHOLE
FOR PIPE 15"
OR SMALLER

S-02

WESTERN VIRGINIA WATER AUTHORITY - CONSTRUCTION STANDARDS

REVISION DATE	DESCRIPTION	REVISION DATE	DESCRIPTION
07/01/04		07/01/04	
03/01/06		03/01/06	

PIPE SUPPORT
IN CASING PIPE

S-18

BORE AND JACK NOTES

GENERAL REQUIREMENTS:

1. BORED, JACKED OR TUNNELED INSTALLATIONS SHALL HAVE A BORE HOLE ESSENTIALLY THE SAME AS THE OUTSIDE DIAMETER OF THE PIPE.
2. THE USE OF WATER OR OTHER LIQUIDS TO FACILITATE CASING EMBLACEMENT AND SPOIL REMOVAL IS PROHIBITED.
3. IF DURING INSTALLATION AN OBSTRUCTION IS ENCOUNTERED WHICH PREVENTS INSTALLATION OF THE PIPE IN ACCORDANCE WITH THE APPROVED PERMIT, THE PIPE SHALL BE ABANDONED IN PLACE AND IMMEDIATELY FILLED WITH GROUT. A NEW INSTALLATION PROCEDURE AND REVISED PLAN MUST BE SUBMITTED TO, AND APPROVED BY, NORFOLK SOUTHERN CORPORATION (NS) BEFORE WORK CAN RESUME.

BORE AND JACK REQUIREMENTS:

1. THE BORING OPERATION SHALL BE PROGRESSSED ON A 24-HOUR BASIS WITHOUT STOPPAGE (EXCEPT FOR ADDING LENGTHS OF PIPE) UNTIL THE LEADING EDGE HAS REACHED THE RECEIVING PIT.
2. THE FRONT OF THE PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE.
3. THE AUGER AND CUTTING HEAD ARRANGEMENT SHALL BE REMOVAL FROM WITHIN THE PIPE IN THE EVENT AN OBSTRUCTION IS ENCOUNTERED. IF THE OBSTRUCTION CANNOT BE REMOVED WITHOUT EXCAVATION IN ADVANCE OF THE PIPE, PROCEDURES AS OUTLINED ABOVE MUST BE IMPLEMENTED IMMEDIATELY.
4. THE OVER-CUT BY THE CUTTING HEAD SHALL NOT EXCEED THE OUTSIDE DIAMETER OF THE PIPE BY MORE THAN 1/2 INCH. IF VOIDS SHOULD DEVELOP OR IF THE BORED HOLE DIAMETER IS GREATER THAN THE OUTSIDE OF THE PIPE BY MORE THAN APPROXIMATELY 1 INCH, GROUTING OR OTHER METHODS APPROVED BY 'NS', SHALL BE EMPLOYED TO FILL SUCH VOIDS.
5. THE FACE OF THE CUTTING HEAD SHALL BE ARRANGED TO PROVIDE A REASONABLE OBSTRUCTION TO THE FREE FLOW OF SOFT OR POOR MATERIAL.

SAFETY REQUIREMENTS:

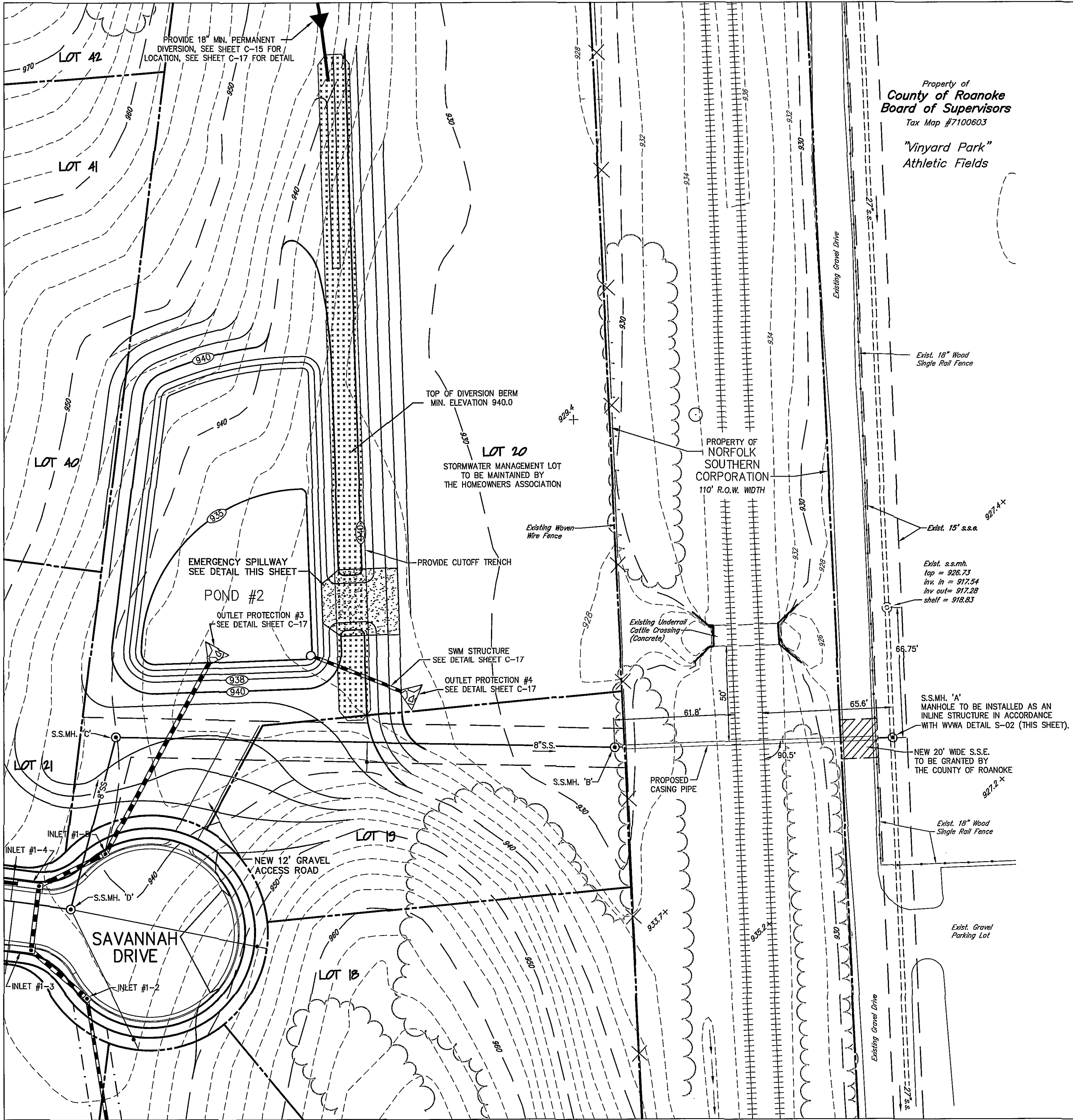
1. ALL OPERATIONS SHALL BE CONDUCTED SO AS NOT TO INTERFERE WITH, INTERRUPT, OR ENDANGER THE OPERATION OF TRAINS NOR DAMAGE, DESTROY, OR ENDANGER THE INTEGRITY OF RAILROAD FACILITIES. ALL WORK ON OR NEAR 'NS' PROPERTY SHALL BE CONDUCTED IN ACCORDANCE WITH 'NS' SAFETY RULES AND REGULATIONS. THE CONTRACTOR SHALL SECURE AND COMPLY WITH THE 'NS' SAFETY RULES AND SHALL GIVE WRITTEN ACKNOWLEDGMENT TO 'NS' THAT THEY HAVE BEEN RECEIVED, READ, AND UNDERSTOOD BY THE CONTRACTOR AND ITS EMPLOYEES. OPERATIONS WILL BE SUBJECT TO 'NS' INSPECTION AT ANY AND ALL TIMES.
2. ALL CRANES, LIFTS, OR OTHER EQUIPMENT THAT WILL BE OPERATED IN THE VICINITY OF THE RAILROAD'S ELECTRIFICATION AND POWER TRANSMISSION FACILITIES SHALL BE ELECTRICALLY GROUNDED AS DIRECTED BY 'NS'.
3. AT ALL TIMES WHEN THE WORK IS BEING PROGRESSSED, A FIELD SUPERVISOR FOR THE WORK WITH NO LESS THAN TWELVE (12) MONTHS EXPERIENCE IN THE OPERATION OF THE EQUIPMENT (INCLUDING THE BORING EQUIPMENT) BEING USED SHALL BE PRESENT.
4. CROSSING OF TRACKS AT GRADE BY EQUIPMENT AND PERSONNEL IS PROHIBITED EXCEPT BY PRIOR ARRANGEMENT WITH AND AS DIRECTED BY, 'NS'.

CASING REQUIREMENTS:

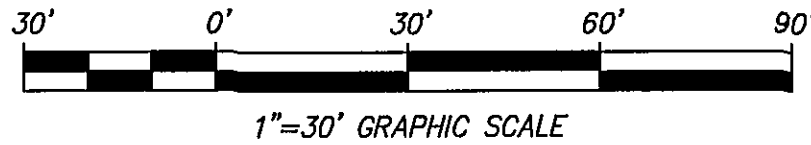
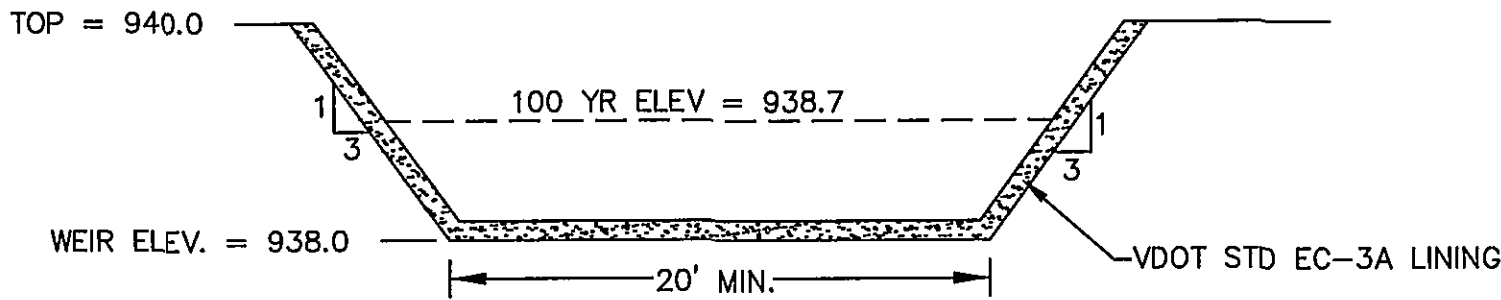
1. CASING PIPE SHALL BE 18" INSIDE DIAMETER SMOOTH WALLED STEEL PIPE WITH A MINIMUM YIELD STRENGTH OF 35,000 ps (ASTM A1011 GRADE 36). MINIMUM WALL THICKNESS SHALL BE 3/8 INCH.
2. ALL JOINTS SHALL BE FULLY WELDED AROUND CIRCUMFERENCE OF THE PIPE WITH A COMPLETE PENETRATION WELD.
3. THE ENDS OF THE CASING PIPE SHALL BE PLUGGED UPON COMPLETION OF INSTALLATION OF THE CARRIER PIPE. THE ENDS OF THE CASING SHALL BE PLUGGED IN ACCORDANCE WITH WVWA STD. S-18 (SEE DETAIL THIS SHEET). PROVIDE SUFFICIENT RESTRICTION TO ANY FOREIGN MATERIAL OBSTRUCTION.
4. CASING SPACERS SHALL BE IN ACCORDANCE WITH DETAIL S-18 OF THE WESTERN VIRGINIA WATER AUTHORITY WATER AND SEWER DESIGN & CONSTRUCTION STANDARDS, LATEST EDITION.

ADDITIONAL REQUIREMENTS:

1. ANY GROUTING REQUIRED SHALL CONSIST OF A UNIFORM MIXTURE OF 1:6 (CEMENT:SAND) CEMENT.
2. WHEN WATER IS KNOWN OR EXPECTED TO BE ENCOUNTERED, PUMPS OF SUFFICIENT CAPACITY TO HANDLE THE FLOW SHALL BE MAINTAINED AT THE SITE, PROVIDED THE CONTRACTOR HAS RECEIVED APPROVAL FROM 'NS' TO OPERATE THEM. WHEN DEWATERING, CLOSE OBSERVATION SHALL BE MAINTAINED TO DETECT ANY SETTLEMENT OR DISPLACEMENT OF RAILROAD EMBANKMENT OR TRACKS.
3. ALL 'NS' COSTS ASSOCIATED WITH THE PIPE INSTALLATION (INSPECTION, FLAGGING, TRACK WORK, PROTECTION OF SIGNAL CABLES, ETC.) SHALL BE REIMBURSED TO 'NS' BY THE LAND OWNER.



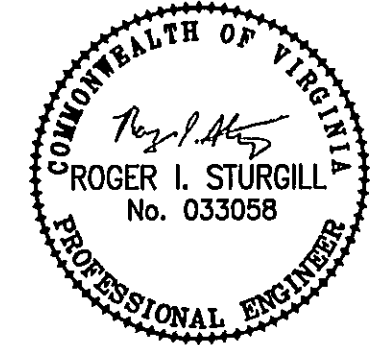
EMERGENCY SPILLWAY DETAIL



1"=30' GRAPHIC SCALE

Property of
County of Roanoke
Board of Supervisors
Tax Map #7100603

"Vinyard Park"
Athletic Fields



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ENGINEERS • SURVEYORS

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Phone: 540/381-4290
FAX: 540/381-4291

1567 Commerce Road
Suite 201
Verona, Virginia 24482
Phone: 540/248-9220
FAX: 540/248-3221

**MOUNTAIN BROOK
SUBDIVISION**
SWM PLAN & SEWER EXTENSION
ROANOKE CITY, VIRGINIA

DRAWN BY: JVV
DESIGNED BY: JVV
CHECKED BY: SMH
DATE: 06/09/2006

REVISIONS:
08/31/06 PER CITY OF
ROANOKE 1ST REVIEW
10/03/08 PER CITY OF
ROANOKE 2ND REVIEW
10/17/08 PER CITY OF
ROANOKE 3RD REVIEW
01/19/07 PER CITY OF
ROANOKE 4TH REVIEW
03/28/07 PER STORM
DRAIN REVISION

SCALE: 1"=30'

SHEET NO.

C-11
JOB NO.
R0500378.01