ABBREVIATIONS

ABUT	ABUTMENT
ADD	ADDITIONAL
ADJ	ADJACENT
AGGR	AGGREGATE
ANR	ANCHOR
AL	ALUMINUM
ALT	ALTERNATE
APPROX	APPROXIMATE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BIT	BITUMINOUS
BL	BASE LINE
BLDG	BUILDING
BM	BENCH MARK
BOT	BOTTOM
B	BRICK
BSMT	BASEMENT
C TO C C/C	CENTER TO CENTER
C & G	CURB & GUTTER
CAP	CAPACITY
CF	CUBIC FEET
CY	CUBIC YARD
CI	CAST IRON
CIRC	CIRCULAR
CL	CENTER LINE
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CND	CONDUIT
CO	CLEAN OUT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECT, CONNECTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
CTR	CENTER
CULV	CULVERT
D	DEPTH DEGREE OF CURVE
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DMH	DROP MANHOLE
DN	DOWN
DR	DRIVE
DWL	DWELLING
DWG	DRAWING
E	EAST
EA	EACH
EF	EACH FACE
EJ	EXPANSION JOINT
ELEV	ELEVATION
ELEC	ELECTRIC, ELECTRICAL
ENGR	ENGINEER
ENTR	ENTRANCE
EOL	END OF LINE
EP	EDGE OF PAVEMENT
EQ	EQUAL
EQPT	EQUIPMENT
EW	EACH WAY, ENDWALL
EXST	EXISTING
EXT	EXTERIOR
F	FRAME
FD	FLOOR DRAIN
FDN	FOUNDATION
FES	FLARED END SECTION
FIG	FIGURE
FIN	FINISH
FL	FLOOR
FLEX	FLEXIBLE
FLG	FLANGE
FT	FOOT
FTG	FOOTING
GAL	GALLON
GALV	GALVANIZED
GND	GROUND
GOVT	GOVERNMENT
GPM	GALLONS PER MINUTE
GV	GATE VALVE
HB	HOSE BIBB
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPT	HIGH POINT
HYD	HYDRANT
ID	INSIDE DIAMETER
IN	INCH
INVT	INVERT
JB	JUNCTION BOX
L	LENGTH
LF	LINEAL FOOT
LP	LOW POINT
LT	LEFT
MATL	MATERIAL
MAX	MAXIMUM
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
N & C	NAIL & CAP
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OPNG	OPENING
OPP	OPPOSITE
PC	POINT OF CURVE
PCC	POINT OF COMPOUND CURVE
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PL	PLATE, PROPERTY LINE
POT	POINT ON TANGENT
PERF	PERFORATED
POL	POINT ON LINE
PRC	POINT OF REVERSE CURVE
PSI	POUNDS PER SQ INCH
PT	POINT OF TANGENT
PVC	POINT OF VERTICAL CURVE POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENT
R	RADIUS
RT	RIGHT
R/W	RIGHT OF WAY
RD	ROOF DRAIN, ROAD
RDCR	REDUCER
REINF	REINFORCE, REINFORCEMENT
REQD	REQUIRED
REV	REVISION
S	SANITARY SEWER, SOUTH, STORY
SAN	SANITARY
SCH	SCHEDULE
SD	STORM DRAIN
SECT	SECTION
SH	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION
SQ	SQUARE
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
SURF	SURFACE
SER	SERVICE
SUR	SURVEY
TDC	TURNED DOWN CURB
TELE	TELEPHONE
TEMP	TEMPORARY
THK	THICK
TV	TELEVISION
TW	TOP OF WALL
TYP	TYPICAL
UG	UNDERGROUND
V	VALVE
VC	VERTICAL CURVE
VERT	VERTICAL
VOL	VOLUME
VDHT	VIRGINIA DEPT OF HIGHWAYS AND TRANSPORTATION
W/	WITH
W/O	WITHOUT
WD	WOOD
WL	WATER LINE
WS	WATER SURFACE
WT	WATERTIGHT
WWF	WELDED WIRE FABRIC
WVDH	WEST VIRGINIA DEPT OF HIGHWAYS

LEGEND

EXISTING	NEW	DESCRIPTION
		BUILDING WITH PORCH OR STOOP
		FOUNDATION ONLY
35	35	CONTOUR, CONTOUR WITH ELEVATION
20.0	20.0	SPOT ELEVATION
		CONCRETE CURB
		CONCRETE CURB & GUTTER
		CONCRETE WALK OR SLAB
		PAVEMENT
		UNPAVED OR GRAVEL ROAD
		TREE LINE
		TREE OR SHRUB
		FENCE AND GATE
		CENTERLINE OF DITCH OR SWALE
		PROPERTY LINE
		CENTERLINE OR BASELINE
		LIMIT OF WORK LINE
		FIELD SURVEY TRAVERSE POINT
		P.C. OR P.T.
		GEOLOGIC BORE HOLE
SD	SD	STORM DRAIN AND ENDWALL
S	S	SANITARY SEWER
G	G	GAS MAIN OR SERVICE LINE
W	W	WATER MAIN OR SERVICE LINE
E	E	ELECTRICAL LINE
		PIPE FITTINGS AND REACTION BLOCKING
		FIRE HYDRANT
		GATE VALVE
CO CO	CO CO	CLEANOUT
		MANHOLE
		DROP INLET (CURB AND GRATING TYPES)
GM○ ○WM	GM● ●WM	G.M. - GAS METER, W.M. - WATER METER
T		TELEPHONE LINE
		TELEPHONE POLE, GUY AND ANCHOR
		POWER POLE, GUY AND ANCHOR
		TELEPHONE PEDESTAL
		BURIED TELEPHONE VAULT
		ABANDON OR REMOVE
		PAVED DITCH
		DRIVEWAY CULVERT
		CULVERT WITH FLARED END SECTION
		IRON PIN OR PINCH PIPE
EC-1		EROSION CONTROL STONE
		STRAW BALES AND SILT TRAP
IP		STORM DRAIN INLET PROTECTION
DD		TEMPORARY DIVERSION DIKE
ST		TEMPORARY SEDIMENT TRAP
CE		TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
STR		STRAW BALE BARRIER
RR		RIPRAP
FM	FM	FORCE MAIN

GENERAL NOTES

1. ALL SEWER AND WATER SYSTEMS SHOWN SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST APPLICABLE SPECIFICATIONS OF THE VIRGINIA STATE DEPARTMENT OF HEALTH AND THE COUNTY OF ROANOKE.

2. ALL WORK SHALL BE SUBJECT TO INSPECTION BY DESIGNATED STATE HEALTH AND ROANOKE COUNTY OFFICIALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFICATION OF APPROPRIATE OFFICIALS 48 HOURS PRIOR TO START OF WORK.

3. MINIMUM CLEAR COVER FOR ALL WATER PIPE AND FORCE MAIN SHALL BE 3 FEET.

4. CONTRACTOR SHALL ACQUIRE ANY AND ALL NECESSARY CONSTRUCTION PERMITS PRIOR TO START OF WORK.

5. THE FORCE MAIN PIPE SHALL BE PVC SDR 26 AS MANUFACTURED BY JOHNS-MANVILLE OR EQUAL.

6. WATER PIPE SHALL BE DUCTILE IRON CLASS 50 AS MANUFACTURED BY CERTAINTEED DUCTILE IRON PIPE

7. SEWER PIPE SHALL BE PVC SDR-35 AS MANUFACTURED BY JOHNS-MANVILLE OR EQUAL. SEWER JOINTS SHALL BE CLASS A. BEDDING SHALL BE CLASS "B", MINIMUM. SEWERS SHALL BE LAID IN A BEDDING OF VDHT #25 TO PIPE SPRINGLINE.

8. CONTRACTOR SHALL INSTALL 4 INCH SEWER CONNECTIONS TO ALL LOTS TO RIGHT-OF-WAY LINE OR EDGE OF EASEMENT AS SHOWN.

9. INSTALLATION OF WATER SERVICE LINE SHALL BE TO WITHIN ONE FOOT OF PROPERTY LINES AS SHOWN, AND SHALL INCLUDE METER BOX, SETTER AND STOP VALVE.

10. INSTALLATION OF WATER SERVICE CONNECTION SHALL BE MADE BY THE CONTRACTOR. INSTALLATION OF WATER METER SHALL BE MADE BY THE COUNTY.

11. FIRE HYDRANT PUMPER CONNECTIONS SHALL FACE IN DIRECTION OF THE ROAD.

12. THE INSTALLATION OF ALL UTILITIES WITHIN ROAD RIGHTS-OF-WAY SHALL BE CONSTRUCTED TO THE VIRGINIA STATE DEPARTMENT OF HIGHWAYS SPECIFICATIONS. WHEREAS, BACKFILLING OF TRENCHES SHALL BE IN LAYERS OF NO GREATER THAN SIX INCHES AND COMPACTED TO 95 PERCENT DENSITY. WHERE UNSUITABLE MATERIAL IS ENCOUNTERED, IT SHALL BE REMOVED AND REPLACED WITH SUITABLE MATERIAL FOR COMPACTION.

13. MANHOLE TOPS AS SHOWN ON PROFILE SHEETS ARE APPROXIMATE ONLY, AND ARE TO BE USED FOR ESTIMATING PURPOSES. THE EXACT MANHOLE TOP ELEVATION SHOULD BE ON THE SAME GRADE AS THE FINISHED ROAD GRADE.

14. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES SHOWN ON PLAN IN AREAS OF CONSTRUCTION PRIOR TO BEGINNING OF WORK. PROJECT ENGINEER SHOULD BE CONTACTED IMMEDIATELY, IF, LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON PLAN; IF, THERE APPEARS TO BE A CONFLICT, AND UPON DISCOVERY OF ANY UTILITY NOT SHOWN ON THE PLAN.

15. THE CONTRACTOR SHALL COORDINATE THE WATER TAP OF THE EXISTING 8" WATER LINE WITH THE APPROPRIATE COUNTY OFFICIALS.

16. THE WATER SYSTEM, SEWER SYSTEM, FORCE MAIN AND PUMP STATION SHALL BE CONVEYED TO, OPERATED AND MAINTAINED BY THE COUNTY OF ROANOKE, UPON COMPLETION AND APPROVAL OF THE SYSTEM.

17. WATER LINE TESTING PROCEDURE:

TESTING OF WATER LINES SHALL BE IN ACCORDANCE WITH AWWA STANDARD C601, SECTION 4. A PRESSURE TEST AND A LEAKAGE TEST SHALL BE PERFORMED ON EACH VALVED SECTION OF PIPELINE AT LEAST SEVEN (7) DAYS AFTER THE LAST CONCRETE REACTION ANCHOR HAS BEEN POURED BUT NOT MORE THAN 10 DAYS AFTER COMPLETION OF THE PIPELINE SECTION.

THE PRESSURE TEST SHALL BE PERFORMED FIRST AND SHALL BE FOR A PERIOD OF 2 HOURS. TEST PRESSURE SHALL BE 150% OF THE NORMAL WORKING PRESSURE OF THE SYSTEM BUT NOT LESS THAN A MINIMUM 150 PSI. THE VALVED SECTION SHALL BE SLOWLY FILLED WITH WATER AND BROUGHT TO THE SPECIFIED PRESSURE BY MEANS OF A PUMP WHILE TAKING NECESSARY MEASURES TO EXPEL ALL AIR. THE HYDROSTATIC TEST PRESSURE SHALL BE 160 PSI BASED ON THE ELEVATION OF THE LOWEST POINT IN THE LINE SECTION BEING TESTED AND CORRECTED TO THE ELEVATION OF THE TEST GAUGE. IF THE SPECIFIED PRESSURE CANNOT BE MAINTAINED, THE CAUSE SHALL BE DETERMINED AND REPAIRED AND THE TEST REPEATED UNTIL SUCCESSFUL.

THE LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. THE LEAKAGE TEST SHALL BE PERFORMED FOR THE DURATION OF 2 HOURS. A TEST METER SHALL BE CALIBRATED AND USED TO DETERMINE LEAKAGE. LEAKAGE SHALL BE DEFINED AS THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE PIPE TO MAINTAIN 160 PSI BASED ON THE ELEVATION OF THE LOWEST POINT IN THE LINE SECTION BEING TESTED AND CORRECTED TO THE ELEVATION OF THE TEST GAUGE. THE PIPE SHALL BE SLOWLY FILLED WITH WATER AND BROUGHT TO THE SPECIFIED PRESSURE BY MEANS OF A PUMP WHILE TAKING NECESSARY MEASURES TO EXPEL ALL AIR. ALLOWABLE LEAKAGE SHALL BE 0.74 GALLONS PER HOUR PER 1000 FEET FOR THE 8" LINE AND 0.55 GALLONS PER HOUR PER 1000 FEET FOR THE 6" LINE. IF LEAKAGE EXCEEDS THAT SPECIFIED, THE LEAKS SHALL BE FOUND AND REPAIRED AND THE TEST REPEATED UNTIL SUCCESSFUL.

18. AFTER THE PIPE IS LAID AND JOINTS COMPLETED, THE FORCE MAIN SHALL BE TESTED AS FOLLOWS: THE PIPE SHALL BE FILLED WITH WATER AND BROUGHT TO THE SPECIFIED PRESSURE BY MEANS OF A PUMP WHILE TAKING NECESSARY MEASURES TO EXPEL ALL AIR. THE HYDROSTATIC TEST PRESSURE SHALL BE 75 PSI BASED ON THE ELEVATION OF THE LOWEST POINT IN THE LINE, AND CORRECTED TO THE ELEVATION OF THE TEST GAUGE. THE MAXIMUM LEAKAGE ALLOWED WHILE MAINTAINING THE TEST PRESSURE SHALL NOT EXCEED THE AMOUNT GIVEN BY THE FOLLOWING FORMULA:

$$L = \frac{ND\sqrt{P}}{3750}$$

WHERE:

L IS ALLOWABLE LEAKAGE IN GALLONS PER HOUR
N IS THE NUMBER OF PIPE JOINTS
D IS THE PIPE DIAMETER IN INCHES
P IS THE TEST PRESSURE IN PSI.

THE TEST SHALL LAST FOR 30 MINUTES. THE CONTRACTOR MUST FURNISH ALL NECESSARY EQUIPMENT AND SHALL BEAR THE COST OF TESTING THE FORCE MAIN. ALL TESTS SHALL BE MADE IN THE PRESENCE OF THE ENGINEER.

SEWER LINE TESTING PROCEDURE

19. ALL EXTERIOR SANITARY SEWERS SHALL BE HYDROSTATICALLY TESTED TO A MINIMUM OF 4' OF HEAD, OR HEAD TO THE TOP OF THE UPSTREAM MANHOLE OF THE SECTION BEING TESTED, WHICHEVER IS LESSER. EXFILTRATION SHALL NOT EXCEED 100 GALLONS PER INCH OF NOMINAL PIPE DIAMETER PER MILE PER DAY FOR ANY SECTION OF SYSTEM. MANHOLES SHALL BE FILLED TO THE TOP, AND ALLOWED TO SOAK FOR 12 HOURS. LEAKAGE SHALL NOT EXCEED 1/2 GAL PER HOUR.

20. ALL SOIL EROSION CONTROL MEASURES SHALL BE CARRIED OUT IN COMPLIANCE WITH "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK", LATEST EDITION, AND ROANOKE COUNTY ORDINANCES.

21. STRAW BALES TO BE PLACED AROUND DENUDED AREAS AS REQUIRED TO CONTROL EROSION.

22. CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTATION AND MAINTENANCE OF ALL EROSION CONTROL MEASURES.

DISINFECTION PROCEDURES

23. DISINFECTION OF ALL EQUIPMENT, PIPE LINES, AND STRUCTURES WITH WHICH WATER COMES IN CONTACT AND WHICH HAVE BEEN CONTAMINATED BY THE CONTRACTOR'S OPERATIONS SHALL BE ACCOMPLISHED AFTER COMPLETION OF CONSTRUCTION AND IMMEDIATELY BEFORE THE SYSTEM OR UNIT IS PLACED IN OPERATION.

THE DISINFECTING AGENT SHALL BE LIQUID CHLORINE OR SODIUM HYPOCHLORITE SOLUTION CONFORMING TO FEDERAL SPECIFICATION O-S-602b, GRADE D. DRY HYPOCHLORITE SIMILAR AND EQUAL TO "HTH" MAY ALSO BE USED AS THE DISINFECTING AGENT.

ALL NEW PIPING SHALL BE THOROUGHLY FLUSHED AND WASHED PRIOR TO THE TIME OF DISINFECTION. CLEAN WATER SHALL BE FLUSHED THROUGH THE SYSTEM FOR AT LEAST ONE-HALF HOUR OR UNTIL NO TRACE OF CUTTINGS, LEAD, OIL, DIRT, OR OTHER FOREIGN MATTER IS VISIBLE. THIS WATER SHALL BE WASTED AT THE NEAREST POINTS AVAILABLE.

THE PIPING AND STRUCTURES SHALL BE DISINFECTED BY INTRODUCING THE DISINFECTING AGENT INTO THE WATER WHICH IS BEING PUMPED INTO THE SYSTEM IN SUCH MANNER THAT THE ENTIRE SYSTEM WILL BE FILLED WITH WATER CONTAINING CHLORINE CONCENTRATION SUFFICIENT TO GIVE A CHLORINE RESIDUAL OF NOT LESS THAN 50 PPM IN THE WATER AFTER 24 HOURS OF CONTACT. CHLORINE AND APPLICATION OF SAME SHALL BE IN ACCORDANCE WITH AWWA STANDARDS C601 AND D102-64. AFTER THE DISINFECTING AGENTS HAVE BEEN PERMITTED TO REMAIN FOR THE SPECIFIED CONTACT PERIODS, THE PIPE LINES SHALL BE THOROUGHLY FLUSHED WITH WATER UNTIL THE RESIDUAL CHLORINE TESTS ARE LESS THAN 1.0 PPM IN EACH INSTANCE. THE DETERMINATION OF THE AMOUNT OF RESIDUAL CHLORINE IN THE SYSTEM SHALL BE MADE AT SUCH POINTS AND IN ACCORDANCE WITH STANDARD TESTS BY MEANS OF A LAMOTTE PALIN DPD CHLORINE TEST KIT, MODEL LP18.

AFTER ANY UNITS OR PORTIONS OF THE WATER MAINS HAVE BEEN DISINFECTED AND FLUSHED AS SPECIFIED, SAMPLES OF WATER SHALL BE TAKEN BY THE CONTRACTOR FROM SEVERAL POINTS IN THE MAINS AS APPLICABLE, IN SUITABLE STERILIZED CONTAINERS AND THE SAMPLES SENT TO THE VIRGINIA STATE DEPARTMENT OF HEALTH FOR BACTERIAL EXAMINATION. SAMPLING SHALL BE REPEATED AT A 24 HOUR INTERVAL. SHOULD THE SAMPLES SHOW A PRESENCE OF COLIFORM BACTERIA, THEN THE DISINFECTION SHALL BE REPEATED. TWO CONSECUTIVE SATISFACTORY TESTS WILL BE REQUIRED BEFORE THE PIPING OF OTHER UNITS ARE PLACED IN SERVICE.

THE COMPLETE DISINFECTION PROGRAM AND METHODS FOLLOWED, ESPECIALLY IF MATERIALLY DIFFERENT FROM THOSE SPECIFIED, SHALL BE IN ACCORDANCE WITH DIRECTIVES OF THE VIRGINIA STATE DEPARTMENT OF HEALTH AND ALL METHODS EMPLOYED SHALL BE SUBJECT TO THE APPROVAL OF THE VIRGINIA STATE DEPARTMENT OF HEALTH. DEFINITE INSTRUCTIONS AS TO THE COLLECTION AND SHIPMENT OF SAMPLES SHALL BE REQUESTED FROM THE VIRGINIA STATE DEPARTMENT OF HEALTH AND SHALL BE FOLLOWED IN ALL RESPECTS. FINAL APPROVAL OF THE BACTERIAL SAMPLES SHALL BE RECEIVED FROM THE VIRGINIA STATE DEPARTMENT OF HEALTH PRIOR TO THE TIME THAT WATER MAINS ARE PLACED IN SERVICE AND ALLOWED TO BE USED FOR DISTRIBUTION OF POTABLE WATER. THE CONTRACTOR SHALL DELIVER COPIES OF THE APPROVED TEST DATA FOR THE OWNER AND THE ENGINEER.

24. STORM DRAIN PIPE SHALL BE CLASS III REINFORCED CONCRETE. ENDWALLS AND APPURTENANCES SHALL CONFORM TO VDHT STANDARDS.

25. SEPARATION OF WATER LINES AND SEWER LINES:

a. Where water mains are near sewers, the water main shall be laid at least 10', horizontally, from any existing or proposed drain or sewer line. Should local conditions prevent a lateral separation of 10', a water main may be laid closer than 10' to a storm or sanitary sewer, provided that the main is laid in a separate trench at such an elevation that the bottom of the water main is at least 18" above the top of the sewer. In no instance will it be allowable to lay the water mains in the same trench as a sewer. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and sewer shall be constructed of AWWA approved water pipe and shall be pressure tested to 50 psi to assure watertightness before backfilling.

b. Wherever water mains must cross house sewers, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18" above the top of the drain or sewer. This vertical separation shall be maintained for that portion of the water main located 10' to be measured as the normal distance from the water main to the drain or sewer.

c. Where conditions prevent the minimum vertical separation set forth in the preceding paragraph from being maintained, or when it is necessary for the water main to pass under a sewer or drain, the water main shall be laid with mechanical joint cast iron pipe, and the pipe shall extend on each side of the crossing until the normal distance from the water main to the sewer or drain line is at least 10'. In making such crossing, it is preferable to center a length of water main pipe over the sewer to be crossed, so that the joints will be equidistant from the sewer and as remote therefrom as possible. Where a water main must cross under a sewer, a vertical separation of 18" between the bottom of the sewer and the top of the water main shall be maintained, with adequate support for the larger sized sewer lines to prevent them from settling on and breaking the water main.

26. ENTRANCE CULVERTS FOR ALL LOTS REQUIRING CULVERTS SHALL BE MINIMUM 15" DIAMETER OR AS DETERMINED BY THE ENGINEER.

COMMONWEALTH OF VIRGINIA
STEWART W. HUSBELL
No. 07
PROFESSIONAL ENGINEER

TAX MAP 18.17, PARCEL # 2-1, PRESENT ZONING R-1, OWNER BUCKLAND LTD., AREA 14.97 AC.

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REVISION	DATE	DESCRIPTION	BY	APP.
	1-22-85	General	DBH	

DATE 5/22/85

COMM. 517

ABBREVIATIONS, LEGEND, GENERAL NOTES AND

SHEET 1

RC-0756