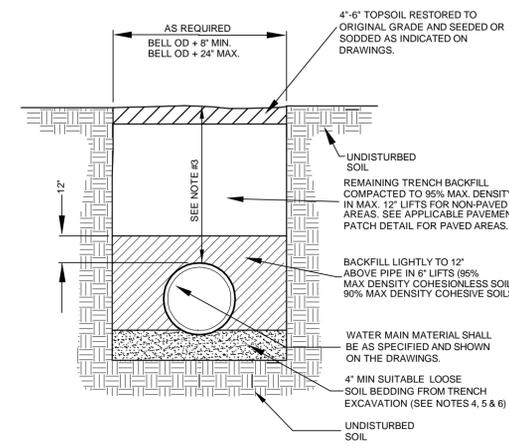
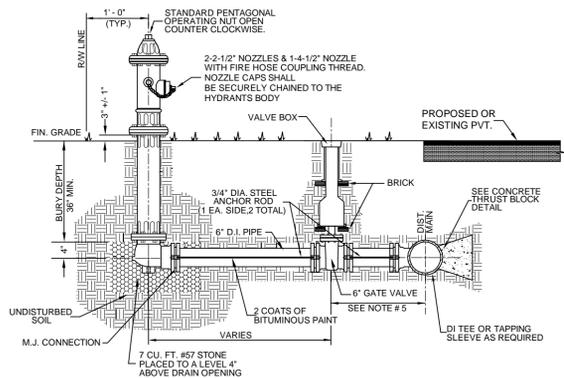


- NOTES:
1. ALL EXCAVATIONS SHALL COMPLY WITH THE TERMS AND CONDITIONS OF THE CONSTRUCTION STANDARDS FOR EXCAVATIONS IN OSHA 'SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION', CHAPTER XV11 OF TITLE 29, CFR, PART 1926. THE CONTRACTOR SHALL HAVE A COMPETENT PERSON ON SITE AT ALL TIMES DURING EXCAVATION AND BACKFILLING.
  2. CONTRACTOR SHALL USE TRENCH BOX SHORING IN ALL OPEN CUTS IN PAVED AREAS. TRENCH WIDTH SHALL BE MAINTAINED AT THE MINIMUM PRACTICAL WIDTH.
  3. SEE PLANS FOR MINIMUM COVER.
  4. LOOSE SOIL OR SELECT MATERIAL IS DEFINED AS "NATIVE" SOIL EXCAVATED FROM THE TRENCH, FREE OF ROCKS, FOREIGN MATERIAL, AND FROZEN EARTH.
  5. BEDDING MATERIAL SHALL EXTEND TO UNDISTURBED TRENCH WALLS AND TRENCH BOTTOM. BEDDING MATERIAL WILL NOT BE PAID FOR UNLESS SPECIFICALLY APPROVED BY THE PROJECT REPRESENTATIVE AND ONLY FOR THE AUTHORIZED QUANTITY.
  6. WHERE NATIVE SOIL IS DETERMINED TO BE ADEQUATE BY THE ENGINEER, NO EXCAVATION BELOW THE BOTTOM OF PIPE IS REQUIRED.
  7. BEDDING MATERIAL SHALL BE PROPERLY RODDED AND COMPACTED AROUND THE PIPE HAUNCHES.
  8. TEST FOR DENSITY OF COMPACTION MAY BE MADE AT THE OPTION OF THE ENGINEER AND DEFICIENCIES SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE ENGINEER MAY HAVE COMPACTION TEST PERFORMED AFTER THE BACKFILL IS COMPLETE. CONTRACTOR SHALL BE REQUIRED TO EXCAVATE TO VARIOUS ELEVATIONS FOR DENSITY TESTING EXCAVATION, BACKFILL AND RECOMPACTION SHALL BE PERFORMED AT NO ADDITIONAL COSTS TO THE OWNER.

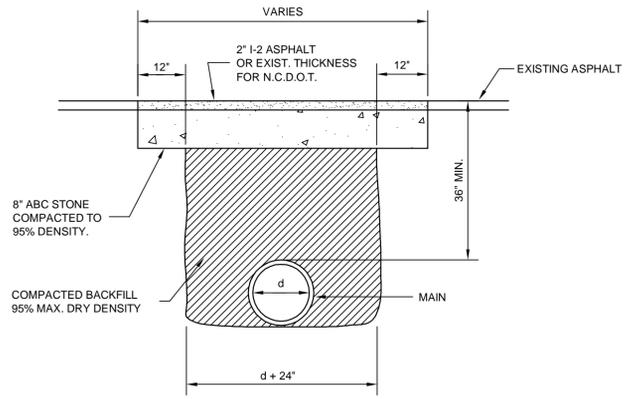


### WATER MAIN BEDDING DETAIL

- NOTES:
1. ALL VALVES AND HYDRANTS SHALL HAVE M.J. CONNECTIONS WITH IRON RETAINING GLAND M.J. RESTRAINT OR ANCHOR LUGS AND 3/4" DIA. STEEL ANCHOR RODS.
  2. 3/4" DIA. STEEL RODS AND ALL BURIED SURFACES SHALL BE PAINTED WITH 2 COATS OF BITUMINOUS PAINT. MARRED OR SCRATCHED SURFACES SHALL BE REPAINTED. PAINT SHALL CURE PRIOR TO BACK FILLING TRENCH.
  3. FIRE HYDRANTS SHALL BE PLACED AS DIRECTED BY THE ENGINEER.
  4. HYDRANT BRANCH SHALL NOT BE BACK FILLED UNTIL INSPECTED AND APPROVED BY ENGINEER.
  5. HYDRANT EXTENSIONS SHALL BE APPROVED BY ENGINEER.

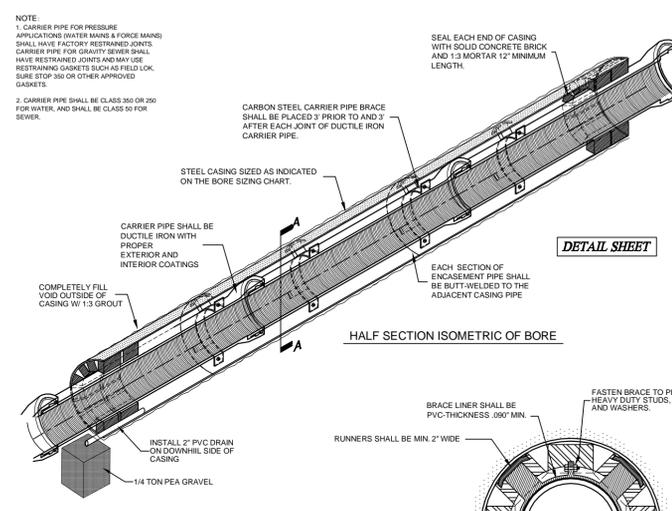


### HYDRANT DETAIL



### OPEN CUT & PATCH DETAIL

<ul style="list-style-type: none"> <li>Preliminary - Do not use for construction</li> <li>Progress Drawings - Do not use for construction</li> <li>Preliminary Plat - Not for recordation, conveyances, or sales</li> <li>Final Drawing - Not released for construction</li> <li>Final Drawing - For Review Purposes Only</li> <li>Final Drawing - Released For Construction</li> </ul>
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BORE SIZING CHART \*

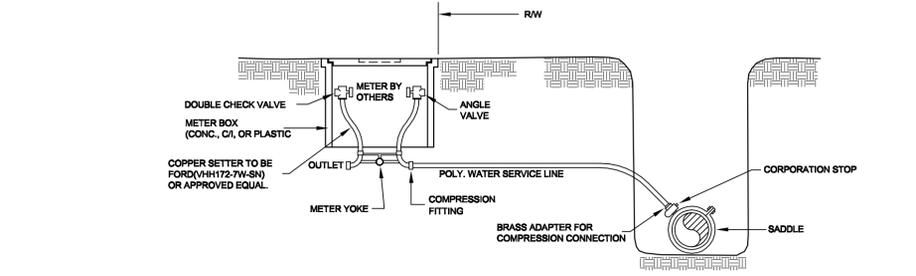
CARRIER PIPE SIZE	MIN. CASING SIZE	ROADWAYS MIN. WALL THICKNESS	RAILROADS MIN. WALL THICKNESS
6"	12"	0.25"	0.250"
8"	16"	0.25"	0.281"
12"	24"	0.25"	0.375"
16"	24"	0.25"	0.375"
18"	30"	0.312"	0.469"
24"	36"	0.375"	0.532"
30"	42"	0.500"	0.625"
36"	48"	0.500"	0.688"

\* CONTRACTOR MAY SUBSTITUTE A LARGER SIZE CASING PIPE HAVING THE MIN. WALL THICKNESS SHOWN FOR SEWER MAINS. ALL ADDITIONAL COSTS SHALL BE INCLUDED IN THE UNIT PRICE BID FOR BORING AND JACKING.

### SECTION "A-A" CARBON STEEL CARRIER PIPE BRACE

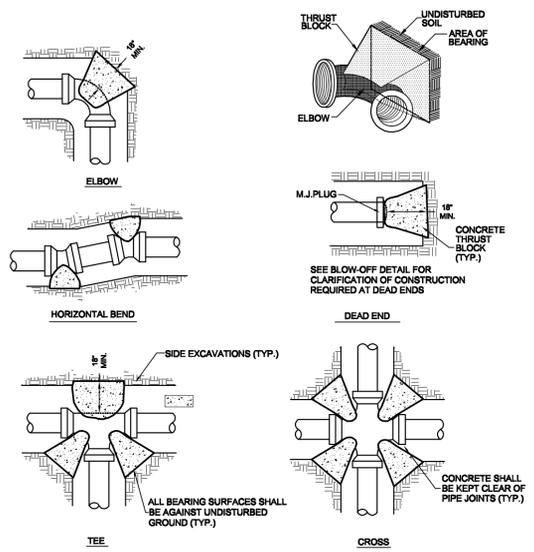
- NOTES:
1. INSTALLATION SHALL BE DRY BORE AND JACKING OF SMOOTH WALL STEEL PIPE. JETTING OR WET BORING WITH WATER SHALL NOT BE ALLOWED.
  2. SEE BORE SIZING CHART FOR CARRIER PIPE SIZE AND STEEL CASING SIZE, MIN. DIA. AND WALL THICKNESS.
  3. CASING PIPE SHALL BE IN ACCORDANCE WITH ASTM A-53, GRADE B WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI.
  4. EACH END OF ENCASEMENT TO BE PLUGGED WITH BRICK. ALL VOIDS OUTSIDE THE CASING PIPE SHALL BE COMPLETELY FILLED WITH 1:3 PORTLAND CEMENT GROUT AT SUFFICIENT PRESSURE TO INSURE NO SETTLEMENT OF ROADWAY/RAILROAD. METHOD OF GROUTING SHALL BE APPROVED BY THE ENGINEER PRIOR TO BEGINNING BORE CONSTRUCTION.
  5. THE BORE SHALL BE ACCOMPLISHED BEFORE PIPE CONSTRUCTION BEGINS. THE MAXIMUM TOLERANCE, IF ANY, IN VARIATION OF INVERT ELEVATIONS BETWEEN ENDS OF CASING AND CARRIER PIPE IS SHOWN ON THE PLAN PROFILE FOR EACH SPECIFIC BORE LOCATION AND STATION.
  6. THE BORING SHALL BE PERFORMED FROM "UPHILL" TO "DOWNHILL" DIRECTION MAINTAINING THE CRITICAL UPHILL ELEVATION. IF APPROVED BY THE ENGINEER, GRADE ADJUSTMENTS DOWNHILL TO COMPENSATE FOR AN INVERT ELEVATION VARIANCE SHALL BE CONSTRUCTED AT NO ADDITIONAL COSTS TO THE OWNER.
  7. THE BORING OPERATION SHALL BE CONDUCTED IN A MANNER THAT THE FLOW OF TRAFFIC IS NOT IMPEDED OR IN SUCH A MANNER SO AS NOT TO CREATE A HAZARD.
  8. IF AN OBSTRUCTION IS ENCOUNTERED DURING THE BORING OPERATION, THE AUGER SHALL BE WITHDRAWN THE EXCESS CASING PIPE CUT-OFF, CAPPED AND THE INTERIOR AND EXTERIOR VOIDS SHALL BE COMPLETELY FILLED WITH 3 PORTLAND CEMENT GROUT UNDER PRESSURE. NO SEPARATE PAYMENT FOR UNSUCCESSFUL BORES.
  9. CONTRACTOR SHALL FIELD ADJUST AND INSTALL PROPER PIPE BRACES TO ACCOMPLISH GRADE AND INVERTS AS SHOWN ON THE DRAWINGS.
  10. A MANUAL CONTROL STEERING HEAD OR OTHER GUIDANCE SYSTEM IS RECOMMENDED FOR BORES 30" DIA. AND/OR LARGER AND FOR BORES EXCEEDING 100' IN LENGTH OR AS SPECIFIED.
  11. SUBCONTRACTORS SHALL BE APPROVED BY THE ENGINEER AND SHALL PROVIDE APPROVED INSURANCE CERTIFICATES AS REQUIRED.
  12. CONTRACTOR SHALL EXECUTE AND PERFORM ALL REQUIREMENTS AND CONDITIONS STIPULATED BY ENCROACHMENT PERMITS.

### BORE UNDER ROADWAYS/RAILROADS



### TYPICAL HOUSE SERVICE DETAIL

- NOTES:
1. INLETS WILL HAVE A BRASS ADAPTOR AS REQUIRED FOR A COMPRESSION FITTING TO 1" P.S. WATER SERVICE PIPE.
  2. YOKE WILL HAVE CHECK VALVE THAT SHALL HAVE SPRING-ASSISTED SEATING, AND THE SEAT SHALL BE OF BUNA-N RUBBER.
  3. OUTLET SHALL BE FORD DOUBLE PURPOSE COUPLING OR APPROVED EQUAL.
  4. METER YOKE SHALL BE SUPPORTED AS CALLED FOR IN SPECIAL PROVISIONS.



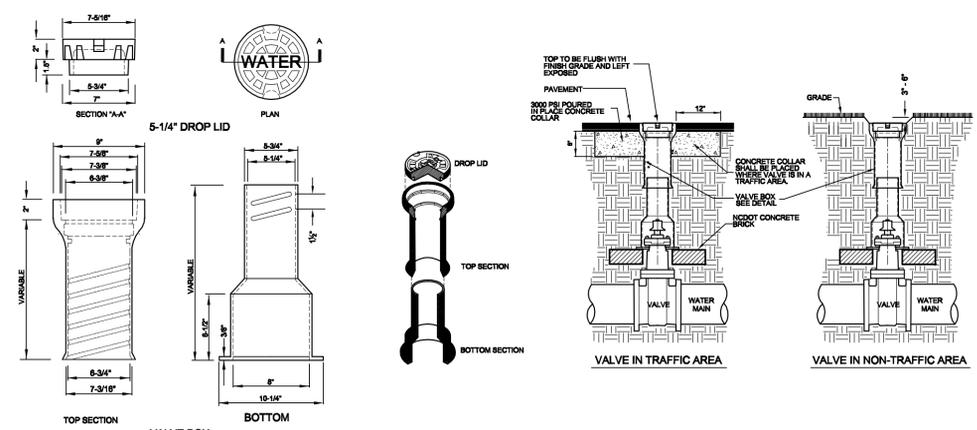
### CONCRETE THRUST BLOCK DETAIL

THRUST BLOCKING SCHEDULE

FITTING SIZE (IN)	MINIMUM BLOCKING AREA AND VOLUME IN S.F. AND (C.Y.)					
	11 1/4"	22 1/2"	45"	90"	TEE	PLUG
2			0.23 (0.11)	0.38 (0.11)	0.30 (0.11)	0.30 (0.11)
4			0.83 (0.18)	1.35 (0.18)	0.86 (0.18)	0.86 (0.18)
6	0.40 (0.01)	0.80 (0.02)	1.73 (0.20)	3.00 (0.33)	2.17 (0.25)	2.17 (0.25)
8	0.80 (0.02)	1.50 (0.04)	3.08 (0.34)	5.40 (0.60)	3.83 (0.42)	3.83 (0.42)
10	1.20 (0.03)	2.30 (0.07)	4.72 (0.52)	8.40 (0.94)	5.92 (0.65)	5.92 (0.65)
12	1.70 (0.05)	3.30 (0.12)	6.82 (0.75)	12.00 (1.33)	8.48 (0.94)	8.48 (0.94)
16	3.00 (0.33)	5.90 (0.65)	11.80 (0.86)	21.30 (1.57)	15.00 (0.97)	15.00 (0.97)
20	4.80 (0.52)	9.20 (0.78)	18.00 (1.32)	33.30 (3.60)	23.30 (1.87)	23.30 (1.87)
24	8.70 (0.75)	13.20 (0.97)	26.00 (2.28)	48.00 (6.29)	33.80 (3.24)	33.80 (3.24)
30	10.40 (0.77)	20.70 (1.80)	40.80 (4.45)	75.00 (10.30)	52.90 (6.32)	52.90 (6.32)
36	15.00 (1.29)	29.80 (3.11)	58.40 (7.67)	108.0 (17.90)	75.80 (10.90)	75.80 (10.90)

NOTE: Values given are based on 150 psi water pressure and 2000 lb/ft soil bearing capacity. Soils with less bearing capacity such as muck, peat or soft clay will require greater blocking areas and volumes.

The thrust blocking shown above is based on the use of mechanical joint as shown on plans.



### Valve Box Detail

DESIGNED BY: SRN  
 DRAWN BY: CBB  
 CHECKED BY: SRN  
 DATE: FEB. 2016  
 SCALE: NOTED  
 FIELD BOOK: -  
 FILE NO.: D-1  
 PROJECT NO.: -

**KNA CONSULTING ENGINEERS**

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STATE OF NORTH CAROLINA  
 PUBLIC WORKS ENGINEER  
 No. 10077-0017

**KOONCE, NOBLE & ASSOCIATES, INC. CONSULTING ENGINEERS**  
 208 EAST 5th STREET • P.O. BOX 1027 • LUMBERTON, N.C. 28359 • PHONE: 910-739-9376 • FAX: 910-739-9378 • LIC. NO.: F-0103 • EMAIL: knaengineering@att.net

**ROBESON COUNTY COUNTY-WIDE WATER SYSTEM**  
**WATER MAIN RELOCATION - NC HWY. 211 - DETAIL SHEET**

SHEET NO. **D-1**

OF

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