

**MINIMUM THRUST BLOCK REQUIREMENT**

(MINIMUM SURFACE AREA IN CONTACT WITH UNDISTURBED SOIL AT THE LOCATION INDICATED IN DETAIL NO. 1)

**1. HORIZONTAL AND DOWNWARD THRUST**

THE FOLLOWING PROCEDURE SHALL BE USED TO ARRIVE AT THE AREA OF THRUST BLOCKING REQUIRED FOR DISTRIBUTION OF HORIZONTAL AND DOWNWARD THRUST TO UNDISTURBED SOIL:

- A. USE TEST PRESSURE OF 150 PSI OR AS DETERMINED BY THE ENGINEER.
- B. MULTIPLY PRESSURE OBTAINED FROM STEP A BY THE VALUE SHOWN IN TABLE 1 FOR THE APPROPRIATE FITTING AND PIPE SIZE. THIS IS THE TOTAL THRUST IN POUNDS AT THE FITTING.
- C. USE TABLE 2 TO DETERMINE THE BEARING STRENGTH OF THE SOIL AT THE SPECIFIC LOCATION. IF NOT SURE, CONTACT THE CITY OF LAWTON ENGINEERING DIVISION.
- D. DIVIDE THE THRUST OBTAINED FROM STEP B BY THE BEARING STRENGTH OF THE SOIL OBTAINED FROM STEP C IN ORDER TO ARRIVE AT THE AREA REQUIRED FOR THRUST BLOCKING IN SQUARE FEET. THIS AREA IS THE MINIMUM SURFACE AREA THAT WILL BE IN CONTACT WITH UNDISTURBED SOIL.
- E. SEE DETAIL 1 FOR LOCATION OF THRUST BLOCKING.

**2. UPWARD THRUST**

THE FOLLOWING PROCEDURE SHALL BE USED TO ARRIVE AT THE QUANTITY OF CONCRETE REQUIRED TO COUNTERBALANCE AN UPWARD THRUST.

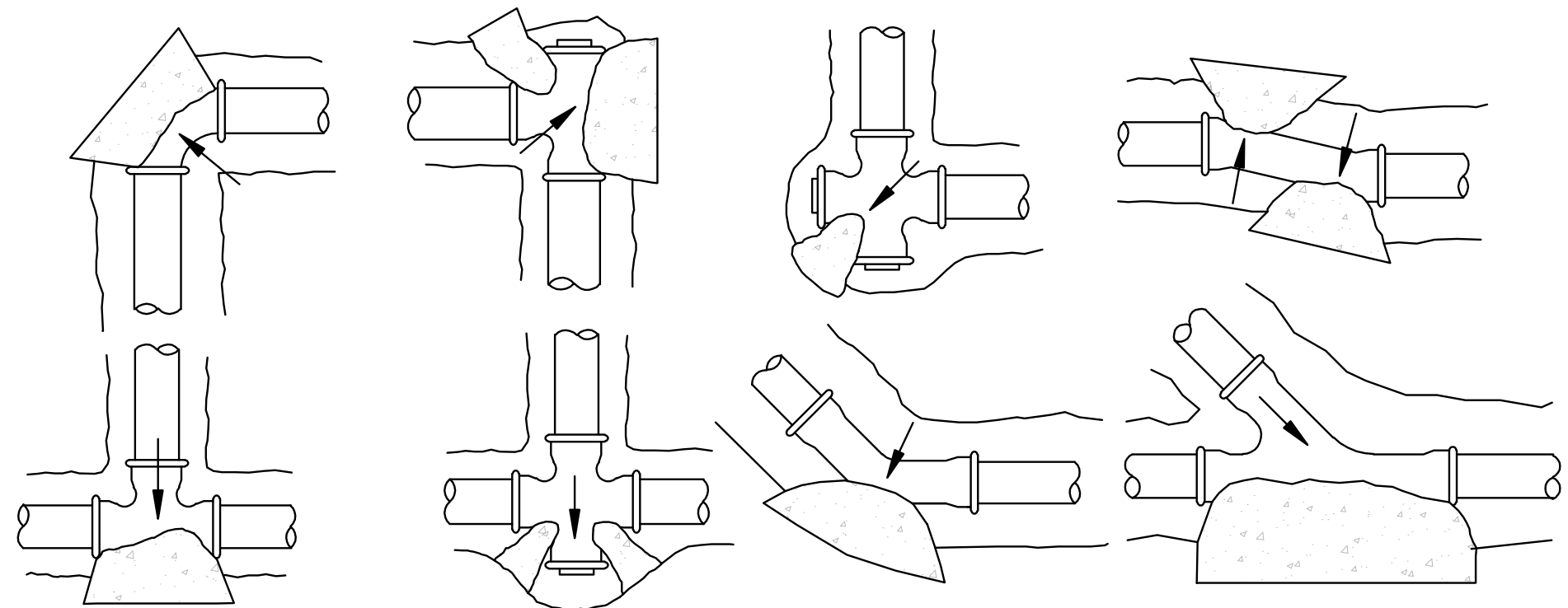
- A. FOLLOWING STEPS 1A & 1B ABOVE.
- B. DIVIDE THE THRUST OBTAINED FROM STEP 1B ABOVE BY 150 POUNDS PER CUBIC FOOT (CONCRETE DENSITY) TO ARRIVE AT THE QUANTITY OF CONCRETE REQUIRED IN CUBIC FEET.
- C. REINFORCE THE CONCRETE PER DETAIL NO. 2

| PIPE SIZE (IN.) | DEAD END, TEE OR FH | 90° ELBOW | 45° ELBOW | 22 1/2° ELBOW |
|-----------------|---------------------|-----------|-----------|---------------|
| 4               | 19                  | 27        | 15        | 7             |
| 6               | 39                  | 55        | 30        | 15            |
| 8               | 67                  | 94        | 51        | 26            |
| 10              | 109                 | 154       | 84        | 43            |
| 12              | 155                 | 218       | 119       | 61            |
| 14              | 210                 | 296       | 161       | 82            |
| 16              | 272                 | 383       | 209       | 106           |
| 18              | 351                 | 494       | 269       | 137           |
| 20              | 434                 | 611       | 333       | 169           |
| 24              | 623                 | 878       | 478       | 244           |

| SOILS AND SAFE BEARING LOADS                 | LBS. PER SQ. FT. |
|--|------------------|
| SOUND SHALE                                  | 10,000           |
| CEMENTED GRAVEL AND SAND (DIFFICULT TO PICK) | 4,000            |
| COARSE AND FINE COMPACTED SAND               | 3,000            |
| MEDIUM CLAY (CAN BE SPADED)                  | 2,000            |
| SOFT CLAY                                    | 1,000            |
| MUCK   | 0                |

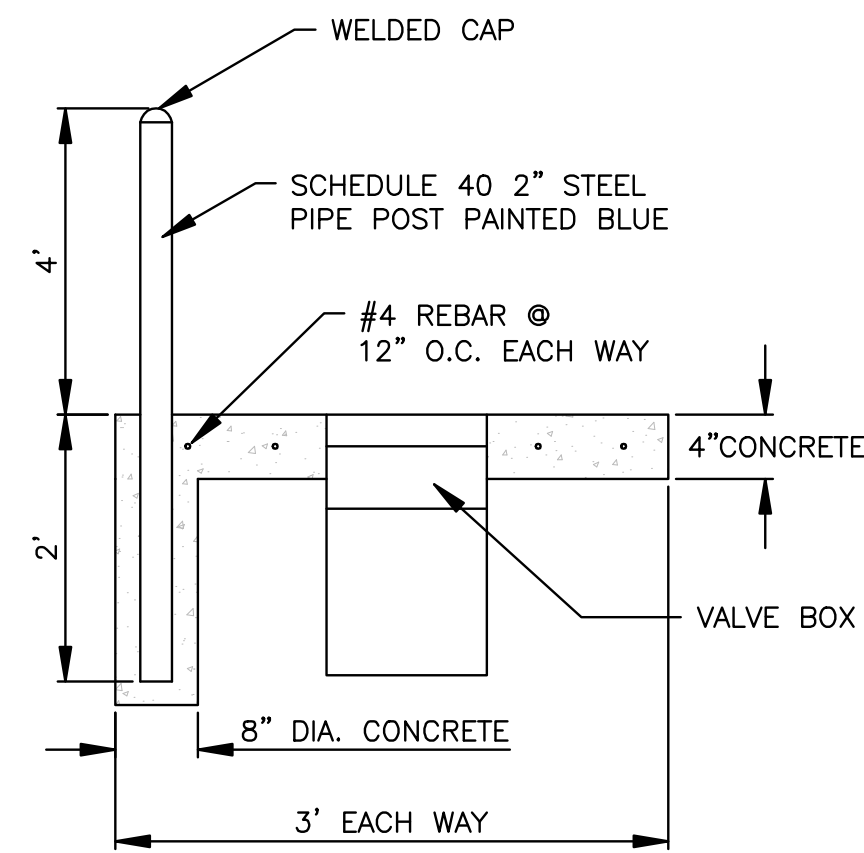
**GENERAL NOTES**

- 1. MINIMUM COVER FOR WATER MAIN IS 30".
- 2. TAPPING SLEEVES FOR ALL PIPE SIZES SHALL BE BOLTED TYPE, HEAVY DUTY, MADE FROM DUCTILE IRON USING CADMIUM PLATED IRON BOLTS OR STAINLESS STEEL WITH STAINLESS STEEL BOLTS, ETC. FOR LARGER THAN 24" PIPE, EPOXY COATED TAPPING SLEEVES (150 PSI WORKING PRESSURE) ARE ALLOWED WITH STAINLESS STEEL NUTS AND BOLTS, ANODE PROTECTION, SAND BACKFILL AND 12 MIL THICKNESS OF FUSION BONDED EPOXY COATING (INTERIOR/EXTERIOR). ALL SLEEVES SHALL BE WRAPPED IN ACCORDANCE WITH NOTE 3. TAPPING SLEEVES AND VALVES SHALL HAVE POURED CONCRETE BLOCKING. TAPPING SLEEVES ARE NOT ALLOWED PER MAIN LINE SIZES 12" AND SMALLER, A TEE SHALL BE CUT IN FOR THIS CONNECTION.
- 3. ALL BELOW GRADE DUCTILE-IRON PIPE, HYDRANTS, FITTINGS AND OTHER APPURTENANCE SHALL BE WRAPPED IN POLYETHYLENE IN ACCORDANCE WITH AWWA C105 (ANSI A21.5).
- 4. FIRE HYDRANTS: RESTRAINED JOINTS SHALL BE UTILIZED WITH A VALVE AND HYDRANT TEE AS SHOWN. CONCRETE THRUST BLOCKING IS NOT REQUIRED, UNLESS RESTRAINED JOINTS CANNOT BE USED AS DETERMINED BY THE CITY ENGINEER.
- 5. IF THE WATER MAIN IS LESS THAN 2'-0" FROM BACK OF CURB THE EXCAVATION SHALL BE BACKFILLED WITH LIMESTONE SCREENINGS COMPACTED TO 95% STANDARD PROCTOR DENSITY.
- 6. ALL FIRE HYDRANTS SHALL BE MUELLER SUPER CENTURIAN 2000, US PIPE METROPOLITAN 250, OR CLOW MEDALLION.
- 7. ALL FITTINGS SHALL BE SUPPORTED WITH POURED CONCRETE BLOCKING. VALVES SHALL BE SUPPORTED WITH CONCRETE BLOCKS (4" MIN. THICKNESS), OR POURED CONCRETE.
- 8. PRIVATE FIRE HYDRANTS AND PRIVATE VALVES SHALL BE MARKED AS PRIVATE.
- 9. IF FIRE HYDRANT LEAD EXCEEDS 20' THEN A SECOND ISOLATION VALVE SHALL BE INSTALLED.
- 11. VALVE BOXES SHALL BE ADJUSTED TO LEVEL WITH GROUND TO NO MORE THAN 2" ABOVE.



**DETAIL NO. 1**

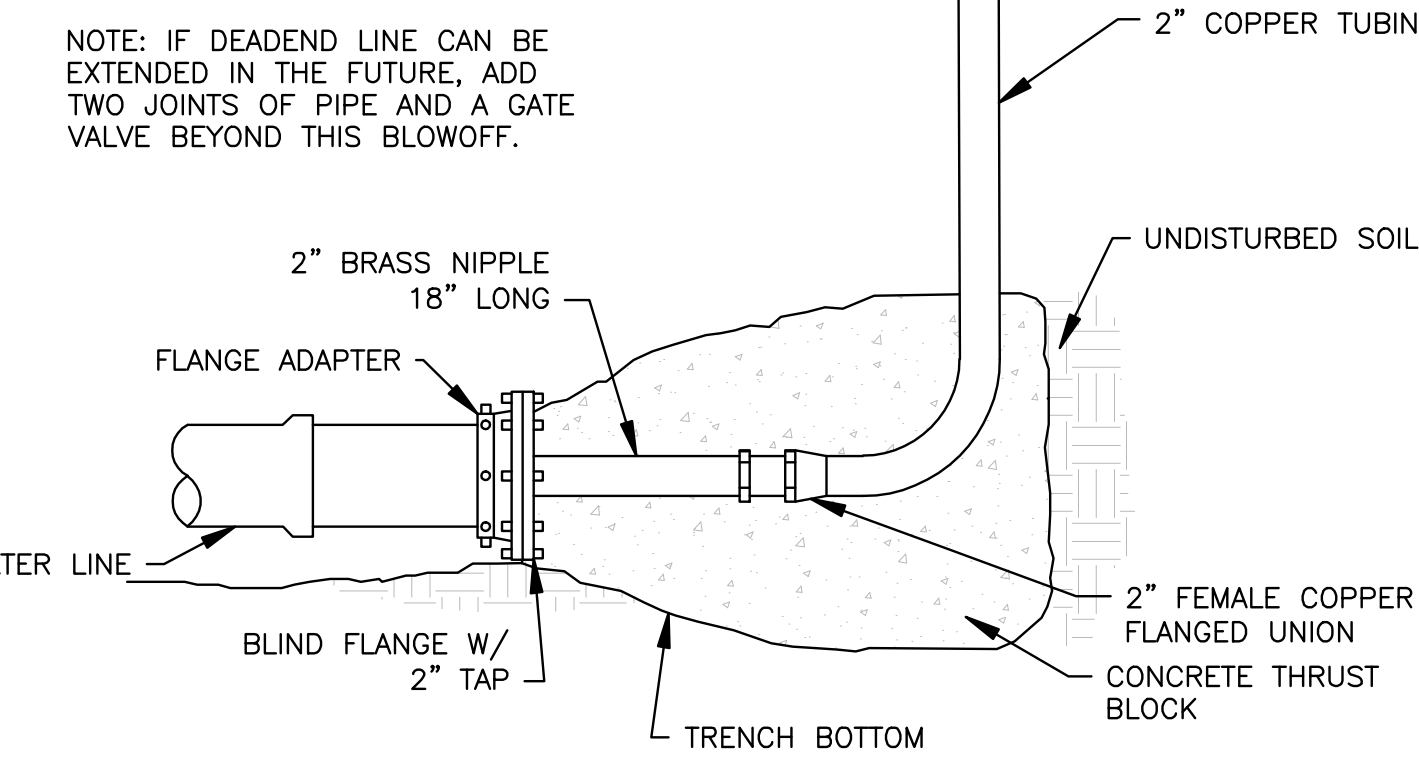
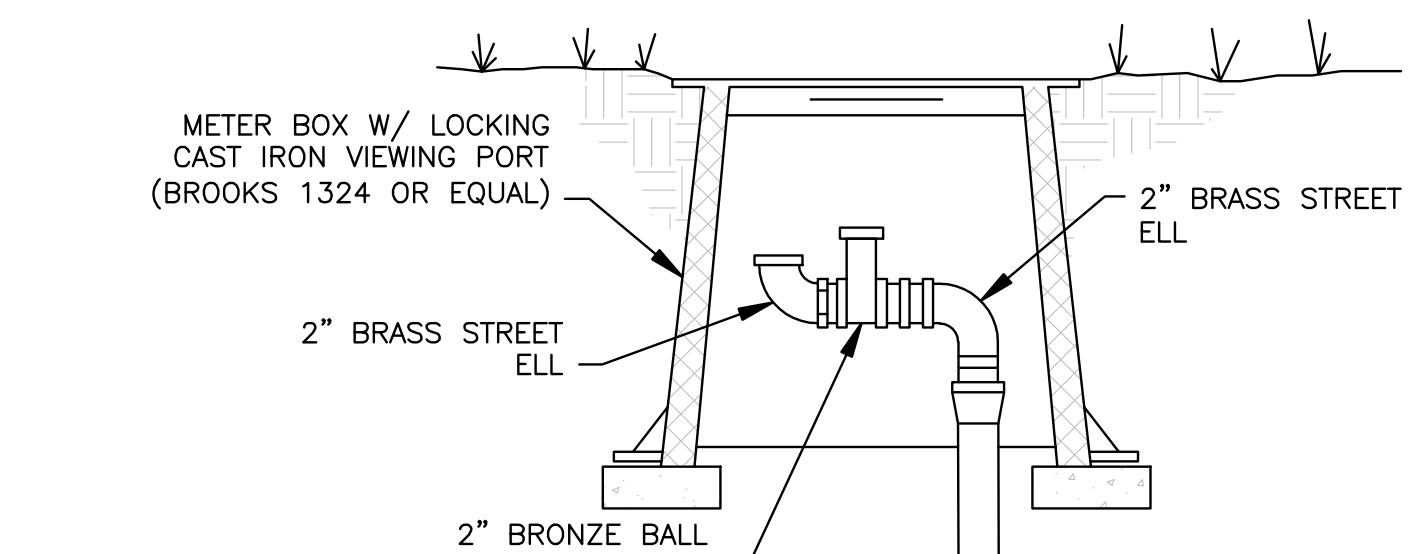
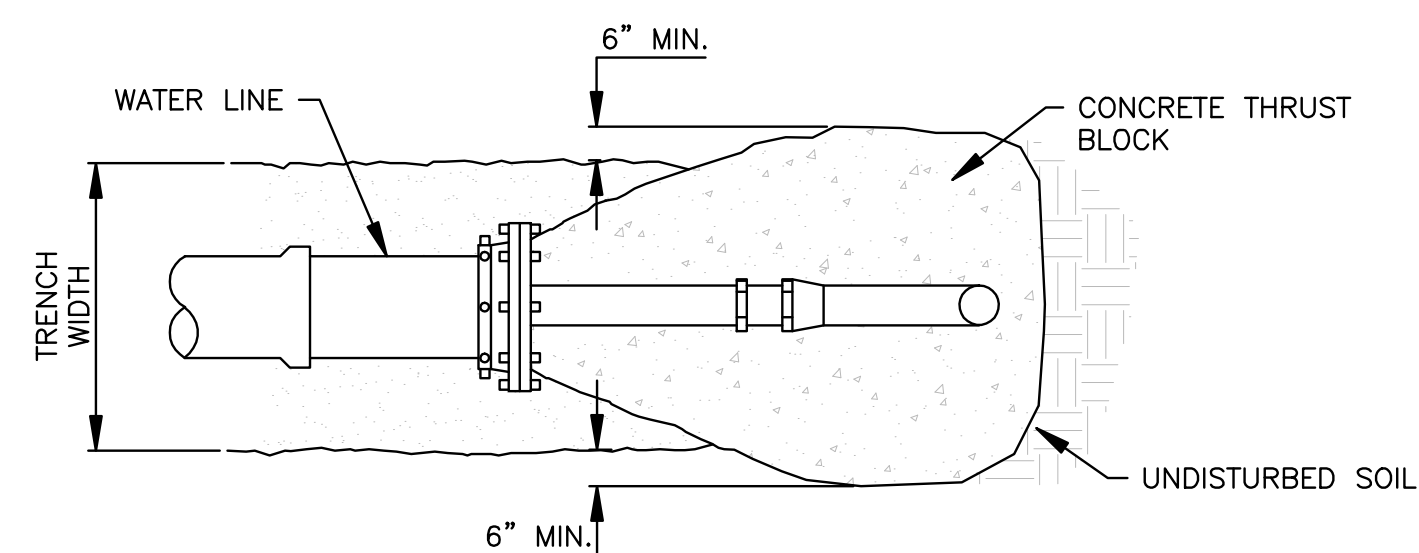
THRUST BLOCKS FOR HORIZONTAL & DOWNWARD THRUST (SEE MINIMUM THRUST BLOCK REQUIREMENT FOR MINIMUM SURFACE CONTACT AREA)



**VALVE BOX DETAIL**

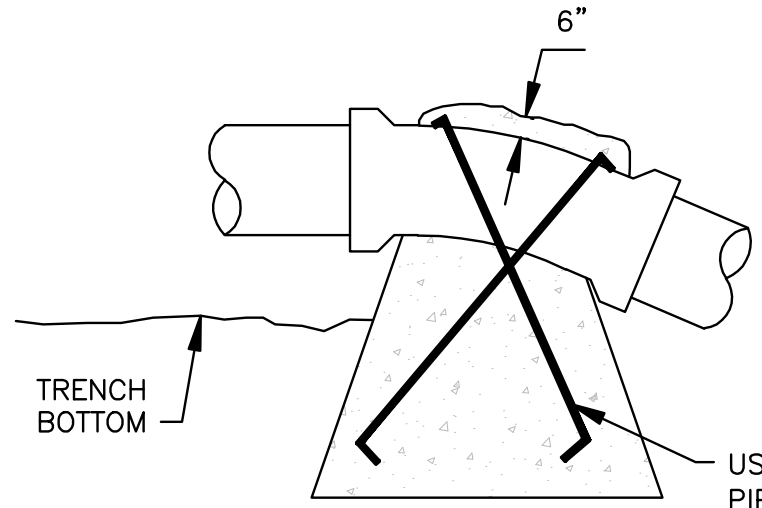
UNIMPROVED AREAS OR AS DIRECTED BY THE ENGINEER

NOTE: ALL CONCRETE FOR THRUST BLOCKING SHALL BE 2500 PSI



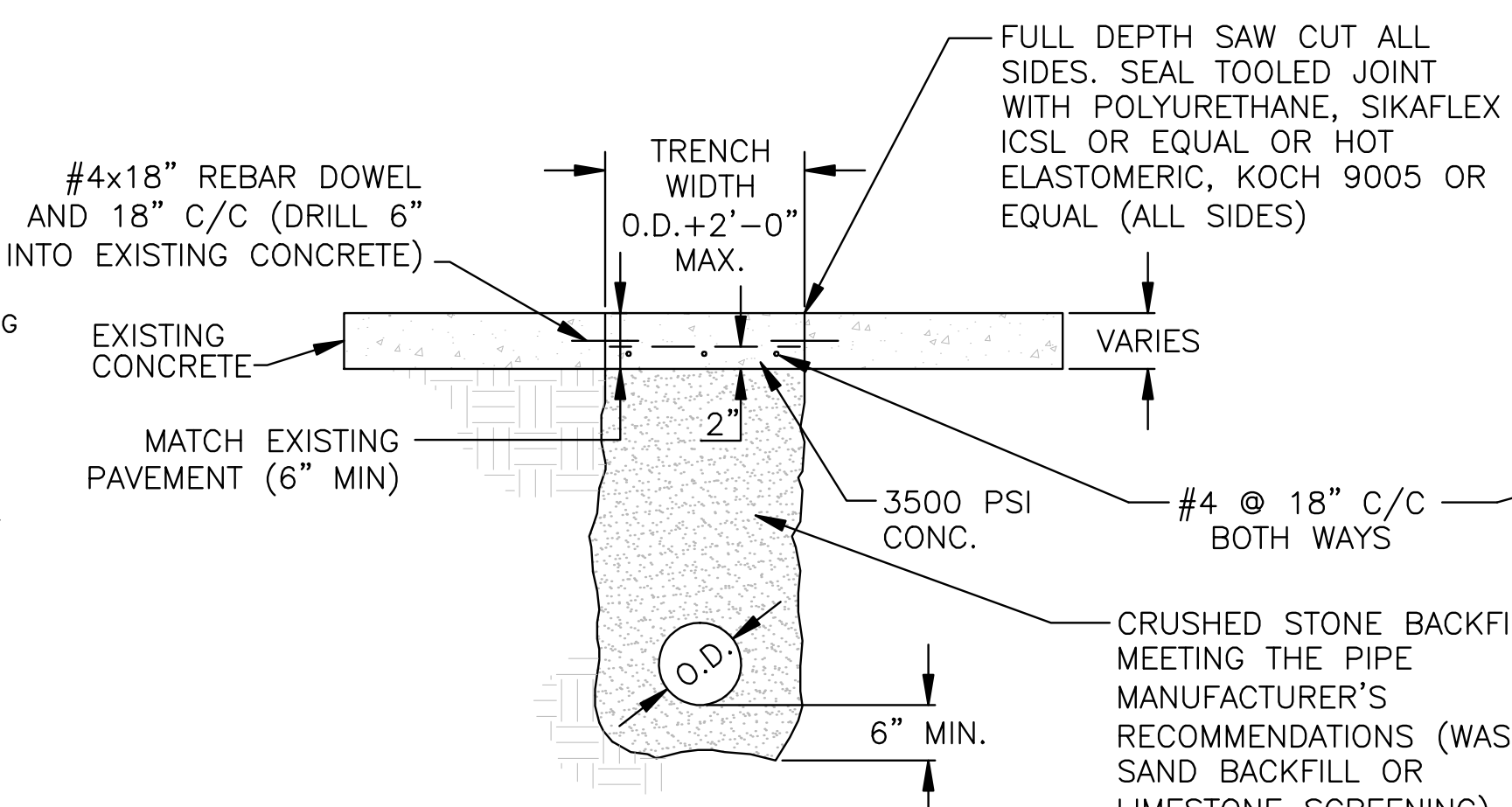
**DETAIL NO. 4**

2" BLOW-OFF FOR DEAD END WATER LINES



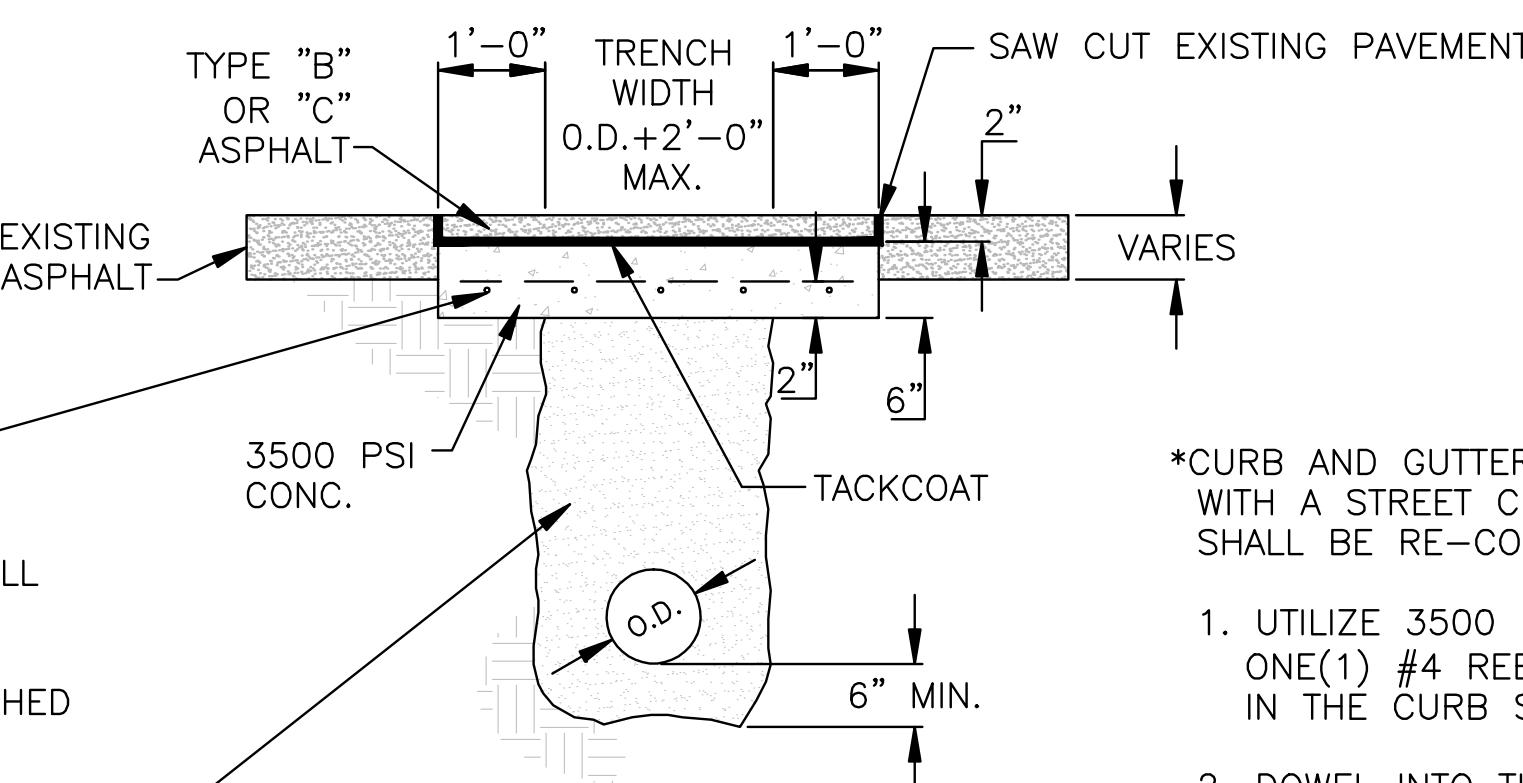
**DETAIL NO. 2**

THRUST BLOCKS FOR UPWARD THRUST



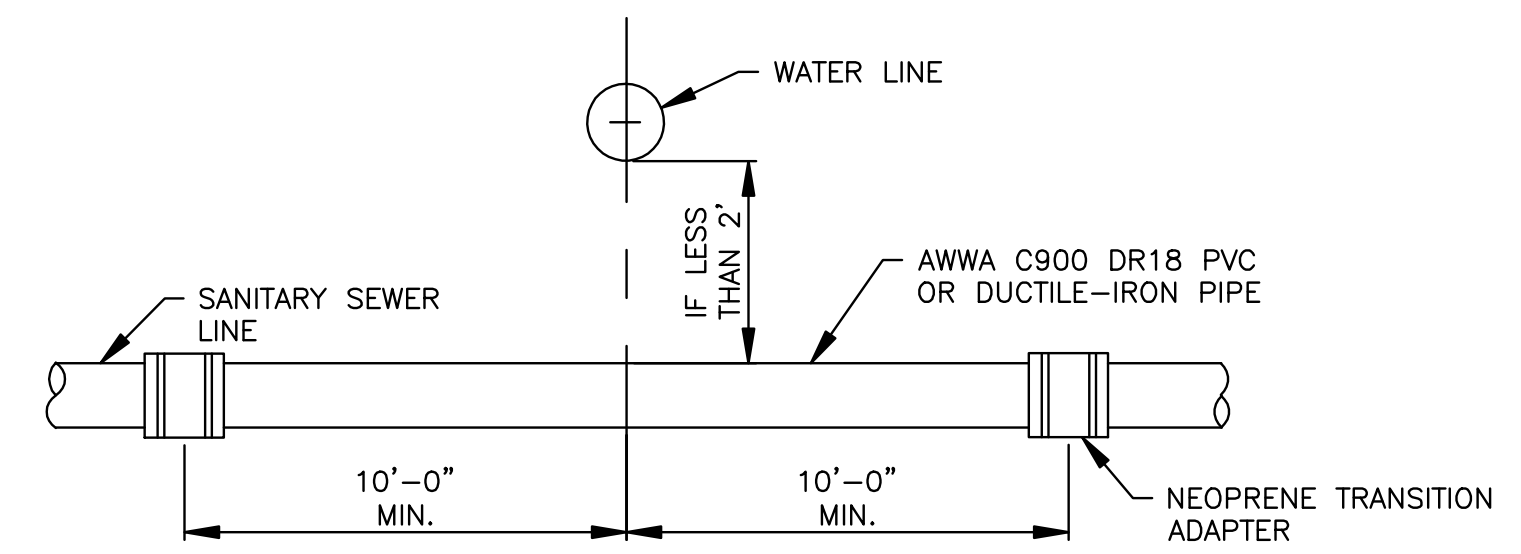
**DETAIL NO. 5**

\* CONCRETE PAVEMENT CUTS & PERMANENT REPAIRS



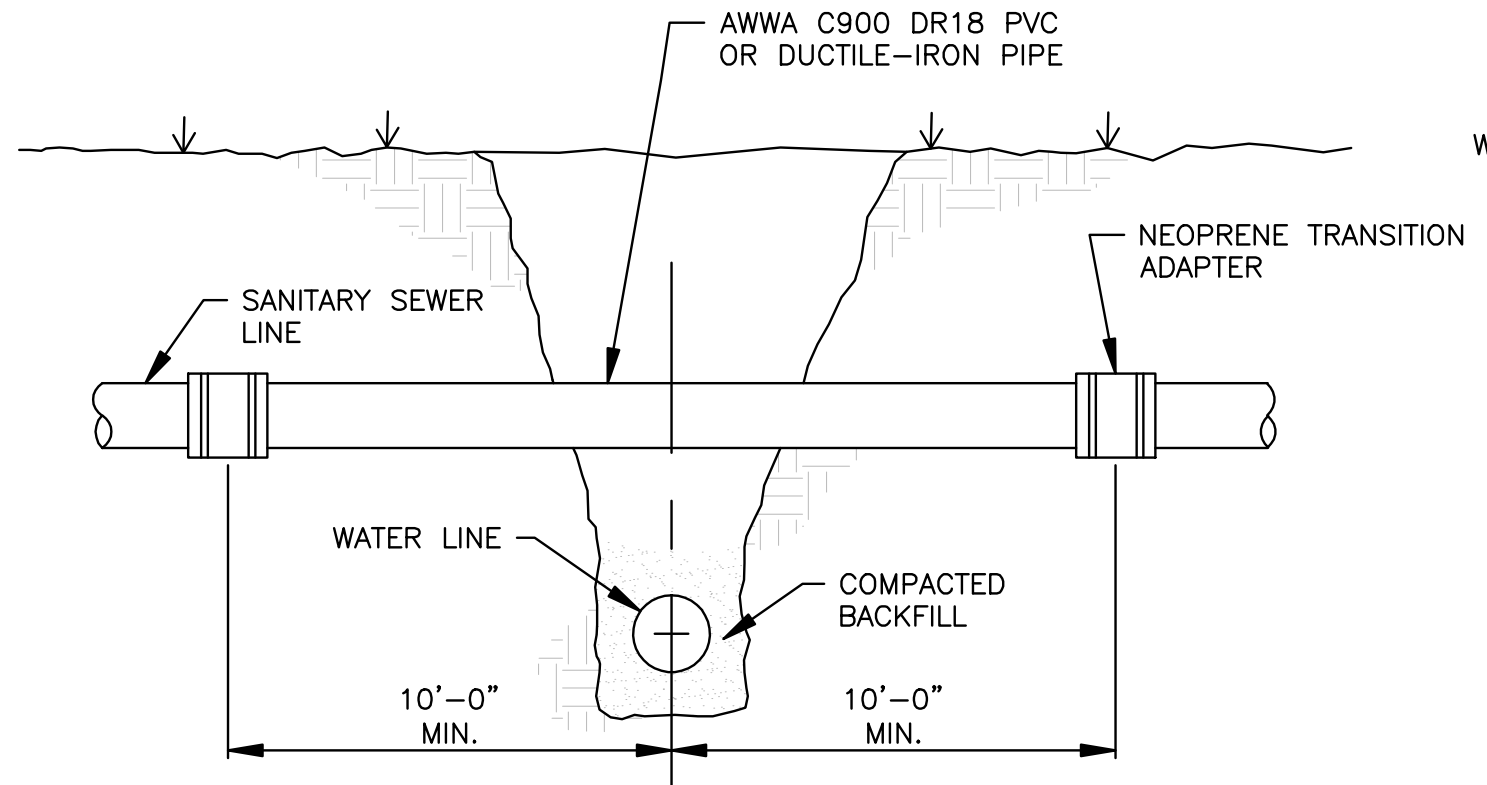
**DETAIL NO. 6**

\* ASPHALT PAVEMENT CUTS & PERMANENT REPAIRS



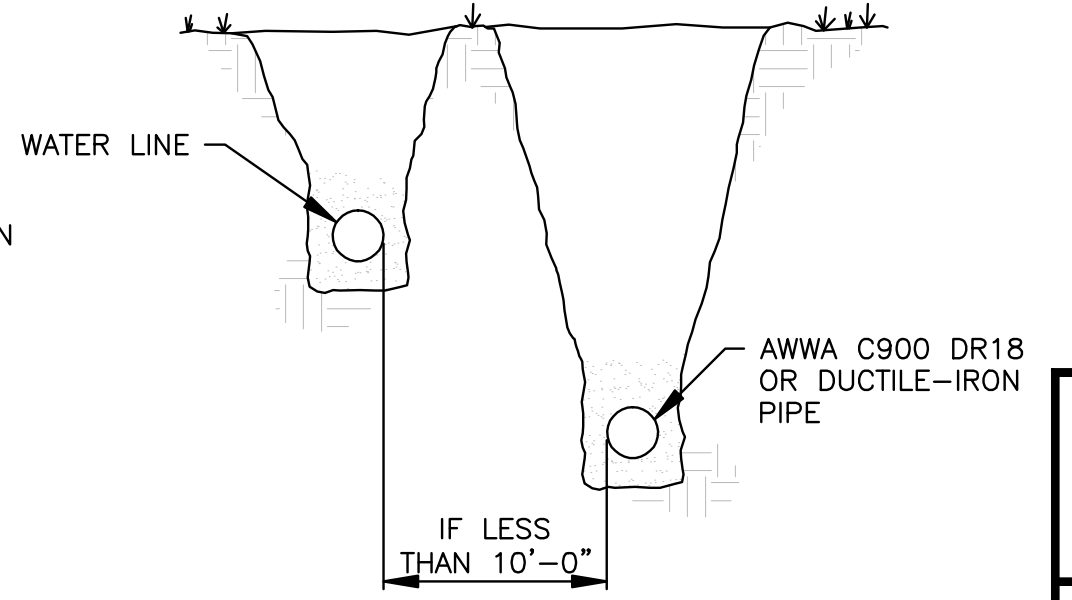
**DETAIL NO. 7**

WATER & SEWER LINE CROSSING WHEN WATER LINE IS ABOVE THE SEWER LINE & VERTICAL CLEARANCE IS LESS THAN 2'-0"



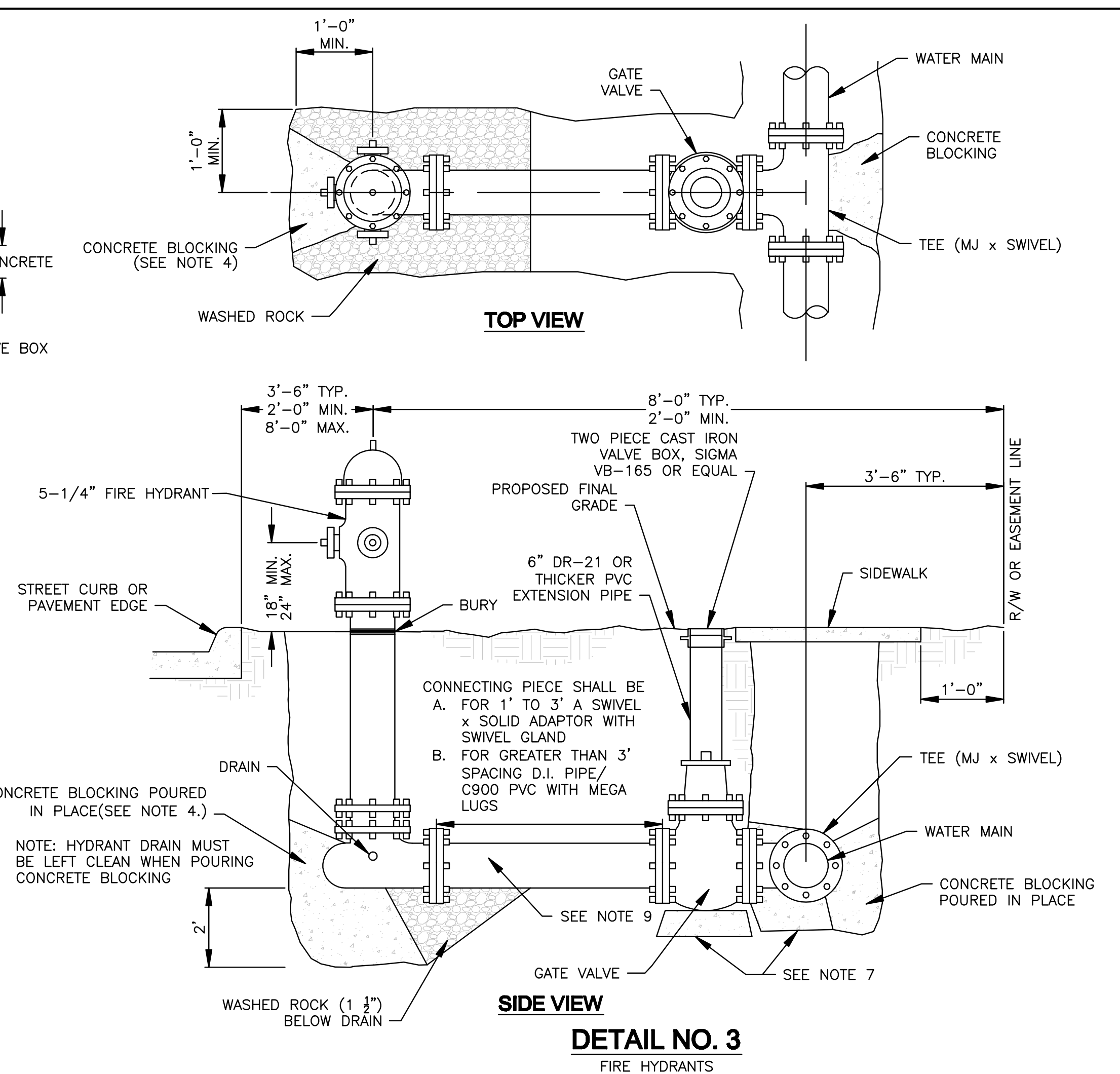
**DETAIL NO. 8**

WATER & SEWER LINE CROSSING WHEN WATER LINE IS BELOW SEWER LINE



**DETAIL NO. 9**

WATER & SEWER LINES WITH HORIZONTAL CLEARANCE OF LESS THAN TEN FEET



**DETAIL NO. 3**

FIRE HYDRANTS

\*CURB AND GUTTER REMOVED IN CONJUNCTION WITH A STREET CUT OR PERMANENT REPAIRS SHALL BE RE-CONSTRUCTED AS FOLLOWS:

- 1. UTILIZE 3500 PSI P.C. CONCRETE WITH ONE(1) #4 REBAR PLACED LONGITUDINALLY IN THE CURB SECTION.
- 2. DOWEL INTO THE EXISTING CURB AND GUTTER AND CONCRETE PAVEMENT WITH #4 REBARS DRIVEN A MINIMUM OF 6" @ 18" C/C.
- 3. EXPANSION/CONTRACTION/CONSTRUCTION JOINTS SHALL BE CONSTRUCTED ACCORDING TO CITY OF LAWTON STANDARD DETAILS FOR SUBDIVISION STREETS.

**STANDARD DETAILS WATER SYSTEM - 1**

**CITY OF LAWTON ENGINEERING DIVISION**

|                      |                                  |
|----------------------|----------------------------------|
| PROJECT NO.:         | DATE:                            |
| REVISION             | REVISION                         |
| CITY ENGINEER UPDATE | OCT 2004 CITY ENGINEER UPDATE    |
| CITY ENGINEER UPDATE | MAY 2006 CITY ENGINEER UPDATE    |
| CITY ENGINEER UPDATE | MAY 2006 CITY ENGINEER UPDATE    |
| CITY ENGINEER UPDATE | MAY 2009 CITY ENGINEER UPDATE    |
| CITY ENGINEER UPDATE | APRIL 2010 CITY ENGINEER UPDATE  |
| CITY ENGINEER UPDATE | AUGUST 2010 CITY ENGINEER UPDATE |
| DESIGNED BY:         | G. HENNESSEE                     |
| DRAWN BY:            | S. MALICOATI                     |
| AS BUILT DATE:       | ###                              |
| SHEET                | OF                               |

12/20/2014 11:25  
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