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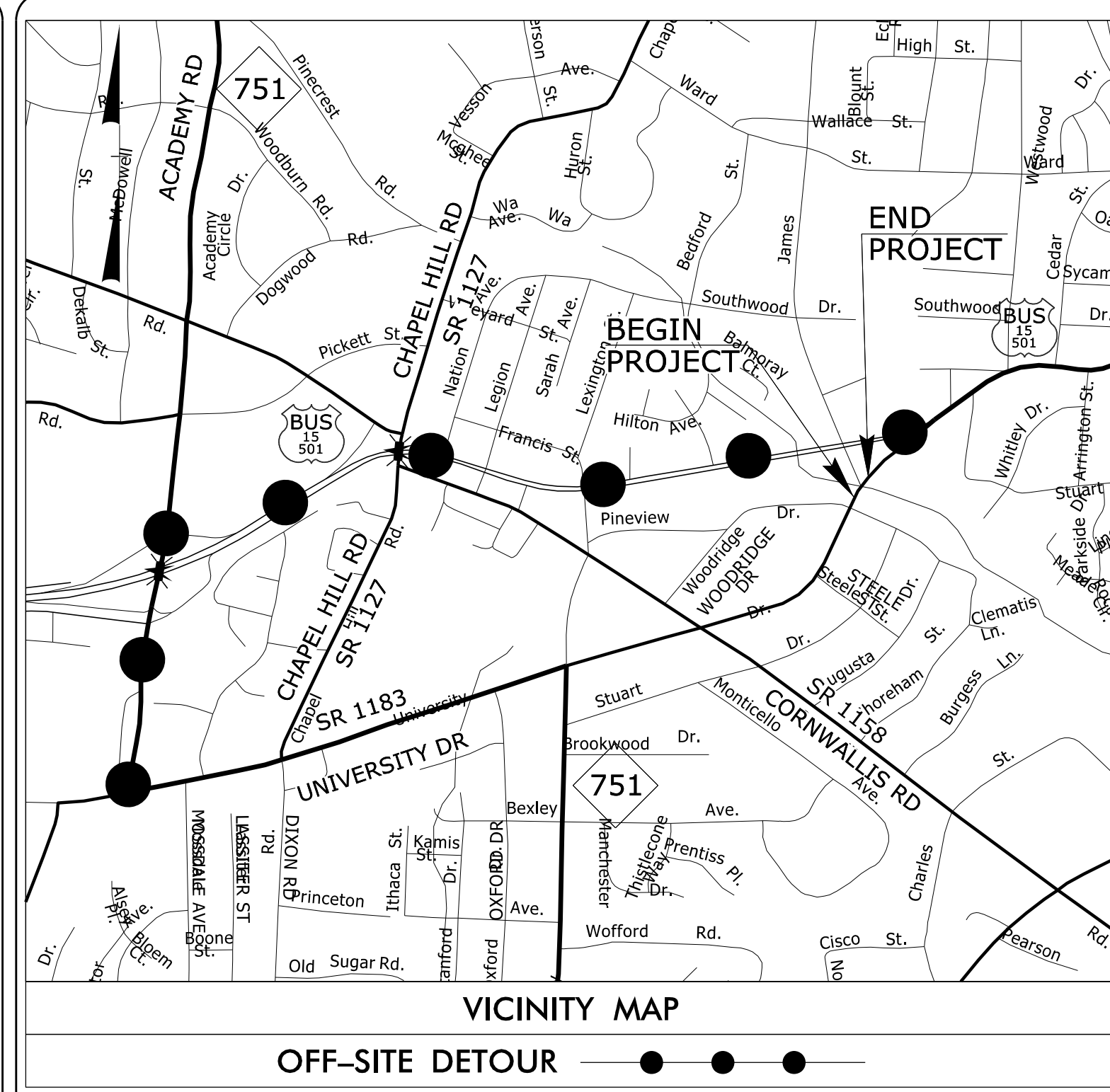
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**PROJECT: 17BP.5.C.02**



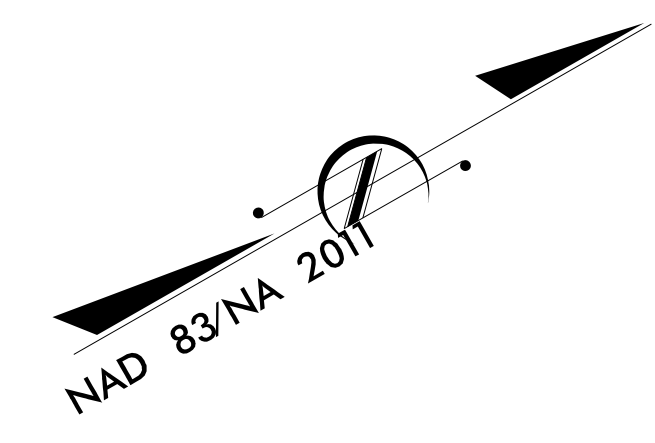
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

T.I.P. NO.	SHEET NO.
17BP.5.C.02	UC-1

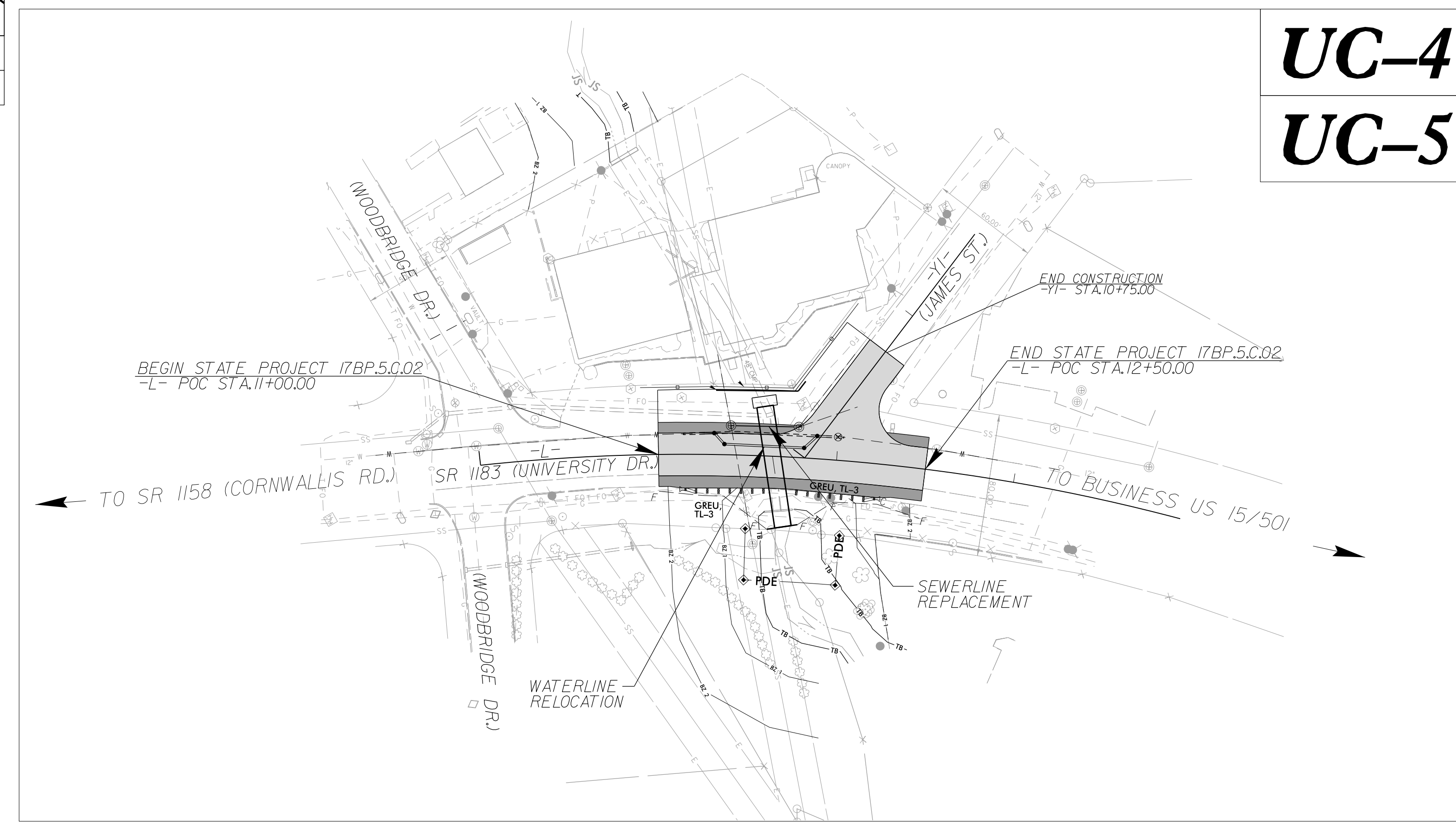
# UTILITY CONSTRUCTION PLANS DURHAM COUNTY

**LOCATION: PIPE REPLACEMENT AT SR 1183  
(UNIVERSITY DR. AND JAMES ST.)**

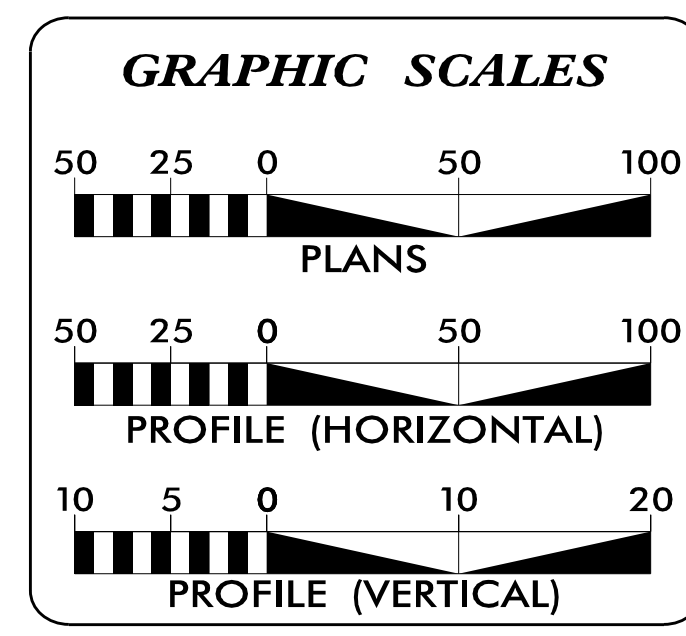
**TYPE OF WORK: SEWERLINE REPLACEMENT AND  
WATERLINE RELOCATION**



**UC-4**  
**UC-5**



DOCUMENT NOT CONSIDERED FINAL  
UNTIL ALL SIGNATURES ARE COMPLETED



SHEET NO.:	DESCRIPTION:
UC-1	TITLE SHEET
UC-2	UTILITY SYMBOLOGY
UC-3	NOTES
UC-3A THRU UC-3E	DETAILS
UC-4	SEWER LINE CONSTRUCTION PLAN AND PROFILE
UC-5	WATER LINE CONSTRUCTION PLAN AND PROFILE

**WATER AND SEWER  
OWNER ON PROJECT**

**1. CITY OF DURHAM**

PREPARED IN THE OFFICE OF:

**STEWART**

223 S WEST ST, STE 1100  
RALEIGH, NC 27603  
T 919.380.8750

Firm License #: C-1051  
www.stewartinc.com  
PROJECT #181001

**DAVID RUGGLES, PE** PROJECT ENGINEER

**ELIZABETH PHELPS, EI** PROJECT DESIGN ENGINEER

SEAL

DAVID RUGGLES  
12/11/2018

**DIVISION OF HIGHWAYS  
DIVISION 5  
PROJECT DELIVERY UNIT**

1555 MAIL SERVICES CENTER  
RALEIGH, NC 27699-1555  
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FAX (919) 250-4151

**S. REID DAVIDSON, P.E.** DDC ENGINEER

**DONALD PROPER** DIVISION 5 UTILITIES ENGINEER

**MONROE BROWN** DIVISION 5 UTILITIES COORDINATOR



**UTILITY CONSTRUCTION**

REVISIONS

Details Provided by APPIAN Consulting Engineers - www.appianengineers.com

### Minimum Restraint Length Chart (for Fittings) See Note 4

Nominal Size	Tee						Horizontal Bend			Reducer		Dead End	
	a	b (branch)					a	a	a	Smaller Line Size	Restraint Length	Restraint Length	
6"	9'	1'	13'	-	-	-	3'	5'	10'	23'	4"	16'	31'
8"	9'	1'	8'	23'	-	-	3'	6'	13'	30'	6"	17'	41'
12"	9'	1'	1'	14'	40'	-	5'	9'	18'	43'	8"	31'	59'
16"	9'	1'	1'	5'	34'	58'	-	6'	11'	23'	12"	33'	76'
24"	9'	1'	1'	1'	20'	48'	91'	8'	16'	33'	16"	60'	110'

See Note 1      See Note 2

#### Table Design Assumptions

Restrained pipe: DIP  
 Soil Type: CL  
 Safety Factor: 1.5:1 (covers most installations)  
 Trench Bury: Pipe bedding in 4" of loose soil with backfill lightly consolidated to top of pipe.  
 Bury Depth: 3 ft.  
 Test Pressure: 200 psi

**TEE**  
 a = Assumed length of solid pipe along run without joints or fittings.  
 b = Length of Restrained Branch Required

**REDUCER**

**DEAD END**

**NOTES:**

- If the length of the solid pipe on either side of the tee or the diameters on any leg of the tee varies, this table does not apply and the restraint length must be calculated.
- If the diameter of the smaller pipe is anything other than what is shown, restraint length must be calculated.
- If any of the assumptions vary from what is shown in the table, the restraint length must be calculated.
- Minimum restraint length to be verified by the design engineer for each project.
- Thrust restraint data shown in Table is based on DIPRA (Ductile Iron Pipe Research Association) guidelines.

**DURHAM** City of Durham, NC  
 Dept. of Water Management  
 1600 Mist Lake Dr.  
 Durham, N.C. 27704  
 Voice (919) 560-4381  
 www.durhamnc.gov

**RESTRAINT LENGTH CHART (FOR FITTINGS)**  
 SCALE: Not To Scale    DETAIL # 512.04  
 REVISION DATE: Feb., 2017    SHEET #: 1 of 1

Details Provided by APPIAN Consulting Engineers - www.appianengineers.com

JOINT RESTRAINT SYSTEM REQUIRED AT ALL JOINTS ON VERTICAL BENDS

ADAPTER TO DIP (IF APPLICABLE) LOCATION BEYOND REQUIRED RESTRAINT LENGTH.

11 1/4, 22 1/2, or 45 DEGREE BENDS AS REQUIRED. (TYPICAL 4 PLACES OR AS NEEDED)

a = Length of DIP required for restraint to be determined by designer & shown on drawings.

#### ALTERNATE OFFSET BEND (6" WATER LINE)

AVAILABLE SIZES	MJ x PE OR MJ x MJ PIPE	
6"x6"	6"x12"	6"x24"
A 6"	12"	24"
B 18"	30"	41"

**NOTES:**

- The offset is to be assembled above ground first.
- Record all as-built lengths using the center lines of the pipes or bends as reference points.
- Adapters vary in type according to the material of the existing water main.
- Compact ductile iron (350 p.s.i.) fire hydrant offset connector pipe (AWWA C153/ANSI A21.53 / And AWWA C104/ANSI A21.4) equal to or exceeding "GRADE LOK" as manufactured by: Assured Flow Sales, Inc., 1-(800)-388-0678
- All mechanical joint fittings or valves shall have a joint restraint system.

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**VERTICAL OFFSET DETAIL**  
 SCALE: Not To Scale    DETAIL # 512.05  
 REVISION DATE: Feb., 2017    SHEET #: 1 of 1

Details Provided by APPIAN Consulting Engineers - www.appianengineers.com

EXTERNAL JOINT WRAP ON ALL BURIED JOINTS PER DETAIL 732.11  
 SEAL INSIDE & OUTSIDE OF ALL JOINTS WITH HYDRAULIC CEMENT

SEE DETAILS 732.02 & 732.03 FOR MANHOLE CONSTRUCTION

5'-0" DIAMETER (MINIMUM)

(DH) DROP HEIGHT = 2.5' MIN. (NOTES 2 & 3)

CONCRETE MANHOLE & BLOCKING TO REST ON COMPACTED No. 57 STONE

**NOTES:**

- No inside drops allowed unless approved by City's Engineer.
- An outside drop is required when influent invert is greater than 6" above the invert of effluent line.
- The minimum allowable distance between the outside drop and the invert is 2.5 ft.

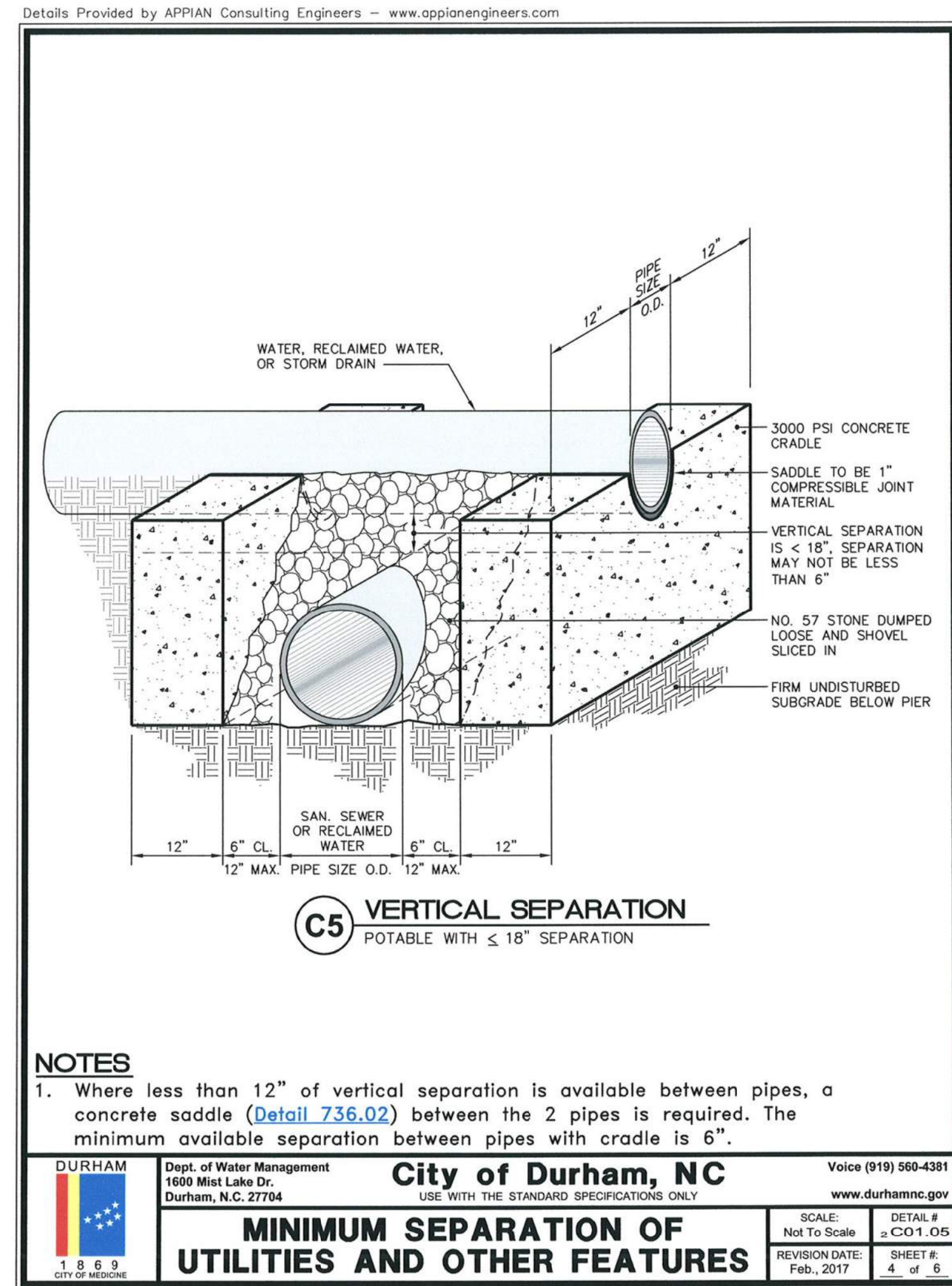
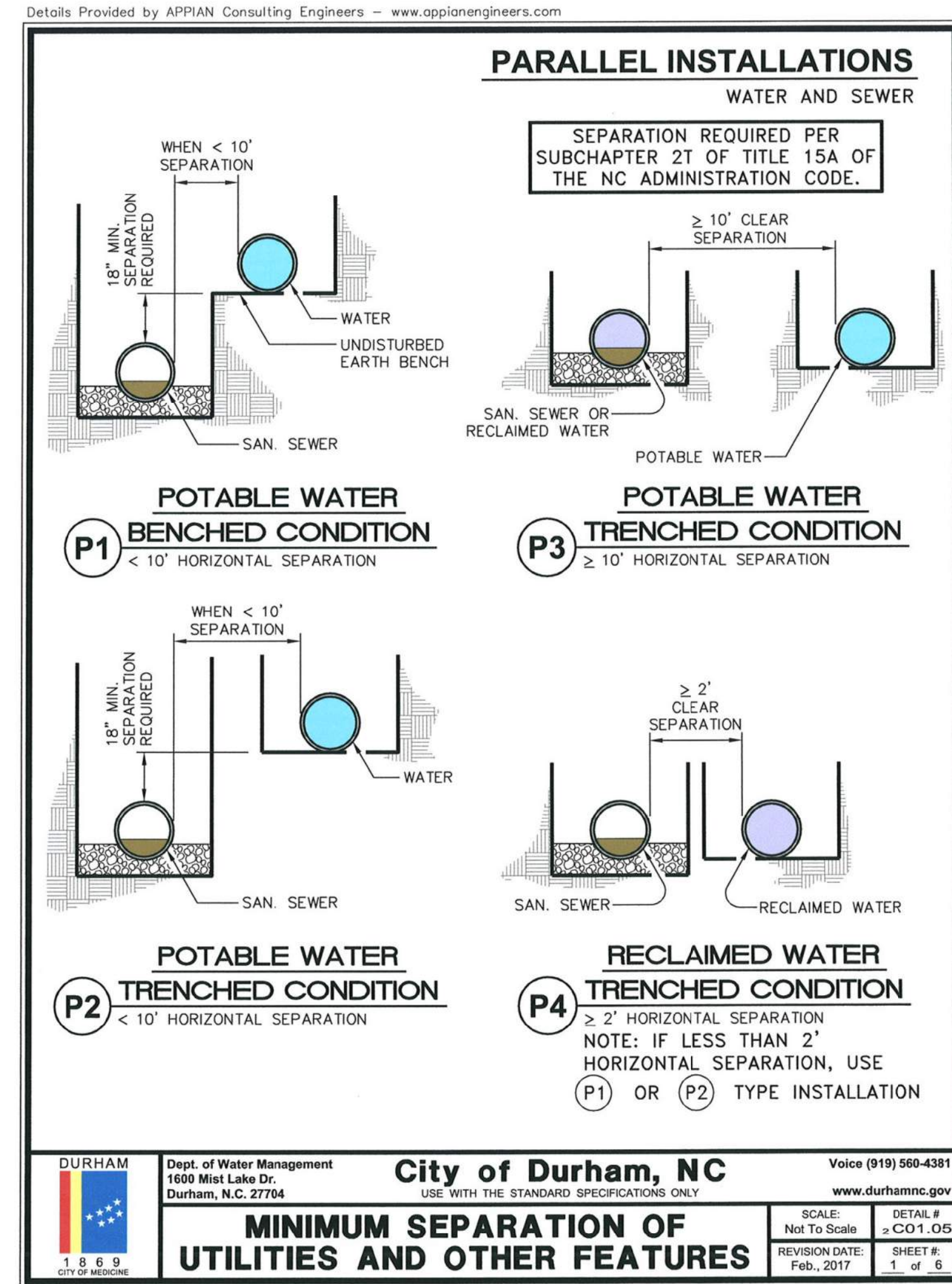
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**SANITARY SEWER OUTSIDE DROP MANHOLE**  
 SCALE: Not To Scale    DETAIL # 732.06  
 REVISION DATE: Feb., 2017    SHEET #: 1 of 1



UTILITY CONSTRUCTION

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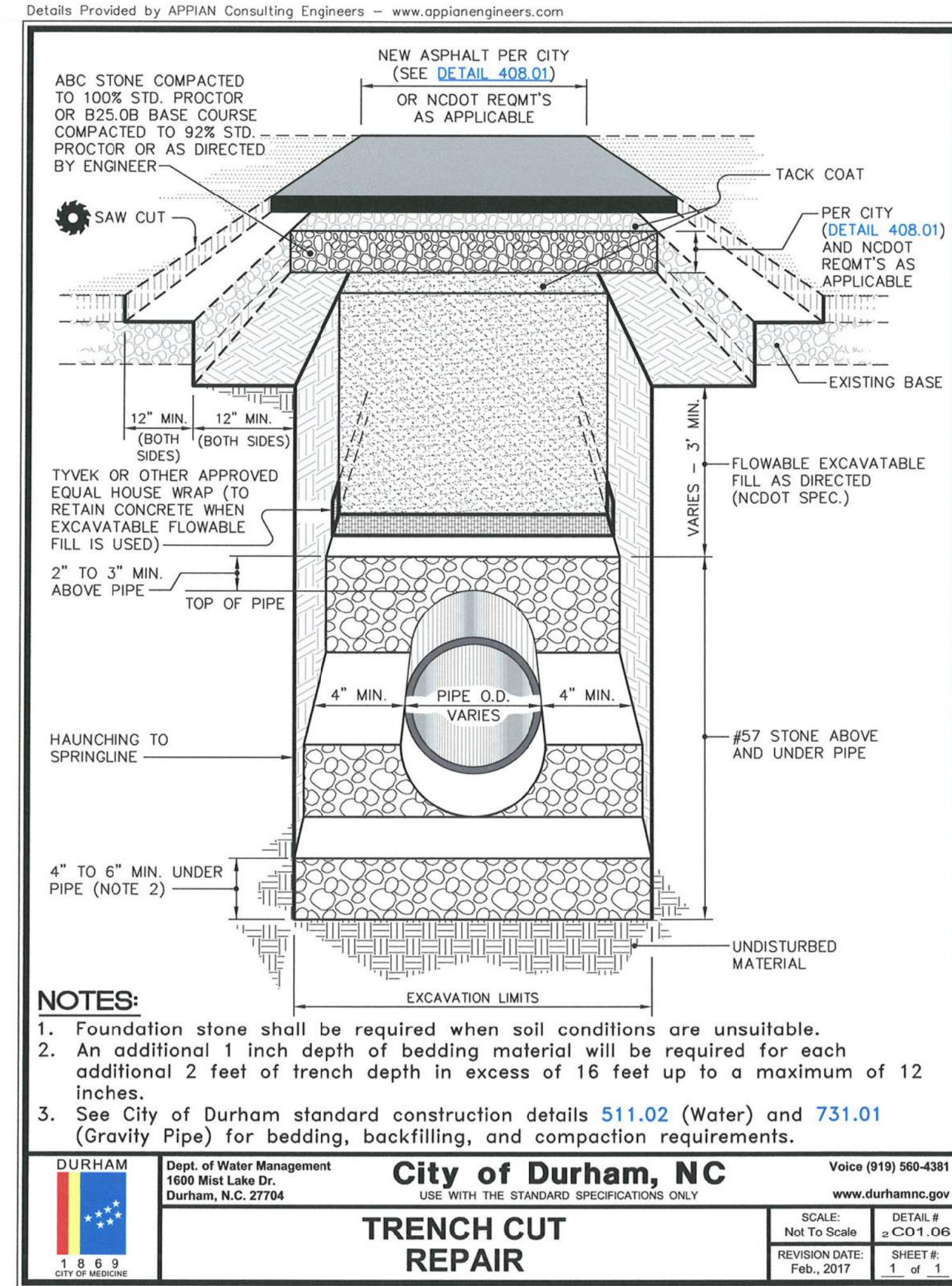
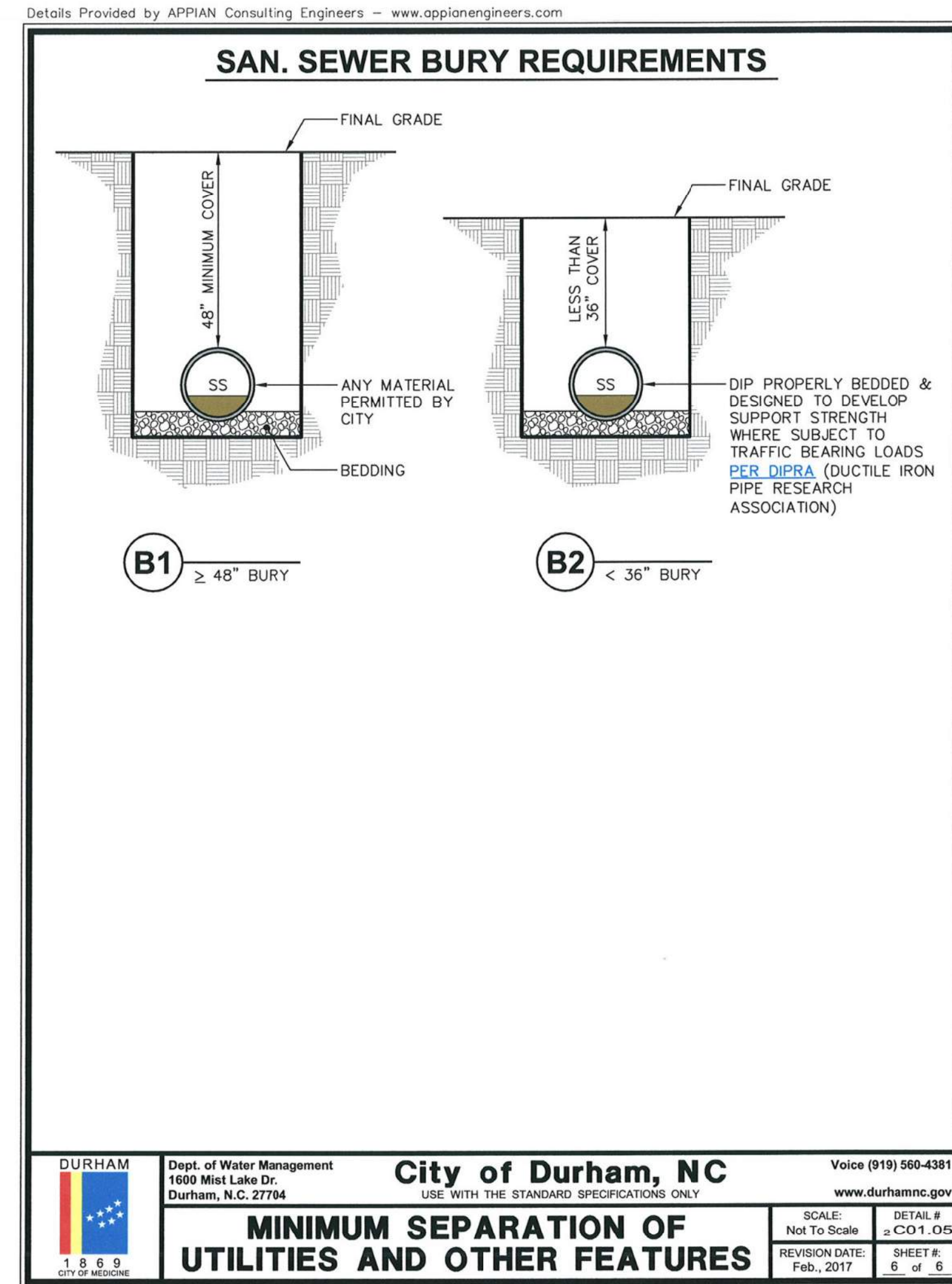


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STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# UTILITIES PLAN SHEET SYMBOLS

## PROPOSED WATER SYMBOLS

Water Line (Sized as Shown)	
11 1/4 Degree Bend	
22 1/2 Degree Bend	
45 Degree Bend	
90 Degree Bend	
Plug	
Tee	
Cross	
Reducer	
Gate Valve	
Butterfly Valve	
Tapping Valve	
Line Stop	
Line Stop with Bypass	
Blow Off	
Fire Hydrant	
Relocate Fire Hydrant	
Remove Fire Hydrant	REM FH
Water Meter	
Relocate Water Meter	
Remove Water Meter	REM WM
Water Pump Station	
RPZ Backflow Preventer	
DCV Backflow Preventer	
Relocate RPZ Backflow Preventer	
Relocate DCV Backflow Preventer	

## PROPOSED SEWER SYMBOLS

Gravity Sewer Line (Sized as Shown)	
Force Main Sewer Line (Sized as Shown)	
Manhole (Sized per Note)	
Sewer Pump Station	

## PROPOSED MISCELLANEOUS UTILITIES SYMBOLS

Power Pole	
Telephone Pole	
Joint Use Pole	
Telephone Pedestal	
Utility Line by Others (Type as Shown)	
Trenchless Installation	
Encasement by Open Cut	
Encasement	

Thrust Block	
Air Release Valve	
Utility Vault	
Concrete Pier	
Steel Pier	
Plan Note	
Pay Item Note	

## EXISTING UTILITIES SYMBOLS

Power Pole		*Underground Power Line	
Telephone Pole		*Underground Telephone Cable	
Joint Use Pole		*Underground Telephone Conduit	
Utility Pole		*Underground Fiber Optics Telephone Cable	
Utility Pole with Base		*Underground TV Cable	
H-Frame Pole		*Underground Fiber Optics TV Cable	
Power Transmission Line Tower		*Underground Gas Pipeline	
Water Manhole		Aboveground Gas Pipeline	
Power Manhole		*Underground Water Line	
Telephone Manhole		Aboveground Water Line	
Sanitary Sewer Manhole		*Underground Gravity Sanitary Sewer Line	
Hand Hole for Cable		Aboveground Gravity Sanitary Sewer Line	
Power Transformer		*Underground SS Forced Main Line	
Telephone Pedestal		Underground Unknown Utility Line	
CATV Pedestal		SUE Test Hole	
Gas Valve		Water Meter	
Gas Meter		Water Valve	
Located Miscellaneous Utility Object		Fire Hydrant	
Abandoned According to Utility Records	AATUR	Sanitary Sewer Cleanout	
End of Information	E.O.I.		

\*For Existing Utilities  
 Utility Line Drawn from Record (Type as Shown)  
 Designated Utility Line (Type as Shown)

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STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**NOTES**

**GENERAL NOTES**

1. THE PROPOSED UTILITY CONSTRUCTION SHALL MEET THE APPLICABLE REQUIREMENTS OF THE NC DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2018 AND APPLICABLE REQUIREMENTS OF THE CITY OF DURHAM PUBLIC UTILITIES AND CROSS CONNECTION CONTROL REGULATIONS AND STANDARDS. IF THERE ARE ANY CONFLICTS BETWEEN NCDOT SPECIFICATIONS AND CITY OF DURHAM SPECIFICATIONS, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
2. THE EXISTING UTILITIES BELONG TO THE CITY OF DURHAM.
3. ALL WATER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES, PUBLIC WATER SUPPLY SECTION. ALL SEWER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT QUALITY, DIVISION OF WATER RESOURCES, WATER QUALITY SECTION. PERFORM ALL WORK IN ACCORDANCE WITH THE APPLICABLE PLUMBING CODES.
4. THE UTILITY OWNER OWNS THE EXISTING UTILITY FACILITIES AND WILL OWN THE NEW UTILITY FACILITIES AFTER ACCEPTANCE BY THE DEPARTMENT. THE DEPARTMENT OWNS THE CONSTRUCTION CONTRACT AND HAS ADMINISTRATIVE AUTHORITY. COMMUNICATIONS AND DECISIONS BETWEEN THE CONTRACTOR AND UTILITY OWNER ARE NOT BINDING UPON THE DEPARTMENT OR THIS CONTRACT UNLESS AUTHORIZED BY THE ENGINEER. AGREEMENTS BETWEEN THE UTILITY OWNER AND CONTRACTOR FOR THE WORK THAT IS NOT PART OF THIS CONTRACT OR IS SECONDARY TO THIS CONTRACT ARE ALLOWED, BUT ARE NOT BINDING UPON THE DEPARTMENT.

5. PROVIDE ACCESS FOR THE DEPARTMENT PERSONNEL AND THE OWNER'S REPRESENTATIVES TO ALL PHASES OF CONSTRUCTION. NOTIFY DEPARTMENT PERSONNEL AND THE UTILITY OWNER TWO WEEKS PRIOR TO COMMENCEMENT OF ANY WORK AND ONE WEEK PRIOR TO SERVICE INTERRUPTION. KEEP UTILITY OWNERS' REPRESENTATIVES INFORMED OF WORK PROGRESS AND PROVIDE OPPORTUNITY FOR INSPECTION OF CONSTRUCTION AND TESTING.
6. THE PLANS DEPICT THE BEST AVAILABLE INFORMATION FOR THE LOCATION, SIZE, AND TYPE OF MATERIAL FOR ALL EXISTING UTILITIES. MAKE INVESTIGATIONS FOR DETERMINING THE EXACT LOCATION, SIZE, AND TYPE MATERIAL OF THE EXISTING FACILITIES AS NECESSARY FOR THE CONSTRUCTION OF THE PROPOSED UTILITIES AND FOR AVOIDING DAMAGE TO EXISTING FACILITIES. REPAIR ANY DAMAGE INCURRED TO EXISTING FACILITIES TO THE ORIGINAL OR BETTER CONDITION AT NO ADDITIONAL COST TO THE DEPARTMENT.
7. MAKE FINAL CONNECTIONS OF THE NEW WORK TO THE EXISTING SYSTEM WHERE INDICATED ON THE PLANS, AS REQUIRED TO FIT THE ACTUAL CONDITIONS, OR AS DIRECTED.
8. MAKE CONNECTIONS BETWEEN EXISTING AND PROPOSED UTILITIES AT TIMES MOST CONVENIENT TO THE PUBLIC, WITHOUT ENDANGERING THE UTILITY SERVICE, AND IN ACCORDANCE WITH THE UTILITY OWNER'S REQUIREMENTS. MAKE CONNECTIONS ON WEEKENDS, AT NIGHT, AND ON HOLIDAYS IF NECESSARY.
9. ALL UTILITY MATERIALS SHALL BE APPROVED PRIOR TO DELIVERY TO THE PROJECT. SEE 1500-7, " SUBMITTALS AND RECORDS" IN SECTION 1500 OF THE STANDARD SPECIFICATIONS.

**SEWER REPLACEMENT**

1. A PUMP AROUND WILL BE UTILIZED BETWEEN MANHOLE 1 AND MANHOLE 2 TO ALLOW FOR INSTALLATION OF NEW SEWERLINE. CONTRACTOR TO SUBMIT PROPOSED PUMP AROUND PROCEDURE TO ENGINEER FOR APPROVAL AT LEAST 10 DAYS PRIOR TO BEGINNING WORK.
2. INSTALL AND ACTIVATE PUMP AROUND. SEE SPECIAL PROVISIONS FOR SEWER LINE PUMP AROUND.
3. REMOVE EXISTING 8" VCP AND EXTERIOR DROP FROM MANHOLE 1 TO MANHOLE 2.
4. REMOVE EXISTING DOUBLE 48" CORRUGATED METAL PIPE AND INSTALL PROPOSED 9'-3" X 6'-5" CORRUGATED ALUMINUM STRUCTURAL PLATE PIPE ARCH.
5. INSTALL CLASS IV SELECT BACKFILL AS SHOWN ON PLANS UP TO ELEVATION OF SEWERLINE. INSTALL CONCRETE SADDLES AS PER CITY OF DURHAM DETAIL C01.05.
6. INSTALL NEW 8" DUCTILE IRON PIPE FROM MANHOLE 1 TO MANHOLE 2, INCLUDING NEW DROP CONNECTION TO MANHOLE 2.
7. NEW SYSTEM SHALL BE TESTED AND APPROVED BY NCDOT AND THE CITY OF DURHAM.
8. REDIRECT FLOW TO NEW 8" DUCTILE IRON PIPE.
9. REMOVE TEMPORARY PUMP AROUND.

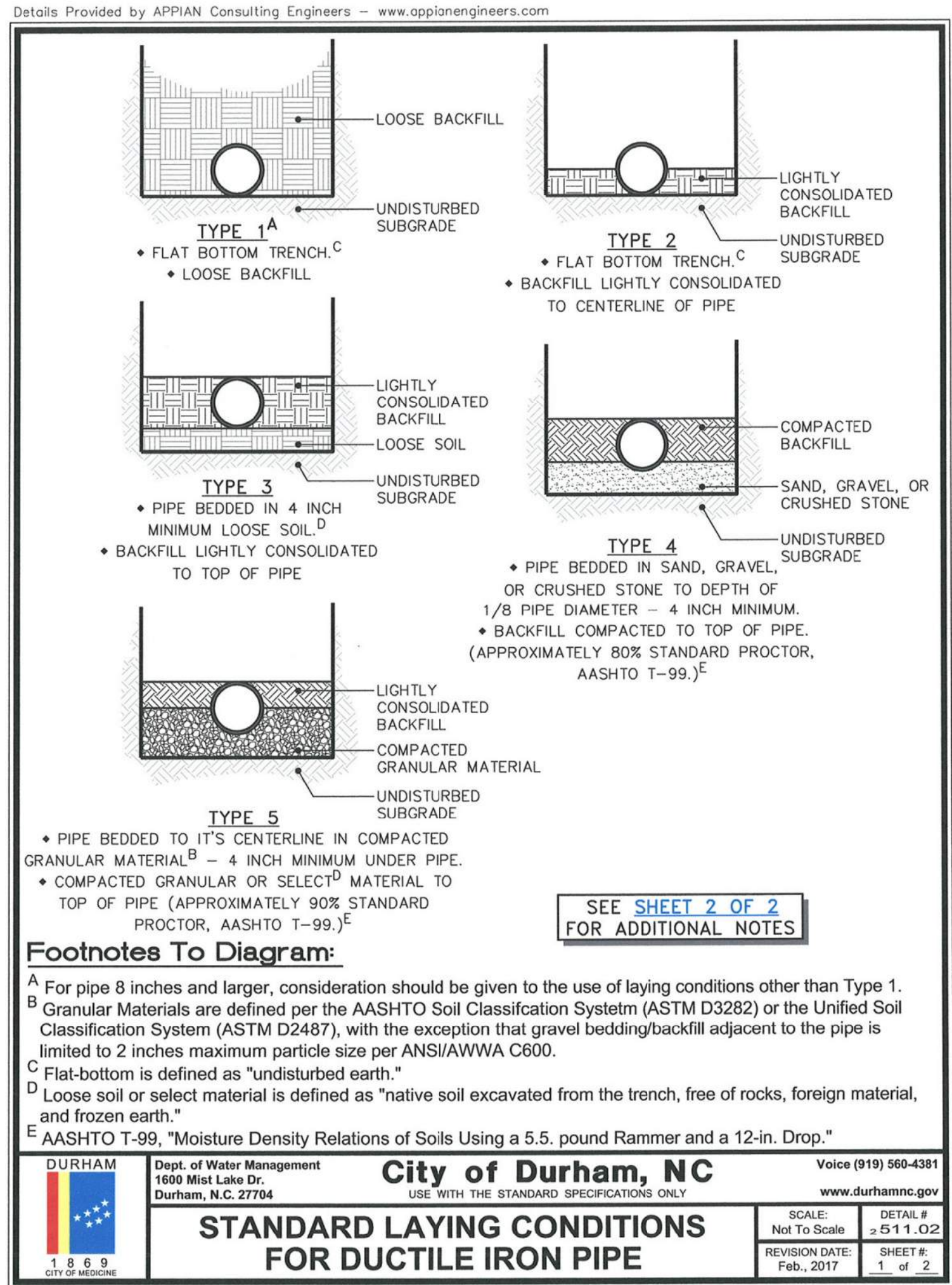
**WATER RELOCATION**

1. CONSTRUCT PROPOSED 63+- FEET 12" RESTRAINED JOINT DUCTILE IRON PIPE WATERLINE ABOVE GROUND WITH END CAPS. WATERLINE SHALL BE FLUSHED, CLEANED, DISINFECTED, AND COMPLETE PRESSURE TESTED PER NCDOT AND THE CITY OF DURHAM STANDARDS AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN NCDOT SPECIFICATIONS AND CITY OF DURHAM SPECIFICATIONS, THE ENGINEER SHALL BE NOTIFIED.
2. INSTALL INSERTION VALVES AT EACH END OF RELOCATION AS SHOWN ON PLANS. LOCATION OF INSERTION VALVES TO BE CONFIRMED WITH THE CITY OF DURHAM. ANY SERVICE LINES LOCATED BETWEEN INSERTION VALVES SHALL BE RELOCATED.
3. SHUT DOWN EXISTING WATERLINE AT INSERTION VALVES. CUT AND REMOVE EXISTING 12" CAST IRON WATERLINE BETWEEN INSERTION VALVES. PROVIDE TEMPORARY COVER OVER ENDS OF EXPOSED WATERLINE.
4. REMOVE EXISTING DOUBLE 48" CORRUGATED METAL PIPE AND INSTALL PROPOSED 9'-3" X 6'-5" CORRUGATED ALUMINUM STRUCTURAL PLATE PIPE ARCH.
5. INSTALL CLASS IV SELECT BACKFILL AS SHOWN ON PLANS UP TO ELEVATION OF WATERLINE.
6. INSTALL NEW WATERLINE BETWEEN INSERTION VALVES, USING HYMAX COUPLING TO CONNECT TO EXISTING WATERLINE.
7. AFTER THE NEW WATERLINE IS CONNECTED TO THE EXISTING SYSTEM, THE SYSTEM SHALL BE PRESSURE TESTED IN ACCORDANCE WITH SPECIFICATIONS AND CITY OF DURHAM STANDARDS.
8. COMPLETE THE INSTALLATION, INCLUDING PLACEMENT OF BACKFILL AND ASPHALT PAVING. ADJUST TOP OF VALVE ELEVATIONS TO ALIGN WITH ASPHALT PAVEMENT.



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**Rated Working Pressure and Maximum Depth of Cover**

Size	Pressure Class psi	Nominal Thickness in.	Laying Conditions				
			Type 1 Trench	Type 2 Trench	Type 3 Trench	Type 4 Trench	Type 5 Trench
Maximum Depth of Cover - ft. <sup>b</sup>							
3	350	0.25	78	88	99	100 <sup>c</sup>	100 <sup>c</sup>
4	350	0.25	53	61	69	85	100 <sup>c</sup>
6	350	0.25	26	31	37	47	65
8	350	0.25	16	20	25	34	50
12	350	0.28	10 <sup>d</sup>	15	19	28	44
16	250	0.30	e	11 <sup>d</sup>	15	24	34
	300	0.32	e	13	17	26	39
	350	0.34	e	15	20	28	44
20	250	0.33	e	10	14	22	30
	300	0.36	e	13	17	26	35
	350	0.38	e	15	19	28	38
24	200	0.33	e	8 <sup>d</sup>	12	17	35
	250	0.37	e	11	15	20	29
	300	0.40	e	13	17	24	32
	350	0.43	e	15	19	28	37
30	150	0.34	e	-	9	14	22
	200	0.38	e	8 <sup>d</sup>	12	16	24
	250	0.42	e	11	15	19	27
	300	0.45	e	12	16	21	29
36	150	0.38	e	-	9	14	21
	200	0.42	e	8 <sup>d</sup>	12	15	23
	250	0.47	e	10	14	18	25
	300	0.51	e	12	16	20	28
350	0.56	e	15	19	24	32	

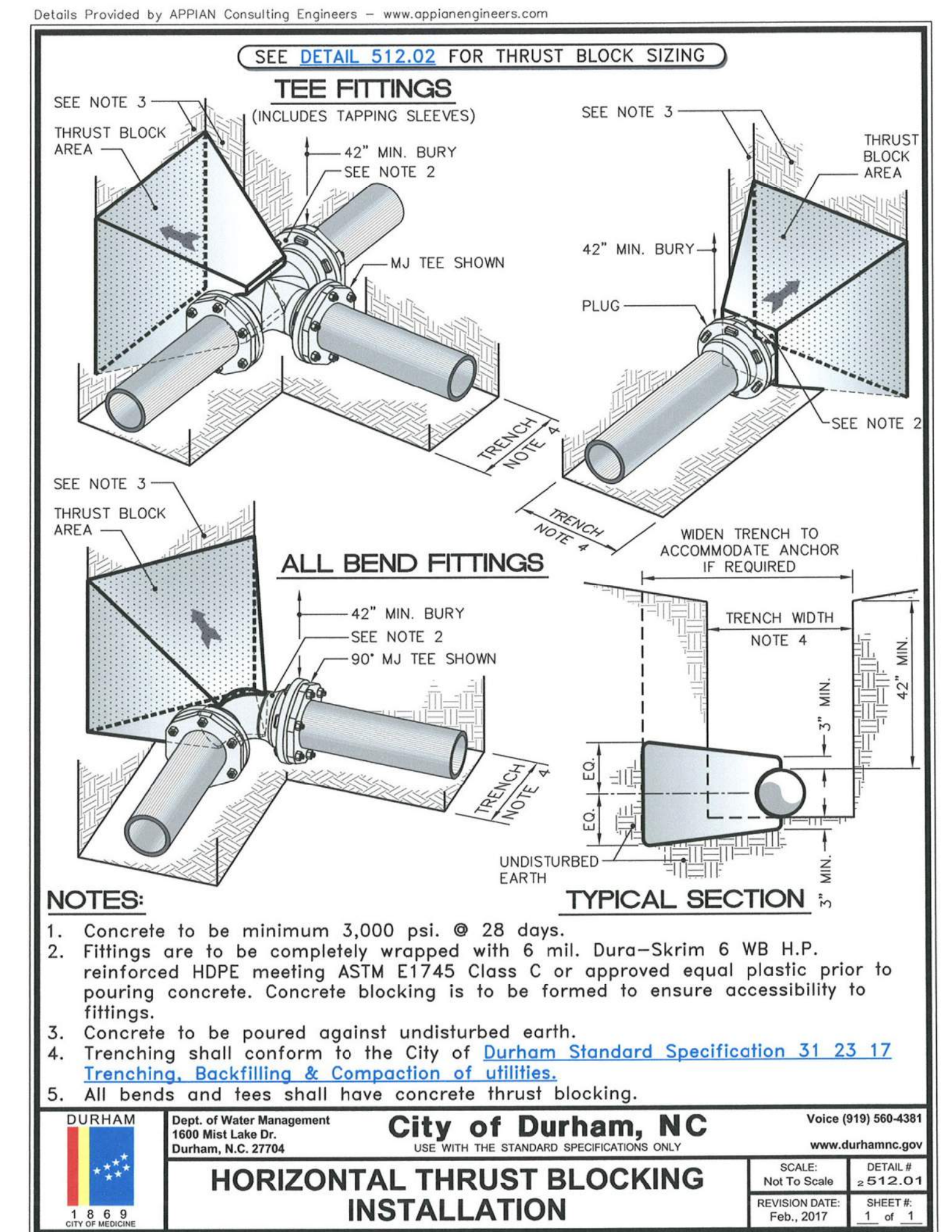
**Footnotes To Table:**  
 Note: This table is based on a minimum depth of cover of 2.5 feet. For shallower depths of cover please consult the DIPRA brochure "Truck Loads on Pipe Buried at Shallow Depths."  
 a Ductile Iron Pipe is adequate for the rated working pressure indicated for each nominal size plus a surge allowance of 100 psi. Calculations are based on a 2.0 safety factor times the sum of working pressure and 100 psi surge allowance. Ductile Iron Pipe for working pressures higher than 350 psi is available.  
 b An allowance for a single H-20 truck with 1.5 impact factor is included for all depths of cover.  
 c Calculated maximum depth of cover exceeds 100 feet.  
 d Minimum allowable depth of cover is 3 feet.  
 e For pipe 14 inches and larger, consideration should be given to the use of laying conditions other than Type 1.

**NOTES:**  
 1. Refer to DIPRA "Design of Ductile Iron Pipe" for additional information pertaining to pipe design.  
 2. See detail C01.01 for excavation in rock.  
 3. See detail C01.02 for unsuitable subgrade improvement.  
 4. For bedding, backfill & compaction requirements, see specification section 312317, Trenching, Backfilling and Compaction of Utilities.

**City of Durham, NC**  
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**STANDARD LAYING CONDITIONS FOR DUCTILE IRON PIPE**

SCALE: Not To Scale	DETAIL # 511.02
REVISION DATE: Feb., 2017	SHEET #: 2 of 2



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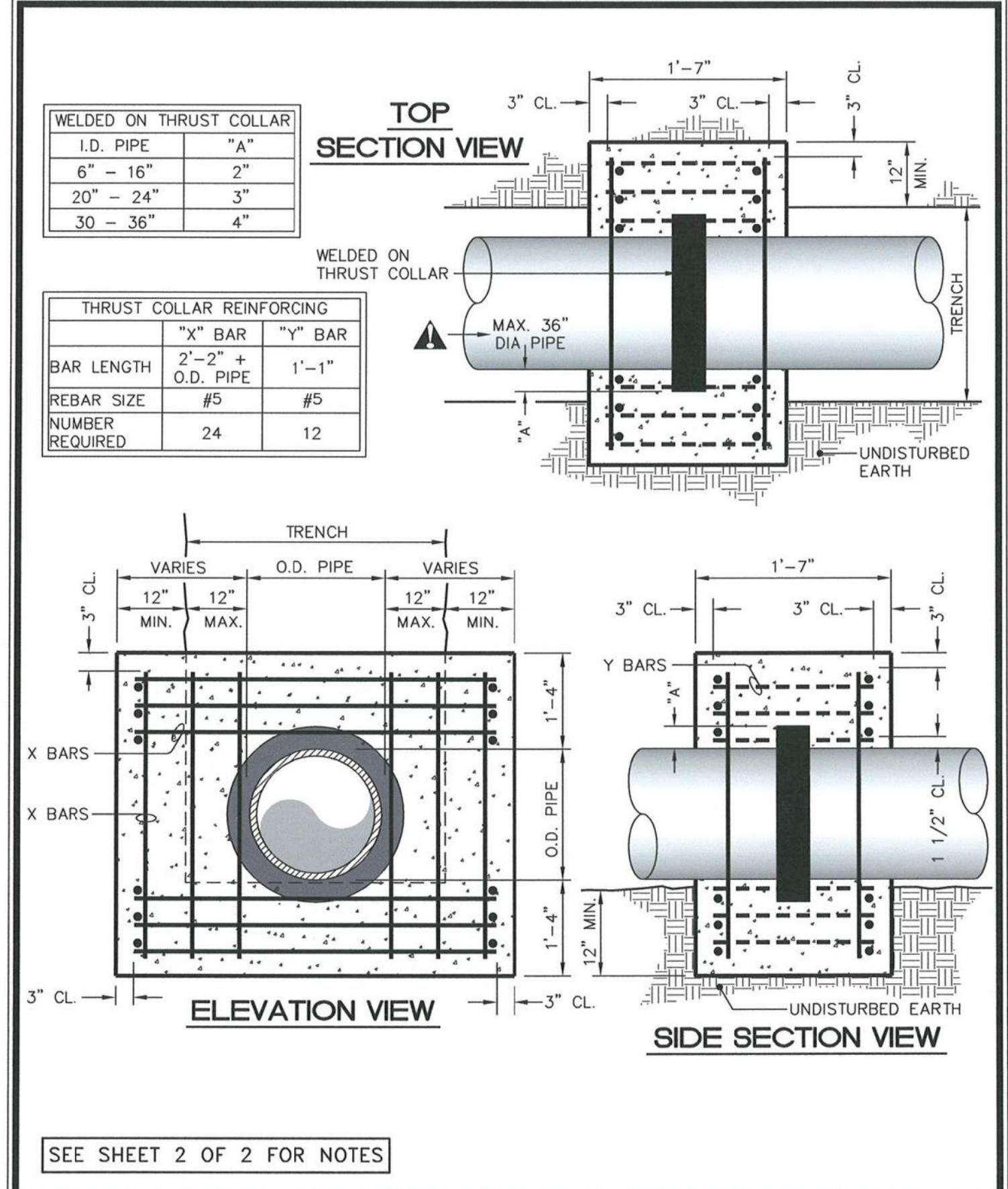
**NOTES:**

- Table is based on test pressure of 200 P.S.I. All areas given in square feet.
- Reaction bearing areas are in square feet measured in a vertical plane in the trench side at an angle of 90° to the thrust vector.
- Use 6"-90° bend value for hydrants for additional safety factors.
- The design pressure, P, is the maximum pressure to which the pipeline will be subjected, with consideration given to the vulnerability of the pipe-soil system when the pressure is expected to be applied. In most cases this will be the test pressure of the pipe, applied shortly after installation when the pipe-soil system is normally the most vulnerable.
- Block height should be chosen such that the calculated block width varies between one and two times the block height.
- Block height should be equal to or less than 1/2 the total depth to the bottom of the block but not less than the pipe diameter.
- Block surface should, where possible, be placed against undisturbed soil. Where it is not possible, the fill between the bearing surface and undisturbed soil must be compacted to at least 90% Standard Proctor dry density.
- The areas in this table have been computed based on DIPRA "Thrust Restrain Design for Ductile Iron Pipe," 6th edition, 2006.

SIZE OF PIPE	DEGREE OF BEND	STATIC THRUST IN POUNDS	CLAY FAIRLY DRY 4,000 LBS / SQ. FT.	CLAY SOFT 2,000 LBS / SQ. FT.	GRAVEL & COARSE SAND 1,500 LBS / SQ. FT.	CLAY MEDIUM 3,000 LBS / SQ. FT.	SAND COMPACT FIRM 8,000 LBS / SQ. FT.	SAND CLEAN & DRY 4,000 LBS / SQ. FT.	QUICKSAND VERY POOR 1,000 LBS / SQ. FT.	ROCK POOR 10,000 LBS / SQ. FT.
<b>6" PIPE</b>										
11 1/4	1,108	1	1	1	1	1	1	2	1	1
22 1/2	2,207	1	2	2	1	1	1	1	3	1
45	4,328	2	3	3	1	1	1	2	5	1
90	7,996	2	4	5	1	1	1	2	8	1
PLUG OR TEE	5,655	2	3	4	1	1	1	2	6	1
<b>8" PIPE</b>										
11 1/4	1,970	1	1	2	1	1	1	1	2	1
22 1/2	3,922	1	2	3	1	1	1	1	4	1
45	7,694	2	4	5	1	1	1	2	8	1
90	14,215	4	8	10	2	2	4	15	2	2
PLUG OR TEE	10,053	3	5	7	2	2	3	10	1	1
<b>12" PIPE</b>										
11 1/4	4,433	2	3	3	1	1	1	1	2	5
22 1/2	8,826	3	5	6	2	2	3	9	1	1
45	17,312	5	9	11	3	3	5	18	2	2
90	31,983	8	16	21	4	4	8	32	4	4
PLUG OR TEE	22,619	6	12	15	3	3	6	23	3	3
<b>16" PIPE</b>										
11 1/4	7,881	2	4	5	1	1	1	2	8	1
22 1/2	15,691	4	8	11	2	2	4	16	2	2
45	30,777	8	16	21	4	4	8	31	4	4
90	56,861	15	29	38	8	8	15	57	6	6
PLUG OR TEE	40,213	10	21	27	5	5	10	41	5	5
<b>20" PIPE</b>										
11 1/4	12,315	3	7	8	2	2	3	13	2	2
22 1/2	24,517	7	13	16	4	4	7	25	3	3
45	48,091	12	24	32	6	6	12	48	5	5
90	88,844	23	45	59	12	12	23	89	9	9
PLUG OR TEE	62,832	16	32	42	8	8	16	63	7	7
<b>24" PIPE</b>										
11 1/4	17,734	5	9	12	3	3	5	18	2	2
22 1/2	35,305	9	18	24	5	5	9	36	4	4
45	69,252	18	35	46	9	9	18	70	7	7
90	127,936	32	64	85	16	16	32	128	13	13
PLUG OR TEE	90,478	23	46	61	12	12	23	91	10	10
<b>30" PIPE</b>										
11 1/4	27,709	7	14	19	4	4	7	28	3	3
22 1/2	55,163	14	28	37	7	7	14	56	6	6
45	108,206	28	55	72	14	14	28	109	11	11
90	199,900	50	100	133	25	25	50	200	20	20
PLUG OR TEE	141,372	36	71	95	18	18	36	142	15	15
<b>36" PIPE</b>										
11 1/4	39,901	10	20	27	5	5	10	40	4	4
22 1/2	79,435	20	40	53	10	10	20	80	8	8
45	155,816	39	78	104	20	20	39	156	16	16
90	287,899	72	144	192	36	36	72	288	29	29
PLUG OR TEE	203,575	51	102	136	26	26	51	204	21	21

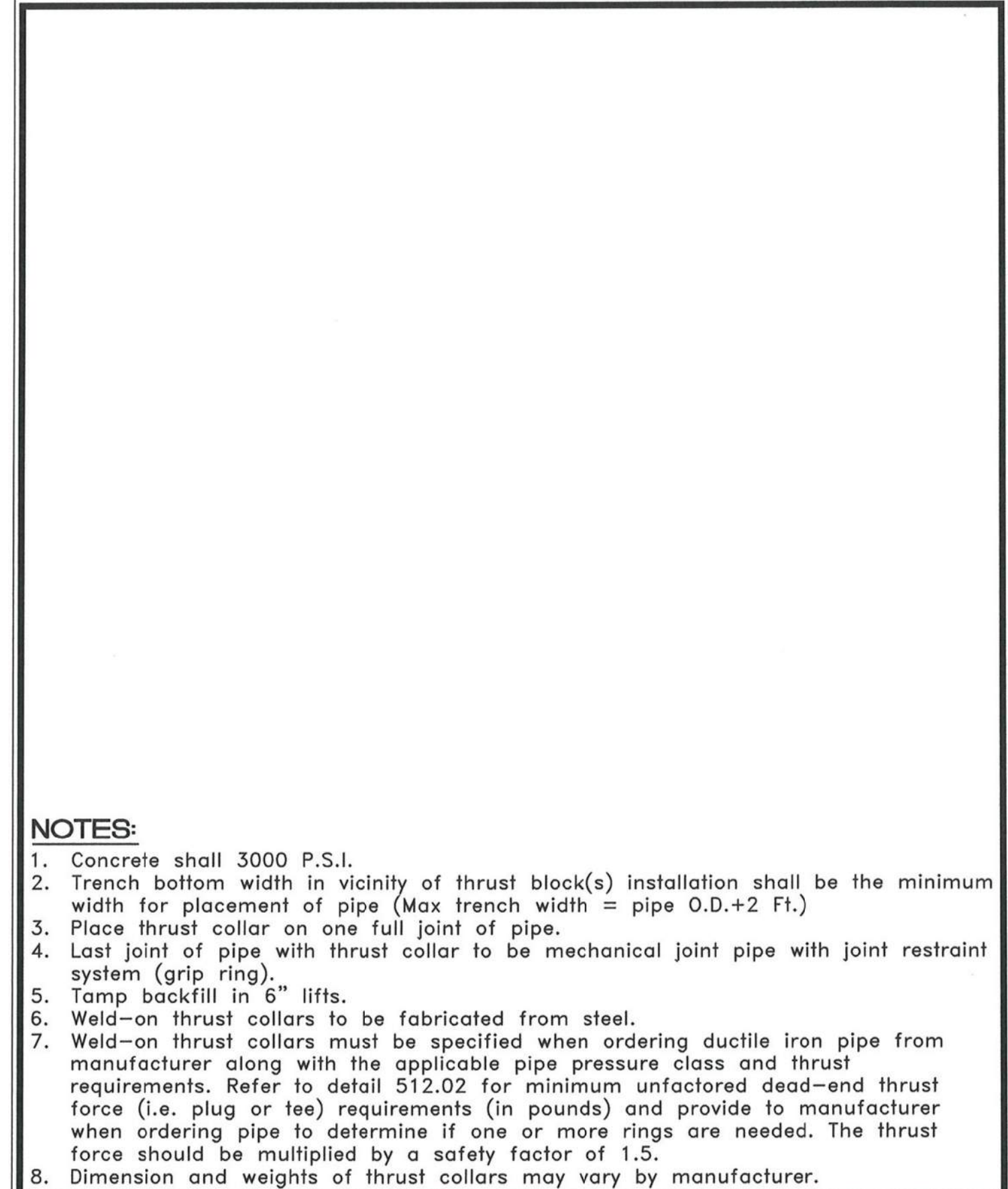
	Dept. of Water Management 1600 Mist Lake Dr. Durham, N.C. 27704	<b>City of Durham, NC</b> USE WITH THE STANDARD SPECIFICATIONS ONLY www.durhamnc.gov	Voice (919) 560-4381
	<b>HORIZONTAL THRUST BLOCKING SCHEDULE</b>		SCALE: Not To Scale DETAIL # 512.02 REVISION DATE: Feb., 2017 SHEET # 1 of 1

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	<b>CONCRETE THRUST BLOCKING INSTALLATION</b>		SCALE: Not To Scale DETAIL # 512.03 REVISION DATE: Feb., 2017 SHEET # 1 of 2

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	<b>CONCRETE THRUST BLOCKING INSTALLATION</b>		SCALE: Not To Scale DETAIL # 512.03 REVISION DATE: Feb., 2017 SHEET # 2 of 2

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