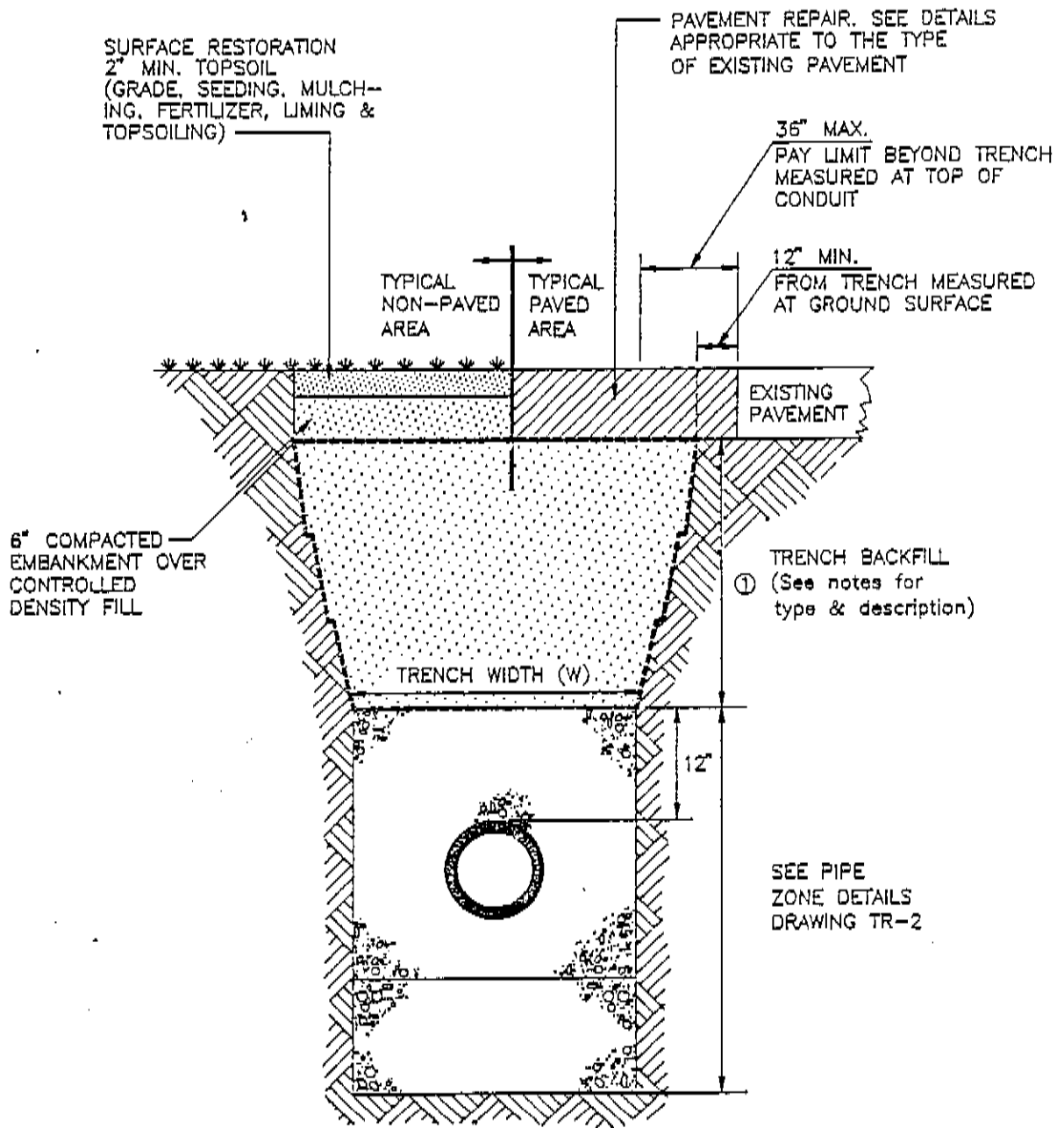


SEWER AND TRENCH DETAILS



SEE SHEET TR-1A FOR NOTES

CITY OF KENT, OHIO	
DEPARTMENT OF PUBLIC SERVICE	
ENGINEERING DIVISION	
CONSTRUCTION DETAILS	
TRENCH DETAIL	
BACKFILL	
DATE 09/01/92	BY RSC NO. TR-1
CITY ENGINEER	<i>[Signature]</i>

GENERAL NOTES (TRENCH EXC)

FOR THE PURPOSE OF DEFINING "TRENCH BACKFILL UNDER PUBLIC STREETS OR ROADWAY PAVEMENTS", THE AREA UNDER THE PAVEMENT STRUCTURE SHALL BE DEFINED AS ALL AREA DIRECTLY UNDER THE PAVEMENT, CURB, PAVED BERM OR SHOULDER AND THE AREA BELOW A LINE EXTENDED OUTWARD AT A 45 DEGREE ANGLE FROM THE PAVEMENT SURFACE AT THE EDGE OF THE PAVEMENT STRUCTURE.

TRENCH WIDTH (W) IS DEFINED AS THE WIDTH OF THE EXCAVATION MEASURED AT THE TOP OF THE PIPE.

THE CITY OF KENT STANDARD SPECIFICATIONS FOR TRENCH BACKFILLING, SEWER INSTALLATION AND WATERLINE INSTALLATION SHALL BE USED IN CONJUNCTION WITH THIS STANDARD DRAWING.

TRENCH DETAIL NOTES

1. TYPE "A" TRENCH BACKFILL SHALL BE USED UNDER ALL PUBLIC STREETS OR ROADWAY PAVEMENTS OR AS OTHERWISE SHOWN ON THE PLANS, STANDARD DRAWINGS, OR CALLED FOR IN THE SPECIFICATIONS.

TYPE "B" TRENCH BACKFILL MAY ALSO BE USED AS A TRENCH BACKFILL UNDER PUBLIC STREETS OR ROADWAY PAVEMENTS OR AS OTHERWISE SHOWN ON THE PLANS, STANDARD DRAWINGS, OR CALLED FOR IN THE SPECIFICATIONS.

TYPE "C" OR "D" TRENCH BACKFILLS SHALL BE USED FOR ALL TRENCH BACKFILL WITHIN THE PUBLIC RIGHT-OF-WAY EXCEPT UNDER STREET AND ROADWAY PAVEMENTS. TYPE "C" OR "D" TRENCH BACKFILL SHALL ALSO BE USED UNDER DRIVEWAY PAVEMENT CROSSINGS WITHIN EASEMENTS, SIDEWALKS, EXISTING CONDUIT CROSSINGS AND OTHER STRUCTURES.

TYPE "E" TRENCH BACKFILL SHALL BE USED FOR ALL OTHER TRENCH BACKFILLS; AND MAY BE USED WITHIN PUBLIC ROAD OR STREET RIGHT-OF-WAYS ONLY IF APPROVED IN WRITING BY THE ENGINEER.

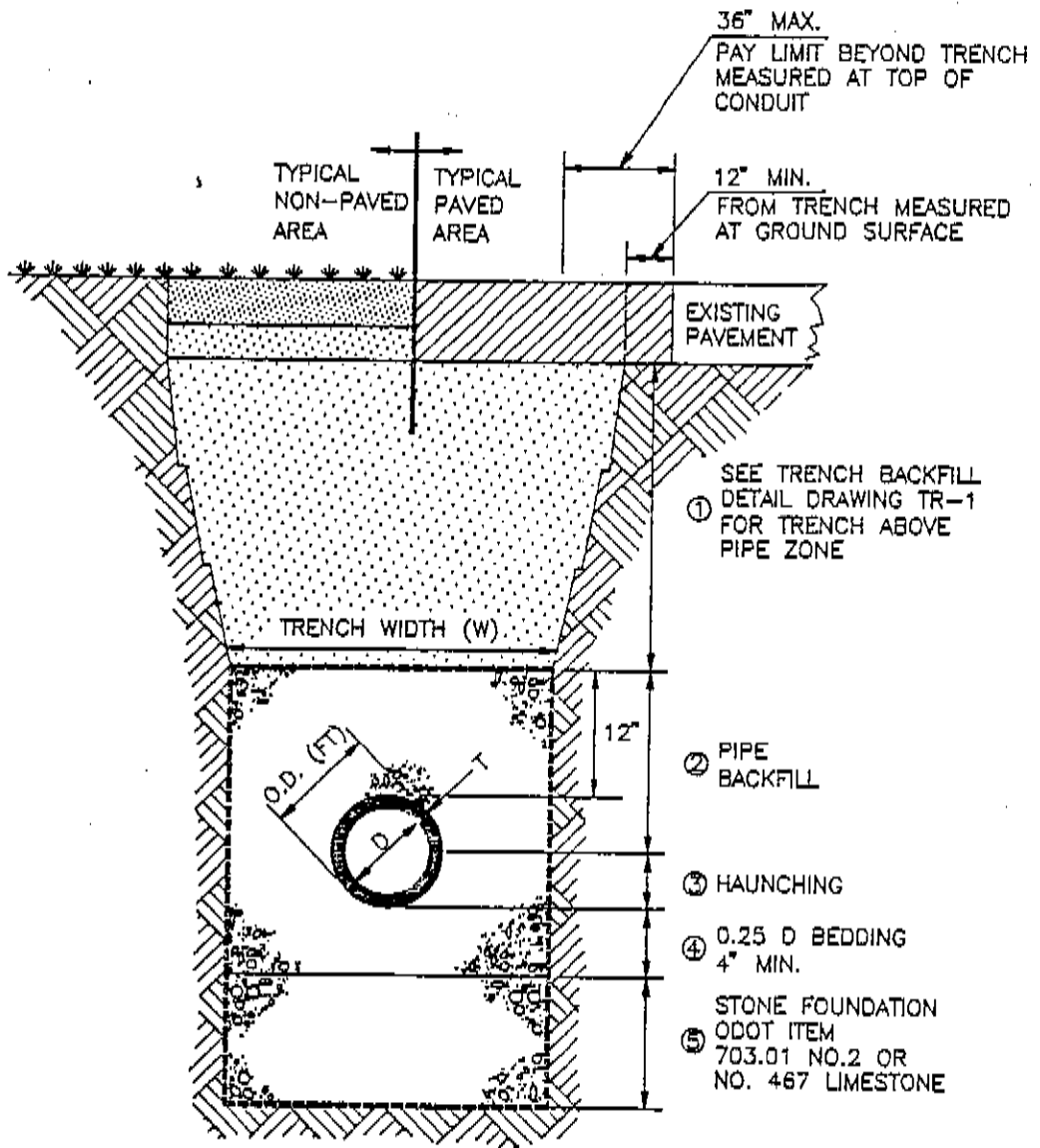
2. PIPE BACKFILL IS THE SAME MATERIAL AS THAT USED FOR BEDDING UNLESS OTHERWISE SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER.
3. HAUNCHING SHALL BE THE SAME MATERIAL AS THE BEDDING MATERIAL AND SHALL EXTEND FROM THE BEDDING TO THE SPRING LINE OF THE PIPE. THIS DIMENSION IS ONLY APPLICABLE IF THE PIPE BACKFILL IS A MATERIAL OTHER THAN THAT USED FOR THE PIPE BEDDING.
4. BEDDING SHALL EXTEND FROM ONE FOURTH THE PIPE DIAMETER BELOW THE PIPE UP TO THE SPRING LINE OF THE PIPE OR FROM A MINIMUM THICKNESS OF 4" BELOW THE PIPE, WHICHEVER IS GREATER. THIS DIMENSION IS ONLY APPLICABLE IF THE PIPE BACKFILL IS A MATERIAL OTHER THAN THAT USED FOR THE PIPE BEDDING.
5. THE USE OF OTHER SIEVE SIZE MIXTURES MAY BE USED FOR STONE FOUNDATION IF APPROVED BY THE ENGINEER. MATERIALS OTHER THAN LIMESTONE MAY BE USED IF IT CAN BE DEMONSTRATED TO FUNCTION PROPERLY AS A FOUNDATION MATERIAL AND IS APPROVED IN WRITING BY THE ENGINEER. THE THICKNESS OF THE STONE FOUNDATION COURSE SHALL BE THAT SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

CITY OF KENT, OHIO
DEPARTMENT OF PUBLIC SERVICE
ENGINEERING DIVISION

CONSTRUCTION DETAILS

TRENCH DETAIL
BACKFILL

DATE 09/01/92 BY RSC NO. TR-1A
CITY ENGINEER *[Signature]*



SEE SHEET TR-2A FOR NOTES

CITY OF KENT, OHIO DEPARTMENT OF PUBLIC SERVICE ENGINEERING DIVISION
CONSTRUCTION DETAILS
TRENCH DETAIL PIPE ZONE
DATE 09/01/92 BY RSC / NO. TR-2
CITY ENGINEER <i>[Signature]</i>

GENERAL NOTES (PIPE ZONE DETAILS)

THE CITY OF KENT STANDARD SPECIFICATIONS FOR TRENCH BACKFILLING, SEWER INSTALLATION AND WATERLINE INSTALLATION SHALL BE USED IN CONJUNCTION WITH THIS STANDARD DRAWING.

TRENCH WIDTH (W) IS DEFINED AS THE WIDTH OF THE EXCAVATION MEASURED AT THE TOP OF THE PIPE.

DEPTH OF BURY

MAXIMUM OR MINIMUM DEPTH OF BURY OF THE SEWER PIPE SHALL NOT EXCEED ANY OF THE FOLLOWING:

- A. THE MAXIMUM DEPTH RECOMMENDED BY THE MANUFACTURER FOR THE SPECIFIED TRENCH AND ALLOWABLE PIPE LOADING CONDITIONS.
 - B. THE MAXIMUM DEPTH ALLOWED BY THE CITY SPECIFICATIONS FOR SEWER CONSTRUCTION.
 - C. THE MAXIMUM DEPTH LIMITED BY PROJECT DETAILED PLANS OR SPECIFICATIONS.
 - D. THE MAXIMUM DEPTH PERMITTED BY THE CITY ENGINEER.
- WHERE APPLICABLE LIVE LOADS SHALL BE INCLUDED IN THE DESIGN OF PIPE LOADINGS.

TRENCH WIDTH (W)

RIGID PIPE

W = MAXIMUM TRENCH WIDTH FOR RIGID PIPE $1.25(OD)+1.0(FT)$

FLEXIBLE PIPE

MINIMUM TRENCH WIDTH FOR FLEXIBLE SEWER PIPE (W) SHALL EQUAL OR EXCEED 3 PIPE DIAMETERS (1 DIAMETER EACH SIDE OF PIPE).

NARROWER TRENCH WIDTHS FOR FLEXIBLE PIPE MAY BE USED UNDER THE FOLLOWING CONDITIONS AND ONLY WHERE APPROVED BY THE CITY ENGINEER:

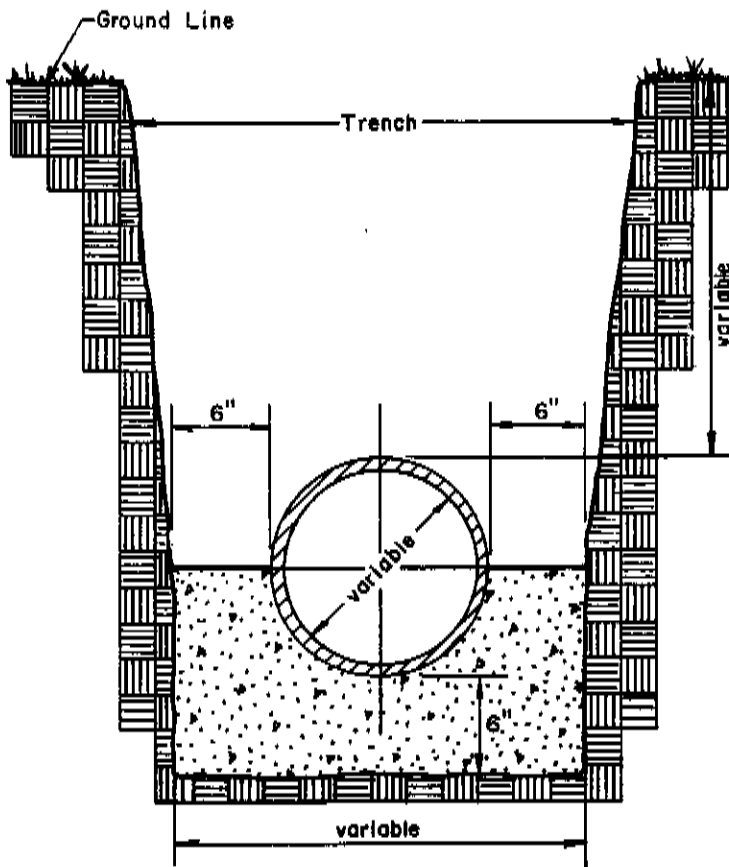
1. IN-SITU MODULUS OF SOIL REACTION OF THE SOIL ADJACENT TO THE BEDDING AND HAUNCHING IS GREATER THAN 2000 PSI; AND
2. STABLE TRENCH WALLS EXIST; AND
3. STABLE FOUNDATION EXIST; AND
4. TRENCHING METHODS DO NOT DISTURB EXISTING SOIL BELOW THE TOP OF PIPE THAT ARE WITHIN 1.0 PIPE DIAMETERS OF THE PIPE OR SHEETING IS USED FOR TRENCH WALL SUPPORT AND IS DRIVEN A MINIMUM OF 2 FEET BELOW THE BOTTOM OF PIPE AND IS LEFT IN PLACE TO MINIMUM 1.5 FEET ABOVE TOP OF PIPE; AND
5. THE EXISTING WATER TABLE OR DEWATERED LEVEL IS A MINIMUM OF 18" BELOW THE BOTTOM OF THE PIPE; AND
6. THE PIPE DEPTH OF BURY IS LESS THAN 24 FEET; OR
7. ANY ONE OF THE CONDITIONS DO NOT SUPPORT NARROW TRENCH CONSTRUCTION BUT THE PIPE INSTALLATION AND TRENCH SECTION DETAILS HAVE BEEN DESIGNED TO LIMIT PIPE DEFLECTION TO 5% MAXIMUM, BY A REGISTERED ENGINEER AND APPROVED BY THE CITY ENGINEER.

MINIMUM TRENCH WIDTHS FOR BOTH RIGID AND FLEXIBLE PIPE SHALL BE AS NECESSARY TO PERMIT PROPER PLACEMENT AND COMPACTION OF BEDDING AND SELECT BACKFILL.

PIPE BACKFILL, HAUNCHING AND BEDDING SHALL BE O.D.O.T. ITEM 703.01 No.57 OR No.67 LIMESTONE OR CRUSHED ROCK COMPACTED TO MINIMUM 98% STANDARD PROCTOR DENSITY OR 75% RELATIVE DENSITY.

THE USE OF OTHER SIEVE SIZE MIXTURES MAY BE USED FOR BEDDING, HAUNCHING AND PIPE BACKFILL IF APPROVED BY THE ENGINEER.

CITY OF KENT, OHIO DEPARTMENT OF PUBLIC SERVICE ENGINEERING DIVISION	
CONSTRUCTION DETAILS	
TRENCH DETAIL PIPE ZONE	
DATE <u>09/01/92</u>	BY <u>RSC</u> NO. <u>TR-2A</u>
CITY ENGINEER	<u>[Signature]</u>



**TYPE "A" CONSTRUCTION
BEDDING**

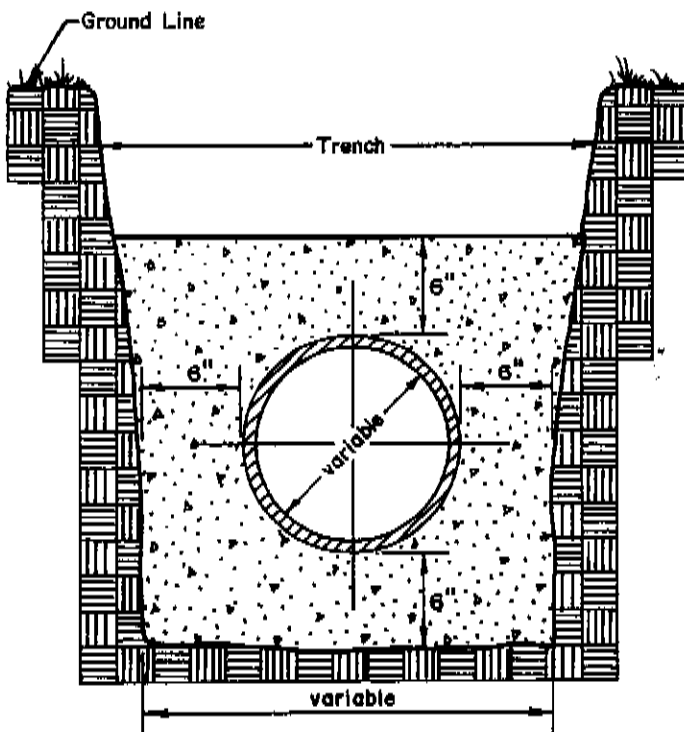
NOTE:

CONCRETE SHALL MEET SPECIFICATIONS FOR CLASS "C" CONCRETE EXCEPT WHERE SHOWN OTHERWISE ON THE PLANS.

SEWER TRENCH SHALL REMAIN OPEN FOR A MINIMUM OF 4 HOURS TO INSURE CONCRETE SETTING IN CORRECT PLACEMENT.

TRAFFIC OF HEAVY EQUIPMENT ACROSS BACKFILLED TRENCH SHALL BE AVOIDED FOR AT LEAST 48 HOURS.

6" DIMENSIONS ARE MINIMUMS.



**TYPE "B" CONSTRUCTION
ENCASEMENT**

PIPE SIZE	CU. YDS. CONC. PER LIN. FT.	
	TYPE "A"	TYPE "B"
6"	0.042	0.084
8"	0.050	0.100
12"	0.067	0.134
15"	0.081	0.162
18"	0.095	0.190
21"	0.110	0.220
24"	0.127	0.253

CITY OF KENT, OHIO
DEPARTMENT OF PUBLIC SERVICE
ENGINEERING DIVISION

CONSTRUCTION STANDARDS

DETAIL OF CONCRETE BEDDING
AND ENCASEMENT OF PIPE

DATE 1-87 BY CLW NO. TR-3
CITY ENGINEER [Signature]

TRENCH SHORING - MINIMUM REQUIREMENTS

Depth of Trench	Kind or condition of earth	Size and spacing of members										
		Uprights		Stringers		Cross braces				Maximum spacing		
		Min. dimension	Max. spacing	Min. dimension	Max. spacing	Width of trench				Vert.	Horl.	
Feet		Inches	Feet	Inches	Feet	Up to 3 feet	3 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 16 feet	Feet	Feet
5 to 10	Hard, compact	3x4 or 2x6	6			2x6	4x4	4x6	6x6	6x8	4	6
	Likely to crack	3x4 or 2x6	3	4x6	4	2x6	4x4	4x6	6x6	6x8	4	6
	Soft, sandy or filled	3x4 or 2x6	Close sheathing	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Hydrostatic pressure	3x4 or 2x6	Close sheathing	6x8	4	4x4	4x6	6x6	6x8	8x8	4	6
10 to 15	Hard	3x4 or 2x6	4	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	Likely to crack	3x4 or 2x6	2	4x6	4	4x4	4x6	6x6	6x8	8x8		6
	Soft, sand or filled	3x4 or 2x6	Close sheathing	4x6	4	4x6	6x6	6x8	8x8	8x10	4	6
	Hydrostatic pressure	3x6	Close sheathing	8x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 to 20	All kinds or conditions	3x6	Close sheathing	4x12	4	4x12	6x8	8x8	8x10	10x10	4	6
Over 20	or conditions	3x6	sheathing	6x8	4	4x12	8x8	8x10	10x10	10x12	4	6

Trench jacks may be used in lieu of, or in combination with, cross braces. Shoring is not required in solid rock, hard shale, or hard slag. Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

NOTES

Sides of trenches 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Tables P-1, P-2.

In lieu of shoring, the sides of the trench above the 5 foot level may be sloped to preclude collapse, but shall not be steeper than a 1 foot rise to each 1/2 foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4 foot minimum shall be provided at the toe of the sloped portion.

Minimum requirements for trench timbering shall be in accordance with Table P-2.

Braces and diagonal shores in a wood shoring system shall not be subjected to compress stress in excess of values given by the following formula:

$$S = 1300 - \frac{20L}{D}$$

Maximum ratio $\frac{L}{D} = 50$

Where:

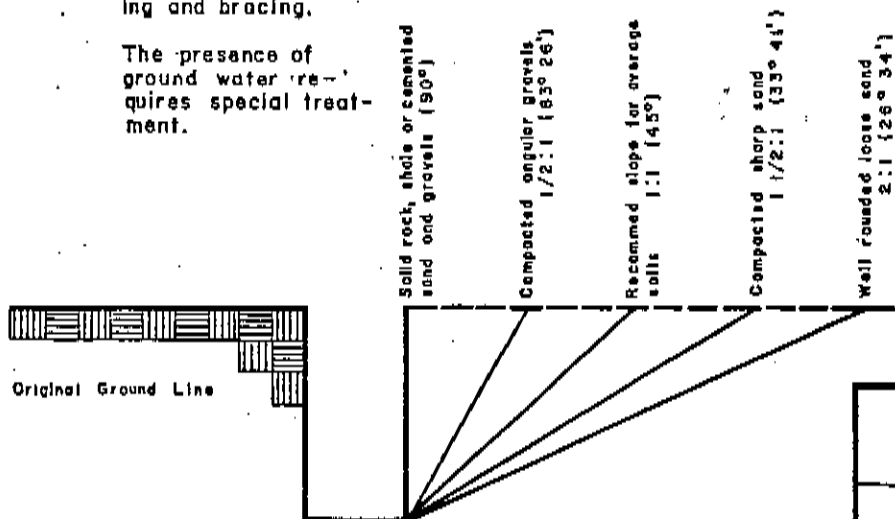
- L = Length, unsupported, in inches.
- D = Least side of the timber in inches
- S = Allowable stress in pounds per square inch of cross-section.

TABLE P-1

APPROXIMATE ANGLE OF REPOSE FOR SLOPING OF SIDES OF EXCAVATIONS

NOTE: Silts, Clay, Loams or non-homogenous soils require shoring and bracing.

The presence of ground water requires special treatment.



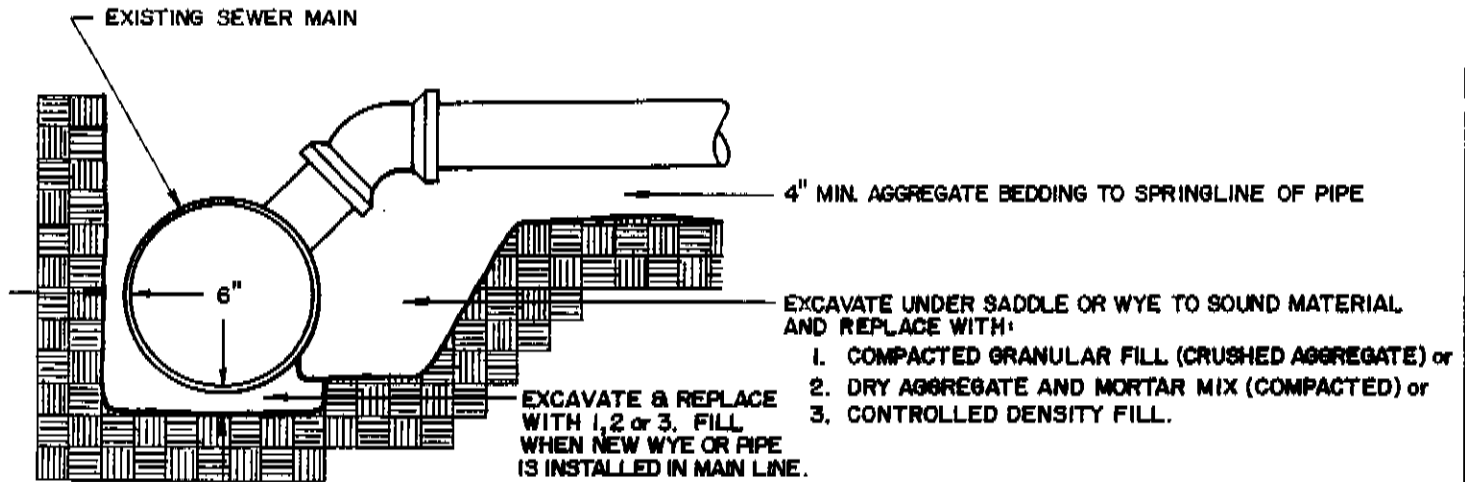
CITY OF KENT, OHIO
DEPARTMENT OF PUBLIC SERVICE
ENGINEERING DIVISION

CONSTRUCTION STANDARDS

SHEETING AND SHORING

DATE 12/77 BY HCS NO. TR-4

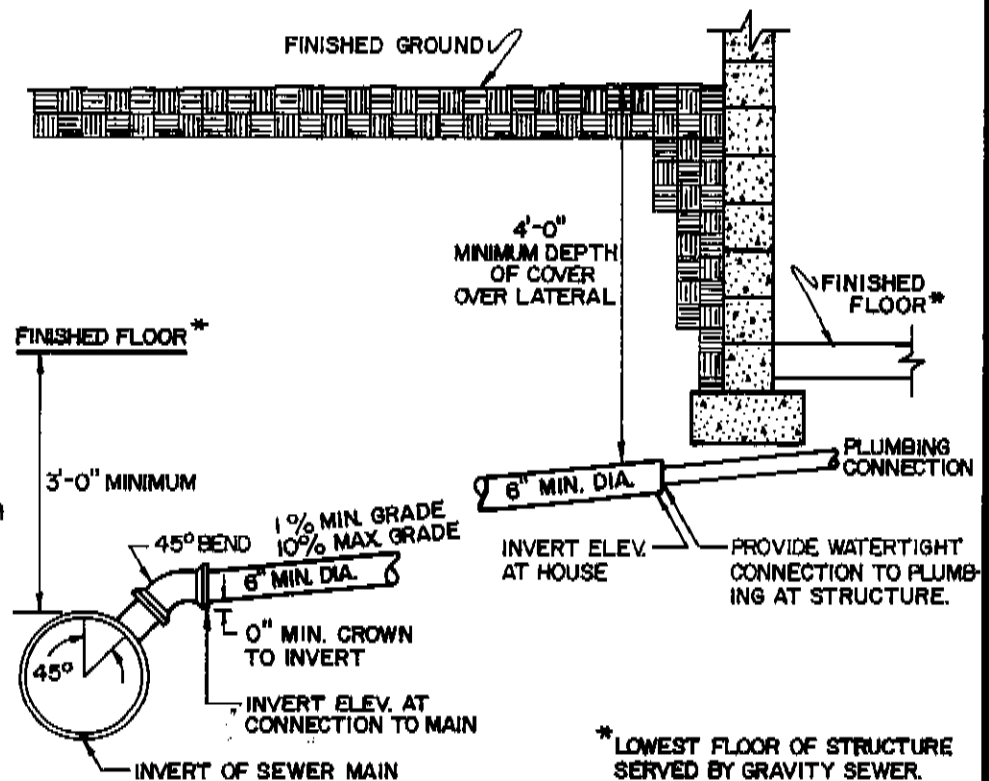
CITY ENGINEER *B. R. Buntaker*



DETAIL OF BEDDING FOR SADDLE OR WYE

NOTES:

1. SADDLE SHALL BE CAST IRON WITH STAINLESS STEEL BANDS, RUBBER O-RING SEAL AROUND THE FITTING, WATERTIGHT.
2. HOLE IN SEWER SHALL BE CORED APPROXIMATELY THE SAME DIA. AS SADDLE INSERT.
3. MAXIMUM LENGTH OF LATERAL, WITH-OUT CLEANOUT IS 150'. CLEANOUTS MUST BE INSTALLED AT ALL ANGLE POINTS.
4. DESIGNER IS TO PROVIDE SCALE PLAN/ PROFILE DRAWING OF THE LATERAL, SHOWING LOCATION & ELEVATION OF ALL EXISTING AND PROPOSED SANITARY SEWER, STRUCTURES, GROUND, UPSTREAM AND DOWNSTREAM MANHOLES, PROPOSED LATERAL, PAVEMENT, SIDEWALK, ETC.
5. SHOW LOCATION OF ALL PROPERTY LINES.
6. INDICATE ALL PIPE SIZES & MATERIALS.
7. ALL PIPE & FITTINGS SHALL BE ONE OF THE FOLLOWING:
 - a. EXTRA STRENGTH VCP ASTM C-700 WITH COMPRESSION FITTINGS.
 - b. SDR 35 (MIN.) ASTM D-3034 WITH GASKETED FITTINGS.
 - c. CAST IRON.
 - d. DUCTILE IRON PIPE CLASS 53 MIN. CEMENT LINED BITUMINOUS COATED.
8. INDUSTRIAL & COMMERCIAL USERS MAY REQUIRE A SANITARY MANHOLE FOR INSPECTION.



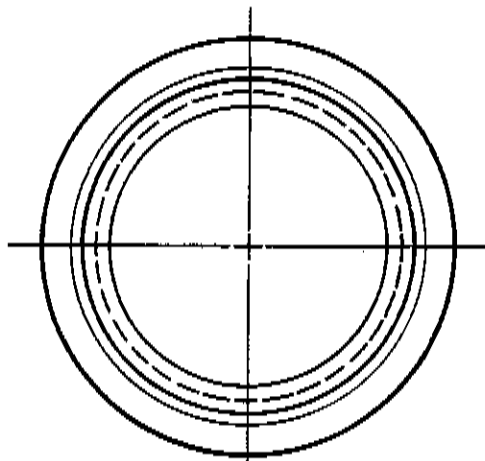
CITY OF KENT, OHIO
DEPARTMENT OF PUBLIC SERVICE
ENGINEERING DIVISION

CONSTRUCTION STANDARDS

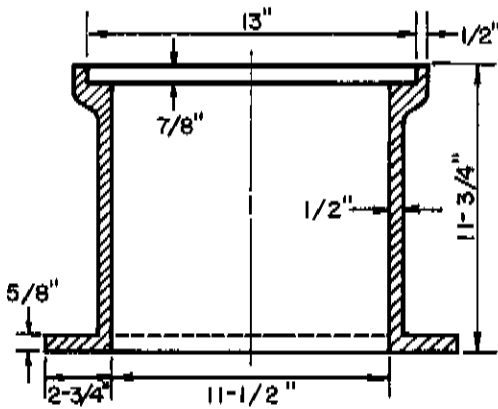
TYPICAL SANITARY SEWER LATERAL &
LATERAL CONNECTION (WYE or SADDLE)

DATE 1-8-88 BY JCLW NO. TR-5

CITY ENGINEER J. A. [Signature]



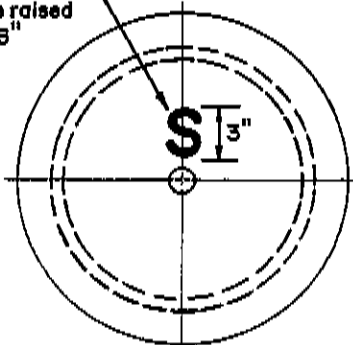
FRAME



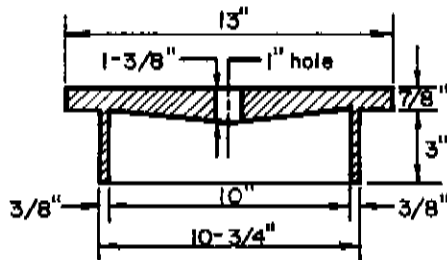
SECTION AT CENTER OF FRAME

Pipe size and type to be the same as sewer or lateral

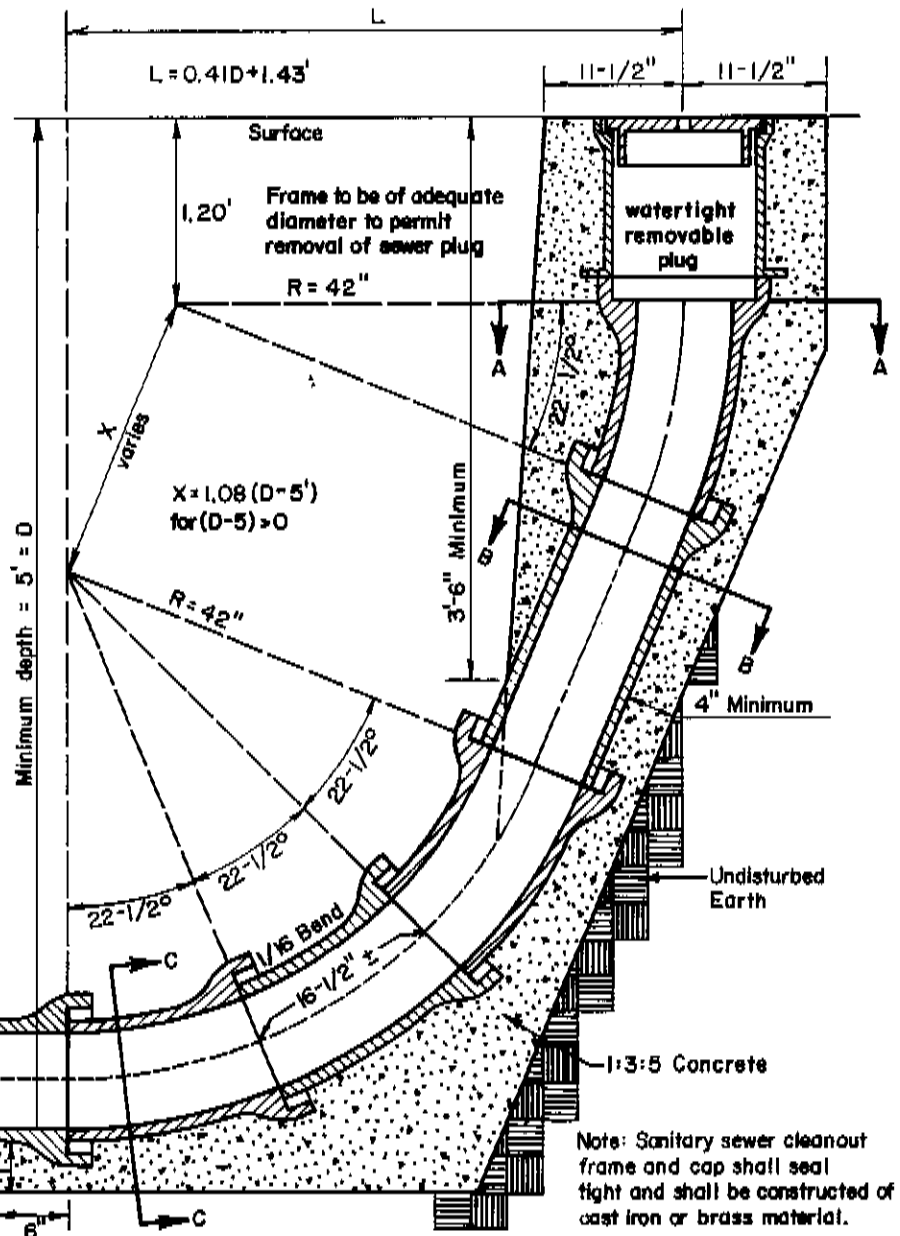
The letter S to be raised 3/16"



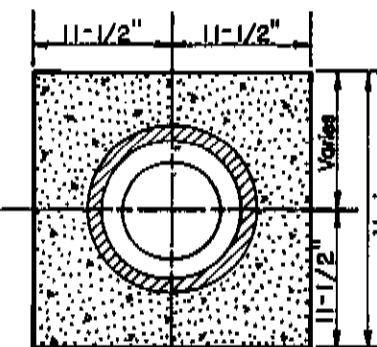
COVER



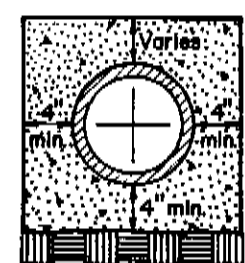
SECTION AT CENTER OF COVER



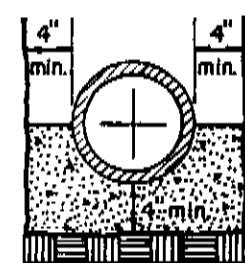
Note: Sanitary sewer cleanout frame and cap shall seal tight and shall be constructed of cast iron or brass material.



SECTION A-A



SECTION B-B



SECTION C-C

CITY OF KENT, OHIO			
DEPARTMENT OF PUBLIC SERVICE			
ENGINEERING DIVISION			
CONSTRUCTION STANDARDS			
TYPICAL CLEANOUT STRUCTURE			
DATE	10/22/87	BY	CLW/
CITY ENGINEER	[Signature]		
		NO.	TR-6