SEWER AND TRENCH DETAILS
SURFACE RESTORATION
2" MIN. TOPSOIL
(GRADE, SEEDING, MULCHING, FERTILIZER, LIMING & TOPSOILING)

PAVEMENT REPAIR, SEE DETAILS APPROPRIATE TO THE TYPE
OF EXISTING PAVEMENT

36" MAX.
PAY LIMIT BEYOND TRENCH MEASURED AT TOP OF
CONDUIT

12" MIN.
FROM TRENCH MEASURED
AT GROUND SURFACE

TYPICAL NON-PAVED
AREA

TYPICAL PAVED
AREA

EXISTING
PAVEMENT

6" COMPACTED
EMBANKMENT OVER
CONTROLLED
DENSITY FILL

TRENCH WIDTH (W)

TRENCH BACKFILL
1 (See notes for
type & description)

SEE PIPE
ZONE DETAILS
DRAWING TR-2

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
GENERAL NOTES (TRENCH EXC)


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 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.
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

36" MAX.
PAY LIMIT BEYOND TRENCH
MEASURED AT TOP OF
CONDUIT

12" MIN.
FROM TRENCH MEASURED
AT GROUND SURFACE

SEE TRENCH BACKFILL
DETAIL DRAWING TR-1
FOR TRENCH ABOVE
PIPE ZONE

PIPE
BACKFILL

HAUNCHING

0.25 D BEDDING
4" MIN.

STONE FOUNDATION
DOT ITEM
703.01 NO. 2 OR
NO. 467 LIMESTONE

TRENCH WIDTH (W)

TYPICAL
NON-PAVED
AREA

TYPICAL
PAVED
AREA

EXISTING
PAVEMENT

O.D. (IN.)
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 PIPEeloadings.

TRENCH WIDTH (W)

RIGID PIPE
W = MAXIMUM TRENCH WIDTH FOR RIGID PIPE 1.25(DD) + 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 DEFORMATION 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.
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.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>CU. YDS. CONC. PER LIN. FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>0.042</td>
</tr>
<tr>
<td>8&quot;</td>
<td>0.050</td>
</tr>
<tr>
<td>12&quot;</td>
<td>0.067</td>
</tr>
<tr>
<td>15&quot;</td>
<td>0.081</td>
</tr>
<tr>
<td>18&quot;</td>
<td>0.095</td>
</tr>
<tr>
<td>21&quot;</td>
<td>0.110</td>
</tr>
<tr>
<td>24&quot;</td>
<td>0.127</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Depth of Trench</th>
<th>Kind or condition of earth</th>
<th>Height</th>
<th>Stringers</th>
<th>Cross braces</th>
<th>Maximum spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td></td>
<td>Min. dimension</td>
<td>Max. spacing</td>
<td>Min. dimension</td>
<td>Max. spacing</td>
</tr>
<tr>
<td>5 to 10</td>
<td>Hard, compact</td>
<td>Inches</td>
<td>Feet</td>
<td>Inches</td>
<td>Feet</td>
</tr>
<tr>
<td></td>
<td>Likely to crack</td>
<td>3 x 4 or 2 x 6</td>
<td>3</td>
<td>4 x 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Soft, sandy or filled</td>
<td>3 x 4 or 2 x 6</td>
<td>Close sheathing</td>
<td>4 x 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Hydrostatic pressure</td>
<td>3 x 4 or 2 x 6</td>
<td>Close sheathing</td>
<td>6 x 8</td>
<td>4</td>
</tr>
<tr>
<td>10 to 15</td>
<td>Hard</td>
<td>3 x 4 or 2 x 6</td>
<td>4</td>
<td>4 x 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Likely to crack</td>
<td>3 x 4 or 2 x 6</td>
<td>2</td>
<td>4 x 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Soft, sand or filled</td>
<td>3 x 4 or 2 x 6</td>
<td>Close sheathing</td>
<td>4 x 6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Hydrostatic pressure</td>
<td>3 x 4 or 2 x 6</td>
<td>Close sheathing</td>
<td>6 x 8</td>
<td>4</td>
</tr>
<tr>
<td>15 to 20</td>
<td>All kinds or conditions</td>
<td>3 x 6</td>
<td>Close sheathing</td>
<td>4 x 12</td>
<td>4</td>
</tr>
<tr>
<td>Over 20</td>
<td></td>
<td>3 x 6</td>
<td>Close sheathing</td>
<td>6 x 10</td>
<td>4</td>
</tr>
</tbody>
</table>

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 clay.
When 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, sheathed, 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 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:

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

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-homogeneous soils require shoring and bracing.
- The presence of ground water requires special treatment.
EXISTING SEWER MAIN

4" MIN. AGGREGATE BEDDING TO SPRINGLINE OF PIPE

EXCAVATE UNDER SADDLE OR WYE TO SOUND MATERIAL
AND REPLACE WITH:
1. COMPACTED GRANULAR FILL (CRUSHED AGGREGATE)
or
2. DRY AGGREGATE AND MORTAR MIX (COMPACTED) or
3. CONTROLLED DENSITY FILL.

EXCAVATE & REPLACE
WITH 1, 2 OR 3. FILL
WHEN NEW WYE OR PIPE
IS INSTALLED IN MAIN LINE.

NOTE OF BEDDING FOR SADDLE OR WYE

FINISHED GROUND

4'-0"
MINIMUM DEPTH
OF COVER
OVER LATERAL

FINISHED FLOOR

3'-0" MINIMUM

45° BEND

5" MIN. DIA.

INVERT ELEV. AT HOUSE

INVERT ELEV. AT CONNECTION TO MAIN

INVERT OF SEWER MAIN

FINISHED FLOOR

-0" MIN. GROWN TO INVERT

Plumbing Connection

Provide Watertight Connection to Plumbing at Structure

* LOWEST FLOOR OF STRUCTURE SERVED BY GRAVITY SEWER.

NOTES:
1. SADDLE SHALL BE CAST IRON WITH
STAINLESS STEEL BANDS, RUBBER
O-RING SEAL AROUND THE FITTING,
WATER TIGHT.

2. HOLE IN SEWER SHALL BE CORED
APPROXIMATELY THE SAME DIA. AS
SADDLE INSERT.

3. MAXIMUM LENGTH OF LATERAL WITHOUT
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 D-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.

6. 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 CLW NO. TR-5
CITY ENGINEER ST. FRANCIS
Frame to be of adequate diameter to permit removal of sewer plug.

Minimum depth: 5 = D + 1.20' for 0 ≤ 5

x = 1.08(D-5')

Undisturbed Earth

1:3:5 Concrete

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