



## **SECTION 4** **STANDARD DETAILS**

**Standard Specifications and Details for Construction**

DETAIL NO.DETAIL NAME


## GRAVITY SEWER LINES &amp; EASEMENTS

RWRD	100	CASING FOR SEWER LINES
*RWRD	101	PILE-SUPPORTED SEWER LINES
RWRD	102	SEWER LINE REPAIR
RWRD	103	COUPLING FOR UNLIKE PIPE MATERIALS
RWRD	104	TYPICAL TRENCH FOR GRAVITY SEWER LINES
RWRD	105-106	(INTENTIONALLY OMITTED)
RWRD	107	DEFLECTION TESTING MANDREL
RWRD	108	SEWER/WATER CROSSING DETAILS
RWRD	109	TURNING RADII FOR SEWER EASEMENTS
RWRD	110	RIGHT ANGLE TURN AROUND FOR SEWER EASEMENTS
RWRD	111	TYPICAL SEWER EASEMENT
*RWRD	112	SEWER EASEMENTS IN ENVIRONMENTALLY SENSITIVE AREAS
*RWRD	113	SCOUR PROTECTION FOR SEWER LINES

## MANHOLES

RWRD	200	PRECAST MANHOLE BASE
RWRD	201	CAST-IN-PLACE MANHOLE BASE
RWRD	202	MANHOLE FLOW CHANNELS
RWRD	203	BLOCK-OUTS
RWRD	204	(INTENTIONALLY OMITTED)
RWRD	205	4' DIAMETER MANHOLE CONFIGURATIONS
RWRD	206	5' DIAMETER MANHOLE CONFIGURATIONS
*RWRD	207	SHALLOW MANHOLES
RWRD	208	MANHOLE JOINTS
*RWRD	209	REINFORCED MANHOLE JOINTS
RWRD	210	MANHOLE STEPS CONFIGURATION
RWRD	211	CONCRETE COLLAR FOR PAVED AREAS
RWRD	212	CONCRETE COLLAR FOR UNPAVED AREAS
RWRD	213	24" FRAME AND COVER
RWRD	214	24" WATERTIGHT FRAME AND COVER
RWRD	215	24" BOLTED WATERTIGHT FRAME AND COVER
RWRD	216	30" FRAME AND COVER
RWRD	217	30" WATERTIGHT FRAME AND COVER
RWRD	218	30" BOLTED WATERTIGHT FRAME AND COVER
RWRD	219-222	(INTENTIONALLY OMITTED)
RWRD	223	MANHOLE VENT ASSEMBLY
RWRD	224	MODIFIED MANHOLE VENT ASSEMBLY
*RWRD	225	FLOW METERING STATION
*RWRD	226	CONCRETE WEIR FOR DIVERSION MANHOLES
RWRD	227	(INTENTIONALLY OMITTED)
*RWRD	228	REDWOOD ISOLATION GATE
*RWRD	229	LOW DROP MANHOLE CONNECTION
*RWRD	230	HIGH DROP MANHOLE CONNECTION

\*SPECIAL STANDARD DETAILS MAY BE USED IF APPROVED  
IN THE PLANS OR IN WRITING BY THE FIELD ENGINEER

ISSUED:	STANDARD DETAIL		DETAIL NO.
1/94			
REVISED:			
12/12	SHEET INDEX		SHEET 1 OF 2

DETAIL NO.DETAIL NAME

## MODIFICATION OF EXISTING SEWER FACILITIES

RWRD	300	CONNECTION TO EXISTING MANHOLE BARREL
RWRD	301	CONNECTION TO EXISTING MANHOLE BASE
RWRD	302	RAISE EXISTING BENCH
RWRD	303	NEW MANHOLE OVER EXISTING SEWER LINE
RWRD	304	GRADE ADJUSTMENT FOR EXISTING BRICK MANHOLE
RWRD	305	GRADE ADJUSTMENT FOR EXISTING PRECAST MANHOLE
RWRD	306	FLOW CHANNEL COVER
RWRD	307	GRADE ADJUSTMENT FOR EXISTING CLEANOUTS
RWRD	308	LEVELING COURSE FOR BRICK MH RECONSTRUCTION


## SERVICE LATERALS

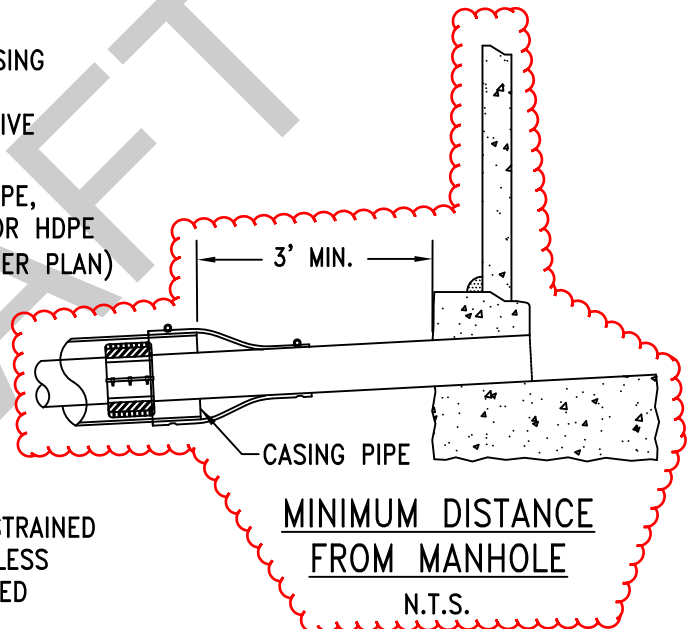
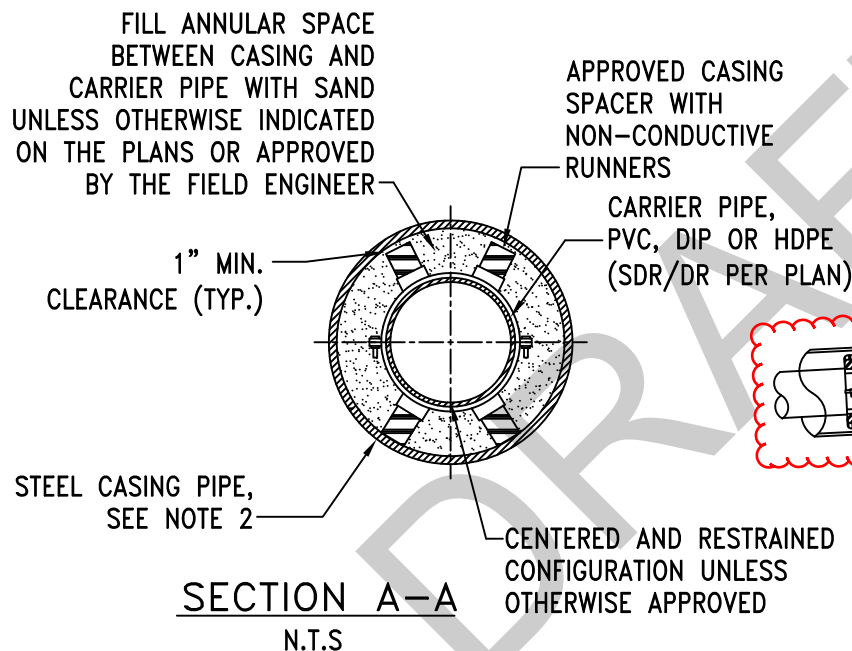
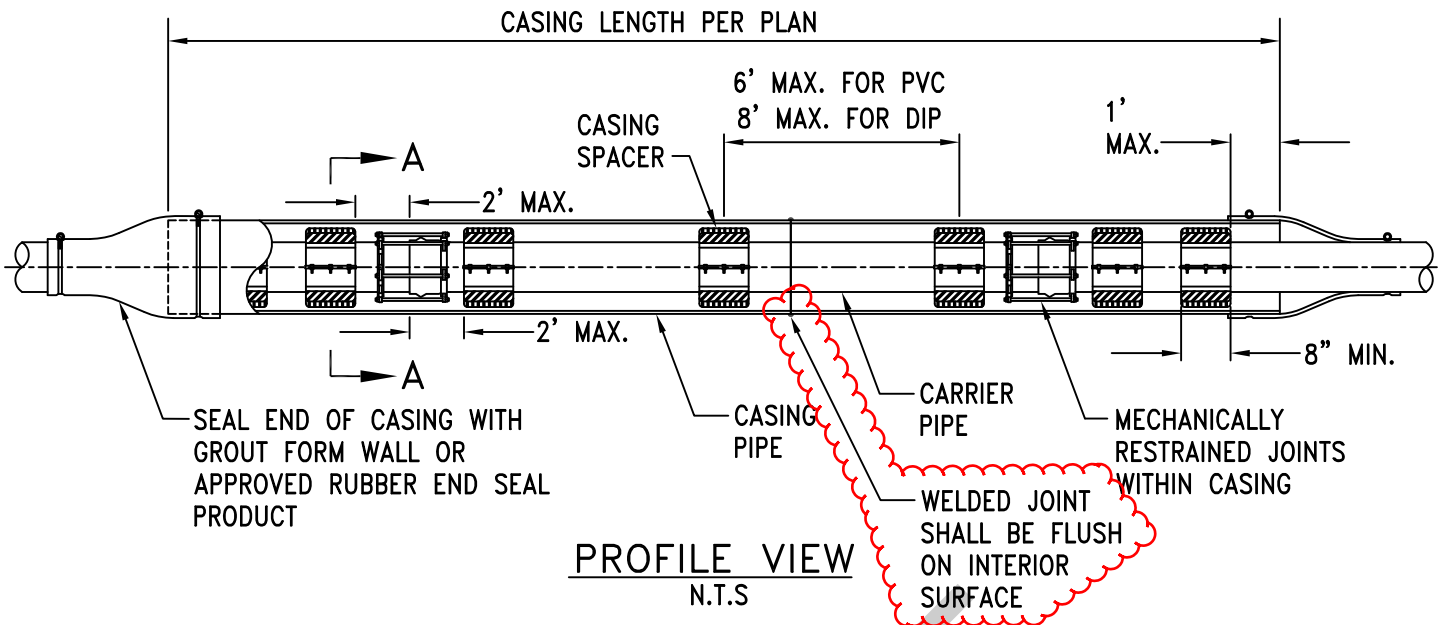
RWRD	400	HCS REROUTING
RWRD	401	HCS CONNECTION TO SEWER LINE
*RWRD	402	HCS CONNECTIONS TO MANHOLES
*RWRD	403	HCS INTERNAL DROP MANHOLE CONNECTION
RWRD	404	HCS CLEANOUTS

## WASTEWATER PUMPING SYSTEMS

RWRD	500	TYPICAL TRENCH FOR FORCE MAINS
RWRD	501	FORCE MAIN TEST STATION
RWRD	502	FORCE MAIN CONNECTION TO MANHOLE
RWRD	503	FORCE MAIN AND ABANDONMENT MONUMENTS
RWRD	504	EQUIPMENT SUPPORT AND SHADE STRUCTURE


\*SPECIAL STANDARD DETAILS MAY BE USED IF APPROVED  
IN THE PLANS OR IN WRITING BY THE FIELD ENGINEER

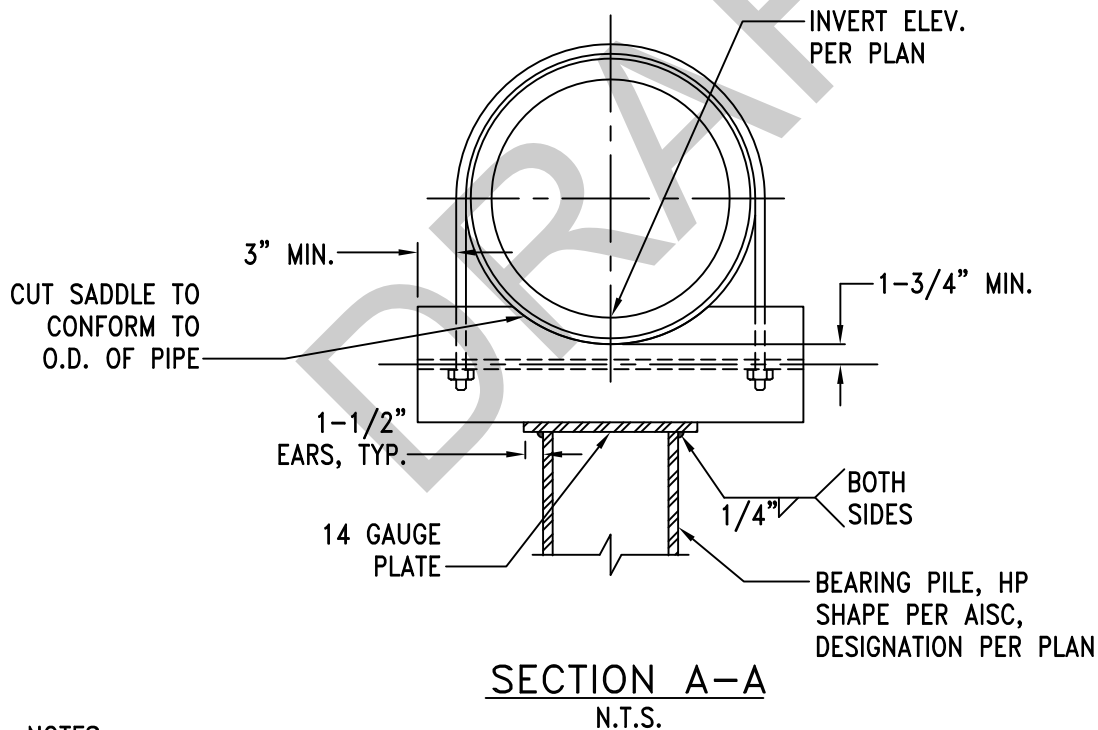
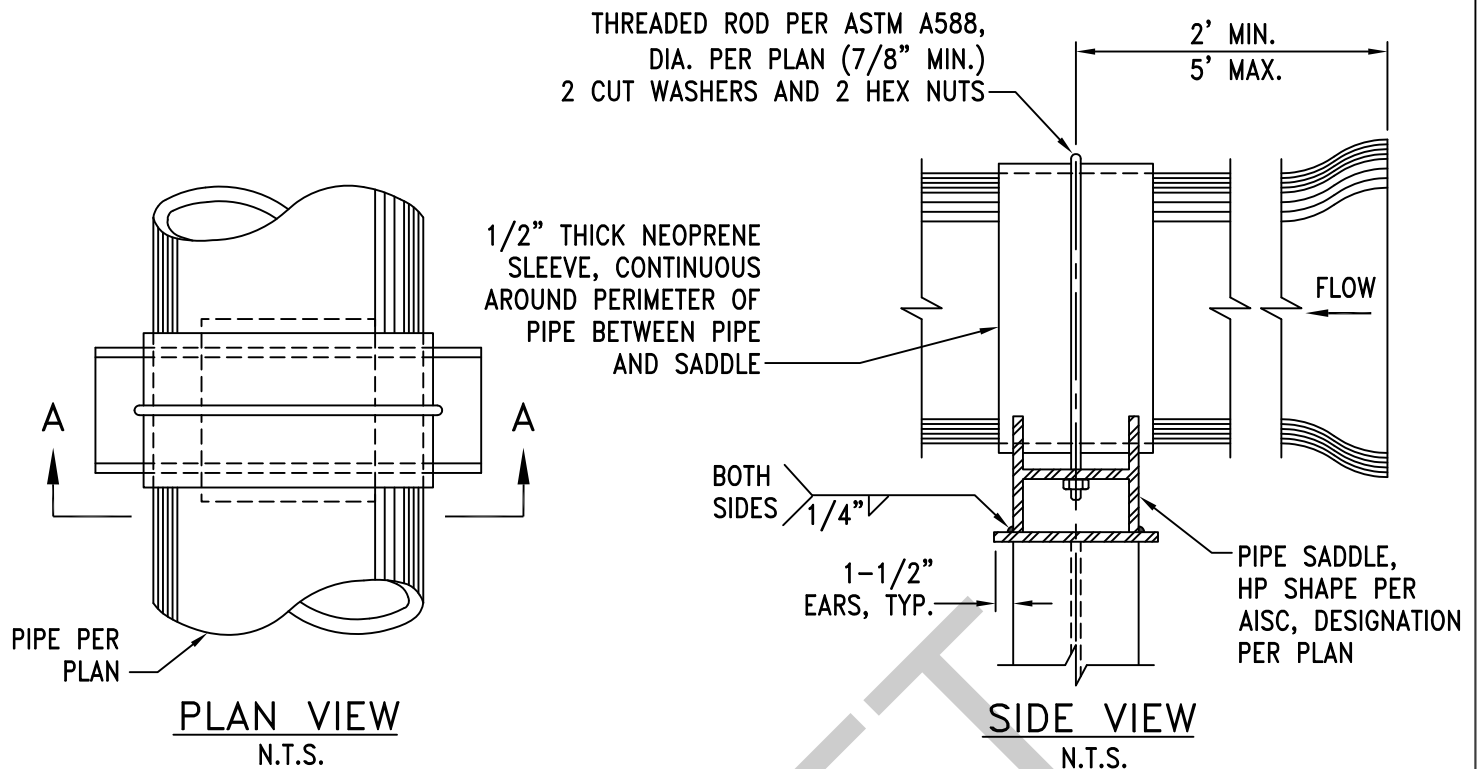
ISSUED:	STANDARD DETAIL		DETAIL NO.
1/94	SHEET INDEX		
REVISED:			
10/15			SHEET 2 OF 2



**NOTES:**

1. THIS DETAIL APPLIES TO GRAVITY SEWER LINES WITH DIAMETERS UP TO 24". FOR CARRIER PIPE GREATER THAN 24" IN DIAMETER OR FORCE MAINS, CASING DETAILS SHALL BE IN ACCORDANCE WITH THE PLANS OR SUBMITTED TO THE FIELD ENGINEER FOR APPROVAL.
2. MINIMUM INSIDE DIAMETER OF CASING PIPE SHALL BE 12" PLUS THE O.D. OF THE CARRIER PIPE. CASING PIPE WALL THICKNESS SHALL BE 1/2" UNLESS OTHERWISE INDICATED ON THE PLANS.
3. UNDER NO CIRCUMSTANCE SHALL WOOD SKIDS OR FULLY-METAL CASING SPACERS BE PERMITTED.
4. SEE SUBSECTION 3.2.3(F) FOR MORE INFORMATION. FOR A CURRENT LIST OF APPROVED PRODUCTS, CONTACT THE DEPARTMENT'S FIELD ENGINEERING OFFICE.

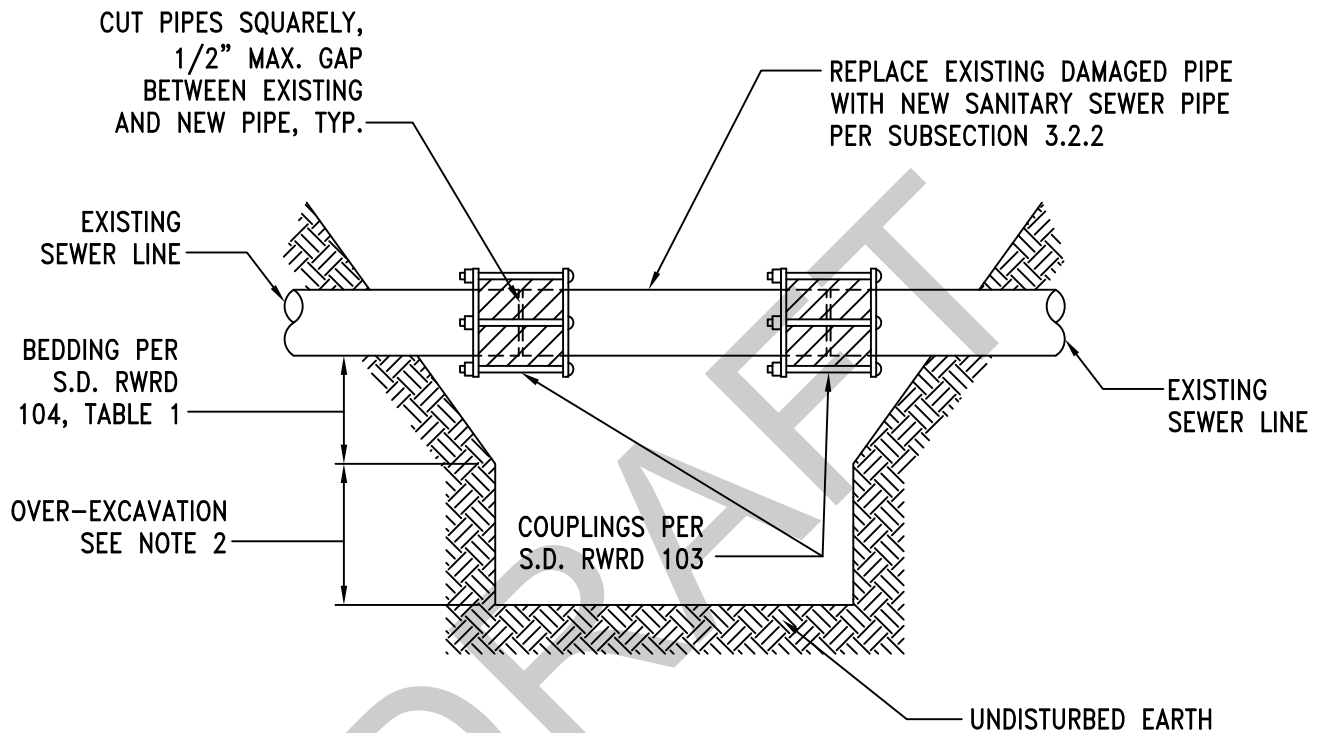
ISSUED:	STANDARD DETAIL  <b>CASING FOR SEWER LINES</b>	 <b>PIMA COUNTY</b> WASTEWATER RECLAMATION	DETAIL NO.
12/12			<b>RWRD 100</b>
REVISED:			
10/15			SHEET 1 OF 1



**NOTES:**

1. THIS SPECIAL STANDARD DETAIL MAY BE USED BY THE CONTRACTOR IF APPROVED IN THE PLANS OR IN WRITING BY THE FIELD ENGINEER.
2. SEE SUBSECTION 3.4.1 FOR MORE INFORMATION.
3. SPECIAL CORROSION PROTECTION MEASURES SHALL BE AS SPECIFIED ON THE PLANS.

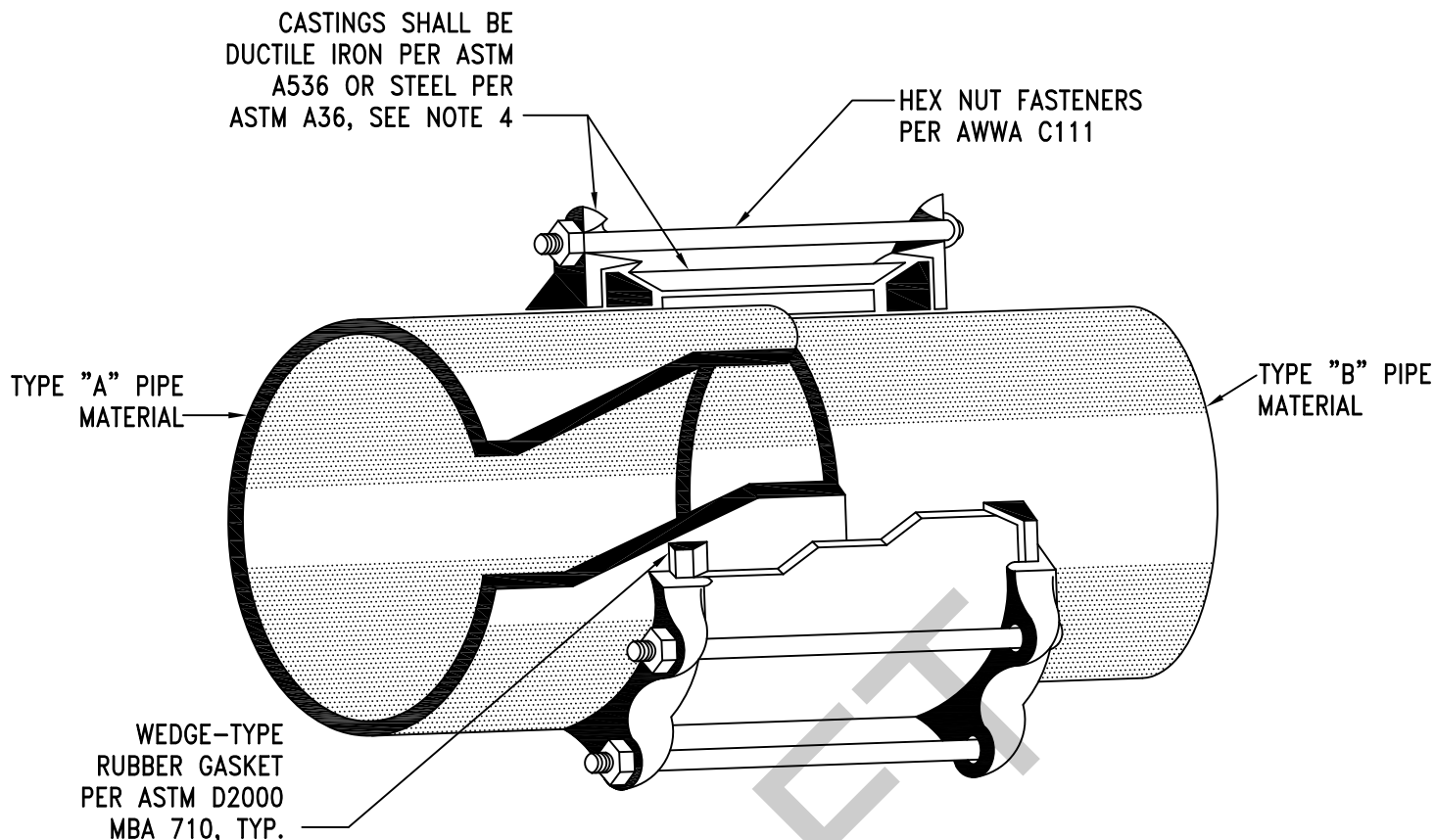
ISSUED:	<b>SPECIAL STANDARD DETAIL</b>  <b>PILE-SUPPORTED SEWER LINES</b>		DETAIL NO.
8/92			RWRD 101
REVISED:			
12/12			SHEET 1 OF 1



**NOTES:**


1. SEE SUBSECTION 3.2.3(G) FOR MORE INFORMATION.
2. IF SATURATED SOIL IS FOUND WHEN THE DAMAGED PORTION OF THE EXISTING SEWER REMOVED, THE SATURATED SOIL SHALL BE EXCAVATED AND REMOVED FROM THE SITE. REPLACE OVER-EXCAVATED MATERIAL WITH APPROVED FOUNDATION MATERIAL PER S.D. RWRD 104 OR AS DIRECTED BY THE FIELD ENGINEER.
3. AFTER BACKFILL INSTALLATION IS COMPLETE, CCTV INSPECTION WILL BE CONDUCTED BY THE DEPARTMENT PRIOR TO FINAL ACCEPTANCE OF THE SEWER LINE REPAIR.

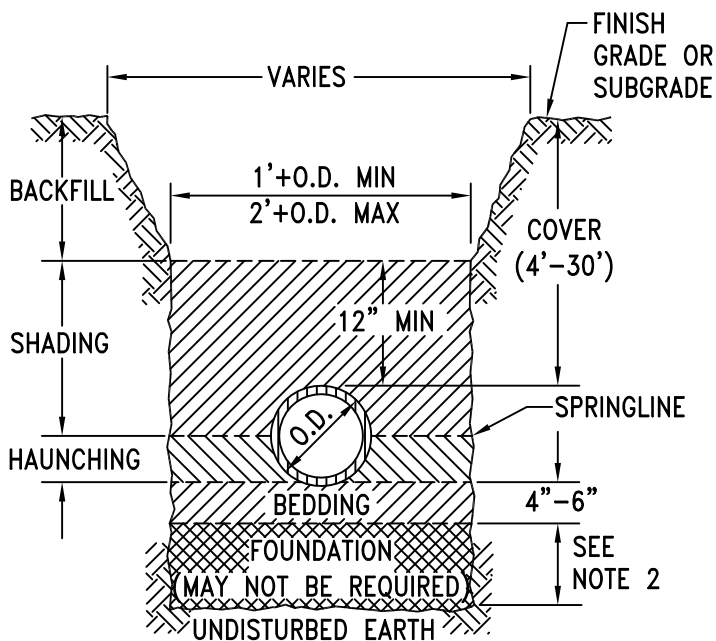
ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	SEWER LINE REPAIR		RWRD 102
REVISED:			SHEET 1 OF 1
12/12			



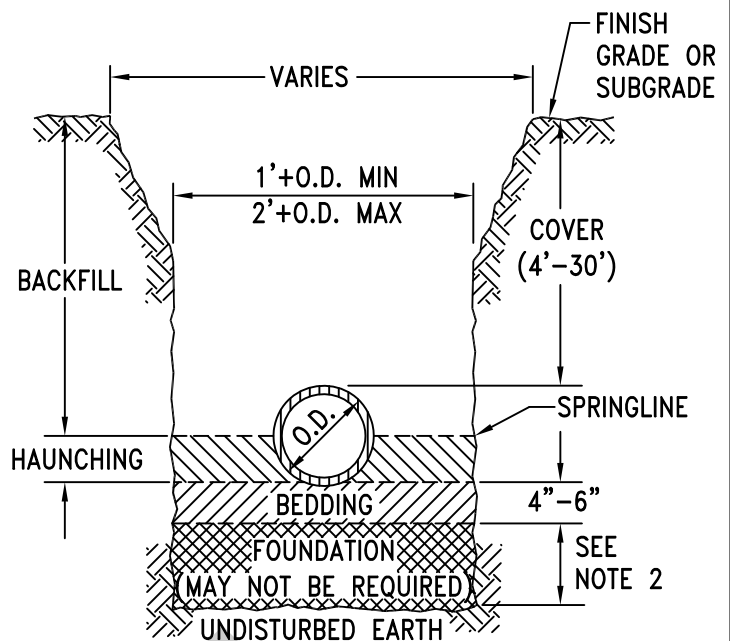
**NOTES:**

1. COUPLINGS SHALL BE RIGID, COMPRESSION TYPE COUPLINGS AS SHOWN, APPROPRIATELY SIZED AND SUITABLE FOR SANITARY SEWER APPLICATIONS. APPROVED COUPLINGS SHALL BE IN THE DEPARTMENT'S LIST OF APPROVED PRODUCTS.
2. ADJUSTABLE REPAIR COUPLINGS (I.E. MISSION) FOR SANITARY SEWER APPLICATIONS MAY BE PERMITTED ON A CASE-BY-CASE BASIS FOR EXISTING 12" DIAMETER VCP OR CONCRETE SEWER PIPE AND SMALLER, ONLY WITH PRIOR APPROVAL BY THE FIELD ENGINEER.
3. WHERE THERE IS A 1" DIFFERENTIAL IN INTERNAL DIAMETERS OF THE 2 DIFFERENT PIPE TYPES, A SPECIAL CONNECTION, APPROVED BY THE FIELD ENGINEER, SHALL BE USED TO ELIMINATE THE DIFFERENTIAL AT THE INVERT.
4. CASTINGS SHALL HAVE AN APPROVED FACTORY-APPLIED INTERIOR AND EXTERIOR CORROSION-RESISTANT COATINGS FOR SANITARY SEWER APPLICATIONS.
5. SEE SUBSECTION 3.4.3 - FOR A CURRENT LIST OF APPROVED PRODUCTS FOR PUBLIC SEWERS, CHECK THE DEPARTMENT'S WEBSITE OR CONTACT THE FIELD ENGINEERING SECTION.

ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	COUPLING FOR UNLIKE PIPE MATERIALS		RWRD 103
REVISED:			
10/15			SHEET 1 OF 1



**FLEXIBLE PIPE  
TRENCH DETAIL**  
N.T.S.




**RIGID PIPE  
TRENCH DETAIL**  
N.T.S.

**TABLE 1: APPROVED TRENCH MATERIALS AND GRADATION REQUIREMENTS**

CRUSHED STONE (FOUNDATION, BEDDING, HAUNCHING & SHADING)		SAND (BEDDING, HAUNCHING & SHADING)		EXCAVATED NATIVE MATERIAL (BACKFILL)		SELECT IMPORT MATERIAL (BACKFILL & FOUNDATION)	
NOM. SIZE	% PASSING	NOM. SIZE	% PASSING	NOM. SIZE	% PASSING	NOM. SIZE	% PASSING
1"	100	1"	100	6"	100	3"	100
3/4"	90-100	#4	60-100	ALSO SEE SUBSECTION 3.1.2(C)		3/4"	60-100
3/8"	20-55	#200	0-10			#8	35-80
#4	0-10	MAX. P.I.=5				SUM OF #200 + P.I. ≤ 25	
#8	0-5	MAX. L.L.=30				ALSO SEE SUBSECTION 3.1.2(D)	
6.0 ≤ pH ≤ 12.0		6.0 ≤ pH ≤ 12.0					
MIN. RESISTIVITY = IN-PLACE MATERIAL OR 2,000 ohm-cm		MIN. RESISTIVITY = IN-PLACE MATERIAL OR 2,000 ohm-cm					
ALSO SEE SUBSECTION 3.1.2(A)		ALSO SEE SUBSECTION 3.1.2(B)					

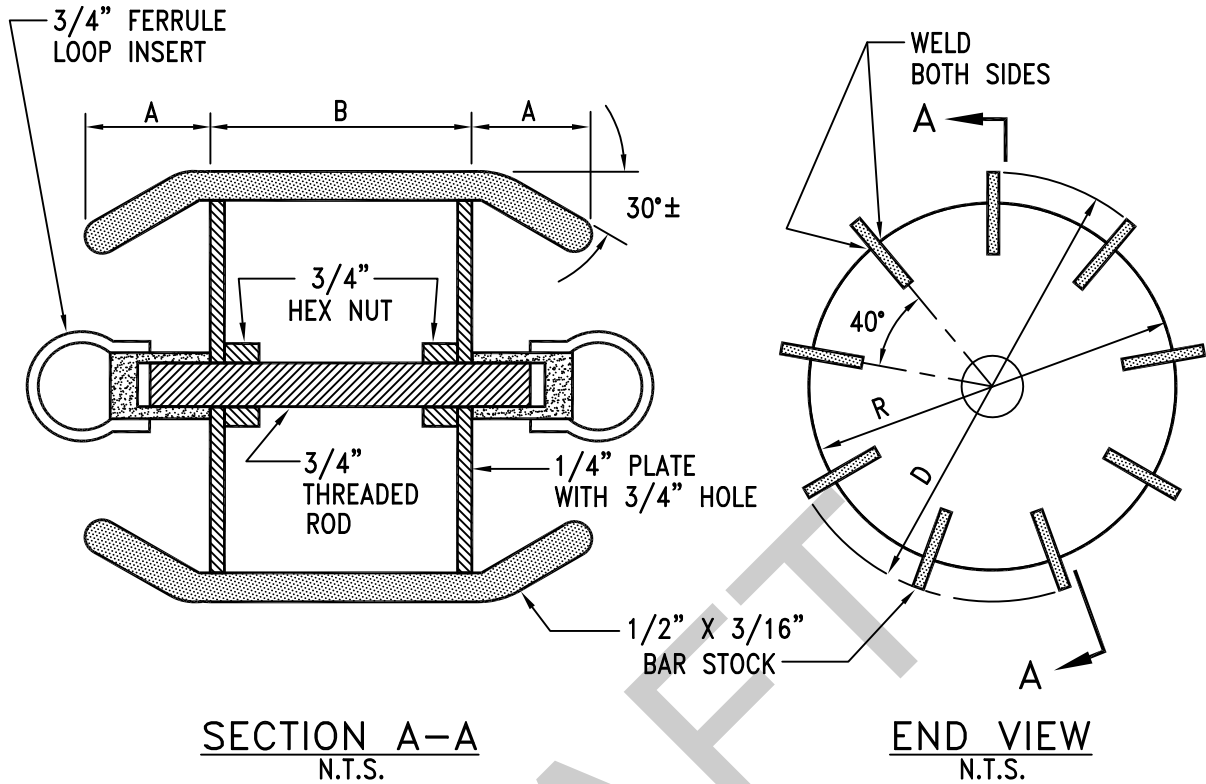
**NOTES:**

- FOR SEWER LINES GREATER THAN 16 INCH DIAMETER OR COVER DEPTHS NOT CONFORMING TO THE STANDARD TRENCH DETAILS, SEE PLANS FOR MODIFIED TRENCH DETAILS.
- FOUNDATION IS REQUIRED FOR OVEREXCAVATION SUCH AS FOR ROCK OR UNSUITABLE MATERIALS. SEE SUBSECTION 3.1.3(B) FOR MORE INFORMATION.
- IN CASES WHERE GROUNDWATER IS ENCOUNTERED, INSTALLATION OF AN APPROVED GEOTEXTILE FABRIC ENCLOSING CRUSHED STONE SHALL BE REQUIRED FOR STABILIZATION.

ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	TYPICAL TRENCH FOR GRAVITY SEWER LINES		RWRD 104
REVISED:			SHEET 1 OF 1
12/12			



# SHOP DRAWING



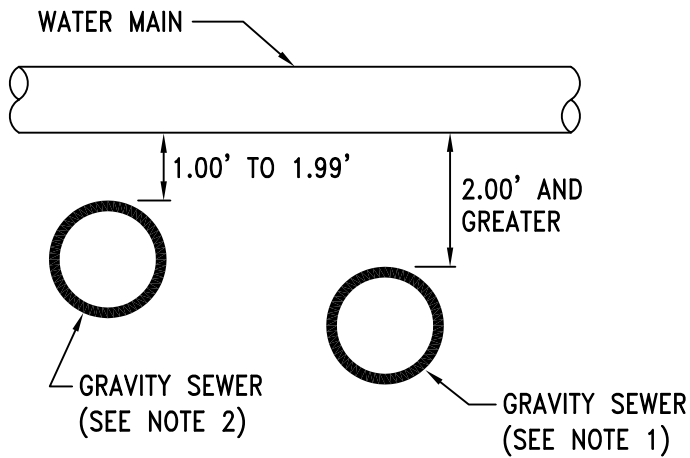
5.0% DEFLECTION LIMIT				
PIPE SIZE	A	B	D	R
8"	2"	2.4"-8"	7.28"	6.28"
10"	2"	3"-10"	9.08"	8.08"
12"	2"	3.5"-12"	10.79"	9.79"
15"	2"	4.3"-15"	13.20"	12.20"
18" AND OVER	SUBMIT SHOP DRAWING			

## NOTES:

1. AFTER WELDING IS COMPLETED, TRUE THE OUTSIDE DIAMETER DIMENSION FOR THE FULL LENGTH OF "B" TO  $\pm 0.010$ " BY TOOL AND LATHE OR GRINDING.
2. FINISHED PART TO BE SANDBLASTED AND RUST-PROOFED WITH PAINT.
3. DEFLECTION TESTING MANDRELS SHALL BE INSPECTED AND APPROVED BY THE FIELD ENGINEER PRIOR TO USE. THE MINIMUM NUMBER OF RIBS IS SUBJECT TO APPROVAL OF THE SHOP DRAWINGS.
4. SEE SUBSECTION 3.2.3(D)(vi) FOR MORE INFORMATION.

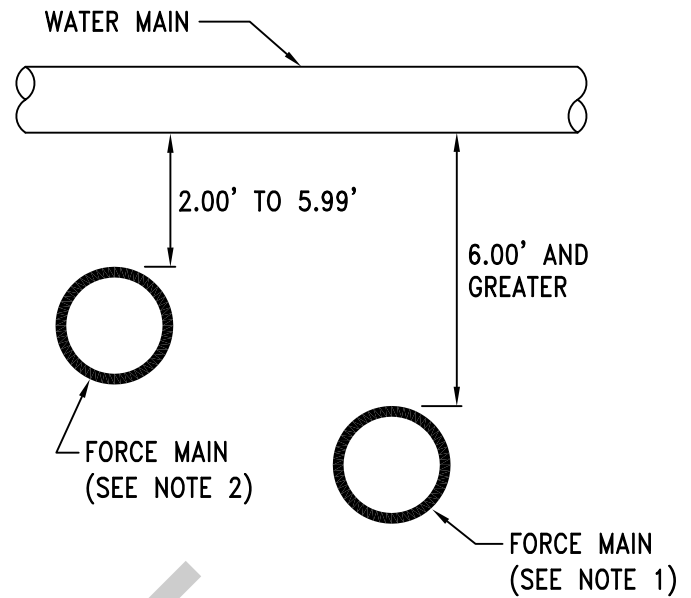
ISSUED:	STANDARD DETAIL  DEFLECTION TESTING MANDREL		DETAIL NO.
8/92			RWRD 107
REVISED:			SHEET 1 OF 1
12/12			

# VERTICAL SEPARATION



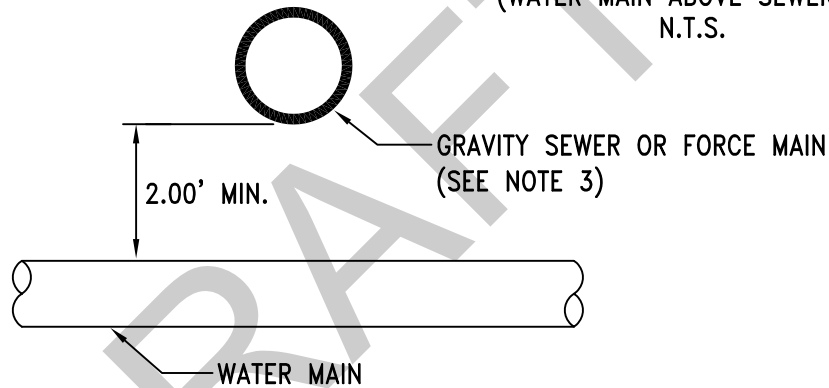
## GRAVITY SEWER CROSSING

(WATER MAIN ABOVE SEWER)  
N.T.S.



## FORCE MAIN CROSSING

(WATER MAIN ABOVE SEWER)  
N.T.S.




## GRAVITY OR FORCE MAIN CROSSING

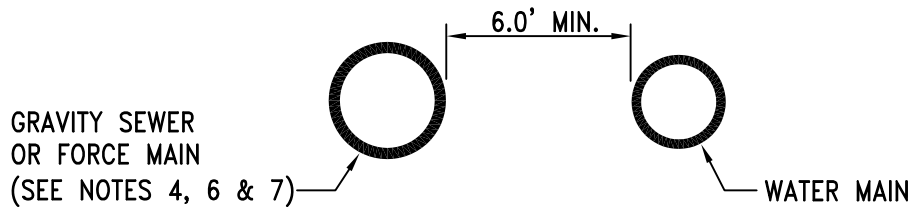
(WATER MAIN BELOW SEWER)  
N.T.S.

### NOTES:

1. WHERE A WATER MAIN CROSSES ABOVE A GRAVITY SEWER WITH 2' OR GREATER VERTICAL CLEARANCE (OUTSIDE SURFACE TO OUTSIDE SURFACE), NO EXTRA PROTECTION IS REQUIRED. WHERE A WATER MAIN CROSSES ABOVE A FORCE MAIN WITH 6' OR GREATER VERTICAL CLEARANCE, NO EXTRA PROTECTION IS REQUIRED.
2. WHERE A WATER MAIN MUST CROSS ABOVE A GRAVITY SEWER WITH LESS THAN 2' OF CLEARANCE OR ABOVE A FORCE MAIN WITH LESS THAN 6' OF CLEARANCE, CONSTRUCT OR REPLACE THE SEWER LINE WITH DUCTILE IRON PIPE (D.I.P.) OR APPROVED EQUAL. IN NO CASE SHALL THE WATER MAIN HAVE LESS THAN 1' OF CLEARANCE ABOVE A GRAVITY SEWER OR 2' OF CLEARANCE ABOVE A FORCE MAIN. IF THE JOINT IS LOCATED LESS THAN 6' FROM THE OUTSIDE SURFACE OF THE WATER MAIN, THEN A RESTRAINED JOINT OR APPROVED EQUAL SHALL BE USED. REFER TO SHEET 3 OF 3.
3. WHERE A WATER MAIN CROSSES BELOW EITHER A GRAVITY SEWER OR A FORCE MAIN, CONSTRUCT OR REPLACE THE SEWER LINE WITH D.I.P. OR APPROVED EQUAL FOLLOWING THE GUIDELINES GIVEN IN NOTE NO. 2. IN NO CASE SHALL THE WATER MAIN BE LESS THAN 2' BELOW EITHER A GRAVITY SEWER OR FORCE MAIN.

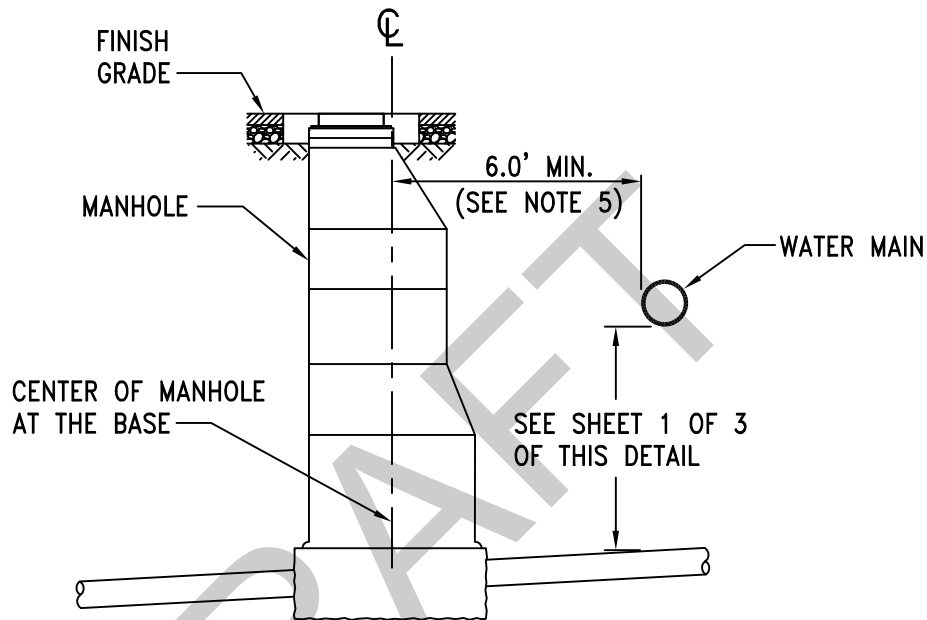
ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	SEWER/WATER		RWRD 108
REVISED:	CROSSING DETAILS		SHEET 1 OF 3
10/15			

# HORIZONTAL SEPARATION



## WATER MAIN SEPARATION WITH SEWER LINES

(PARALLEL ALIGNMENTS)  
N.T.S.




## WATER MAIN SEPARATION WITH SEWER MANHOLE

N.T.S.

### NOTES (CONTINUED):

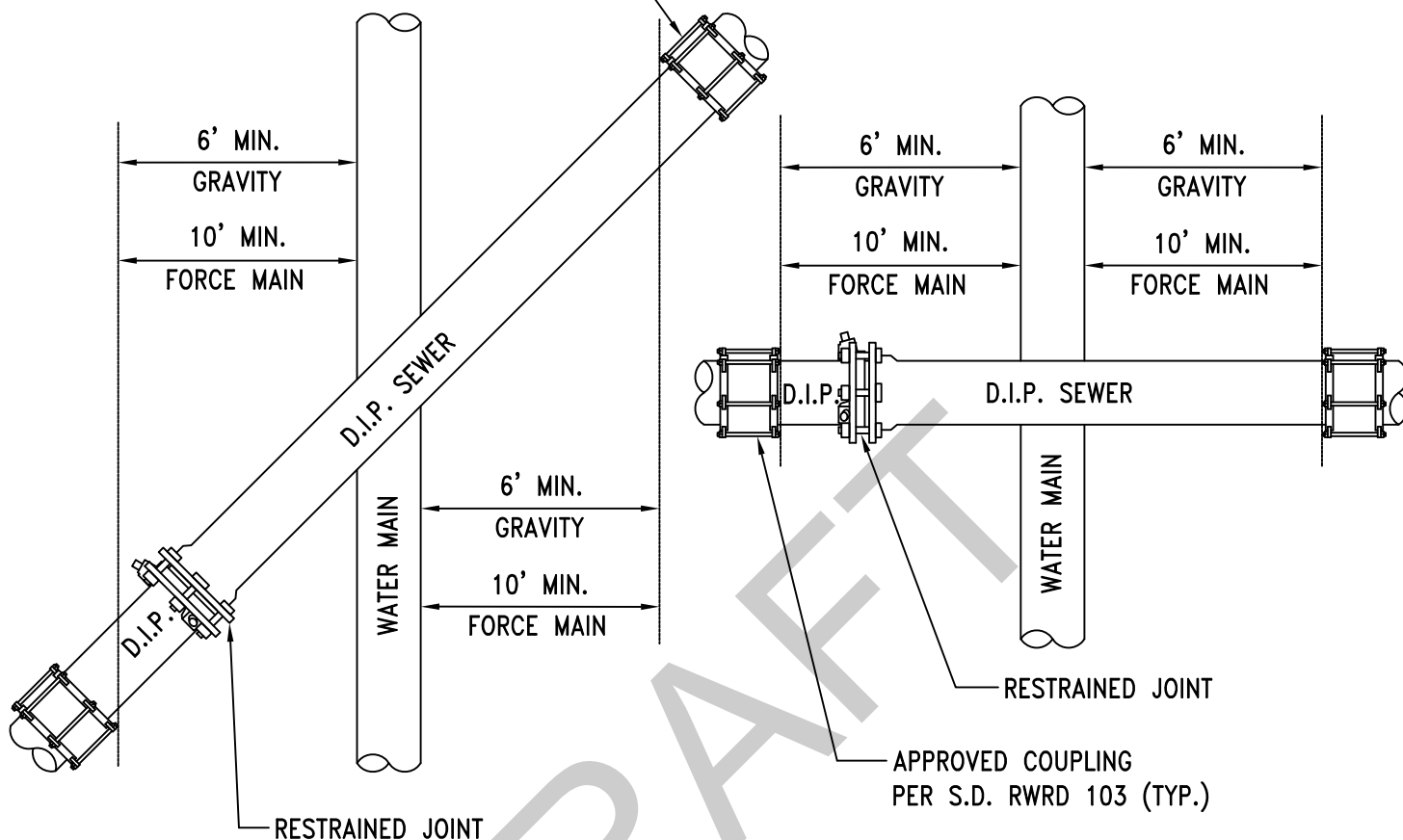
4. THE MINIMUM HORIZONTAL CLEARANCE WITHOUT EXTRA PROTECTION BETWEEN A WATER MAIN AND A FORCE MAIN OR GRAVITY SEWER LINE SHALL BE 6' OUTSIDE SURFACE TO OUTSIDE SURFACE.
5. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN A WATER MAIN AND A SEWER MANHOLE SHALL BE 6' FROM THE OUTSIDE SURFACE OF THE WATER MAIN TO THE CENTER OF MANHOLE.
6. WHERE A 6' HORIZONTAL CLEARANCE CANNOT BE MAINTAINED WITH A GRAVITY SEWER, CONSTRUCT OR REPLACE THE SEWER LINE WITH D.I.P. OR APPROVED EQUAL FOLLOWING THE GUIDELINES GIVEN IN NOTE NO. 2. IN NO CASE SHALL A GRAVITY SEWER LINE BE LOCATED LESS THAN 2' HORIZONTALLY FROM A WATER MAIN.
7. IN NO CASE SHALL A FORCE MAIN BE LOCATED LESS THAN 6' HORIZONTALLY FROM A WATER MAIN.
8. THE AMERICAN NATIONAL STANDARD FOR THE THICKNESS DESIGN OF D.I.P. (ANSI/AWWA C150/A21.50) SHALL BE USED TO DETERMINE THE REQUIRED PRESSURE CLASS EXCEPT FOR D.I.P. WITH A DIAMETER OF 3" THRU 24", A MINIMUM PRESSURE CLASS OF 350 IS REQUIRED. FOR D.I.P. WITH A DIAMETER GREATER THAN 24", A MINIMUM PRESSURE CLASS OF 200 IS REQUIRED.

ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	SEWER/WATER CROSSING DETAILS		RWRD 108
REVISED:			
12/12			SHEET 2 OF 3

# PLAN VIEWS


N.T.S.

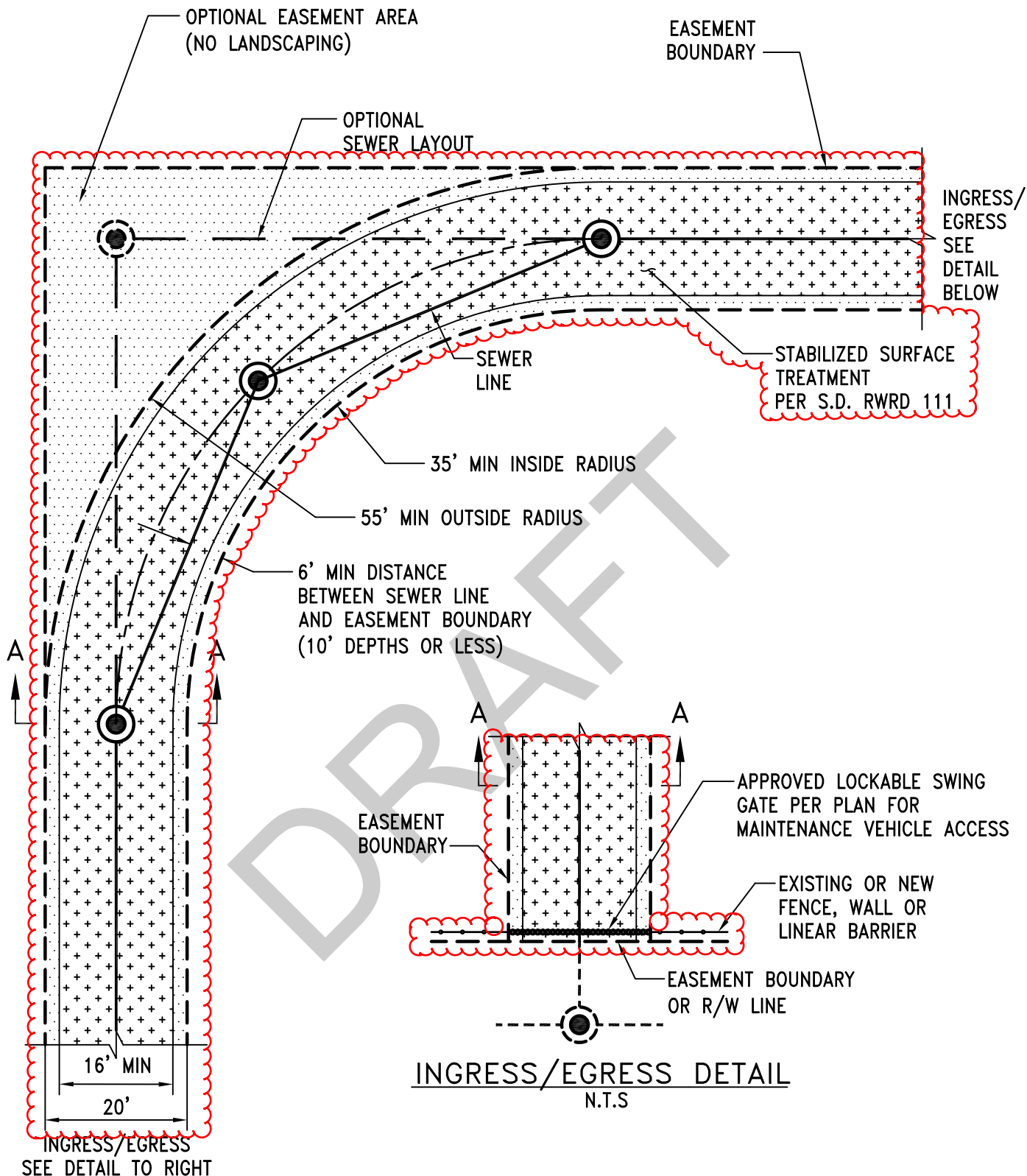
APPROVED COUPLING  
PER S.D. RWRD 103 (TYP.)



## NOTES (CONTINUED):

9. WHERE THE SEWER LINE IS A GRAVITY SEWER, THE D.I.P. INSTALLATION OR REPLACEMENT SHALL EXTEND A MINIMUM OF 6' BEYOND EACH SIDE OF THE WATER MAIN, MEASURED HORIZONTALLY FROM AND PERPENDICULAR TO THE WATER MAIN.
10. WHERE THE SEWER LINE IS A FORCE MAIN, THE D.I.P. INSTALLATION OR REPLACEMENT SHALL EXTEND A MINIMUM OF 10' BEYOND EACH SIDE OF THE WATER MAIN, MEASURED HORIZONTALLY FROM AND PERPENDICULAR TO THE WATER MAIN.
11. WHEN UNUSUAL CONDITIONS SUCH AS, BUT NOT LIMITED TO, HIGHWAY OR BRIDGE CROSSINGS PREVENT THE WATER AND SEWER LINE SEPARATIONS REQUIRED BY THIS DETAIL FROM BEING MET, PCRWRD WILL REVIEW AND MAY APPROVE (SUBJECT TO APPROVAL BY THE ENVIRONMENTAL REGULATORY AGENCY HAVING JURISDICTION), REQUESTS FOR AUTHORIZATION TO USE ALTERNATE CONSTRUCTION TECHNIQUES, MATERIALS AND JOINTS ON A CASE-BY-CASE BASIS.
12. ALL DUCTILE IRON PIPE SHALL BE INTERNALLY LINED AND EXTERNALLY WRAPPED PER SUBSECTION 3.2.2(D).

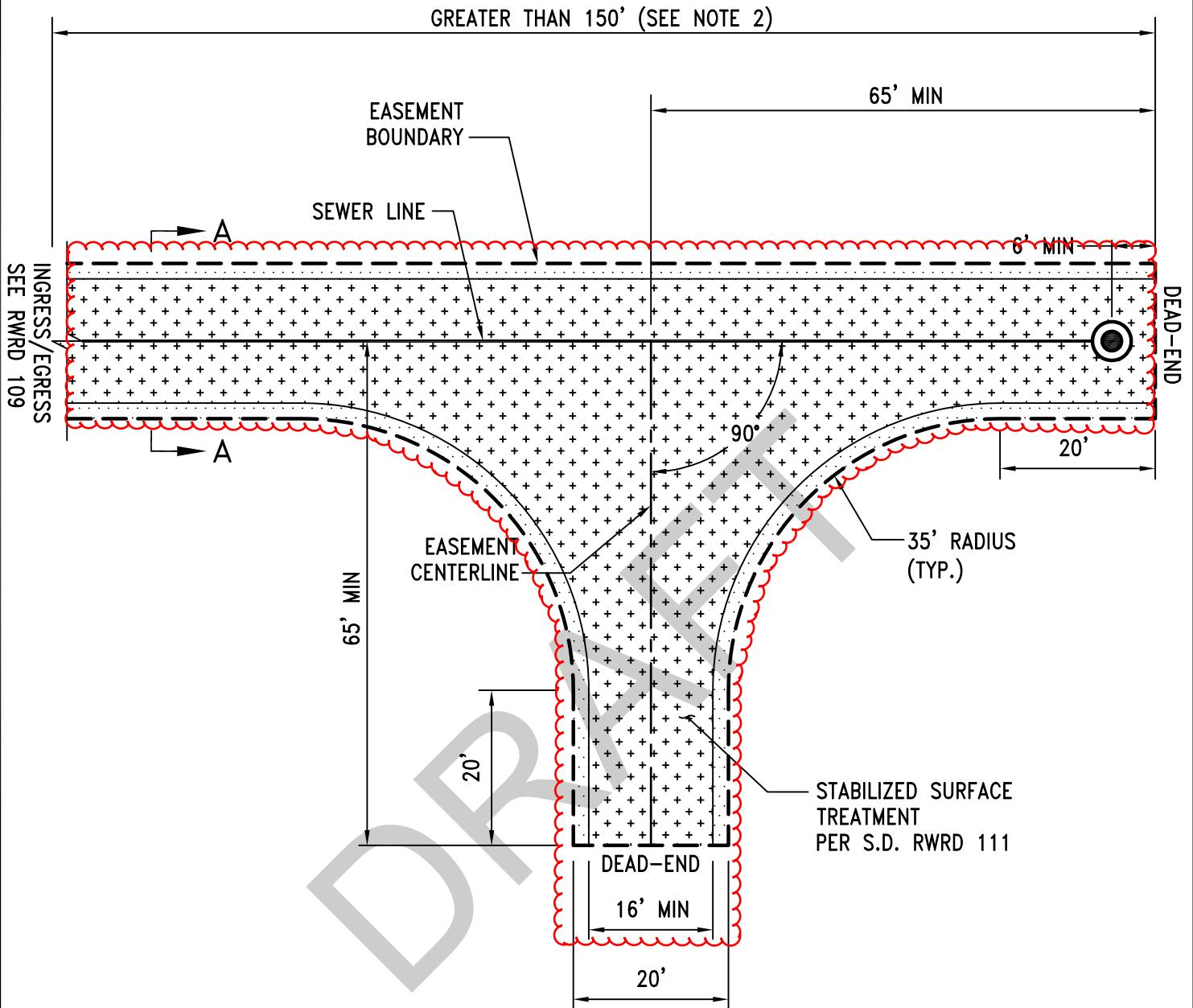
ISSUED:	STANDARD DETAIL		DETAIL NO.
8/92	SEWER/WATER CROSSING DETAILS		RWRD 108
REVISED:			
12/12			SHEET 3 OF 3



**NOTES:**


1. SEE S.D. RWRD 111 FOR SECTION A-A.
2. SEE THE DESIGN STANDARDS, SUBSECTION 7.1 FOR MORE INFORMATION.

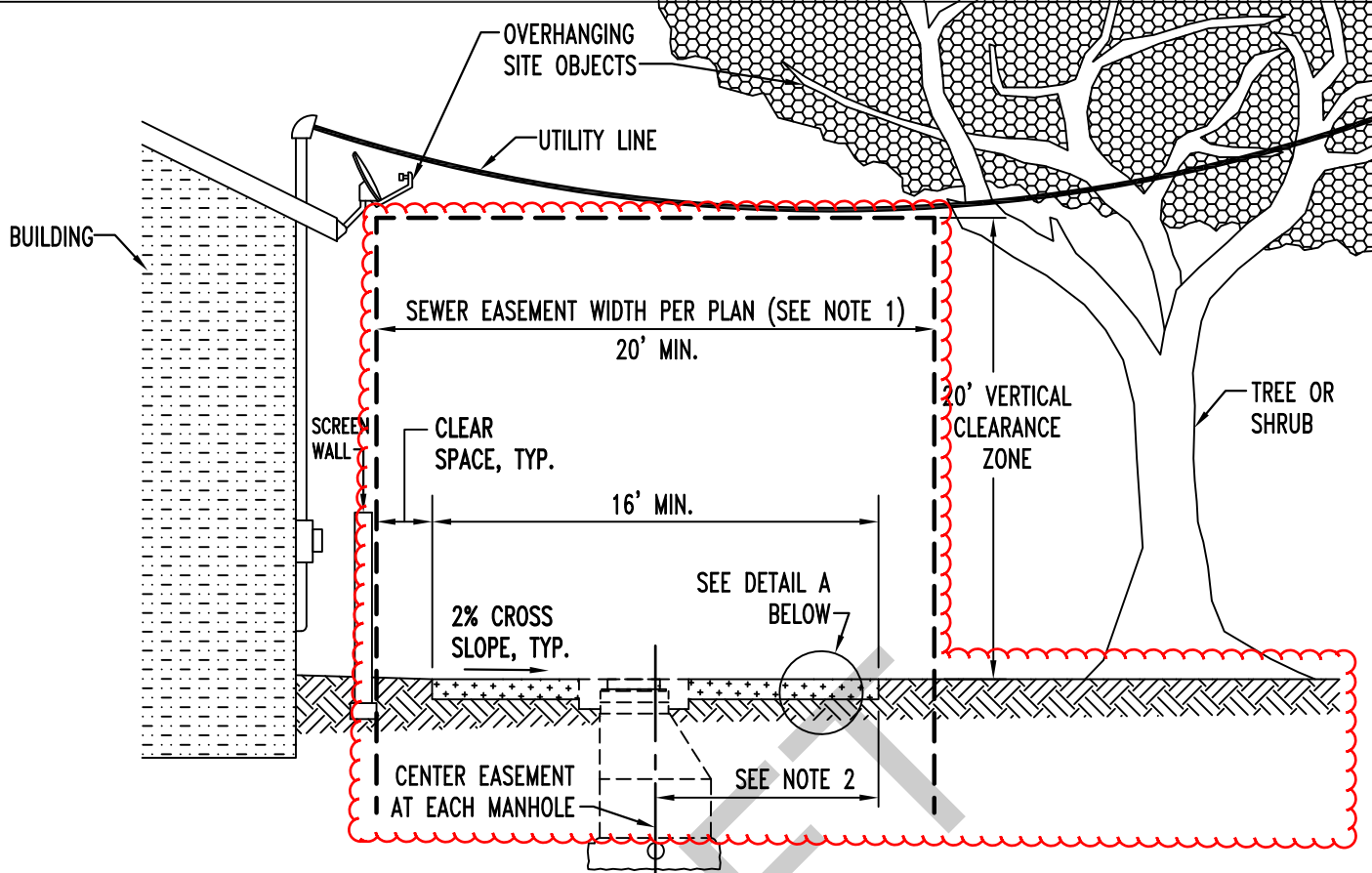
ISSUED:	STANDARD DETAIL  TURNING RADII FOR SEWER EASEMENTS	 PIMA COUNTY WASTEWATER RECLAMATION	DETAIL NO.
8/92			RWRD 109
REVISED:			SHEET 1 OF 1
10/15			



**NOTES:**

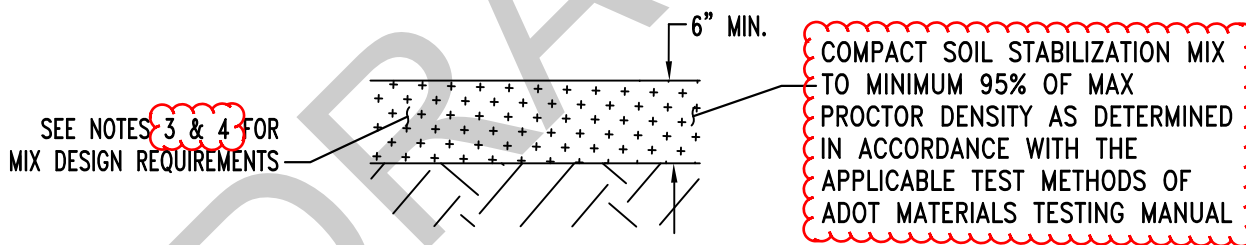
1. SEE S.D. RWRD 111 FOR SECTION A-A.
2. RIGHT ANGLE TURN-AROUNDS REQUIRED FOR DEAD-END SEWER EASEMENTS WITH LENGTHS EXCEEDING 150'. FOR LENGTHS OF 150' OR LESS, A SHORT ACCESS EASEMENT MAY BE PERMITTED. SEE THE DESIGN STANDARDS, SUBSECTION 7.1.2 FOR MORE INFORMATION.

ISSUED:	STANDARD DETAIL		DETAIL NO.
1/02	RIGHT ANGLE TURN AROUND FOR SEWER EASEMENTS		RWRD 110
REVISED:			SHEET 1 OF 1
10/15			



### SECTION A-A

(SEE DETAILS S.D. RWRD 109 & 110)  
N.T.S.




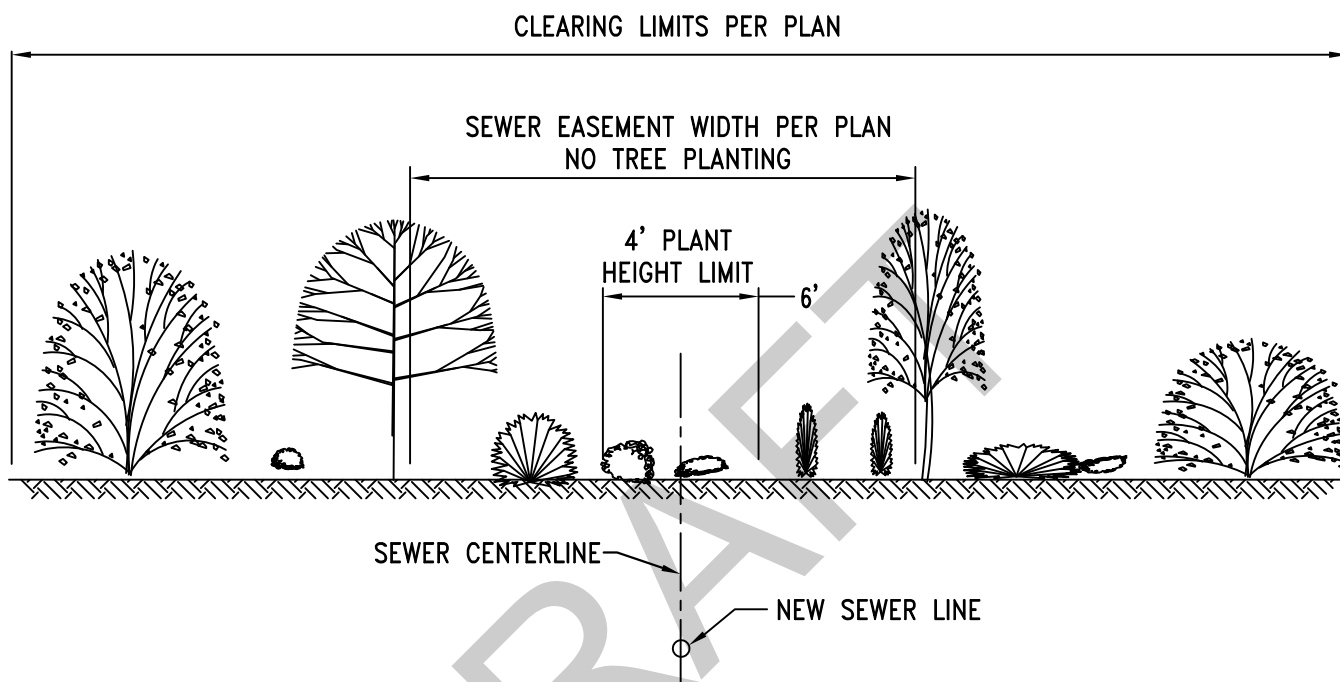
### STABILIZED SURFACE TREATMENT

N.T.S.

#### NOTES:

- FOR MINIMUM SEWER EASEMENT WIDTHS AND OTHER REQUIREMENTS SEE THE DESIGN STANDARDS, SUBSECTION 7.1.
  - THE EDGE OF THE STABILIZED SURFACE SHALL BE 6' MINIMUM FROM THE CENTER OF EACH MANHOLE.
  - MIX DESIGN FOR STABILIZED SURFACE TREATMENTS SHALL BE SUBMITTED BY THE CONTRACTOR FOR APPROVAL BY THE FIELD ENGINEER UNLESS PROVIDED ON THE PLANS.
  - MIX DESIGN SHALL BE CERTIFIED BY AN ARIZONA REGISTERED GEOTECHNICAL ENGINEER AND SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:
    - BASED ON SITE-SPECIFIC SOILS, USE ONE OF THE FOLLOWING APPROVED STABILIZING AGENTS: HYDRATED LIME SLURRY (HLS), HLS AND FLY ASH, OR PORTLAND CEMENT;
    - PASS 100% THROUGH THE 3 INCH SIEVE;
    - SHALL NOT CONTAIN DELETERIOUS MATERIALS; AND
    - MINIMUM COMPRESSIVE STRENGTH OF 600-800 PSI.
- SUBMIT ALL TESTING TO THE FIELD ENGINEER. (COMPACTION AND STRESS TESTS)

ISSUED:	STANDARD DETAIL	 PIMA COUNTY WASTEWATER RECLAMATION	DETAIL NO.
7/02	SEWER EASEMENT TYPICAL SECTION		RWRD 111
REVISED:			SHEET 1 OF 1
10/15			



## CLEARING AND PLANTING LIMITS

N.T.S.

### NOTES:

1. THIS SPECIAL STANDARD DETAIL MAY BE USED BY THE CONTRACTOR IF APPROVED IN THE PLANS OR IN WRITING BY THE FIELD ENGINEER.
2. SEE THE DESIGN STANDARDS, SUBSECTION 7.1 AND 7.7 FOR MORE INFORMATION.

ISSUED:	SPECIAL STANDARD DETAIL SEWER EASEMENTS IN ENVIRONMENTALLY SENSITIVE AREAS		DETAIL NO.
12/12			RWRD 112
REVISED:			
			SHEET 1 OF 1