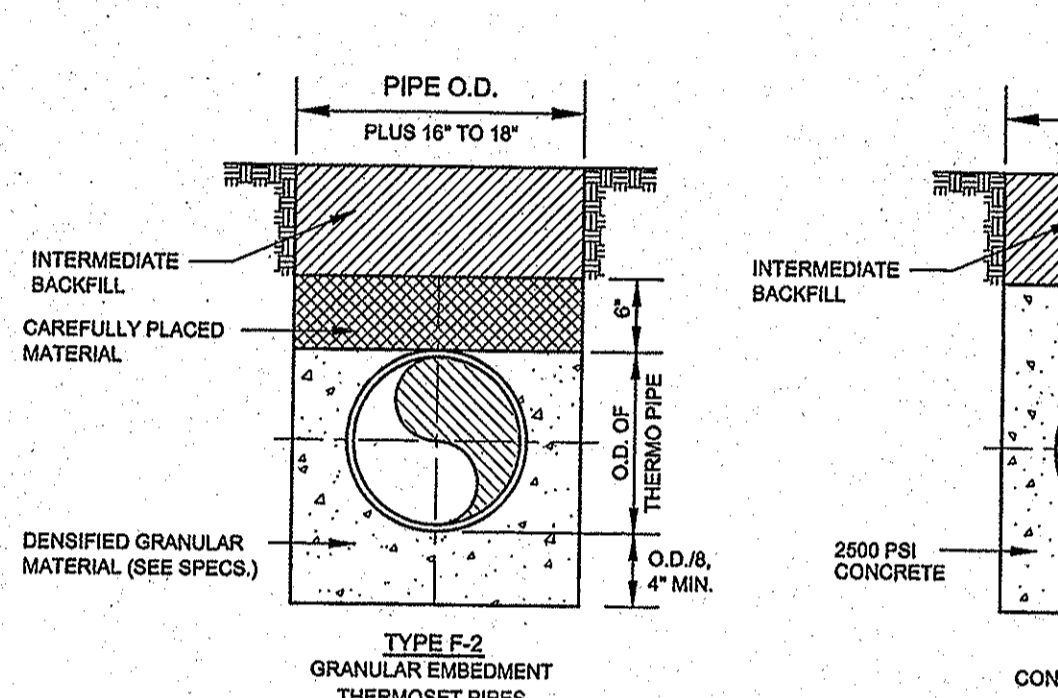


**STANDARD TERMINOLOGY**

TYPE F-2 GRANULAR EMBEDMENT THERMOSET PIPES

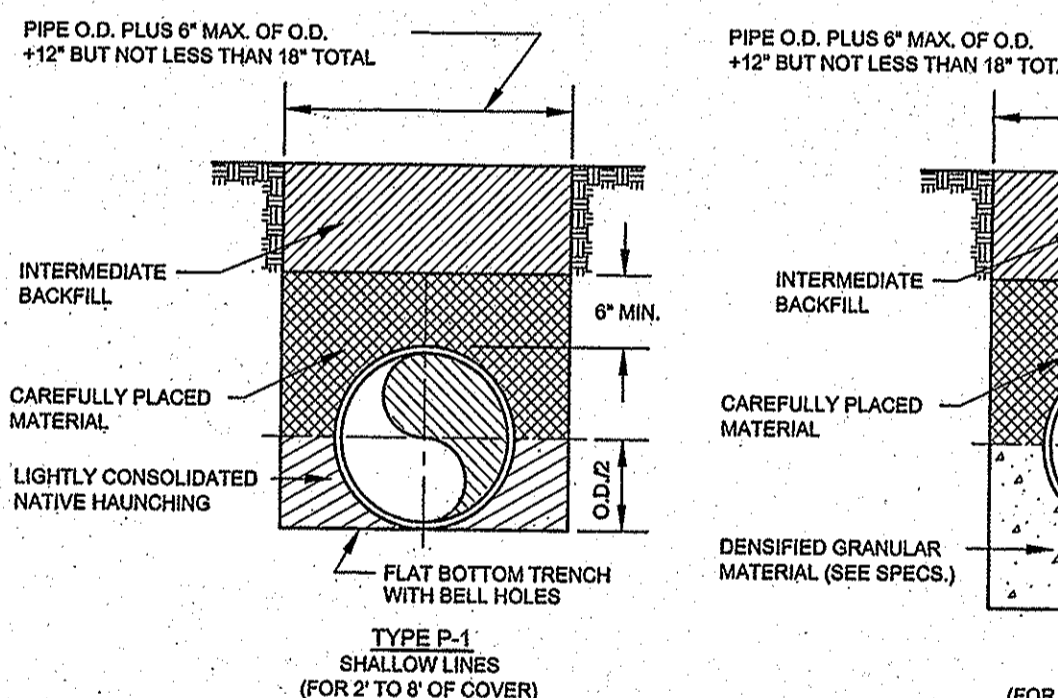
TYPE F-3 CONCRETE ENCASEMENT



**FLEXIBLE EMBEDMENT (HDPE)**

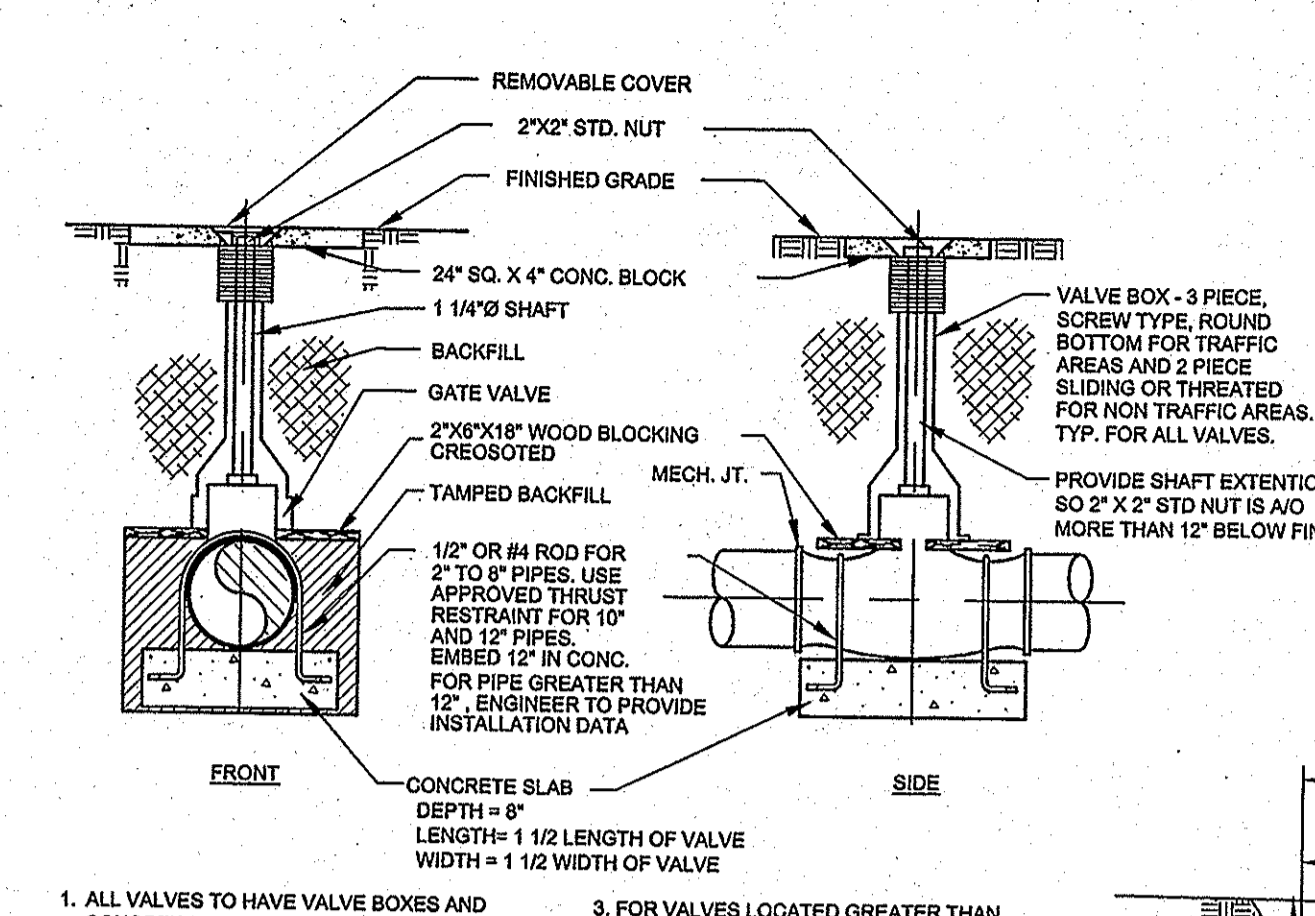
TYPE P-1 SHALLOW LINES (FOR 2" TO 6" COVER)

TYPE P-2 DEEP LINES (FOR 6" TO 20" COVER)



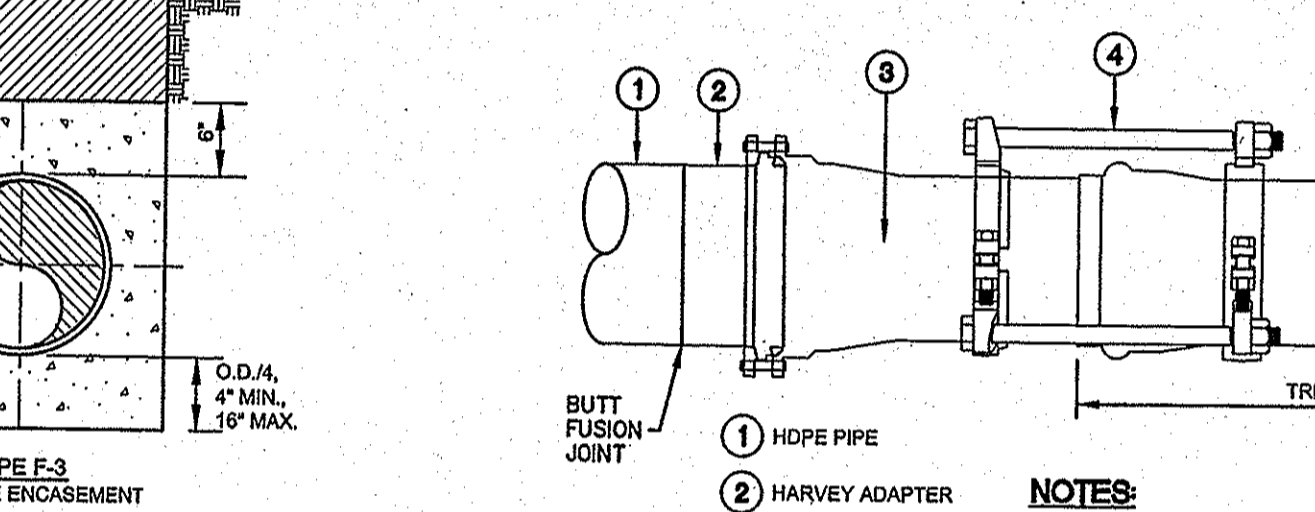
**PRESSURE PIPE EMBEDMENT (DUCTILE IRON, PVC)**

- NOTES:**
- FLEXIBLE (TYPE F) WATER PIPE CONSTRUCTED BELOW 6" OF COVER SHALL BE INSTALLED WITH BEDDING AND HAUNCHING USING CLEAN, WELL GRADED GRANULAR MATERIAL COMPACTED TO 85% STANDARD PROCTOR DENSITY (MIN.), IN NATIVE CLAY OR SILT TRENCHES, USE SIZE NO.76(1/2" TO NO.8 NOMINAL SIZE) WITH 3/4" MAXIMUM SIZE) A.N.S.I.A.S.T.M. D448. IN ROCK OR COARSE GRANULAR TRENCHES, USE SIZE NO.7(1/2" TO NO.4 NOMINAL SIZE WITH 3/4" MAXIMUM SIZE) A.N.S.I.A.S.T.M. D446.
  - PRESSURE PIPE (TYPE P) CONSTRUCTED BELOW 6" OF COVER SHALL USE SELECTED NATIVE MATERIAL FOR BEDDING AND HAUNCHING COMPACTED TO 80% STANDARD PROCTOR DENSITY (MIN.).
  - CONTRACTOR SHALL FURNISH THE TYPE OF EMBEDMENT SHOWN AT THE DEPTHS SHOWN AT NO DIRECT PAY. COST FOR EMBEDMENT COMPACTOR REQUIREMENT AND IMPORTED MATERIALS SHALL BE INCLUDED IN UNIT COST OF WATER PIPE.
  - CONTRACTOR SHALL PROVIDE FOUNDATION MATERIAL, WHERE REQUIRED OF THE DRAWINGS OR DIRECTED BY THE ENGINEER AT THE UNIT PRICE FOR FOUNDATION MATERIAL. FOUNDATION MATERIAL (CONCRETE, GRAVEL, SHEL, CRUSHED STONE, CLEAN SAND, ETC.) ARE NOT NATIVE MATERIAL AND WILL BE PAID FOR AS A DIRECT ITEM.
  - TRENCH WIDTHS SHALL BE MAINTAINED AT AN ELEVATION OF ONE FOOT ABOVE THE TOP OF THE PIPE BELL AND MAY BE INCREASED IN CERTAIN CASES ABOVE THAT POINT.
  - SEE SPECIFICATION FOR INITIAL INTERMEDIATE AND FINAL TRENCH BACKFILL FOR USE OF ACCEPTABLE NATIVE MATERIAL OR IMPORTED MATERIAL AND DENSIFICATION REQUIREMENTS.
  - SEE SPECIFICATION FOR DENSIFICATION REQUIREMENTS UNDER ROADWAY AND DRIVE SECTIONS.



- ALL VALVES TO HAVE VALVE BOXES AND CONCRETE PAD. COST OF BOXES AND PAD TO BE INCLUDED IN COST OF VALVE.
- ALL CONCRETE FOR ANCHORAGE OR THRUST BLOCKS SHALL BE 2000 PSI AT 28 DAYS.
- FOR VALVES LOCATED GREATER THAN FOUR(4) FEET BELOW GRADE AN EXTENSION SYSTEM WITHIN TWO(2) FEET OF GRADE SHALL BE FURNISHED.
- CONTRACTOR SHALL FURNISH TWO(2) OPERATORS PER PROJECT.

**GATE VALVE SETTING**



**PE X PVC TRANSITION**

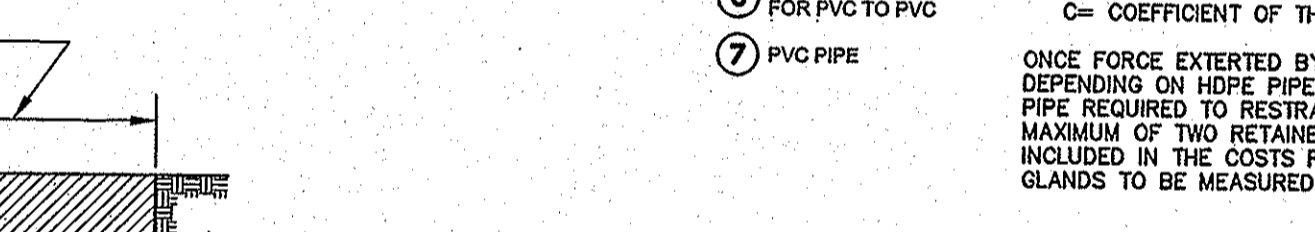
NOTES:

- THRUST DEVICES SHALL HAVE THIRD PARTY CERTIFICATION FROM EITHER FM (FACTORY MUTUAL) OR UL (UNDERWRITERS LABORATORY) AND COMPLIES WITH UNISELL UN1-81-93 STANDARDS
- TRPL SHALL BE SUFFICIENT TO RESIST FORCE GENERATED BY:  $F = (A)(E)(C)(T)$

WHERE:

- E = MODULUS OF ELASTICITY, INSTANTANEOUS (PSI)
- T = TEMPERATURE CHANGE, °F (IF NOT STATED, A T OF 75° SHALL BE USED)
- C = COEFFICIENT OF THERMAL EXPANSION IN/IN/°F

ONCE FORCE EXERTED BY CHANGE IN TEMPERATURE HAS BEEN ESTABLISHED, DEPENDING ON PIPE USED, THE ENGINEER WILL ESTABLISH A LENGTH OF PIPE REQUIRED TO RESTRAIN BASED ON SOIL CONDITIONS. IN FIELD A MAXIMUM OF TWO RETAINER GLANDS PER SIDE OF TRANSITION WILL BE INCLUDED IN THE COSTS FOR PE TO PVC TRANSITION ADDITIONAL RESTRAINT GLANDS TO BE MEASURED & PAID FOR PER GLAND INSTALLED.



**POINT REPAIR DETAIL**

**TABLE A (Horizontal Bends)**  
Length to Be Restrainted (Feet) at 100 psi for Cohesive Granular Soil

Soil Properties:  
 $\phi$  = Bend angle in degrees  
 H = Depth of cover (ft.)  
 D = Nominal diameter (in.)  
 R = 2/3 (except as noted)  
 Trench Construction

Soil Properties:  
 $f_c$  = 0.5  
 $f_s$  = 0.85  
 $w$  = 120 pcf

D	H	1	2	3	4	5	6	8	10
6	12	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5
6	14	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6
6	16	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7
6	18	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
6	20	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9
6	22	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0
6	24	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1
6	26	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2
6	28	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
6	30	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4
8	12	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
8	14	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9
8	16	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0
8	18	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1
8	20	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2
8	22	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
8	24	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4
8	26	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5
8	28	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6
8	30	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7
10	12	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1
10	14	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2
10	16	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
10	18	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4
10	20	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5
10	22	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6
10	24	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7
10	26	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8
10	28	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
10	30	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0
12	12	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3
12	14	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4
12	16	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5
12	18	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6
12	20	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7
12	22	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8
12	24	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
12	26	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0
12	28	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1
12	30	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2
14	12	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.5
14	14	2.3	2.2	2.1	2.0	1.9	1.8	1.7	1.6
14	16	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7
14	18	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8
14	20	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
14	22	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0
14	24	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1
14	26	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2
14	28	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3
14	30	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
16	12	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7
16	14	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.8
16	16	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
16	18	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0
16	20	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1
16	22	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2
16	24	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3
16	26	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
16	28	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
16	30	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
18	12	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9
18	14	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.0
18	16	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1
18	18	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2
18	20	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3
18	22	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
18	24	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
18	26	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
18	28	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7
18	30	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8
20	12	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1
20	14	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2
20	16	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3
20	18	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
20	20	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
20	22	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
20	24	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7
20	26	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8
20	28	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9
20	30	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0
22	12	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3
22	14	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
22	16	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
22	18	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
22	20	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7
22	22	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8
22	24	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9
22	26	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0
22	28	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1
22	30	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.2
24	12	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
24	14	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
24	16	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7
24	18	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8
24	20	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9
24	22	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0
24	24	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1
24	26	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.2
24	28	4.0	3.9	3.8	3.7	3.6	3.5	3.4	3.3
24	30	4.1	4.0	3.9	3.8	3.7	3.6	3.5	3.4
26	12	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7
26	14	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8
26	16	3.6	3.5	3.4	3.3	3.2	3.1	3.0	2.9
26	18	3.7	3.6	3.5	3.4	3.3	3.2	3.1	3.0
26	20	3.8	3.7	3.6	3.5	3.4	3.3	3.2	3.1
26	22	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.2
26	24	4.0	3.9	3.8	3.7	3.6	3.5	3.4	3.3
26	26	4.1	4.0	3.9	3.8	3.7	3.6	3.5	3.4
26	28	4.2	4.1	4.0	3.9				