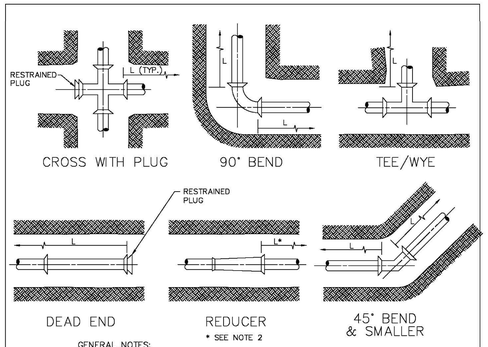

GENERAL NOTES:

1. VALUES IN TABLE ARE BASED ON 3' OF COVER, 100 PSI INTERNAL PRESSURE, FOR FORCE MAINS, 150 PSI REUSE WATER LINES, ANSI/AWWA C605 & C150/A21.50 LAYING CONDITION 3, ASTM D2487 SAND–SILT SP SOIL TYPE, AND SAFETY FACTOR OF 2.0. RESTRAINED LENGTHS WERE COMPUTED PER DIPRA "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE" AND "PVC PIPE THRUST RESTRAINT DESIGN HANDBOOK," EBAA IRON, INC.
2. CONFIRM THE EXACT LENGTH OF RESTRAINING REQUIRED FOR REDUCERS, PIPE ENCASED IN POLYETHYLENE AND ENCROACHING RESTRAINED LENGTHS WITH THE DESIGN ENGINEER.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROPER INSTALLATION OF THE RESTRAINED JOINTS TO PREVENT MOVEMENT OF THE PIPE & FITTINGS.
4. IN THE EVENT OF A CONFLICT BETWEEN RESTRAINED LENGTHS SHOWN ON THE TABLE AND RESTRAINED LENGTHS SHOWN ON THE DRAWINGS, THE LONGEST RESTRAINED LENGTH SHALL BE USED.

RESTRAINED JOINT INFORMATION

ENGINEERING STANDARDS 2019

REVISIONS BY	DATE	ENGINEERING DIVISION CITY OF POMPANO BEACH	RESTRAINED JOINT INFORMATION
		SCALE: N.T.S.	DATE: DECEMBER 2010 DWG. NO. 118-1

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PVC HORIZONTAL BENDS AND VERTICAL UP BENDS					
	RESTRAINED JOINT LENGTH L	(MINIMUM DISTANCE IN FEET FROM FITTING – EACH WAY)			
PIPE SIZE (IN.)	BENDS				CROSS WITH PLUG DEAD END TEE/WYE
	90°	45°	22.5°	11.25°	
6	26	11	6	3	53
8	33	14	7	4	68
12	46	19	10	5	96

PVC VERTICAL DOWN BEND					
	RESTRAINED JOINT LENGTH L	(MINIMUM DISTANCE IN FEET FROM FITTING – EACH WAY)			
PIPE SIZE (IN.)	BENDS				
	90°	45°	22.5°	11.25°	
6	26	11	6	3	
8	33	14	7	4	
12	46	19	10	5	

DIP HORIZONTAL BENDS AND VERTICAL UP BENDS					
	RESTRAINED JOINT LENGTH L	(MINIMUM DISTANCE IN FEET FROM FITTING – EACH WAY)			
PIPE SIZE (IN.)	BENDS				CROSS WITH PLUG DEAD END TEE/WYE
	90°	45°	22.5°	11.25°	
12"	68	28	14	7	144
24"	119	49	24	12	258

DIP VERTICAL DOWN BEND					
	RESTRAINED JOINT LENGTH L	(MINIMUM DISTANCE IN FEET FROM FITTING – EACH WAY)			
PIPE SIZE (IN.)	BENDS				
	90°	45°	22.5°	11.25°	
12"	144	60	29	14	
24"	258	107	51	25	

RESTRAINED JOINT INFORMATION

ENGINEERING STANDARDS 2019

REVISIONS BY	DATE	ENGINEERING DIVISION CITY OF POMPANO BEACH	RESTRAINED JOINT INFORMATION
		SCALE: N.T.S.	DATE: DECEMBER 2010 DWG. NO. 118-2

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MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED
(SOURCES: EBAA IRON RESTRAINT LENGTH CALCULATION PROGRAM FOR PVC PIPE, RELEASE 3.1. AND DIPRA THRUST RESTRAINT FOR DUCTILE IRON PIPE, RELEASE 3.2)

FITTING TYPE		PIPE SIZE 4"	6"	8"	10"	12"	16"	20"	24"	30"	36"	42"	48"
		200psi											
90° HORIZ. BEND		14	20	25	30	35	45	54	62	98	112	124	135
45° HORIZ. BEND		6	8	11	13	15	19	22	26	41	46	51	56
22.5° HORIZ. BEND		3	4	5	6	7	9	11	12	19	22	25	27
11.25° HORIZ. BEND		1	2	3	3	4	5	6	10	11	12	13	
90° VERT. OFFSET	UPPER BEND	29	41	53	64	74	95	115	134	214	246	278	304
	LOWER BEND	7	10	13	16	19	25	30	35	57	66	74	83
45° VERT. OFFSET	UPPER BEND	12	19	24	29	34	39	48	56	89	102	114	126
	LOWER BEND	3	4	6	7	8	10	12	15	23	27	31	34
22.5° VERT. OFFSET	UPPER BEND	6	9	12	14	17	19	23	27	43	49	55	60
	LOWER BEND	1	2	4	4	4	5	6	7	11	13	15	16
11.25° VERT. OFFSET	UPPER BEND	3	4	5	7	8	9	11	13	21	24	27	30
	LOWER BEND	1	1	1	2	2	2	3	3	6	6	7	8
PLUG (DEAD END)		32	45	59	70	83	107	129	151	214	246	276	304
IN–LINE VALVE		32	45	45	45	56	65	80	110	125	140	155	
TEE (BRANCH RESTRAINT)	4"x ø	23	–	–	–	–	–	–	–	–	–	–	–
	6"x ø	21	35	–	–	–	–	–	–	–	–	–	–
	8"x ø	18	34	47	–	–	–	–	–	–	–	–	–
	10"x ø	16	32	46	58	–	–	–	–	–	–	–	–
	12"x ø	13	30	44	57	69	–	–	–	–	–	–	–
	16"x ø	7	28	41	55	67	90	–	–	–	–	–	–
	20"x ø	1	21	38	52	65	88	109	–	–	–	–	–
	24"x ø	1	15	34	49	62	86	108	129	–	–	–	–
	30"x ø	1	8	28	44	58	83	106	127	208	–	–	–
	36"x ø	1	1	22	39	54	80	103	124	206	240	–	–
	42"x ø	1	1	15	33	49	77	100	122	205	239	270	–
	48"x ø	1	1	7	27	44	73	97	120	203	238	269	298
REDUCER (LARGER PIPE RESTRAINT)	6"x ø	23	–	–	–	–	–	–	–	–	–	–	–
	8"x ø	38	25	–	–	–	–	–	–	–	–	–	–
	10"x ø	57	43	24	–	–	–	–	–	–	–	–	–
	12"x ø	72	60	44	41	–	–	–	–	–	–	–	–
	16"x ø	99	90	78	75	45	–	–	–	–	–	–	–
	20"x ø	123	115	107	105	81	45	–	–	–	–	–	–
	24"x ø	146	140	132	131	111	82	45	–	–	–	–	–
200psi	30"x ø	209	204	197	188	177	153	115	75	–	–	–	–
	36"x ø	243	236	233	226	217	196	168	135	74	–	–	–
	42"x ø	273	270	265	259	252	234	211	183	133	72	–	–
	48"x ø	301	298	294	289	283	268	249	226	183	131	71	–

NOTES:
1. THE DATA IN THE ABOVE TABLE ARE BASED UPON THE FOLLOWING INSTALLATION CONDITIONS:
SOIL TYPE–SAND TEST PRESSURE–150 PSI/200 PSI DEPTH OF BURY–3'
TRENCH TYPE–3 SAFETY FACTOR–1.5 VERTICAL OFFSET–3'
MINIMUM PIPE LENGTH ALONG TEE RUN–5'
2. THE RESTRAINED PIPE LENGTHS APPLY TO DUCTILE IRON AND PVC PIPE.
3. ALL JOINTS BETWEEN UPPER AND LOWER BENDS SHALL BE RESTRAINED.
4. RESTRAINED PIPE LENGTHS APPLY TO PIPE ON BOTH SIDES OF VALVES AND FITTINGS.

RESTRAINED JOINT INFORMATION

ENGINEERING STANDARDS 2019

REVISIONS BY	DATE	ENGINEERING DIVISION CITY OF POMPANO BEACH	RESTRAINED JOINT INFORMATION
		SCALE: N.T.S.	DATE:FEBRUARY 2009 DWG. NO. 118-3

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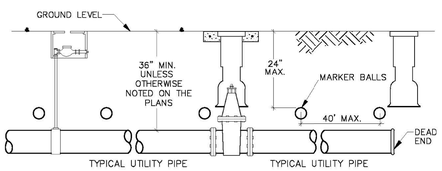

GENERAL NOTES:

1. ALL NONMETALLIC PIPE SHALL BE INSTALLED WITH 12 THHN SOLID COPPER TRACING WIRE.
2. THE MARKER BALLS MUST BE INSTALLED DIRECTLY ABOVE THE PIPE.
3. MARKER BALLS SHALL BE INSTALLED AT 40' O.C.
4. BALL COLOR CODING:
POTABLE WATER SYSTEM: BLUE PER 62–555.320(21)(b)(3) F.A.C.

UTILITY PIPE AND MARKER BALLS LOCATION

ENGINEERING STANDARDS 2019

REVISIONS BY	DATE	ENGINEERING DIVISION CITY OF POMPANO BEACH	UTILITY PIPE AND MARKER BALLS LOCATION
S.S.	01/12		
S.S.	06/16		DATE: JAN. 2012 DWG. NO. 120-1
		SCALE: N.T.S.	

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NO.	REVISIONS	DATE	NO.	REVISIONS	DATE

DESIGNED: WFI DATE: 01/2023
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PALM AIRE TENNIS CENTER
RWB / LINARES ARCHITECTURE

CITY OF POMPANO BEACH
STANDARD WATER DETAILS

APPROVED: EB-0002995 LB-0002995
DATE:
PROJECT NUMBER 22-06
SHEET 52 OF 4

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