

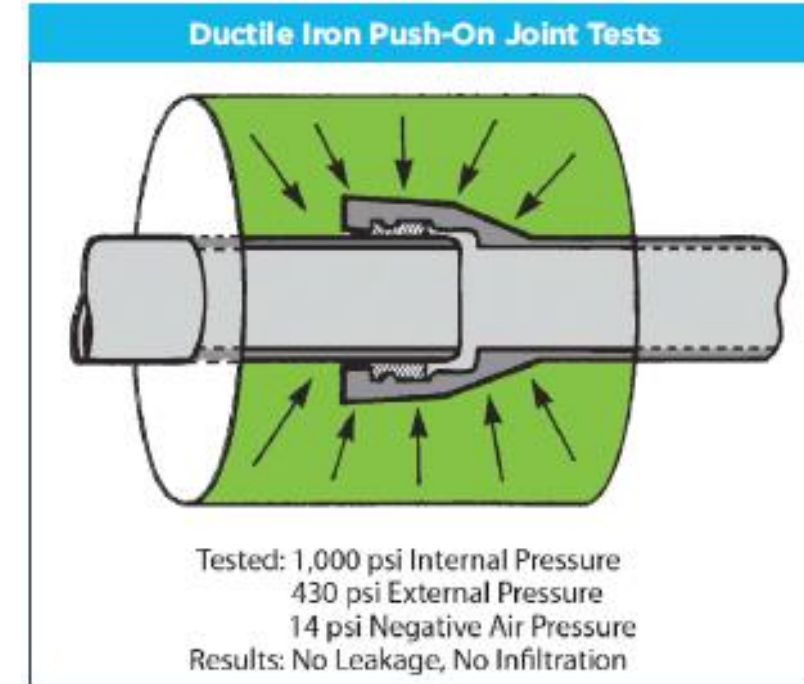
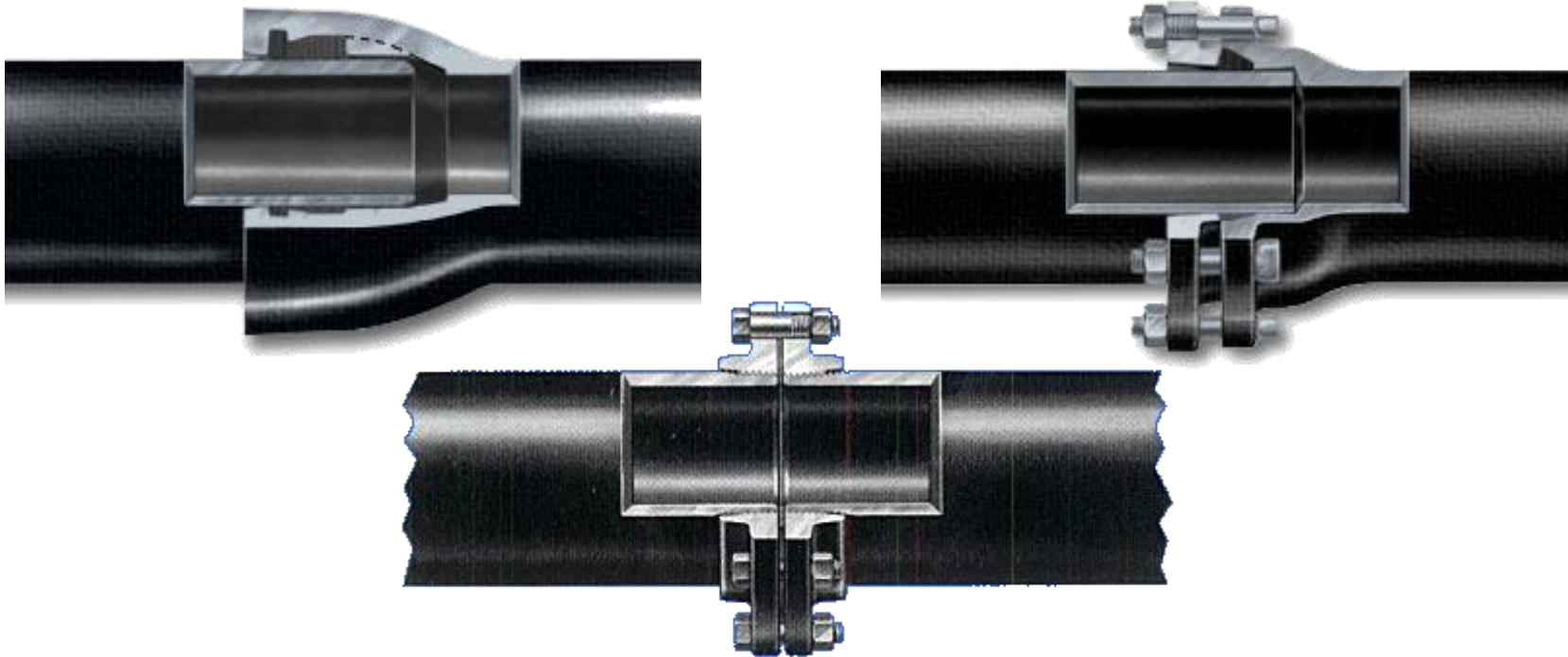


Ductile Iron Pipe
Available Joints



Available joints

- Tyton joint (5° of deflection)
- Mechanical joint (8° - 2° of deflection)
- Flanged joint (0° of deflection)



Available joints

- Restrained joints vs. Thrust forces
 - TR Flex internally restrained joint pipe
 - Sure Stop 350 gaskets

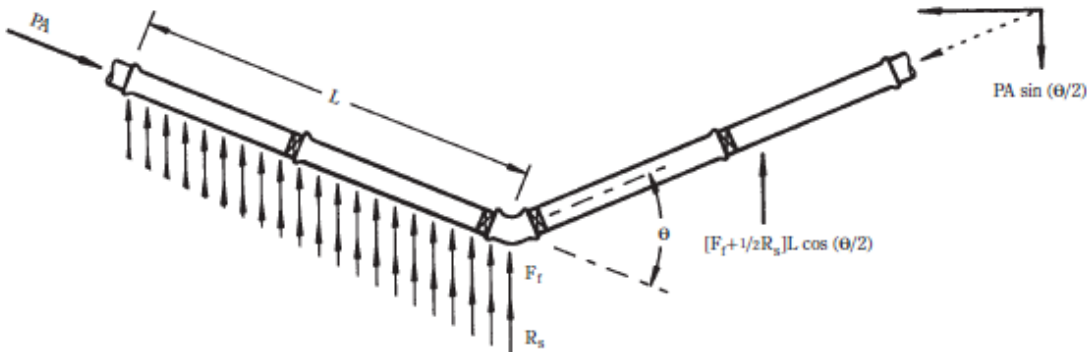


Thrust forces

➤ When are restraint joints needed?



➤ How many restraints do I need?

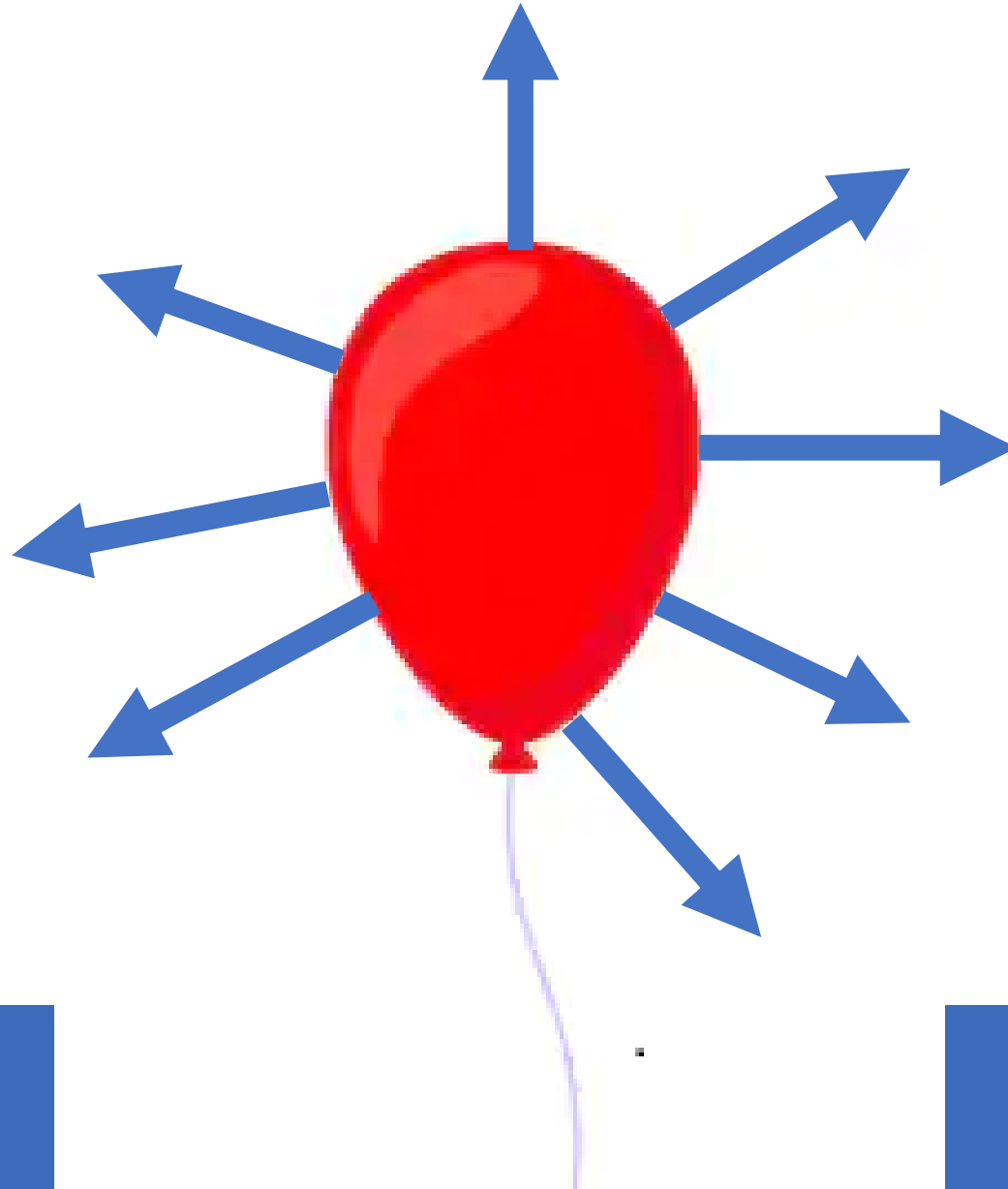


Thrust forces

- Two types of thrust forces
 - Hydrostatic (internal pressure)
 - Hydrodynamic (fluid velocities) generally insignificant

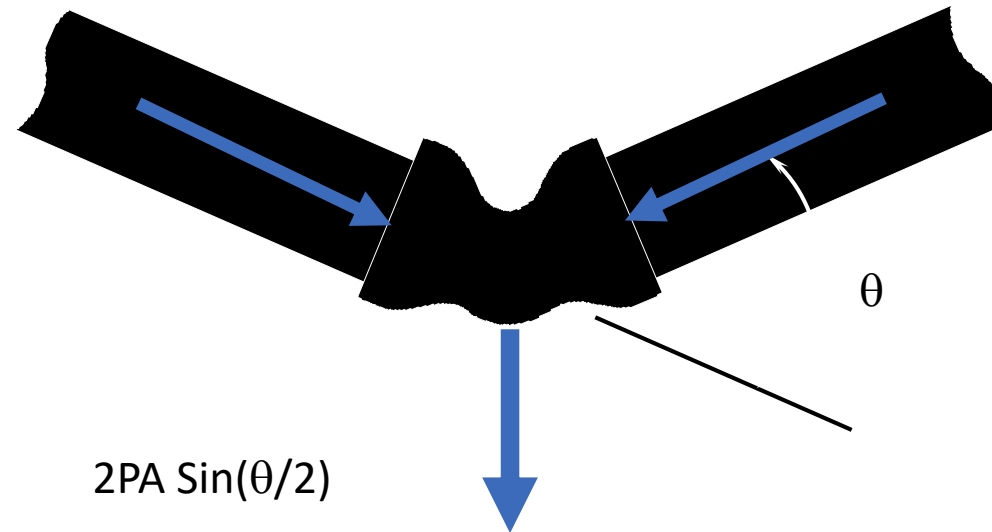


Hydrostatic (internal pressure)



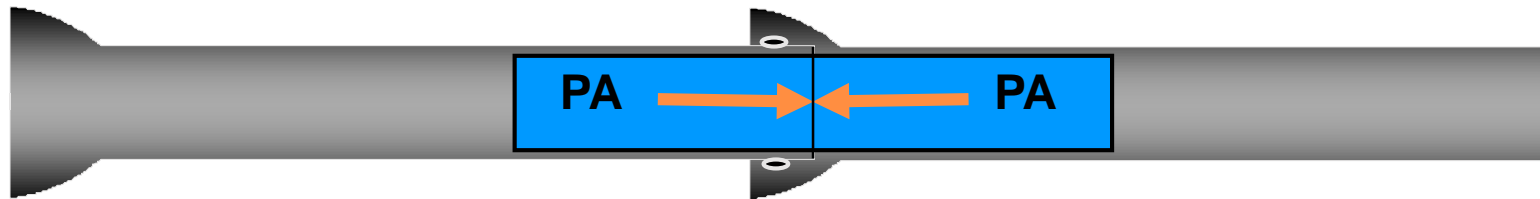
Bends

➤ How does it apply to pipe?



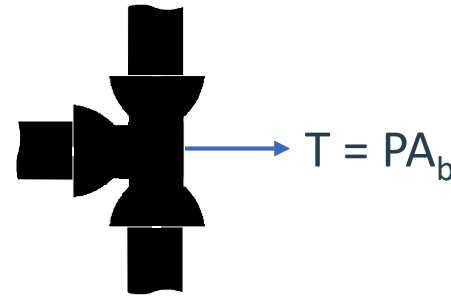
Straight run

- No restraints needed as the forces balance each other out.

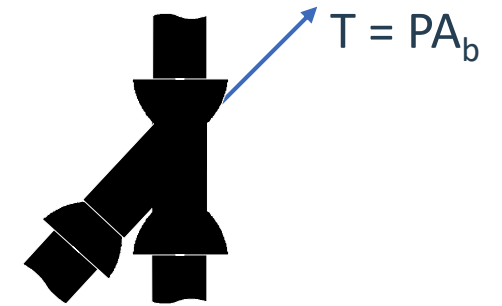


Where restraints are needed

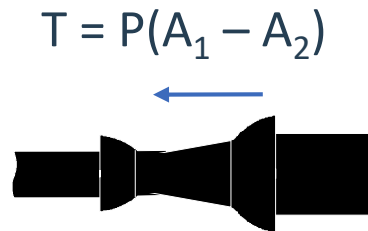
- Bends (11.25°; 22.5°; 45°; 90°)
- Reducers
- Offsets
- Tees
- Wyes
- Dead ends
- Valves



Tee



Wye



Reducer

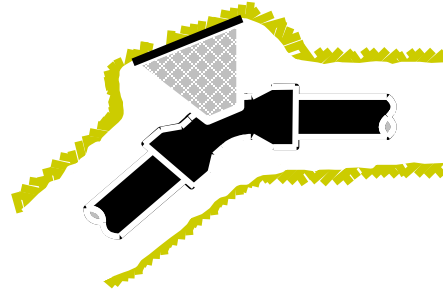


Dead End / Valve

Restraining the pipe

What holds the pipe back so it doesn't separate?

➤ Thrust blocks



➤ Soil surrounding the pipe



➤ Mechanical thrust restraint


➤ External wedge restraints

➤ Sure stop 350 gaskets

➤ TR Flex



Thrust forces at 150 psi (1035 kPa)

Nominal Pipe Size (in)	Thrust Force (lbs)				
	Dead End	90° Bend	45° Bend	22.5° Bend	11.25° Bend
6	5,609	7,932	4,293	2,189	1,100
12	20,527	29,030	15,711	8,009	4,024
24	78,419	110,901	60,019	30,598	15,373
36	172,814 	244,396	132,266	67,429	33,878
48	304,024	429,956	232,690	118,625	59,599
64	508,060	718,506	388,852	198,235	99,597



Basic Data

Pipe Diameter (in)

Depth of Cover ft

Design Pressure (PSI)

Trench Type

Safety Factor

Static Pressure (PSI)

First Joints ACROSS TEE (total ft 2-20)

Soil Condition

Soil Type

Density (lbs/cf)

Thrust Restraint Calculator

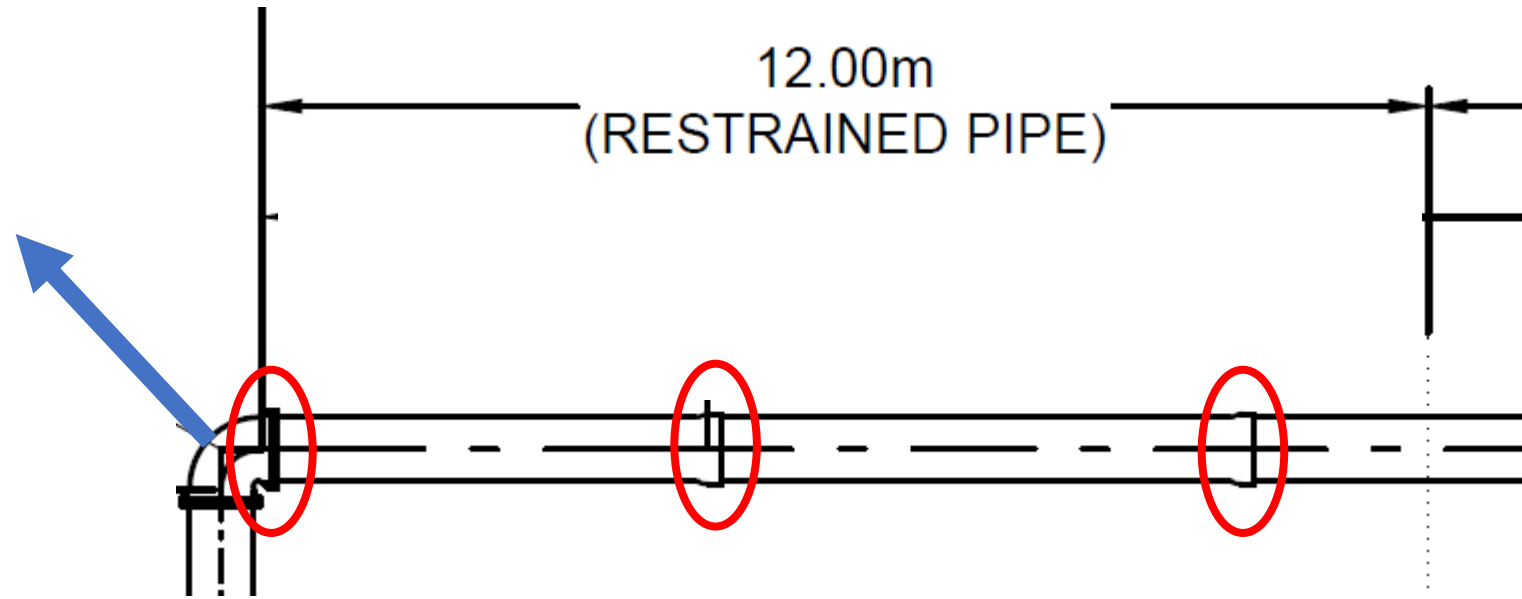
Bends, Dead ends, Valves

Design Results (in feet)

11-Degree BEND	HORIZ		VERT UP		VERT DOWN	
	BARE	POLY	BARE	POLY	BARE	POLY
	3	3	3	3	7	10
22-Degree BEND	HORIZ		VERT UP		VERT DOWN	
	BARE	POLY	BARE	POLY	BARE	POLY
	5	6	5	6	15	21
45-Degree BEND	HORIZ		VERT UP		VERT DOWN	
	BARE	POLY	BARE	POLY	BARE	POLY
	11	12	11	12	31	44
90-Degree BEND	HORIZ		VERT UP		VERT DOWN	
	BARE	POLY	BARE	POLY	BARE	POLY
	26	29	26	29	74	106

PLUG/CAP/DEAD END	BARE	POLY
	74	106
CLOSED INLINE VALVE with one side empty (0 PSI)	BARE	POLY
	74	106
CLOSED INLINE VALVE with one side at STATIC PRESSURE (100 PSI)	BARE	POLY
	25	35

Restrained length



➤ In this scenario, 12m of restraints would be needed on both sides of the fitting.

TR Flex (internally restrained joint)



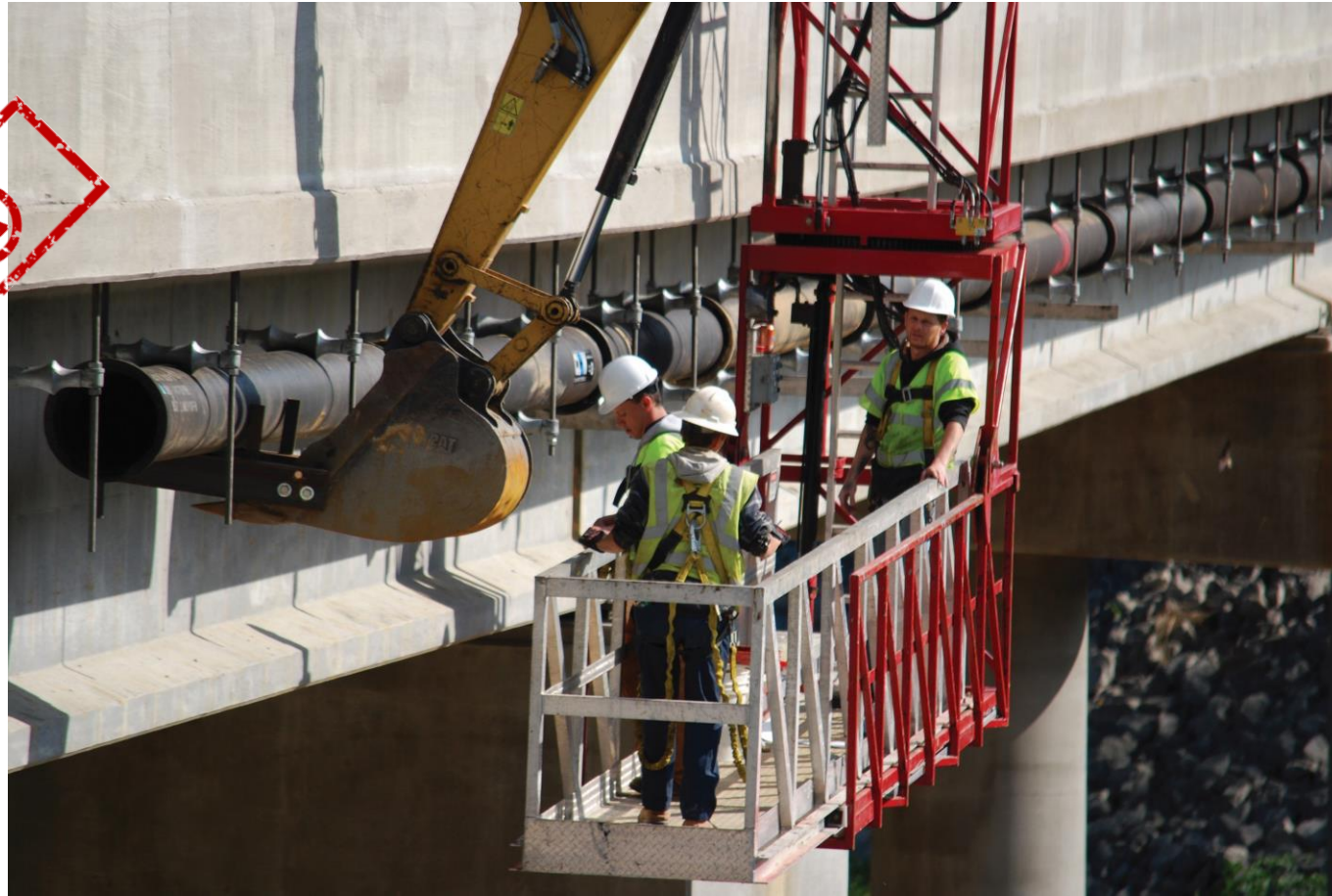
- Sizes range from 4'' to 36''
 - 4'' to 24'' working pressure = 350 psi
 - 30'' & 36'' working pressure = 250 psi
- 5° to 1.5° of deflection
- Easy transition from TR Flex to Tyton joints.
- Labor savings

TR Flex (internally restrained joint)



TR Flex applications

➤ Bridge crossings



TR Flex applications

- Trenchless applications
 - Horizontal Directional Drilling

TR FLEX®



TR Flex (internally restrained joint)

Common uses of TR Flex[®] joints include:

- Reclaimed land
- Pipe in casings
- Seismic considerations
- Pipe bursting
- Above ground applications
- Restraining joints on either side of a fitting per design requirements



TR Flex (what does it look like in the field?)

- When laying a pipe or fitting in a trench, orient the locking segment insertion bell slots so that:
 - The 2 slots on 4" - 20" pipe are at the horizontal or 3 and 9 o'clock positions
 - The 4 slots on 24" - 36" pipe are at the 2, 4, 8 and 10 o'clock positions or forming an 'X' when looking at the bell face



4"-20"



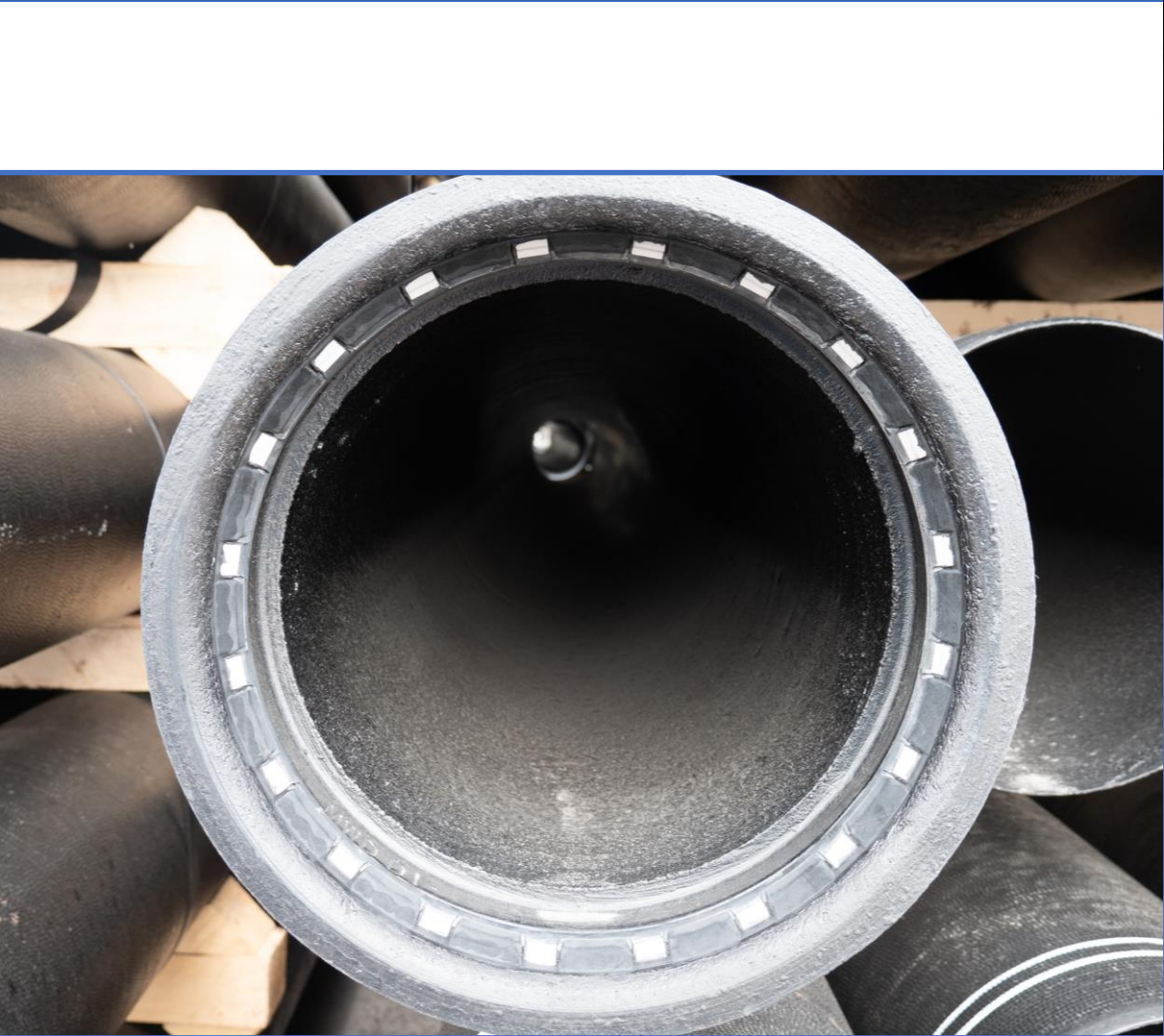
24"-36"



TR Flex (what does it look like in the field?)



Sure Stop 350 gaskets (Using the Tyton joint)



Save assembly time with Sure Stop 350 gaskets.



IRON STRONG

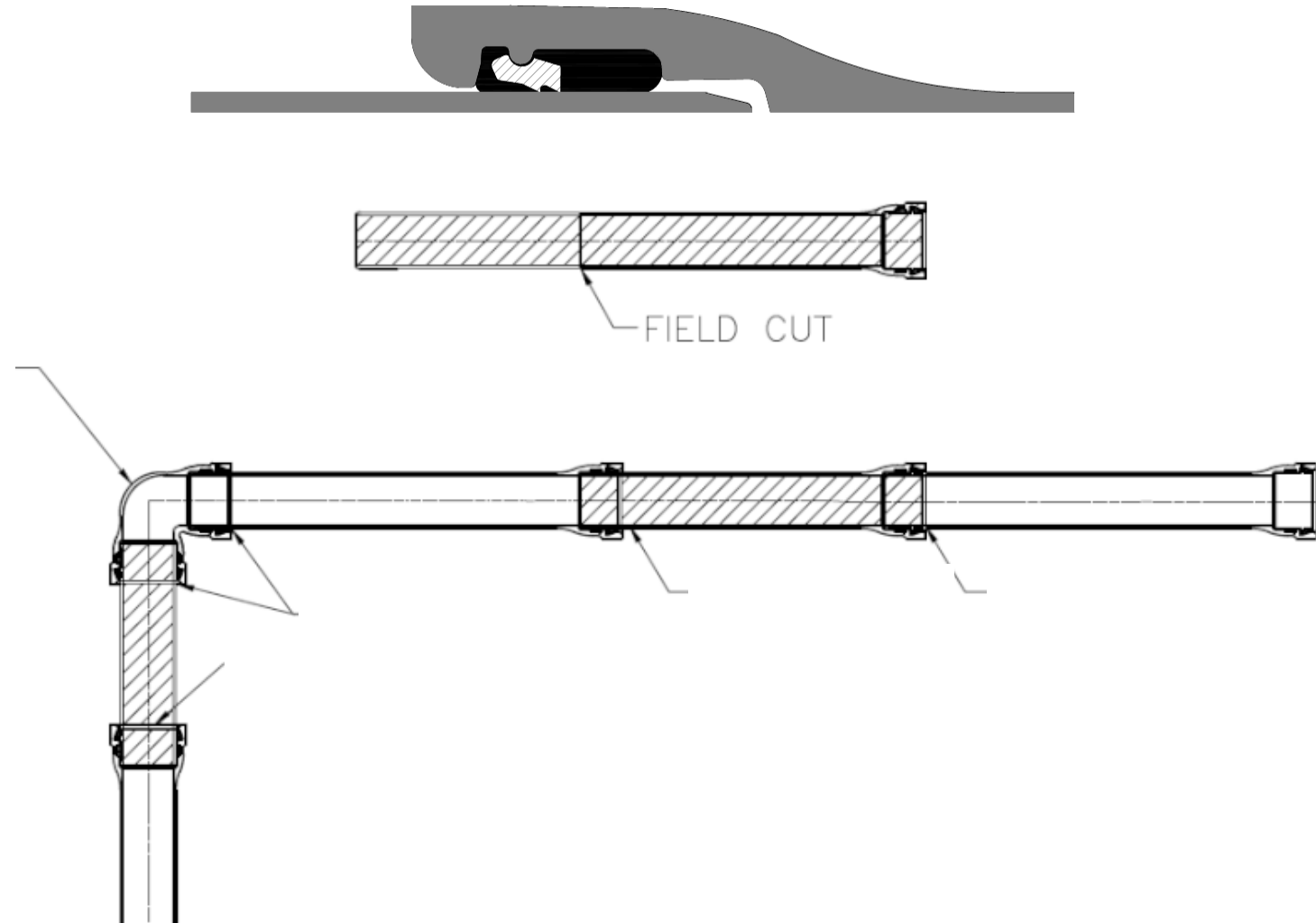
Sure Stop 350 gaskets (Using the Tyton joint)

Sure Stop 350 gaskets

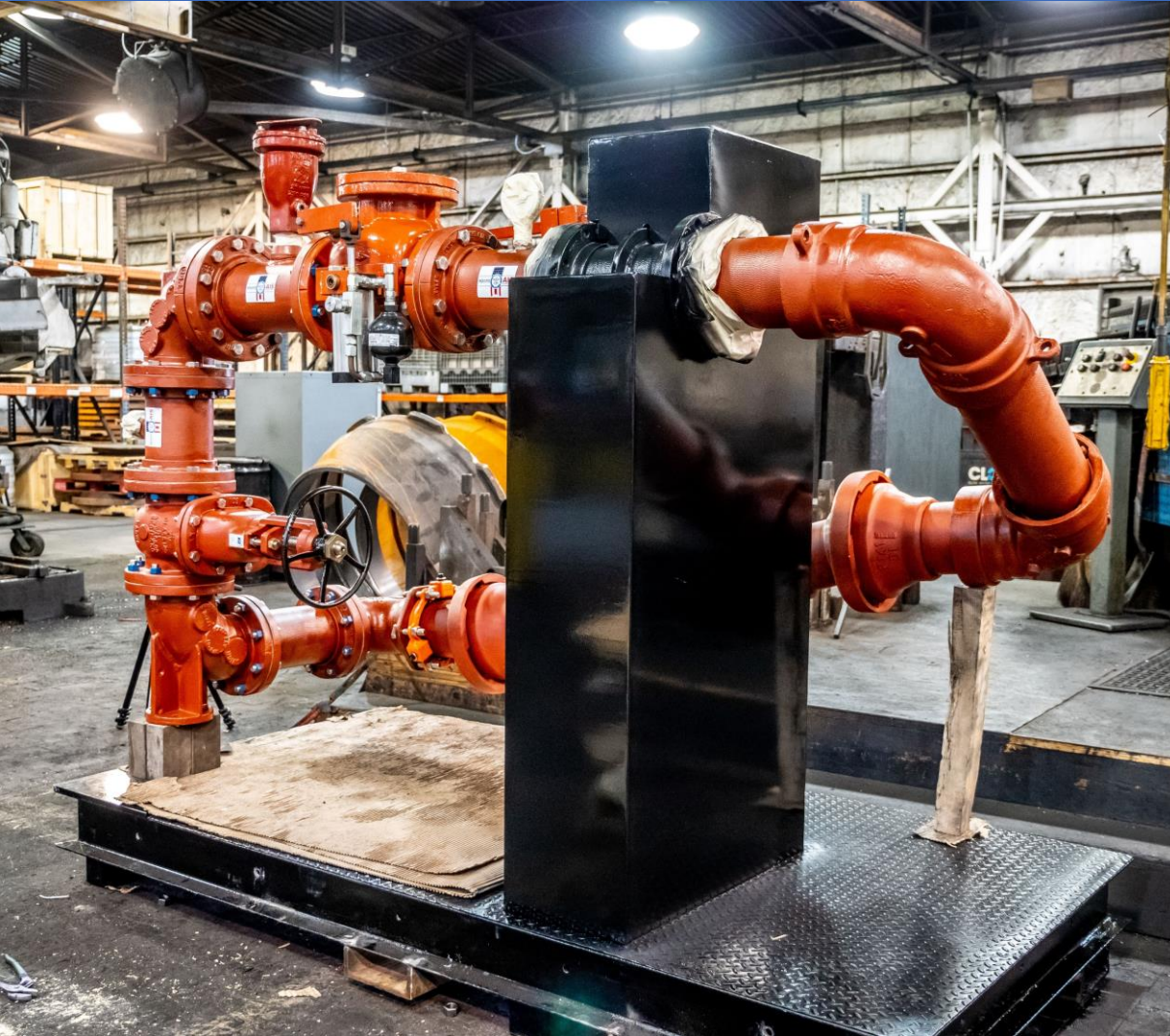
- Rated to 350psi
- Uses the tyton joint
- 5° to 2.5° of deflection

Certification

- NSF 61
- UL listed

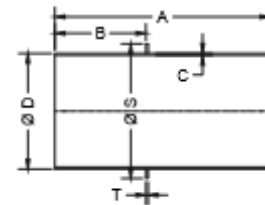


Flanged Pipe / Grooved/ PE / MJ / Wall Collars

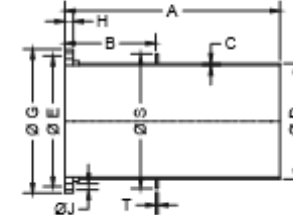


Fabricated pipes 3'' to 48''
As per shop drawings

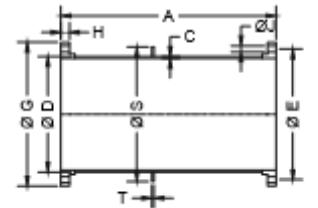
PE X PE



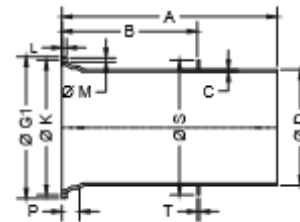
FLG X PE



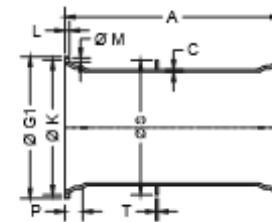
FLG X FLG



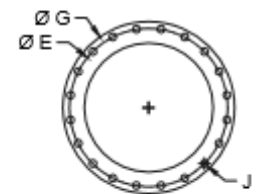
MJ X PE



MJ X MJ

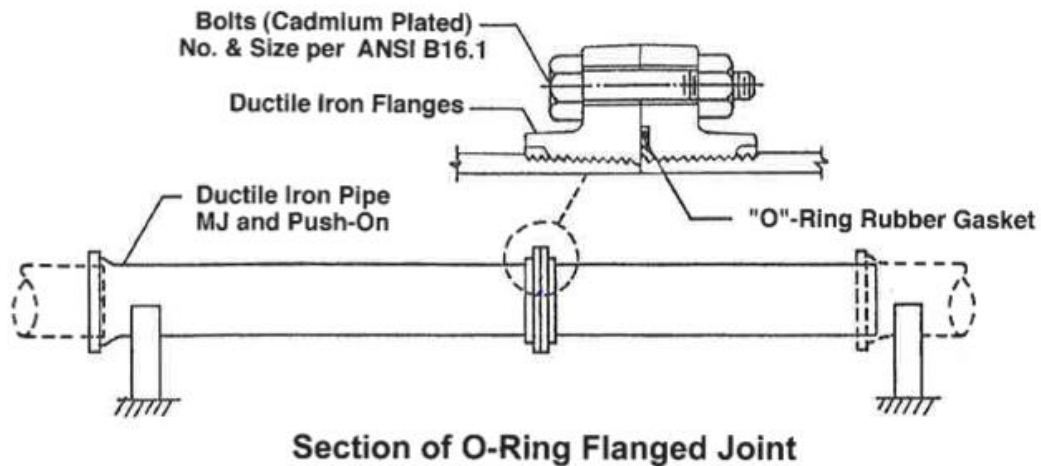


FLANGE DETAIL



Long span pipe

- Pipes on supports.
- Long-span pipes are ideal for minimizing the number of supports required.
 - Spans up to 45 feet.





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Thank You