

A photograph of several large, yellow plastic pipes stacked in a row, viewed from a low angle against a clear blue sky. The pipes are arranged in a slightly overlapping manner, creating a sense of depth and repetition. The lighting is bright, highlighting the smooth texture and vibrant color of the pipes.

# Plastic Pipe

*Materials, Joining, Installation &  
Other Considerations*

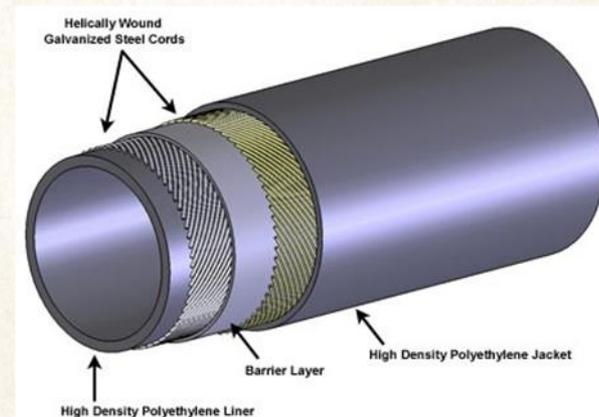
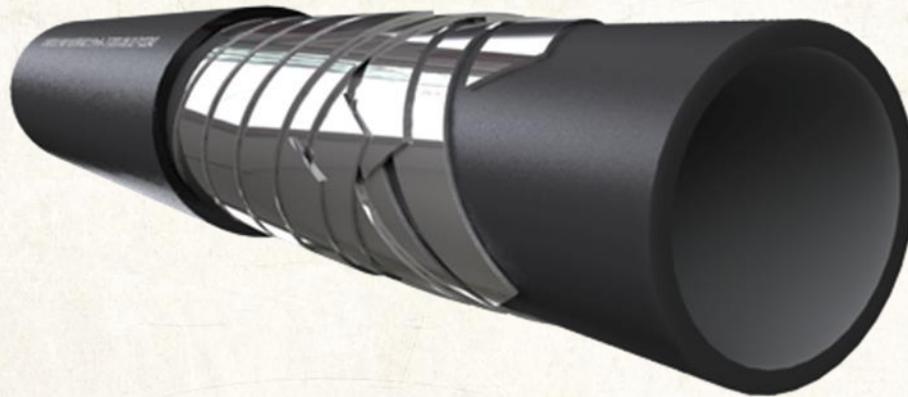
# Thermoplastic Pipe Materials

Acrylonitrile-Butadiene-Styrene	(ABS)
Cellulose-Acetate-Butyrate	(CAB)
Poly Butylene	(PB)
Polyethylene	(PE)
Polyvinylchloride	(PVC)
Polyamide	(PA)

# Thermosetting (Fiberglass)



# Spool-able Composites



# Polyethylene

## Medium Density

2406(Past) /2708

## High Density

3408(Past) /4710

## Med-Low Density

Uponor Aldyl

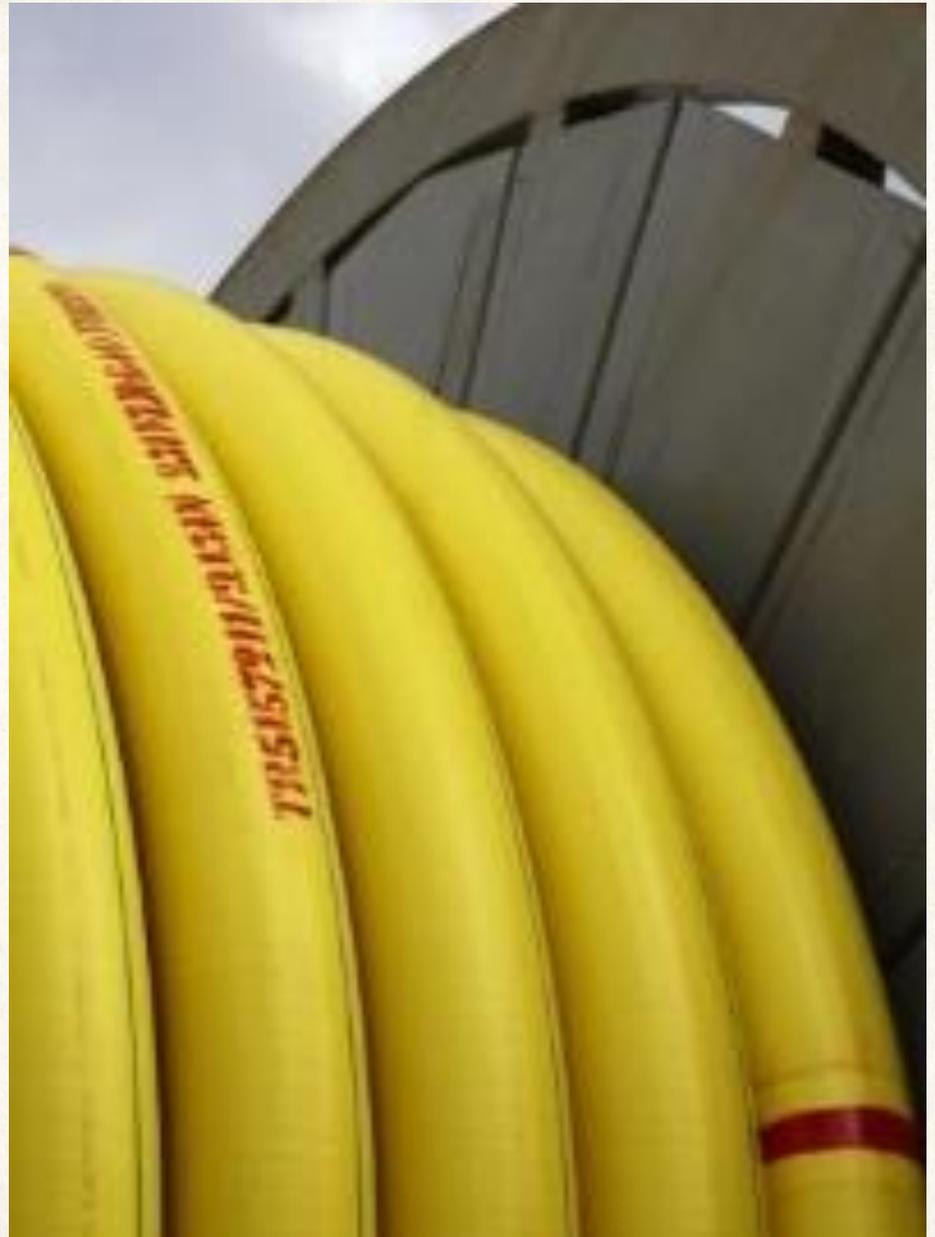


# Polyamide

## Nylon

PA-11 (Current)

PA-12 (Future)



# Plastic Materials Must Meet

## **ASTM D 2513 (Thermoplastic)**

2009 Edition – Polyethylene pipe  
and marking

1999 Edition – Thermoplastics

1987 Edition – Marking

2012ae1 for PE  
(Plastic Pipe NPRM)

## **ASTM D 2517 (Thermoset)**

2000 Edition



# Long Term Hydrostatic Strength

<b>Material Designation</b>	<b>HDB @ 23°C (73°F)</b>
ABS 1210	2,000
CAB MH08	1,600
PE 2110	2,000
PE 2406	1,250
PE 3408	1,600
Polyamide	2,500
PVC 1120/1220	4,000
Thermosetting	11,000

# Marking Designations

From **ATSM D 2513 1987 Edition**

First Two Digits Grade of  
Material

Second Two Digits Half of  
HDB @ 73° F

Temperature

HDB @ Evaluation Temp



# Variation in Soil Temperatures Three Feet Below the Surface, °F

<i>Location</i>	<i>January</i>	<i>April</i>	<i>July</i>
Massachusetts	36	42	60
Michigan	38	43	60
Washington	37	44	61
Illinois	41	46	66
Nebraska	38	43	68
Kentucky	40	50	70
Colorado (Plains)	35	44	65
Alabama	61	61	79
Mississippi	57	70	80
Texas (Panhandle)	42	55	75
Texas (South)	62	66	80
Oklahoma	48	60	78

# §192.121 Design of Plastic Pipe

$$P = (2s / \text{SDR} - 1) \times DF$$

- P = Design Pressure (psi)
- S = Long-term Hydrostatic Strength (HDB)
- D = Specified Outside Diameter
- t = Specified Minimum Wall Thickness
- SDR = Outside Diameter / Wall Thickness
- **DF = .32 for PE**
- **DF = .40 for PA-11**

# §192.123 Design Limitations

a) Design Pressure 100 psig for:

- Distribution systems
- Class 3 and 4 locations
- Except as provided in (e) and(f)

## §192.123 Design Limitations

- e) Design Pressure for pipe produced after 7/14/2004 may exceed 100 psig if:
- Design pressure does not exceed 125 psig
  - PE 2406 or 3408 per ASTM D-2513 (PE 2708 or 4710 post March 6, 2015)
  - Nominal pipe size is 12 inches or less
  - Design pressure in accordance with §192.121

# §192.123 Design Limitations

e) Design pressure up to 200 psig:

- Pipe produced after 1/23/09
- PA-11
- Nominal pipe size is 4 inches or less
- SDR is 11 or greater (thicker wall)

# Subpart F

Applies to all joints except steel welding



# §192.273 General

## Joining of Materials Other Than By Welding



- a) Each joint must be made in accordance with written procedures
- b) Procedures must be proven by test
- c) Each joint must be inspected

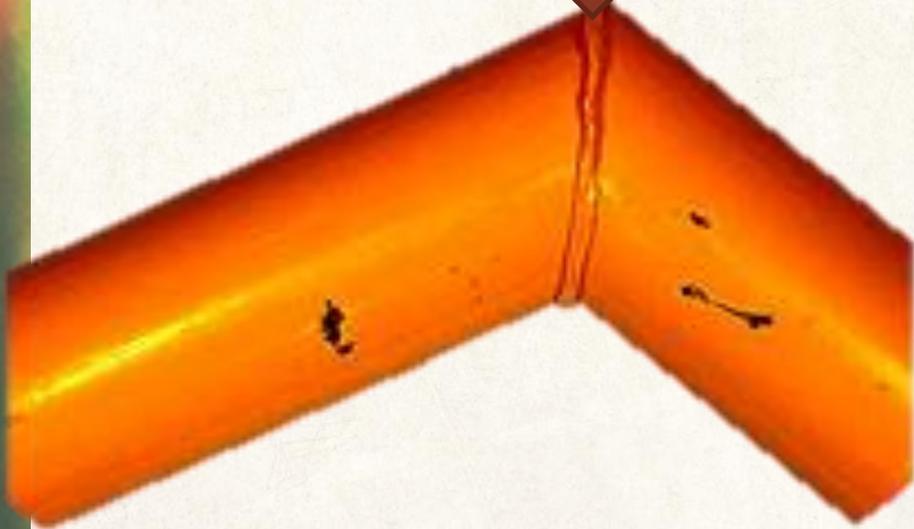
# §192.281 General Requirements For Plastic Pipe

- a) Plastic pipe may NOT be joined by THREADED or MITER joints
- b) Solvent cements (PVC) - ASTM D 2513
- c) Heat fusion joints (PE)
  - Must be joined by a **device** which holds the ends aligned and heats uniformly





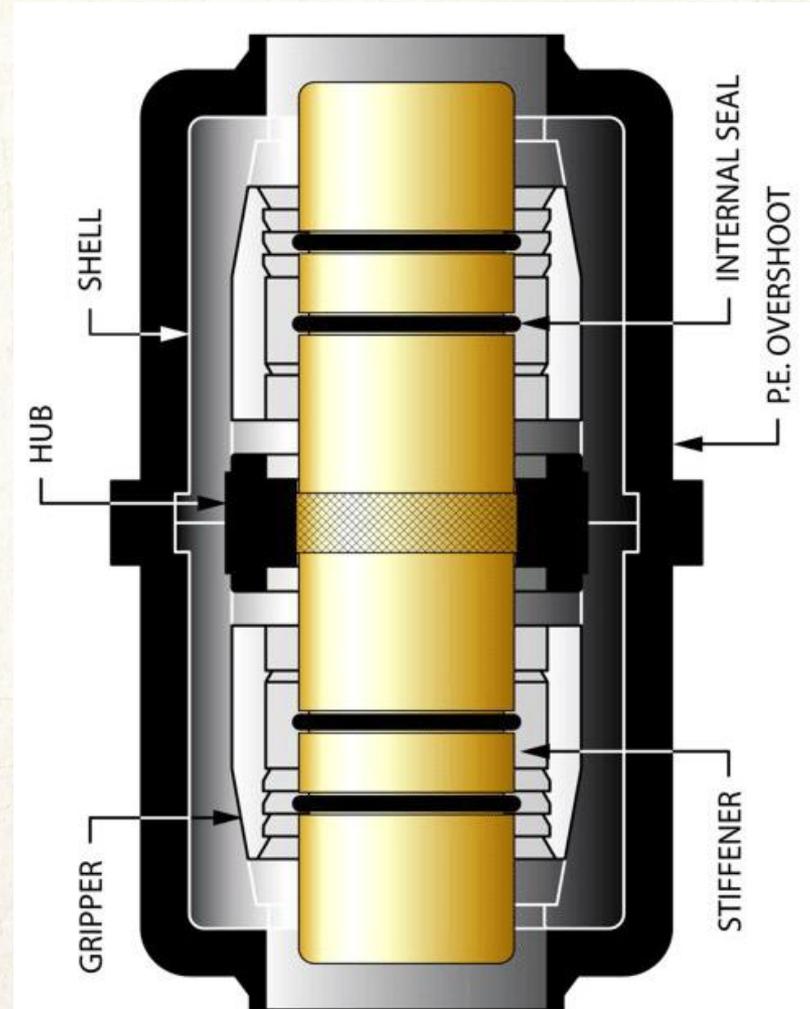
**Can't Do These**



# General Requirements For Plastic Pipe

## §192.281 (cont.)

- d) Adhesive joints  
(Fiberglass)  
ASTM D 2517
- e) Mechanical joints (All Plastic)
  1. Gasket compatible with plastic
  2. Rigid internal tubular stiffener



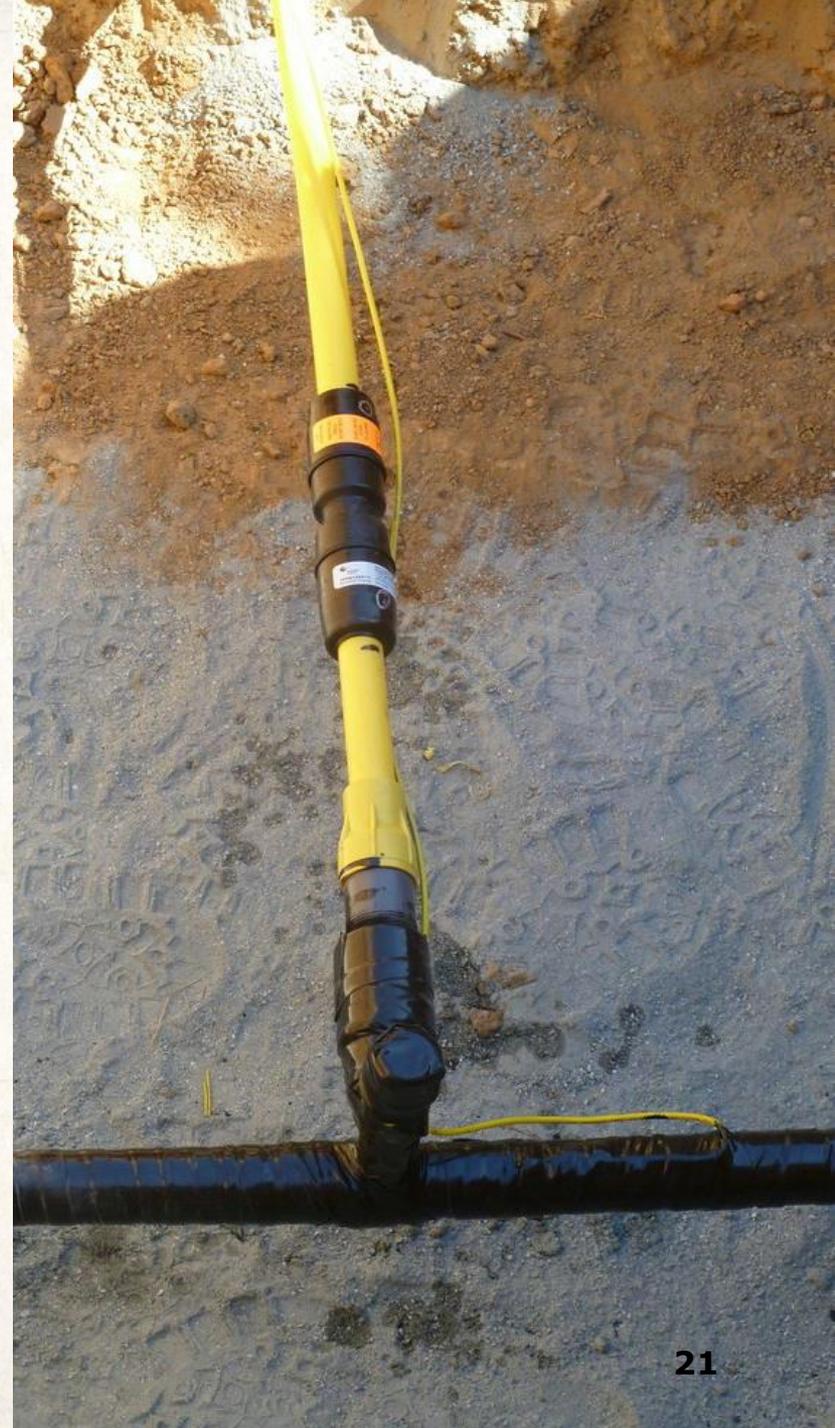
# Mechanical Fitting Types

## By Category Classification

1. Those that provide pressure seal and restraint equal to forces that cause pipe yield.
2. Those that provide pressure seal only.
3. Those that provide pressure seal and restraint equal to forces generated by temperature changes

# Mechanical Joints

*Necessary  
measures  
must be employed  
to prevent pullout*



# §192.283 Qualifying Joining Procedures

Written joining procedures must be qualified by testing

- Heat fusion, solvent cement, and adhesive joints
  - Burst tests per ASTM D2513 or
  - ASTM D 2517(Sustained Pressure or Quick Burst)



# Qualifying Joining Procedures

## §192.283(a) Written Joining Procedures Must Be Qualified By Testing

- Heat fusion, solvent cement, and adhesive joints
  - Destructive test for lateral connections
  - Tensile test (ASTM D 638) for non-lateral connections
  - Electrofusion (ASTM F 1055)

# Qualifying Joining Procedures (cont.)

## Mechanical Joints

- Subject five specimens to tensile test (ASTM D 638)
  - Specimen must fail outside of the joint

*Written procedures must be available to persons making and inspecting joints*



# Qualifying Persons To Make Joints

§192.285(a)

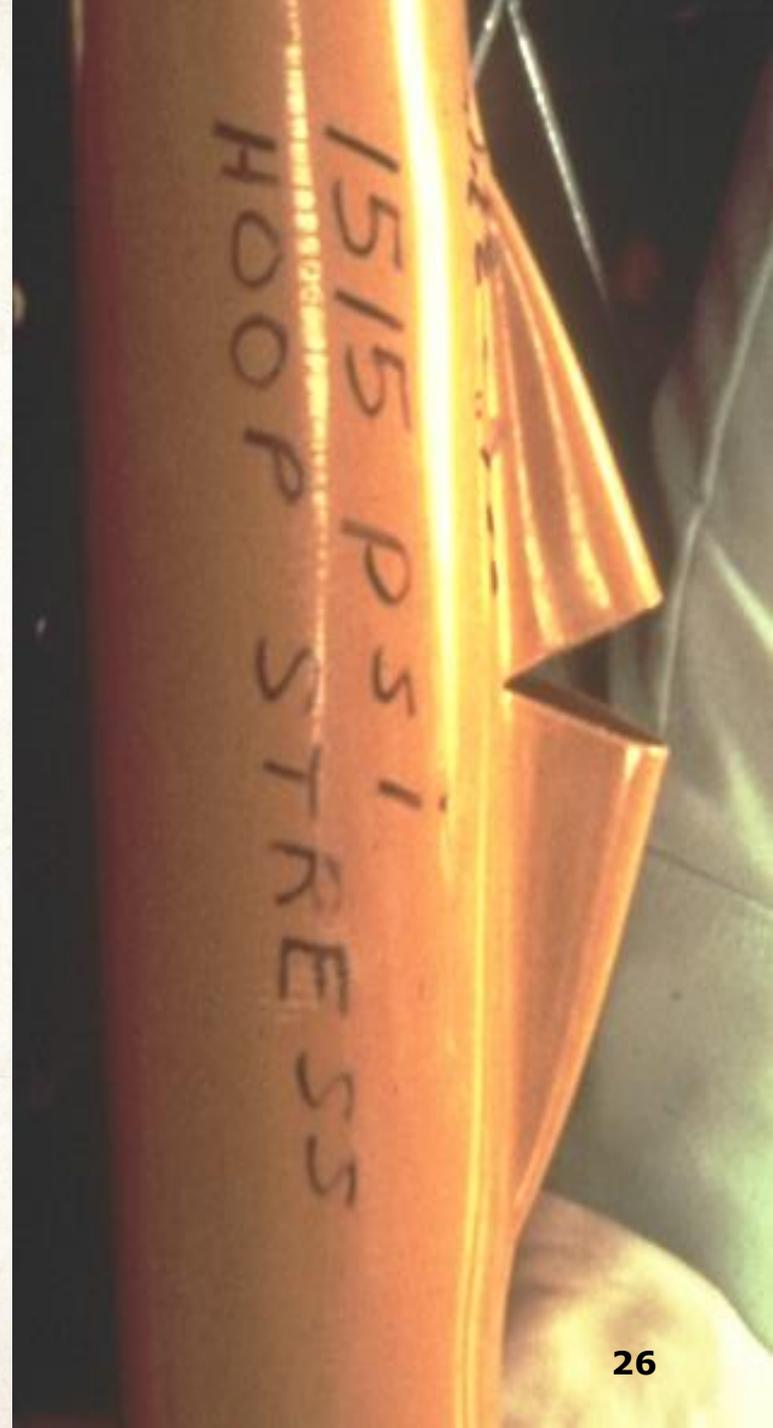
A person must be qualified under a joining procedure

- Training or Experience;
- and***
- Make a specimen joint

# Qualifying Persons To Make Joints (cont.)

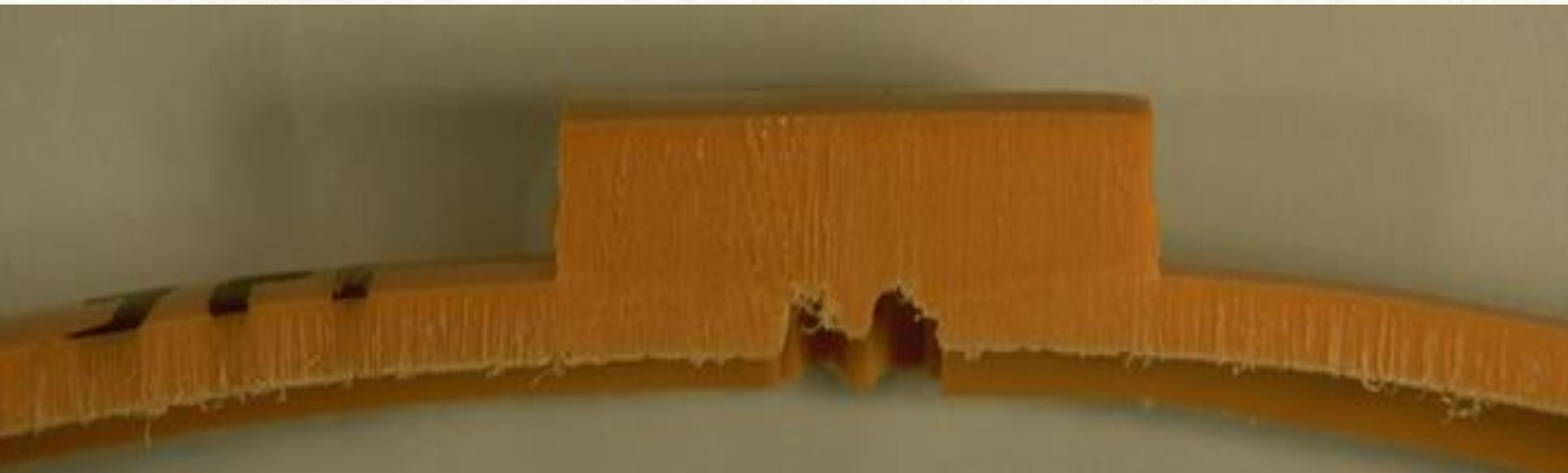
## §192.285(b) Specimen Joint Check

- Visually examined  
(Compared to photos of  
acceptable joints);  
***and***
- Subjected to testing per  
§192.283(a)  
(burst or sustained  
pressure); **or**



# Qualifying Persons To Make Joints (cont.)

- Ultrasonic test; or
- Cut straps  
(Visual examination and deform)



# Qualifying Persons to Make Joints (cont.)

**Retesting Pre Oct. 1, 2015** required if:

- Person doesn't join in twelve months; **or**
- 3 or 3% Joints found unacceptable (under test as required by 192.513)

Records **MUST**  
be kept.



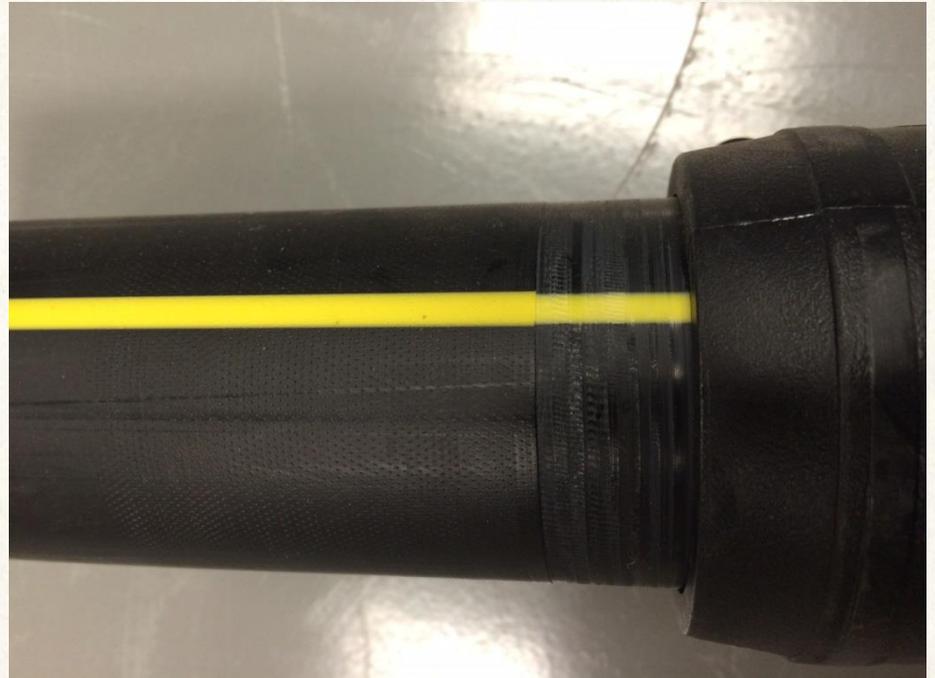
# Qualifying Persons to Make Joints (cont.)

## Retesting **Post**

**Oct. 1, 2015**

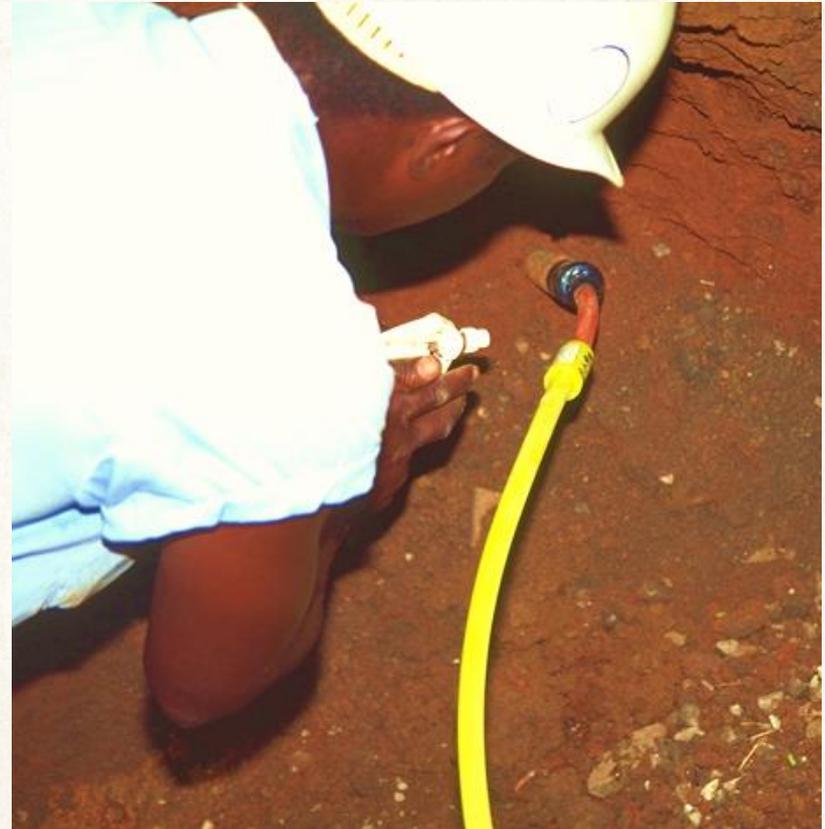
required if:

- **Any Joints** are Found unacceptable (Under test as required by §192.513)
- Joiners must be requalified **each Calendar Year.**



# §192.287 Inspection of Joints

No person may inspect joints unless that person has been qualified by training or experience.

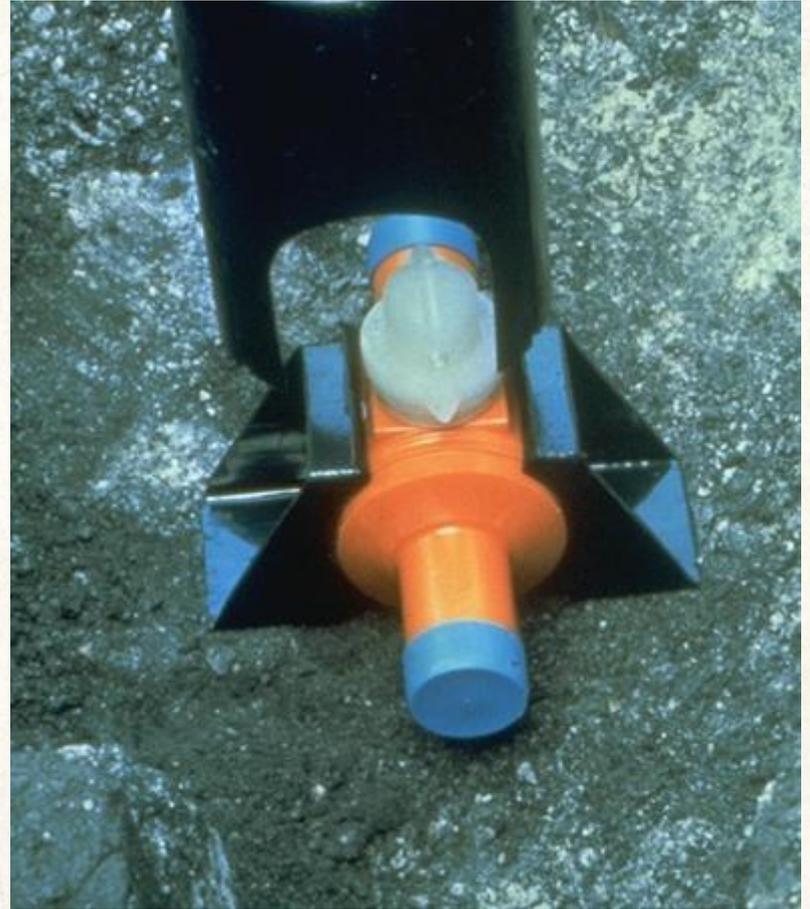


# Additional Concerns



# 192.193 Installation of Valves

Plastic valves must be installed to prevent torsional, shearing, and secondary stresses

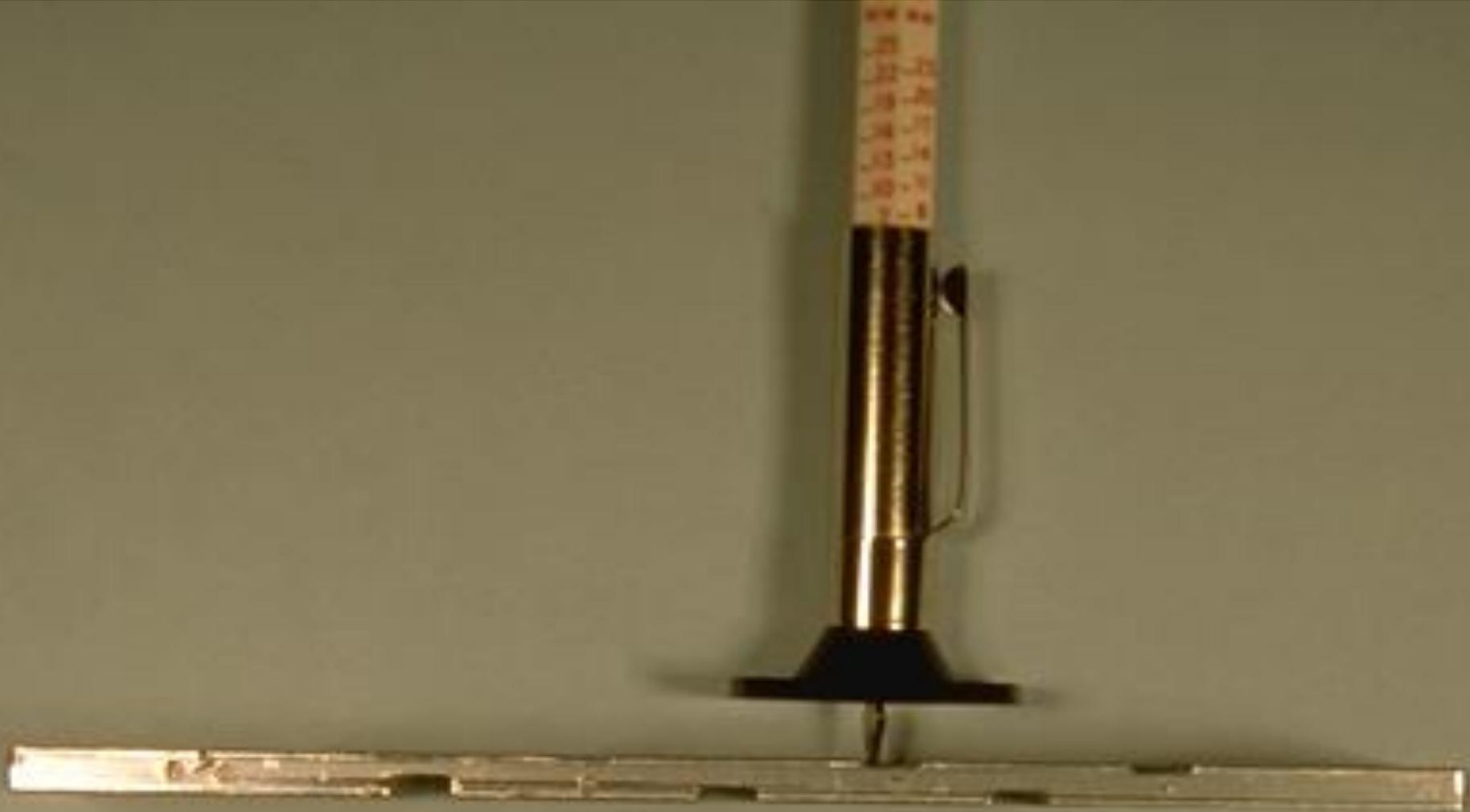


# 192.311 Repair of Plastic Pipe

Each  
imperfection or  
damage that  
would impair  
the  
serviceability of  
plastic pipe  
***Must*** be  
repaired or  
removed



# Quick, Easy Check



## §192.321 Installation Of Plastic Pipe

- a) Plastic pipe **MUST** be installed below ground (exceptions in g & h)
- b) Plastic installed in vaults and other below ground enclosures must be encased in gas-tight metal pipe and fittings protected from corrosion.
- c) Shear or tensile stresses must be minimized.

# §192.321 Subpart “G”



## §192.321 Installation Of Plastic Pipe (cont.)

- (d) Minimum wall thickness .090"  
O.D. of .875 (7/8) may be .062"
- (e) Must be installed with tracer wire  
or other means of locating.  
(Cannot wrap tracer wire around pipe)
- (f) Leading ends must be sealed before  
insertion.

# Installed With a Means of Locating

**Locatable  
Like This**



**NOT Like  
This**



# §192.321 Installation Of Plastic Pipe

(g) Uncased plastic pipe may be temporarily installed above ground level under the following conditions:

- (1) The operator must be able to demonstrate that the cumulative aboveground exposure of the pipe does not exceed the manufacturer's recommended maximum period of exposure or 2 years, whichever is less.

# Storage of Plastic

## **Manufactured Pre March 6<sup>th</sup> 2015**

- 2 Years Maximum UV Exposure

## **Manufactured Post March 6<sup>th</sup> 2015**

- 3 Years MDPE
- 10 Years HDPE

**Temporary Installations are still Limited to 2 Years**

# §192.321 Installation Of Plastic Pipe

(h) Plastic pipe may be installed on bridges provided that it is:

- 1) Installed with protection from mechanical damage, such as installation in a metallic casing;
- 2) Protected from ultraviolet radiation; and
- 3) Not allowed to exceed the pipe temperature limits specified in §192.123.

# §192.375 Service Lines: Plastic

a) Plastic above ground and outside of buildings must:

- Be protected against deterioration and external damage
- Plastic **CANNOT** support external loads



# Storage of Plastic



## *§192.375 Service Lines: Plastic*

**b) Plastic Inside a Building Must Be Protected Against External Damage**



# Handling of Plastic

Bend Radius should be no less than 20x's pipe O.D.



# Drisco 7000/8000



# Drisco 7000/8000

## **ADB-12-03**

**Mar 6, 2012**

Notice to Operators of  
Driscopipe 8000 High  
Density Polyethylene  
Pipe of the Potential  
for Material  
Degradation



# Drisco 7000/8000

## **Known Issues**

- Under 60 PSIG
- Desert Environments
- 1/2" to 2" Pipe
- Manufactured at Watsonville, CA Plant

# Questions

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