
Heat-Shrinkable Sleeve Technology

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Appalachian Underground Corrosion Short Course

Heat Shrink Sleeves

- **Specification**
- **Surface Prep**
- **Application**
- **Quality Control**



Prevent corrosion !

Coatings need to have

- high electrical resistance
- low permeability to hydrogen and oxygen
- mechanical strength
- chemical stability

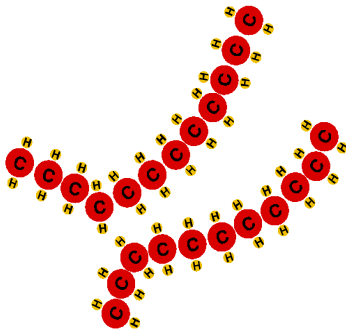


Irradiation Cross-linking

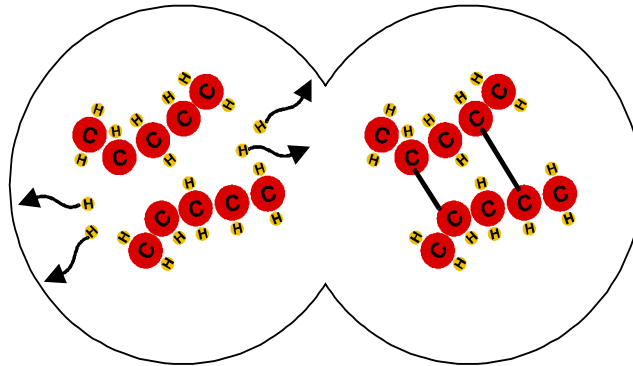
- High energy electrons are used to strike the molecules at the CH bond
- The hydrogen atom is set free leaving the parent carbon atom as a “free radical”
- At adjacent sites, the free radicals use their energy to form a chemical bond
- This bond is called a cross-link



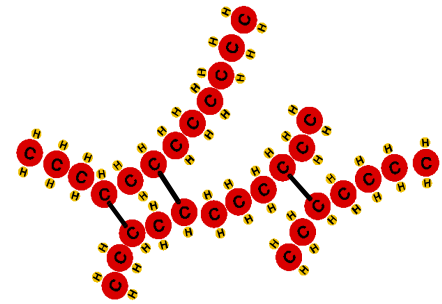
Polyolefin Cross-linking



**Polyolefin
(before)**



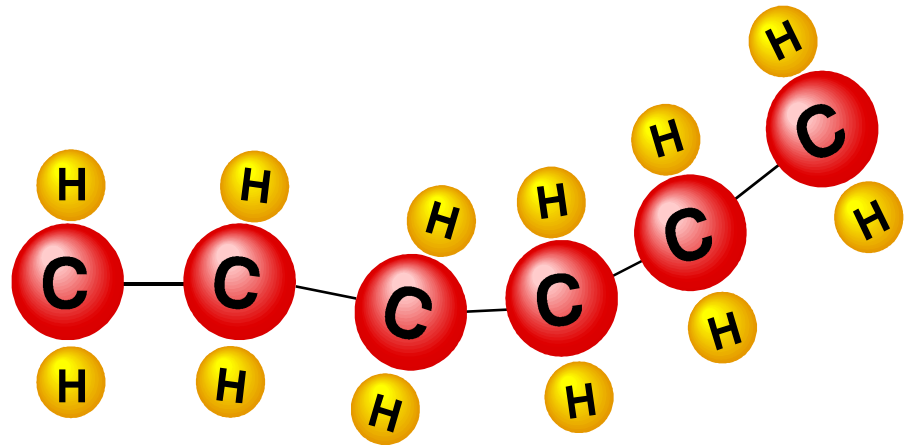
**Irradiation
processing**



Cross-linked Polyolefin (after)

Properties of Cross-linked Backings

- Imparts Elastic Memory
- Increases Tensile Strength
- Increases Impact Resistance
- Increases Abrasion Resistance
- Increases Insulation Value



General Design Criteria

- Ultimate performance dependent upon installation and surface preparation.
- Installation is typically more critical with more demanding performance in service.
- Ideal shrink sleeve can be installed in the harshest of climates by unskilled labor and is insensitive to pipe surface contamination.



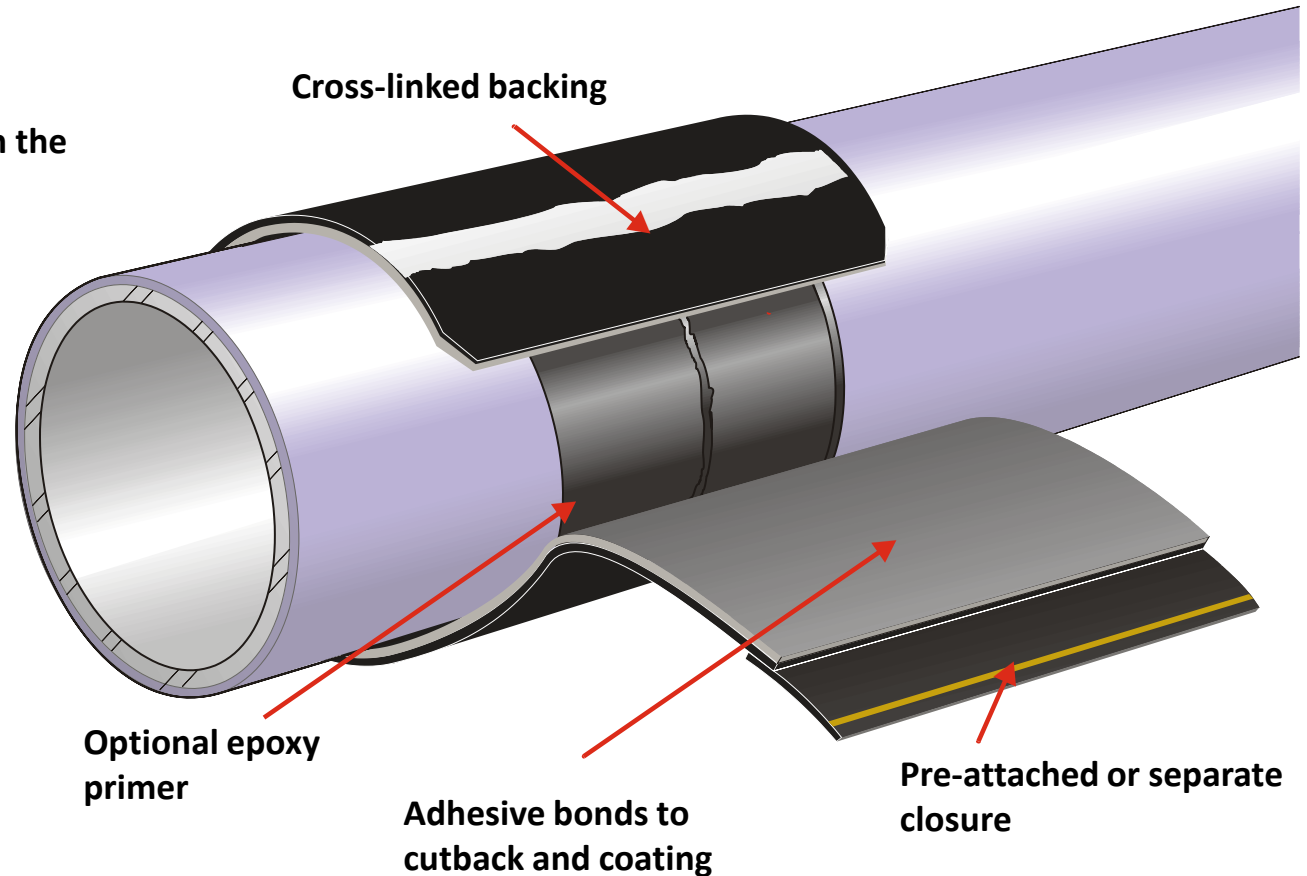
Heat-Shrinkable Sleeve System

- Sleeves consist of a backing and adhesive
- The backing needs to be cross-linked in order to be heat shrinkable
- The adhesive has several functions:
 - corrosion protection, shear resistance, long term adhesion to the steel, bond to the coating...
- Design of the backing and adhesive dictates performance at operating temperature



Heat-Shrinkable Sleeve System

Must be compatible with the
mainline coating



Polyolefin Support

- Provides the mechanical protection while assisting in the bonding the adhesive with hoop stresses provided by the elastic memory.
- Must withstand excessive heat without splitting, melting or pinholing.



Polyolefin Support

- Must withstand punishment of laying operation.
- Will be flexible in cold climates yet tough in hot, tropical climates.
- In above ground service, must avoid degradation by U.V.



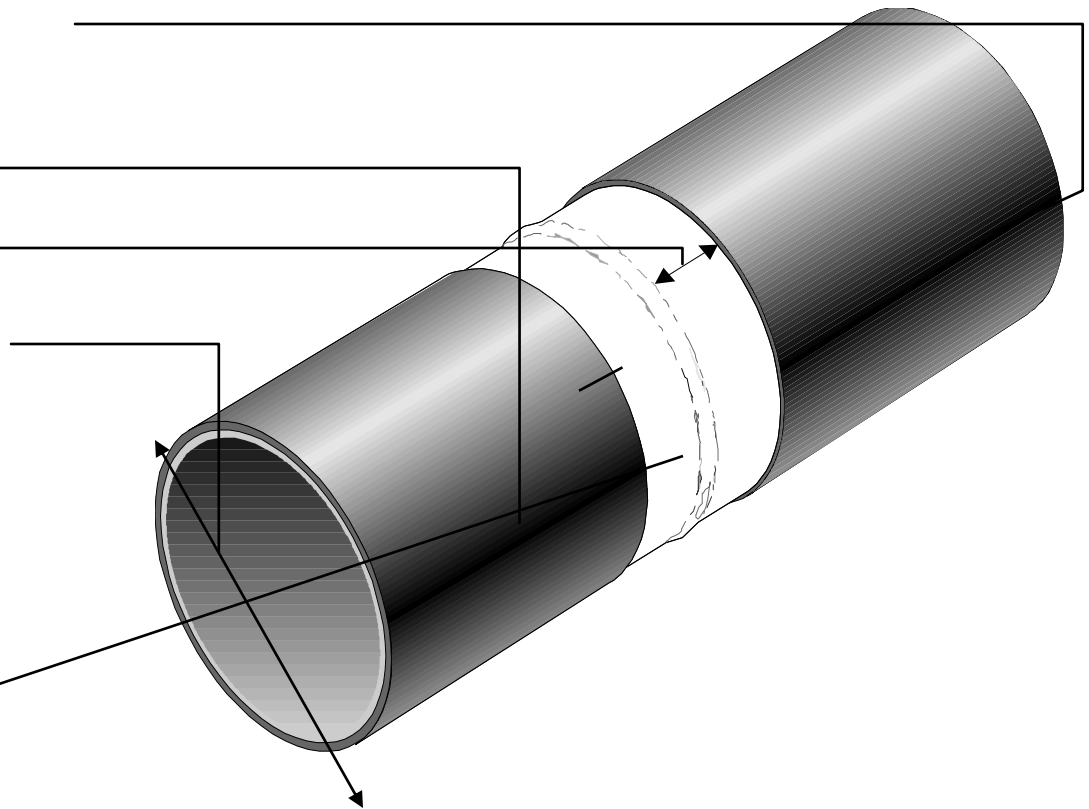
Adhesive

- Must be sensitive to surface preparation and preheating limitations.
- Provide an effective bond to steel.
- Must bond to the adjacent coating, critical to know coating compatibility.
- Provide good cathodic disbondment resistance.
- Resist soil stress and pipe movement.



Selecting the sleeve

- Pipe operating temperature
- Pipe coating type
- Cutback distance
- Outside pipe diameter
- Adverse soil conditions
- Pipe laying method
- Climate conditions
- Recommended pipe preparation
- Mechanical resistance class



Hot Melts vs. Mastics

- Precise melt point, preheat temperature is critical.
- Anchor pattern and surface preparation are critical.
- Ensure that higher preheat temperature does not damage main line coating.
- Mastics more forgiving in the field under extreme conditions.
- Tackiness and pressure sensitive nature of mastics allow for good performance with less than perfect surface preparation.



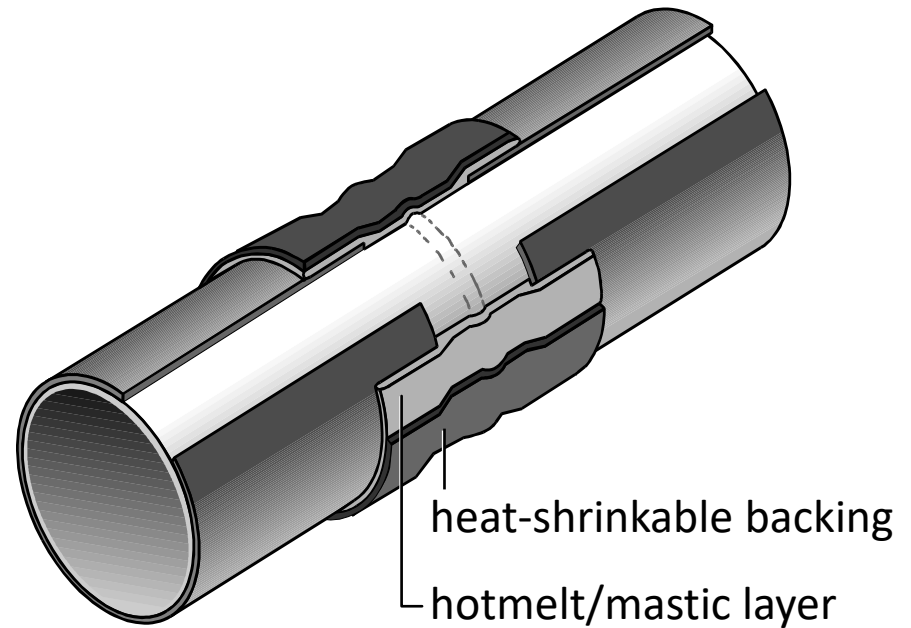
What is important to install?

- Suitable surface preparation
- Use of the proper tools
- Primer application (if used)
- Achieve the correct pre-heat
- Sleeve centered on the cutback
- Correct overlap to the coating
- Closure properly installed
- Correct procedure for shrinking
- Visual Inspection
- Field Peel Test
- Holiday Detection



Wraparound 2 Layer Sleeve

- Installation directly on cleaned and dried pipe surface
- Compatible with standard commercial mill-applied coatings
- No primer required





Preheat Surface Area



Center & Loosely Wrap Sleeve around Joint



Applying one end of Sleeve



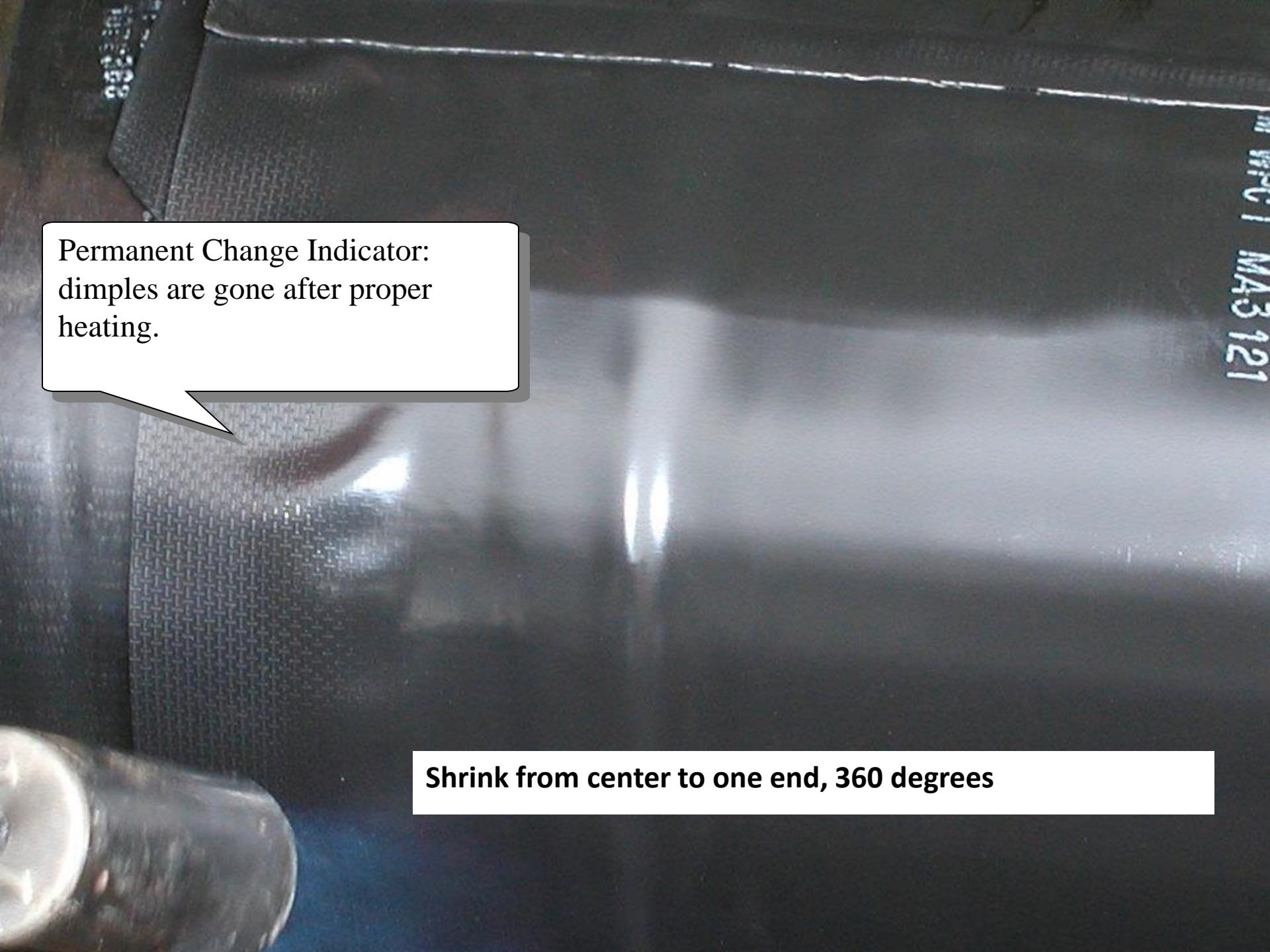
Flash adhesive & bring up other half of sleeve



Secure closure strip by heating



Start shrinking at the weld bead, 360 degrees around



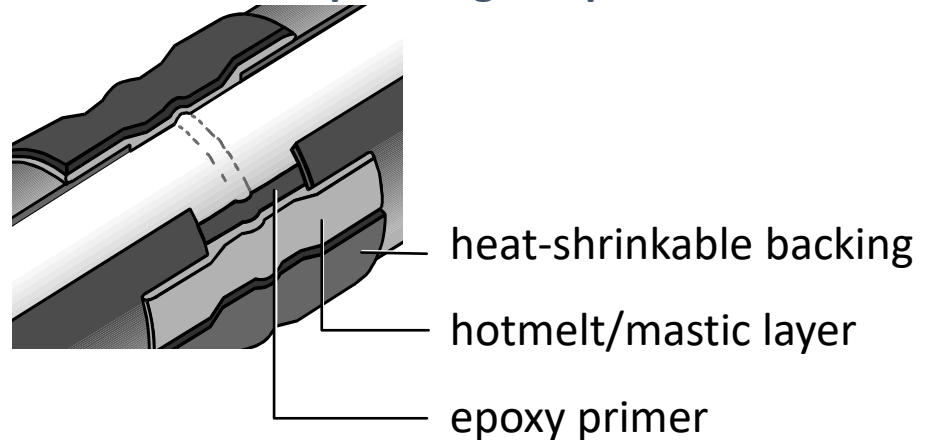
Permanent Change Indicator:
dimples are gone after proper
heating.

Shrink from center to one end, 360 degrees

Wraparound 3 Layer Sleeve

Three-layer coating for pipes with ambient and elevated operating temperature

- Epoxy first layer for superior bonding and chemical resistance
- Resist high soil shear forces
- Superior cathodic disbondment
- Superior high temp. performance
- Low preheat requirements







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Sleeve Application Summary

Sleeve Type	Surface Prep	Preheat
Mastic	Wire Brush	140°F
3 Layer (Hot Melt)	Blast to white metal finish	160°F
Hot Melt	Blast to white metal finish	240°F +

Coating of Fittings & Bends

Heat Shrink Tape

- Highly flexible, hand installed tape
- Minimal inventory



Tubular Heat Shrink Sleeves

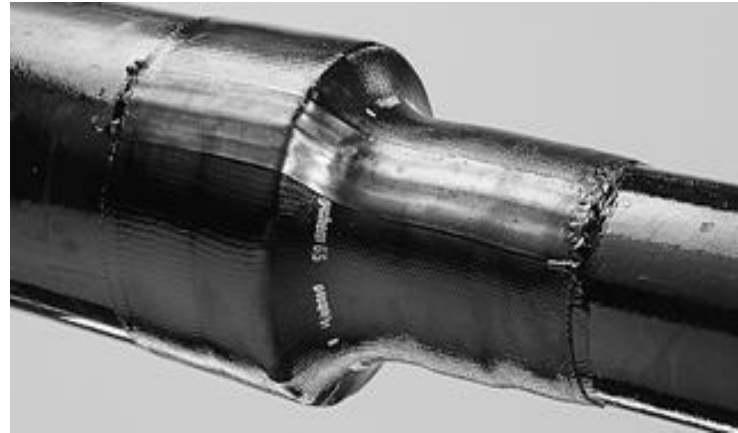
Two-layer coating for pipes with ambient operating temperature up to 30°C (86°F)

- Only handbrush or wirebrush required
- No closure patch, easy to install
- High impact strength and penetration resistance
- Thermal indicator (TPS)



Shrink Sleeves for Casing Ends and Flanges

- Fiberglass reinforced: mechanical strength, high impact strength, high penetration resistance
- Convenient wraparound design
- High shrink ratio (65%)



Special Applications

Three-layer coating for horizontal or directional drilling

Extremely high shear and peel strength

- Fiber-reinforced sleeve, excellent abrasion resistance
- No 'curing time' - just cool and use immediately
- Superior cathodic disbondment
- Simple installation without special tools



Thank you!

Comments, questions or compliments!

Questions???

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