WHAT are Cured-In-Place-Pipes (CIPPs)?

- The process chemically manufactures a new plastic pipe inside an existing damaged pipe.
- Advantages: Do not dig up existing pipe, little to no traffic shutdowns, can be less expensive than other repair alternatives.
- Raw chemicals and materials are brought onsite to manufacture the plastic outdoors.
HOW is a CIPP created onsite?

**Step 1. Prepare Materials**
- Uncured resin
- Initiators, felt, plastic films and coatings, filters, and reinforcements

* Styrene-based resins, such as polyester and vinyl ester, are the most popular

**Step 2. Material Insertion**
- Flexible tube containing raw chemicals is inserted into the damaged culvert.

**Step 3. Polymerization**
- Thermal (hot water, steam) or photo (UV light) curing

* Steam method is the most popular U.S.

**Step 4. Physically cuts**
- The ends of the hardened plastic are mechanically removed
- The new CIPP pipe is placed into service
Multiple types and methods for CIPP manufacturing

**Resin Types**
- **Polyester** (est. most popular)
- **Vinyl ester** (est. > cost of polyester)
- **Epoxy** (est. >> cost of polyester)

People also say “Styrene resin” vs. “Non-styrene based” resin
Resin + Solvents + Fillers + Catalysts + Initiators are added to create an uncured resin tube

**Method to insert uncured resin tubes**
- **Air inversion**
- **Water inversion**
- **Pull in place**

Sometimes resin may leave the tube and flow into cracks and sewer laterals. May not cure.
Tubes sometimes have a plastic coating. Plastic “preliners” sometimes used.

**Method to polymerize resin**
- **Thermal – Steam injection** (most popular)
- **Thermal – Hot water recirculation**
- **UV – Light exposure** (est. most growth)

**Cooldown method**
- **Forced hot air**
- **Forced ambient air**
- **Recirculated water**
WHAT CIPP manufacture looks like?

Material Preparation

Uncured RESIN tube delivered on a truck

Material Insertion

Uncured RESIN tube inserted into damaged pipe (raw chemicals)

Polymerization

Uncured RESIN tube inflated with air inside host pipe

“Curing (Hardening) Method”

Thermal (Hot Water or Steam) or UV Light

Hard ends are cut off

Wrap-up cutting

Pipe allowed into service

Water flow

Chemical emissions