

PLUMBING

McWane PLUMBING TECHNICAL SERVICES

AB&I FOUNDRY

anaco-husky

TYLER PIPE & COUPLING



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MCWANE COMPANIES *AROUND THE WORLD*



Canada Pipe
Suite 1, 33 Frid Street | Hamilton, Ontario, Canada L8P 4M3
P: 905.547.5251 | F: 905.547.7369

Bibby Ste. Croix
6200 Rue Principale | Ste-Croix, Quebec G0S 2H0
P: 418.926.3262 | F: 418.926.2430

Ditech Testing — Scoudouc
4 Addison Avenue | Scoudouc, NB E4P 3N4
P: 506.384.6157 | F: 506.384.5400

Clow Canada
245 Industrial Drive | Saint John, NB E2R 1A4
P: 506.833.2541 | F: 506.547.0113

Kennedy Valve
1021 E. Water Street | Elmira, NY 14801
P: 607.734.2211 | F: 607.378.1404

McWane Ductile - Ohio
2266 S 8th Street | Coonhock, OH 43812
P: 740.622.6651 | F: 740.622.8551

McWane Poles
2266 S 8th Street | Coonhock, OH 43812
P: 740.622.6651 | F: 740.622.8551

McWane Plant & Industrial - Wethersfield
800 Wells Road | Wethersfield, CT 06109
P: 888.949.6666

McWane Ductile - New Jersey
183 Stignees Street | Phillipsburg, NJ 08865
P: 908.554.1161 | F: 908.654.1006

Tyler Pipes & Coupling
111 Somers Court | South Plainfield, NJ 07080
P: 973.317.0005

McWane Plant & Industrial - Madison Heights
161 Corneal Drive | Madison Heights, VA 24572
P: 434.582.9511

Manchester Tank Campbellsville
901 New Columbia Rd | Campbellsville, KY 42718
P: 800.399.5628

Manchester Tank & Equipment Company
1000 Corporate Center Drive, Suite 300 | Franklin, TN 37067
P: 615.370.3833 | F: 615.370.8150

M&H Valve
805 West 23rd Street | Anniston, AL 36201
P: 256.237.2621 | F: 256.741.8253

Tyler Union
1501 W 17th Street | Anniston, AL 36201
P: 800.226.7601 | F: 800.226.0800

Amerex
7555 Gardenton Highway | Trussville, AL 35173
P: 205.655.3271 | F: 800.654.3980

McWane Plant & Industrial
1201 Vandevort Road | Birmingham, AL 35234

McWane Corporate
2001 Highway 200, Suite 900 | Birmingham, AL 35223
P: 205.414.3100 | F: 205.414.3170

McWane Plant & Industrial - Calera
801 Foundry Rd | Calera, AL 35040
P: 205.668.0706

Ditech Testing — Lethbridge
24 Pall Side Drive | Lethbridge, AB T1J 5S3
P: 506.384.6157 | F: 506.384.5400

McWane Ductile - Utah
1401 E. 2000 South | Provo, UT 84606
P: 801.373.6810 | F: 801.377.0338

McWane Plant & Industrial - Exeter
25500 Road 204, PO Box 458 | Exeter, CA 93221
P: 559.562.4000 | F: 559.562.2277

McWane Poles
1401 E. 2000 South | Provo, UT 84606
P: 801.373.6810 | F: 801.377.0338

Clow Valve
902 South 2nd Street | Okaloosa, FL 32577
P: 800.620.2569 | F: 841.678.8269

Manchester Tank Quincy
3400 Wainman Lane | Quincy, IL 62551
P: 800.926.2791 | F: 600.596.2264

Tyler Coupling
675 Tyler Road | Marshall, MD 20659
P: 417.468.2804 | F: 417.468.2833

Tyler Pipe
11910 County Road 492 | Tyler, TX 75706
P: 800.527.8478 | F: 800.246.8537

McWane Plant & Industrial - Houston
5107 Brookhagen Drive | Houston, TX 77017
P: 713.473.3900

OVERVIEW



Historical
Perspective

01



Shifting
Environment

02



The Epoxy
Solution

03



Testing
Protocols

04



Applications

05



Conclusions

06



HISTORICAL PERSPECTIVE

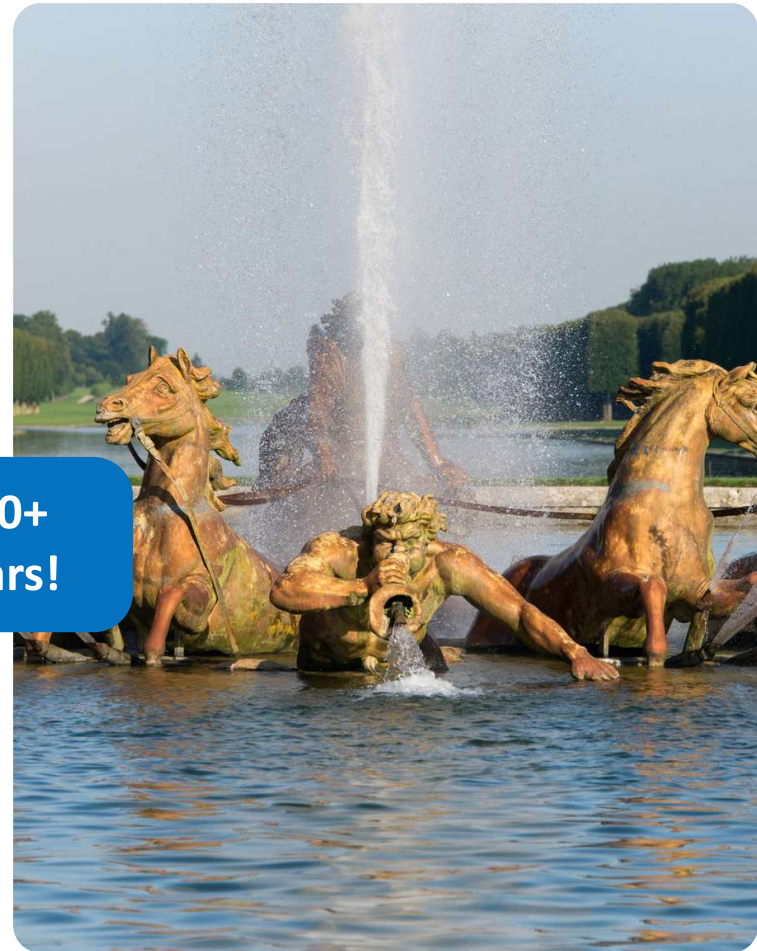


EARLIEST HISTORY OF CAST IRON

- ✓ First recorded use → Germany 1562, water fountain
- ✓ First full-scale cast iron pipe system used to distribute water in 1664 → Fountains of Versailles in France



360+
Years!

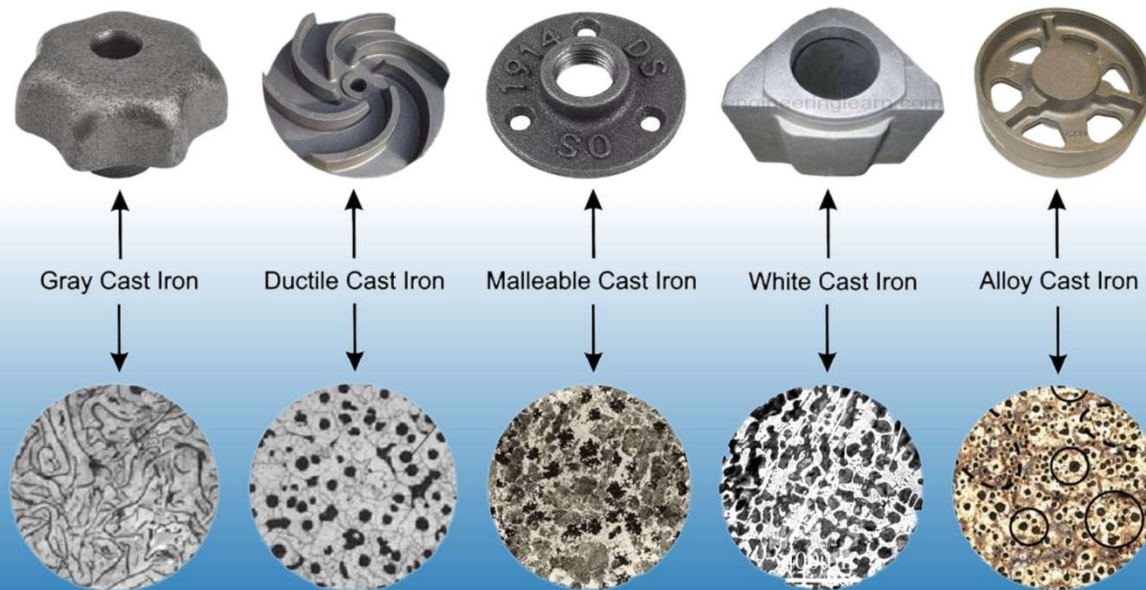


140-YEAR-OLD CAST IRON IN NYC!



THE CAST IRON PIPE ITSELF

The cast iron pipe used today is typically called Gray Cast Iron



ASTM STANDARDS

ASTM A888 / CISPI 301 & ASTM A74



Designation: A888 - 24

Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications¹

This standard is issued under the fixed designation A888; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

CISPI DESIGNATION: 301-21

STANDARD SPECIFICATION FOR HUBLESS CAST IRON SOIL PIPE AND FITTINGS FOR SANITARY AND STORM DRAIN, WASTE, AND VENT PIPING APPLICATIONS



Designation: A74 - 21

Standard Specification for Cast Iron Soil Pipe and Fittings¹

This standard is issued under the fixed designation A74; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

Endorsed by the
Cast Iron Soil Pipe Institute
American Association of State
Highway and Transportation Officials Standard
AASHTO No. M 203-77



Coating

The **pipe and fittings shall be uniformly coated** with a material suitable for the purpose that is adherent and not brittle.

“Internal corrosion of cast iron soil pipe and fittings can be caused by strong acids or other aggressive reagents with a pH of 4.3 or lower if allowed to remain in contact cast iron pipe for an extended period of time.” – CISPI Handbook

HISTORICAL DESIGN ENVIRONMENT

 **Bituminous asphalt** works very well with lots of water

 **Cast Iron** likes to be wet

 **Water solves** a lot of problems

 **Prevents clogging** (ex: fatburg)

 **Consistent performance**
throughout the life of the building



CAST IRON SOIL PIPE RANGE

pH Scale



Traditional
Black
CISP

CISP tolerates alkaline environments well
CISP struggles in low pH environments

Water solves a lot of problems
“Dilution is the Solution to Pollution”

Constant contact is the problem

Seasonal Occupancy Buildings:
Stadiums, dorms, campus labs, beach restrooms

Extremely high or low pH
Rarely seen prior to 1992

PREMATURE FAILURES IN CISP?





SHIFTING ENVIRONMENT



SHIFTING DESIGN PARAMETERS

Energy Policy Act of 1992 (EPAAct)

- Prior sizing methodology assumed flow rates for all different types of fixtures
- Previous average WC usage: 3.5 gpf

More fixture types

- Consistent flow rates due to water volume

Reduced water consumption

- WC – 1.6 gpf, Urinals – 1.0 gpf, Lavs – 2.2 gpm
- Fixture designers had to redesign trap and bowl to allow for evacuation of contents
- Lavatory valves required redesign as well

LEED & Green Building Initiatives

- Widespread low-flow fixture adoption

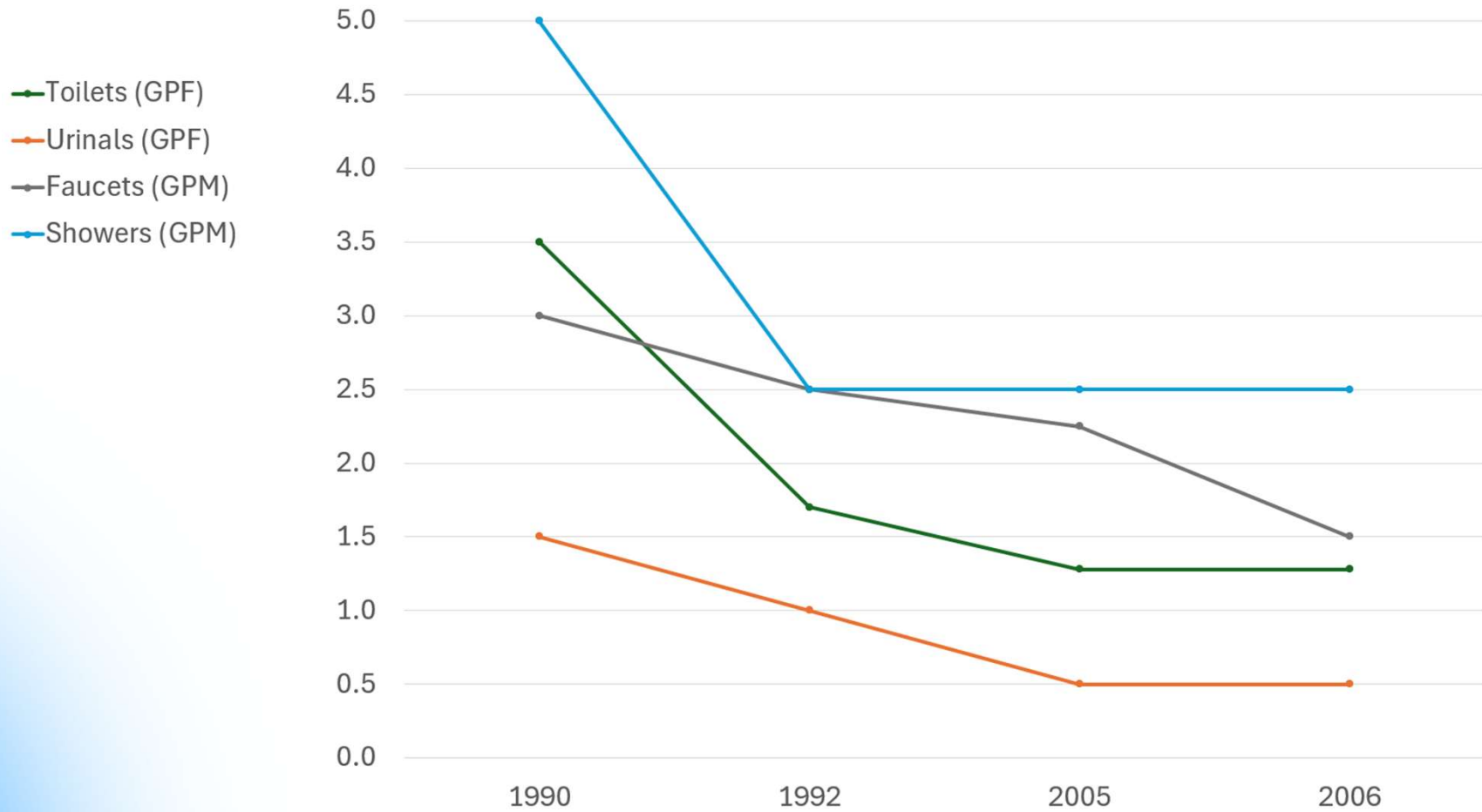
Fixture	Before EPAAct	After EPAAct
Toilets	3.5 - 7.0 gpf	1.6 gpf max.
Showerheads	5-8 gpm	2.5 gpm max.
Lavatories	3.5 gpm	2.2 gpm max.
Urinals	1.5 gpf	1.0 gpf max.

Massive disruption to entire plumbing industry

Traded one problem for another:

→ Saved water at the expense of sanitary system integrity!

Low Flow Requirements



LOW FLOW APPLICATIONS

Low-flow water fixtures & codes

- Toilets: 5 gpf → 3.5 → 1.6 → 1.28 → pushing <1.0 gpf!
- 65 - 80% water reduction since the 70's

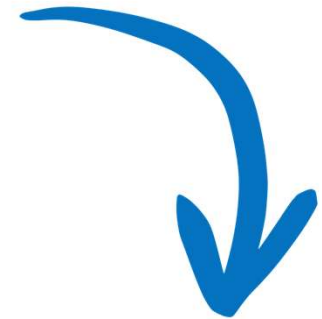
Lack of “carry” to remove human effluence

- Sanitary system becomes a septic system
- Increased $H_2S \rightarrow H_2SO_4 \rightarrow$ 12 o'clock failures

Corrosives are NOT being neutralized/removed

Pipe is NOT being “washed” to dilute the pH of everyday household items

DWV designs have not changed



MUNICIPAL SEWER GASES



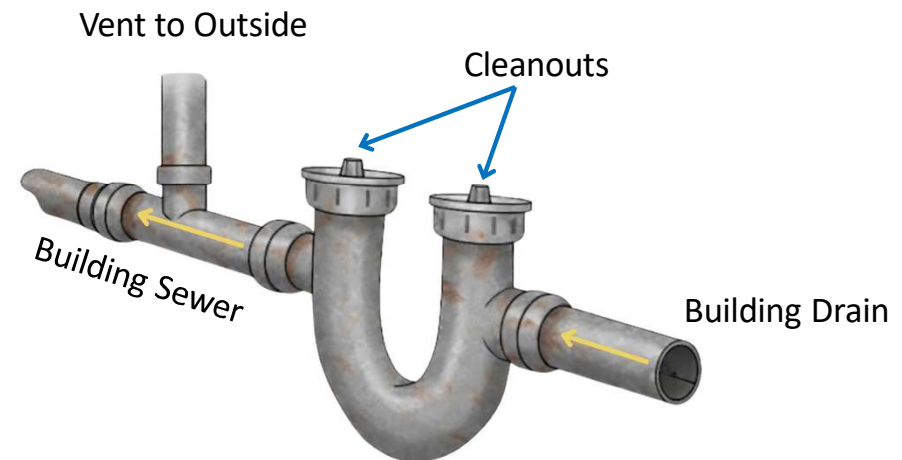
Manhole covers in major metropolitan areas being sealed up

Pedestrian complaints



Sewer gasses now vented through buildings

Adoption of Running Traps to mitigate corrosion in building



MAINTENANCE



Loss of facilities folks who maintained buildings (i.e. flush)
Left to janitors with **cleaning chemicals**



Testing designed to **simulate 50-year life**
With proper maintenance!



Like all **mechanical systems...**
It must be maintained!



CHEMICAL EXPOSURE

Everyday household liquids at pH extremes



pH 2.82



pH 2.95



pH 3.1



pH 12.5



pH 3.1



pH 2.49



pH 13.5

OTHER FACTORS

↗ Energy drink consumption dramatically increased

Highest among adolescents & young adults

Soda consumption relatively flat

🔄 COVID-19 Pandemic



PERFECT STORM



A MORE CORROSIVE ENVIRONMENT



POST EPA^{act} 1992 RESULTS: PREMATURE CAST IRON FAILURES

40-80% reduction in volumetric flow rate

Sewer gases present in **DWV system longer**

Gases pulled along with **solids/fluids**

Increased production of **sewer gases**



THE EPOXY SOLUTION



NEW PROBLEM → SAME SOLUTION

- ✓ Epoxy has been the chosen **coating polymer** for corrosion resistance in most industries
- ✓ **Oil and Gas** lines across our country are coated with cross linked Epoxy
- ✓ Not a new technology



WHAT IS EPOXY?

✓ Epoxy is not paint

✓ Paint

- Single component: Solvent-based
- Easy to use & dries fast
- Less durable

✓ Epoxy

- Two component: Resin & hardener
- Requires mixing & longer cure time
- Stronger Adhesion
- Much harder, more durable
- Suitable for harsh environments



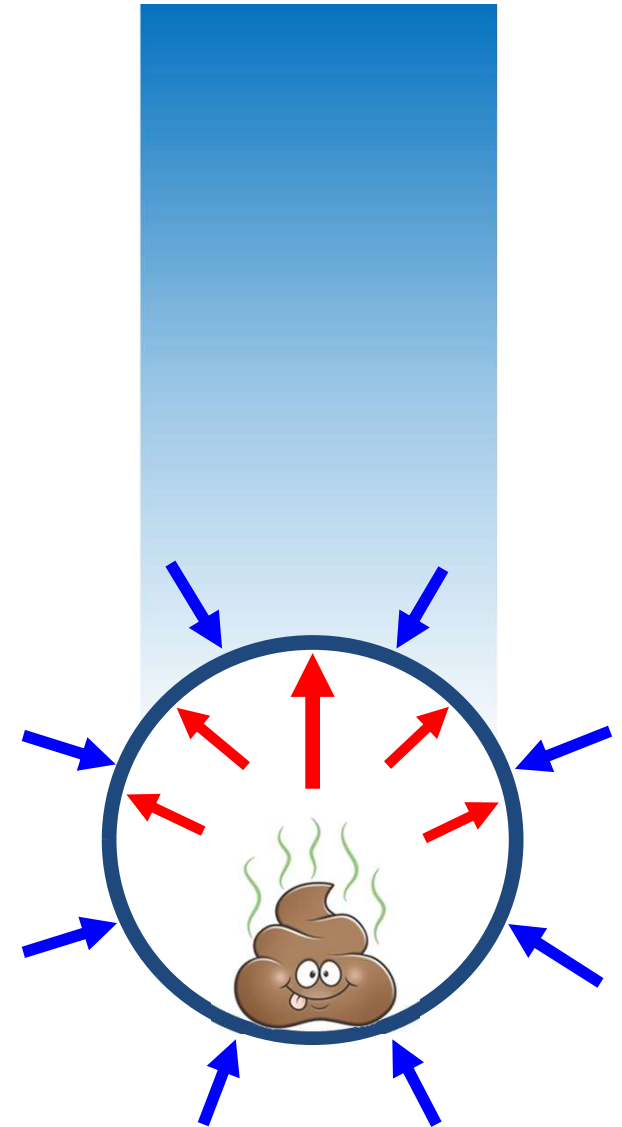
FAILURE MECHANISMS

ID - “Inside → Out” corrosion

- ✓ H_2S (Hydrogen Sulfide Gas) + H_2O (Water) = H_2SO_4 (Sulfuric Acid)
- ✓ Fats, Oils, & Grease (FOG)
- ✓ Soda lines
- ✓ Dialysis waste
- ✓ Mechanical condensate
- ✓ Sewer gasses

OD - “Outside → In” corrosion

- ✓ Fresh water
- ✓ Salt spray (coasts)
- ✓ Road salts



Ideal internal

DESCRIPTION

Two-component, solvent-free, amine-cured novolac phenolic epoxy coating

PRINCIPAL CHARACTERISTICS

- Suitable for heavy H₂S wastewater environments
- Suitable for use on primed steel or direct to concrete/masonry
- Good visibility due to light color
- Glossy and smooth appearance
- Reduced explosion risk and fire hazard
- Suitable for storage of unleaded gasolines
- Good chemical resistance against a wide range of chemicals and solvents
- A clear (semi-transparent) version is available for systems reinforced with chopped glass fibers or glass fiber mats
- Excellent resistance to crude oil up to 120°C (250°F)

Ideal external

DESCRIPTION

Two-component, fast dry multi-purpose epoxy coating

PRINCIPAL CHARACTERISTICS

- Multi-purpose high build epoxy
- Application over a wide range of surface temperatures
- Suitable for immersion in fresh and salt water
- Class A slip resistance for high strength bolted connections

All epoxies are not created equal!

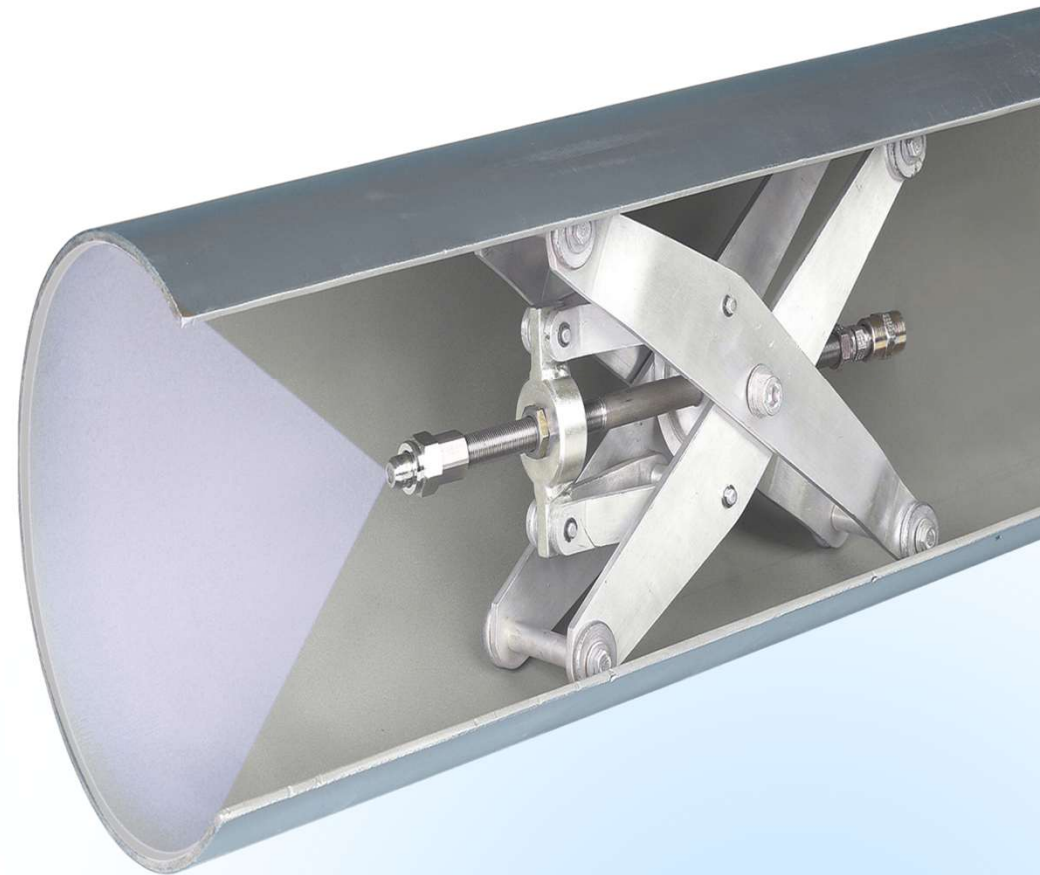
COATING METHODS

✓ Electro-coating (E-coat) & dipping

- Difficult to get uniform coverage
- Much thinner coating thickness

✓ Spray applied (pipe only)

- Exterior should be shot-blasted for optimal adhesion/strength
- Interior is reamed/bored for optimal flow & adhesion
- Ideal for uniform pipe geometries





COATING METHODS

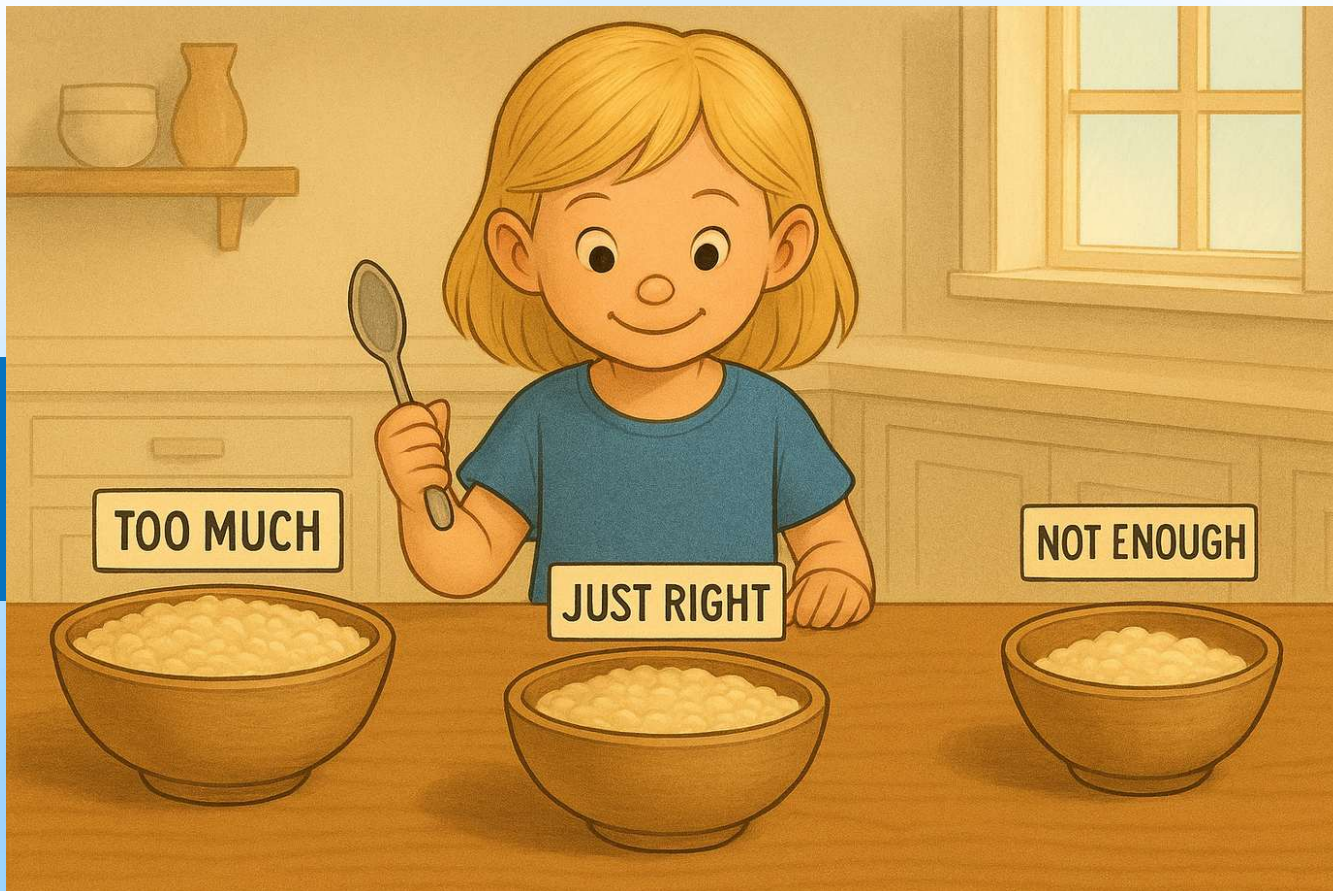
✓ Fusion bonded (fittings)

- Fitting is cleaned & heated
- Individually dipped in fluidized bed of epoxy powder
- Powder melts onto fitting surface with controlled and uniform thickness

✓ Powder Coat

- Similar to Fusion Bonding
- Static electricity used to make dry powder stick
- Widely used in painting applications

COATING THICKNESS



FIELD CUTS

✓ Reapply epoxy

- **Pros:** Most durable, longest lasting solution
- **Cons:** Cure time, pot life of epoxy, availability

✓ Touch-up primer (single component)

- **Pros:** Widely available, easily applied, minimal labor, chip repair option
- **Cons:** Drying time

DESCRIPTION

One-component, multi-purpose tank and structural primer

PRINCIPAL CHARACTERISTICS

- Rust Inhibitive interior/exterior alkyd primer
- Ideal for structural steel, tank exteriors, piping and equipment
- May be topcoated on ferrous metal with epoxy and polyurethane coatings as well as conventional alkyds and latex products
- Fast drying properties
- Lead and chromate free

Curing time for DFT up to 2.0 mils (51 µm)

Substrate temperature	Dry to touch	Dry hard
70°F (21°C)	20 minutes	1 hour

Note: Curing times valid for a relative humidity of 50%

STANDARDS

- ✓ **NO specific standards for special and/or enhanced coatings on cast iron in the US (yet!)**
- ✓ **European standard, EN 877, is often referenced**
 - Does NOT apply in the US
 - Metric units
 - NOT possible to satisfy EN877 (in its entirety) AND ASTM A888 / ASTM A74
- ✓ **Some testing standards for coatings, but few were designed with DWV application in mind**
- ✓ **Currently, ASTM A04 committee developing standard for enhanced coatings**





TESTING PROTOCOLS



APPLICABLE TESTING OF EPOXY COATING FOR DWV

Resistance to Salt Spray

- ✓ References **ASTM B117**
- ✓ Test Length: **350 hours** (~15 days)
- ✓ Test Procedure: Immersed in Salt Spray



APPLICABLE TESTING OF EPOXY COATING FOR DWV

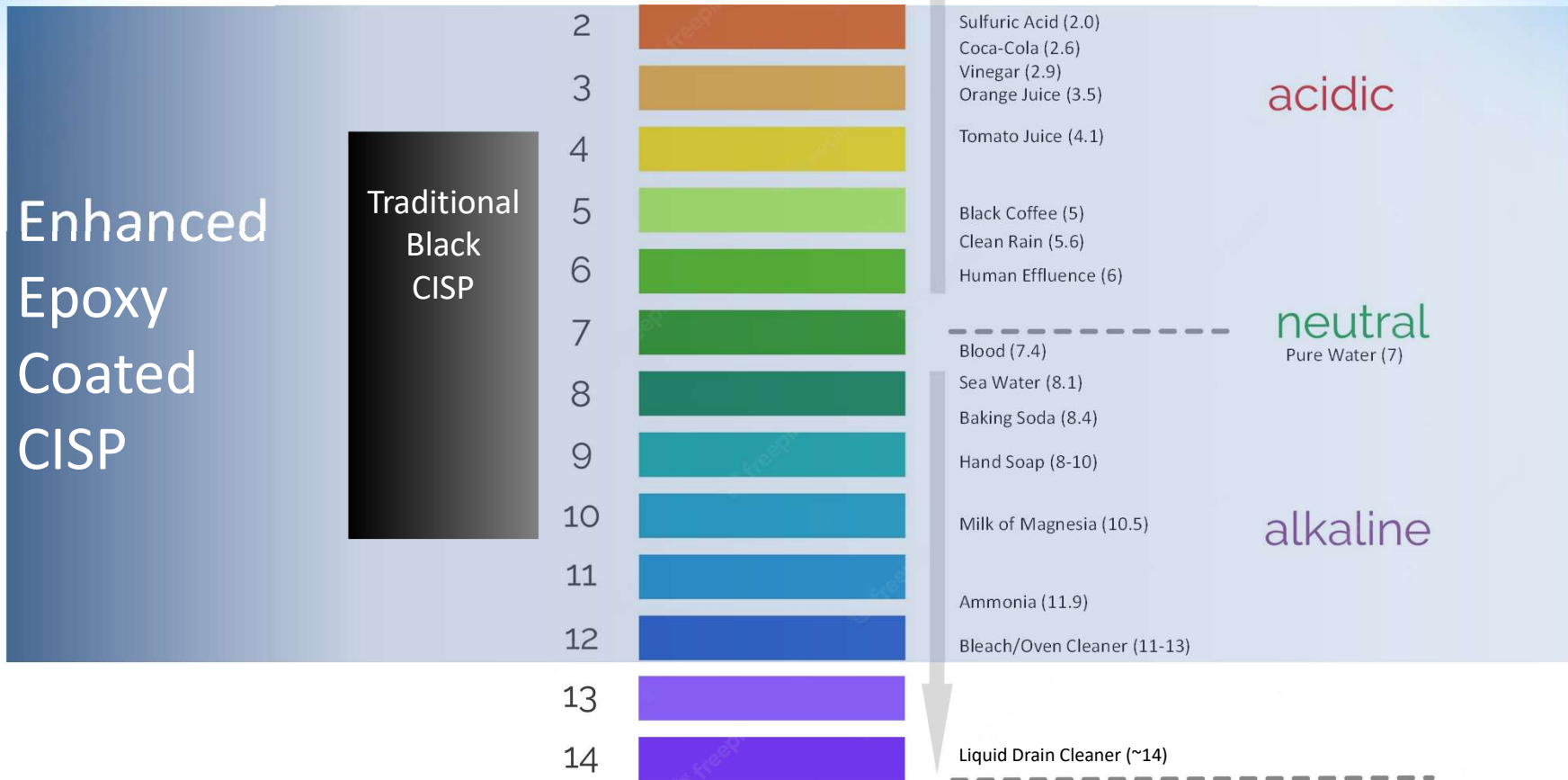
Chemical Resistance

- ✓ Scored according to **ASTM D714**
- ✓ Test Length: **30 days** immersed
- ✓ Test Procedure:
 - 1st Sample: sulfuric acid (pH 2) held at **68-78 °F**
 - 2nd Sample: sodium hydroxide (pH 12) held at **68-78 °F**



Note: Baseline test (i.e. not all acids are created equal)

pH Scale



APPLICABLE TESTING OF EPOXY COATING FOR DWV

Resistance to Wastewater

- ✓ Test Length: **30 days**
- ✓ Test Procedure: Immersed conditions at **73.4 °F**

Constituents	mg/l
Starch	50
Sodium stearate	32
Sodium acetate	56
Glycerine tri-stearate	15
Urea	13
Ammonium sulphate	70
Proteins	90
Potable water	balance

APPLICABLE TESTING OF EPOXY COATING FOR DWV

Coating Thickness

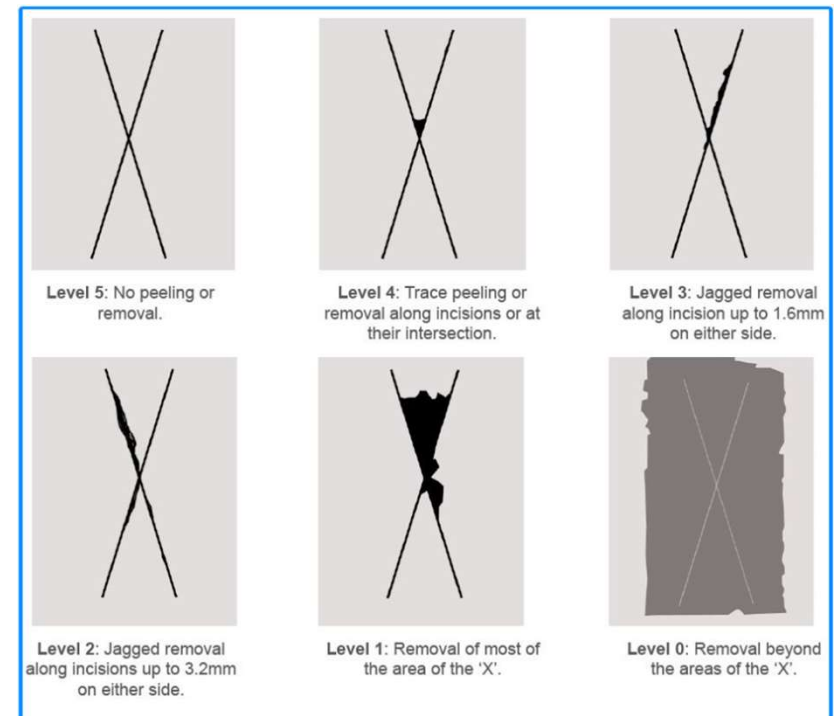
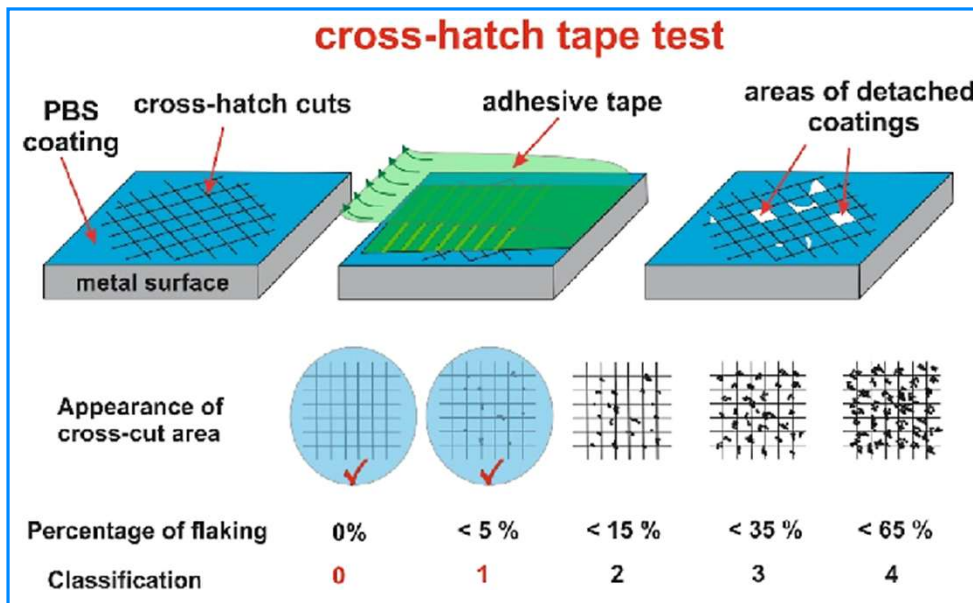
- ✓ Test Procedure: Mean value of **5+** measurements
- ✓ Should meet **manufacturer's** guidelines



APPLICABLE TESTING OF EPOXY COATING FOR DWV

Adhesion

- ✓ Tape Test Method according to **ASTM D3359**
- ✓ Test Method A: "X" cut (**5+ mils**)
- ✓ Test Method B: "Crosscut" Method (**<5 mils**)



APPLICABLE TESTING OF EPOXY COATING FOR DWV

Resistance to Hot Water

- ✓ Test Length: **24 hours**
- ✓ Test Procedure: Immersed for in a water bath held at **200-207°F**
- ✓ Blistering scored according to **ASTM D714**





AGGRESSIVE APPLICATIONS



INSTALLING THE CORRECT PRODUCT WILL AVOID FUTURE DOWN TIME AND WASTED \$\$\$\$\$



THE EPOXY SYSTEM IS FOR ALL DWV AND STORM/SANITARY APPLICATIONS

- ✓ Hospitals / Labs
- ✓ Bars / Kitchens
- ✓ Hot Water over 180°F
- ✓ Soda Machines
- ✓ Underground
- ✓ Cleaning Chemicals
- ✓ Waterless / HEU
- ✓ Boiler Condensate

HOSPITAL APPLICATIONS



Corrosive environment challenges

- Nurse/Doctor Hand Washing Station, Eye Wash, Exam Room, Surgery, Dialysis
- Average WC usage 3.5 gpf



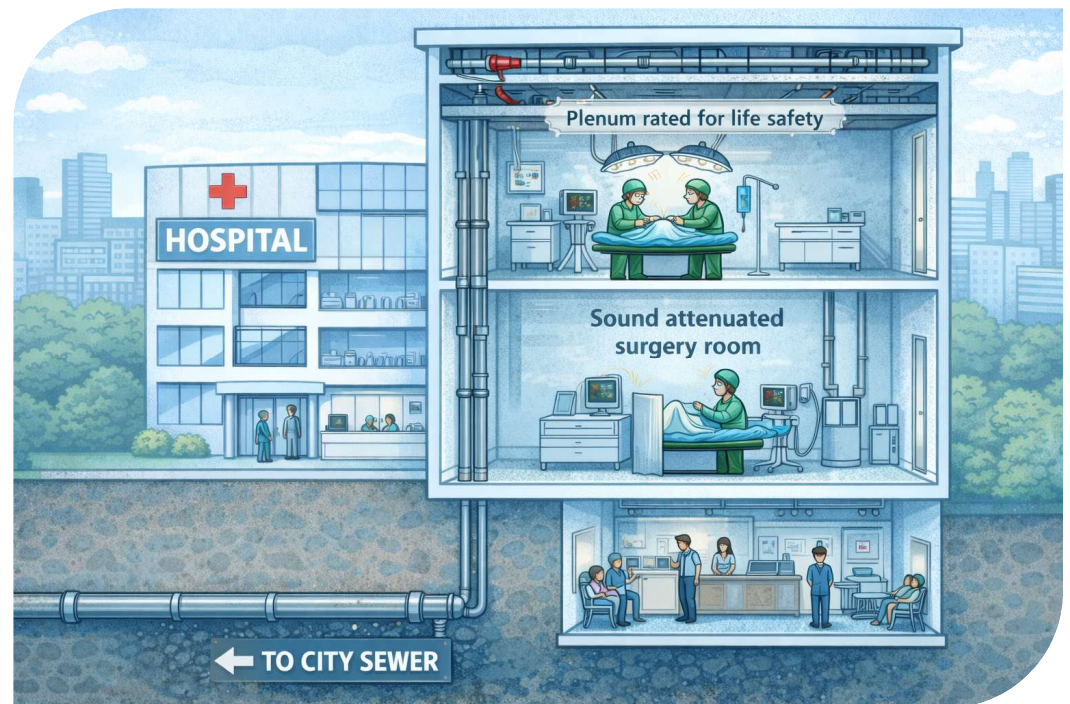
Plenum rated Life safety

Sound attenuation Surgery rooms



Kitchens on ground floor

- Hot water and extreme pH under the slab
- Higher replacement expense



DIALYSIS WASTE



Sodium chloride (NaCl)

- Primary dialysis byproduct
- Extremely aggressive to black CISP



In general, Epoxy Coated Cast Iron is resilient to fully concentrated Sodium Chloride for 30 Days with no effects to the coating

KITCHEN APPLICATIONS

 **HOT WATER:** Dishwasher discharge at 140+ °F

 **All DWV systems encounter different corrosives**

- Coke / Lemon Juice / Vinegar = pH 2-3
- Baking Soda = pH 9

 **Plenum rating and no smoke spread**

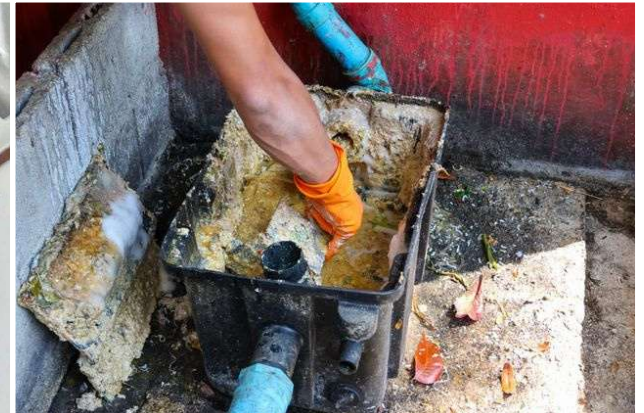
 **Kitchens are typically on the ground floor**

- Hot water and higher pH under the slab
- Much higher replacement expense



GREASE WASTE

- ✓ All decaying organic matter releases, **Hydrogen Sulfide (H_2S)** gas
Includes human effluence & **grease waste!**
- ✓ H_2S combines with oxygen/water to create **Sulfuric Acid (H_2SO_4)**
- ✓ Epoxy coated CISP can be **heat traced** to keep FOG moving!



CASINOS

- Bars & Kitchens
- Event spaces
- Pools & Spas
- Parking garages
- Restrooms
- Janitorial
- Laundry
- Grease Waste
- Shenanigans?

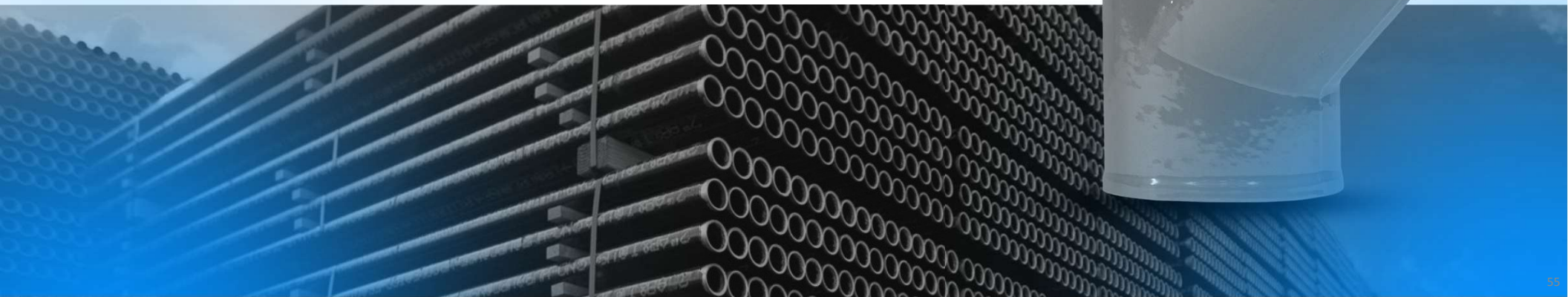






ADDITIONAL CONSIDERATIONS

- Site of Manufacturing
- Site of Coating
- Meets CISPI 301, ASTM A888/A74 and listed by NSF
- Passes all relevant extreme environmental testing
- Hydrojet, auger, and/or mechanical cleanout resistance
- Plenum rating

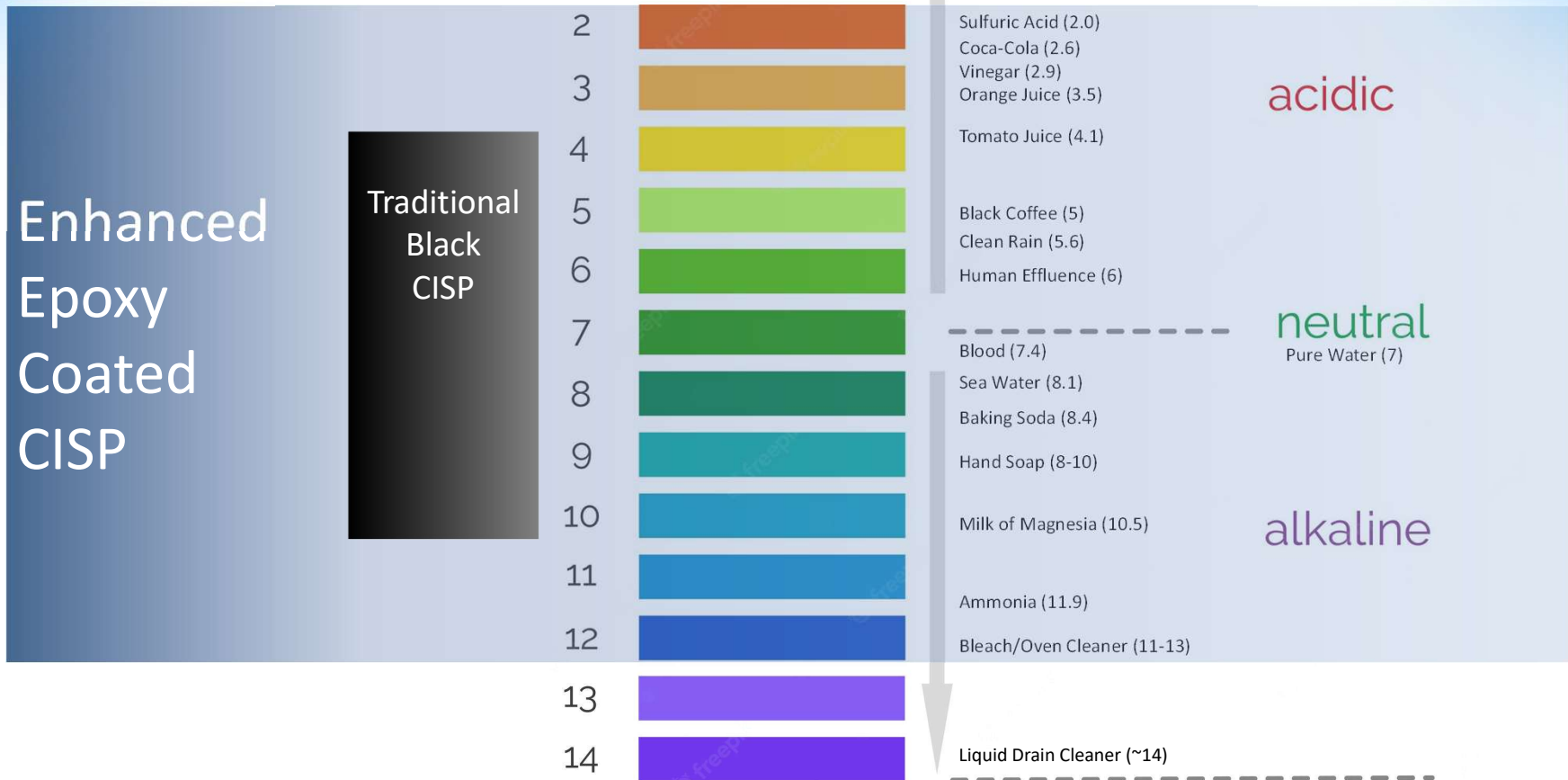


FINAL THOUGHTS

- ✓ Epoxy coated CISP designed for aggressive DWV applications
- ✓ Not suitable for chemical or special waste
- ✓ Corrosion Resistance + Durability
 - Best of both worlds
- ✓ Long term peace-of-mind



pH Scale



THANK YOU!
QUESTIONS?

