



CPVC Technical Update



Guy Watson GIFirE, IRMCert
Director of Technical Services
for Europe, Middle East
& North Africa





CPVC Technical Update - Agenda:

- Introduction
- Properties
- Manufacturers & Brands
- Applications, Approvals & Listings
- The Importance of Training
- Summary

BlazeMaster
FIRE SPRINKLER SYSTEMS

Lubrizol

FlameGuard
CPVC FIRE SPRINKLER PRODUCTS



FG SKADETEKNIKK

CPVC Technical Update

FlameGuard CPVC FIRE SPRINKLER PRODUCTS

Lubrizol **BlazeMaster** FIRE SPRINKLER SYSTEMS

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3 Generations of Watson's in Sprinklers!

About Your Presenter:



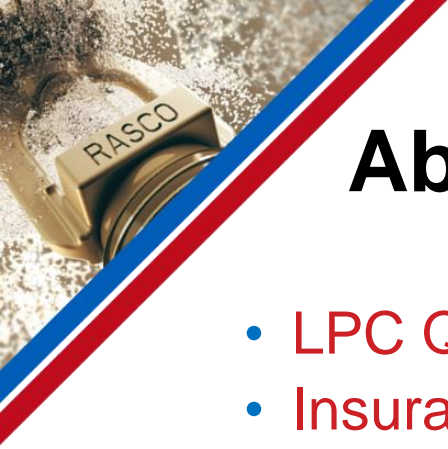
Barry



Guy



Luke



About Your Presenter:

- LPC Qualified Sprinkler System Designer
- Insurance Sprinkler System Surveyor



- Graduate Member Institute of Fire Engineers
- Certificate Member Institute of Risk Engineers
- Global Insurance Risk Engineer



- Technical Director – Reliable
- EFSN, BAFSA, RSA Technical Committees
- **Certified CPVC Trainer**





About Your Presenter:

- Non-Sales Role
- Responsible to Vice President
- Answer Client's Technical Queries
- Research New Applications for Existing Products
- New Product Development & Testing
- Liaise with Manufacturing & Quality Departments
- **Internal & External Product Training**
- **Engage With AHJ's & Consultants**



LinkedIn

<https://www.linkedin.com/in/guywwwatson>

Guy Watson GIFirE, IRMCert
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Reliable is an Authorised Distributor for Spears Flameguard CPVC Pipe & Fittings...

Reliable®

Manufacturer & Global Distributor of Fire Protection Products



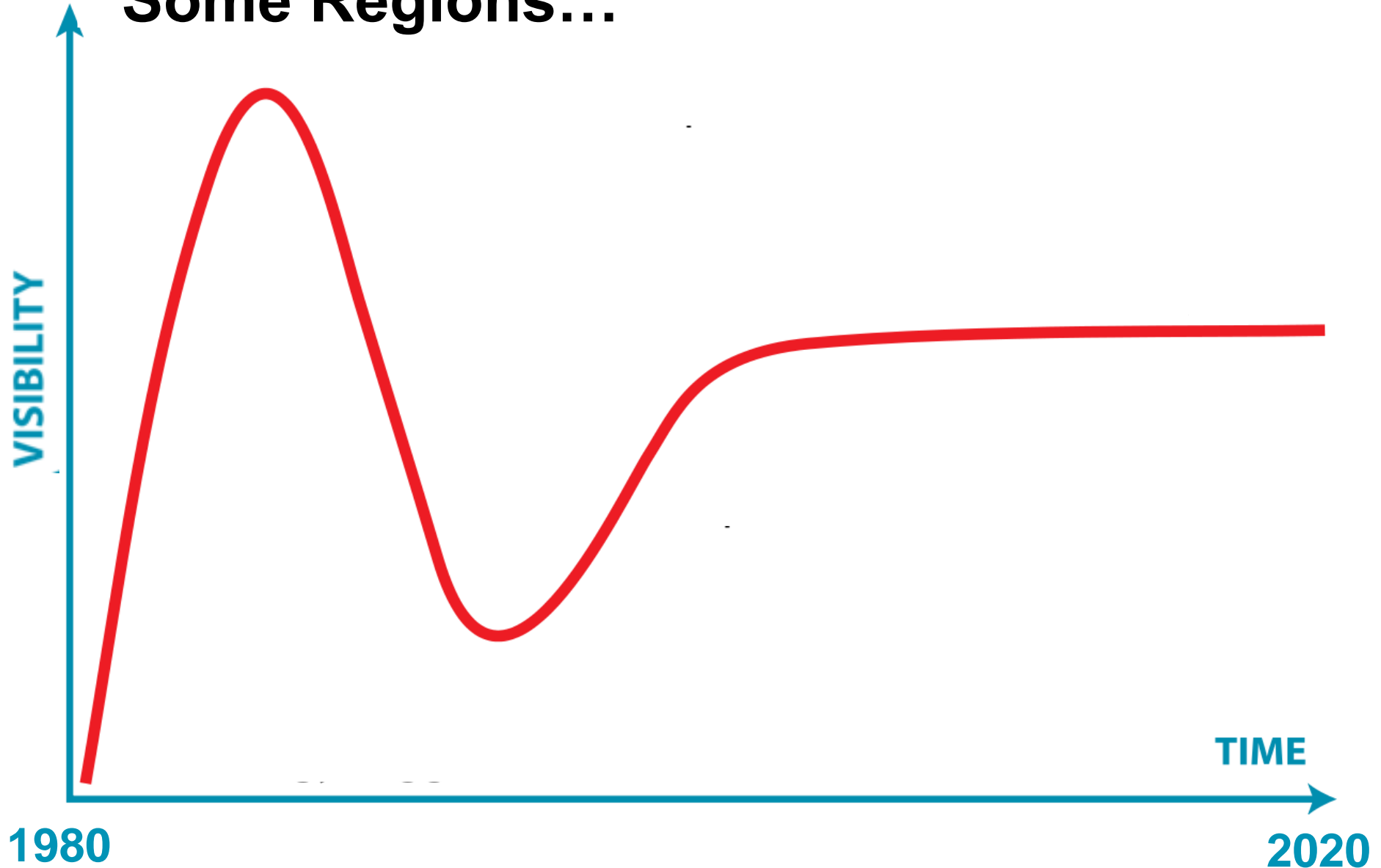
Reliable
TECHNOLOGY • QUALITY • SERVICE

Reliable Automatic Sprinkler (UK) Ltd
Unit 25 Birches Industrial Estate,
East Grinstead,
RH19 1JZ
+44 (0) 1342 316800

RASCO Residential
SPRINKLER PRODUCT BROCHURE

www.reliablesprinkler.com Issue for April 2015

CPVC is Still a Relatively New Product in Some Regions...



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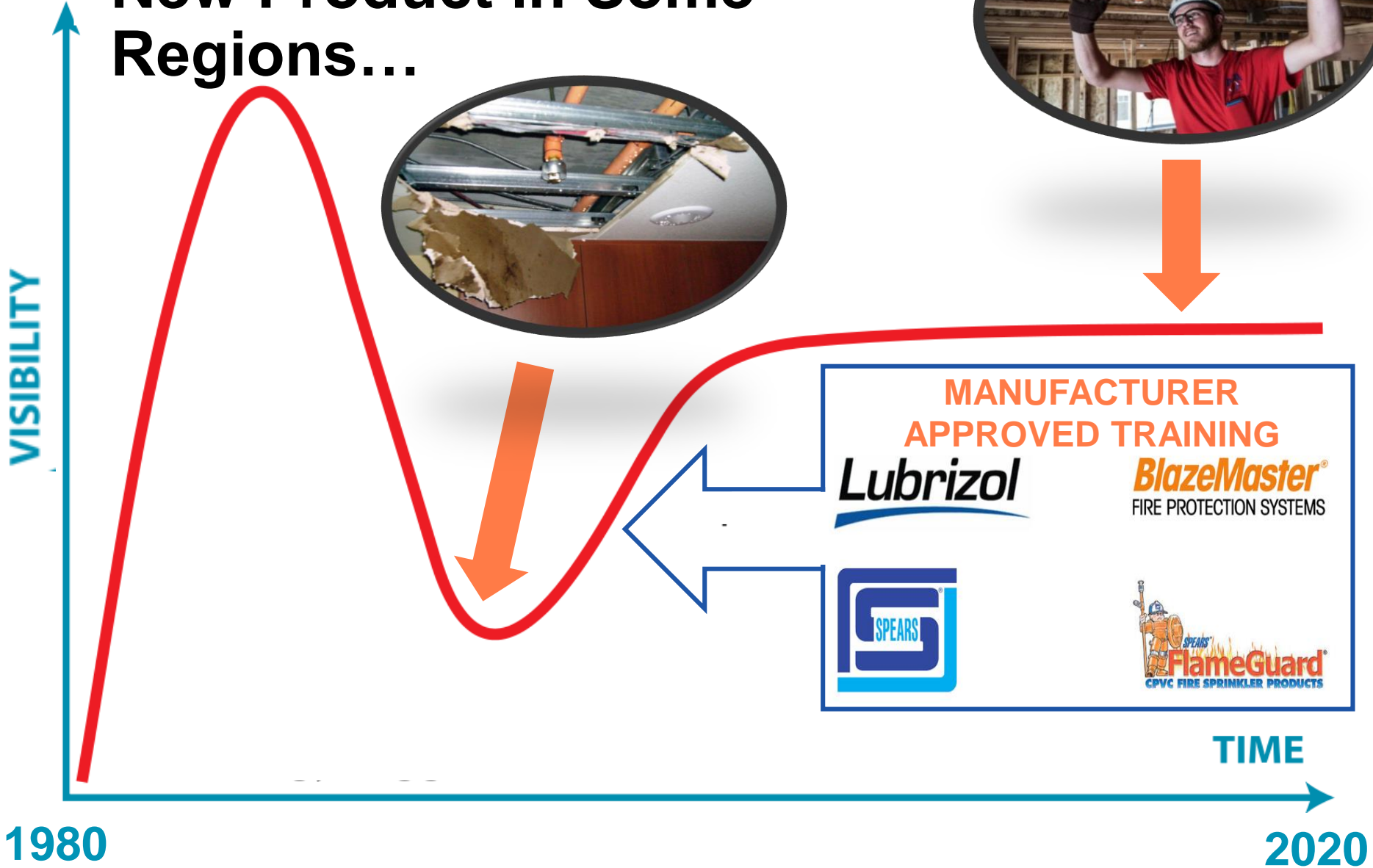
Lubrizon

FlameGuard
CPVC FIRE SPRINKLER PRODUCTS





CPVC is Still a Relatively New Product in Some Regions...



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1980

2020



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UL Listed CPVC Material Properties:

- Chlorinated Polyvinyl Chloride (CPVC) is PVC enhanced with Chlorine – Adding Chlorine gives a **Fire Rating**
- In the 1980's a special compound formula was developed to provide strength at high temperatures, as required in a fire sprinkler system



CPVC Fire Sprinkler Products are Orange in color



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Why Use CPVC in Sprinkler Systems?

- **Easy Installation**
 - Can be installed with a quick, clean & simple one-step joining system
 - Light weight – 5 times lighter than steel
- **Cost Effective**
 - Reduced installation times and equipment costs - hand tools only
 - Easy to modify when there are clashes with other services etc.
- **Hydraulic Advantages**
 - Hazen Williams C-factor of 150, that will not diminish over time, unlike steel.
 - Less friction = smaller pipe sizes and components than steel (cheaper)
- **Reliability**
 - Up to 50 years of service life
 - Immunity to Microbiologically Influenced Corrosion (MIC)
 - Long-term cost benefits – unlike steel, **it does not rust!**
- **UL listed** (Orange) CPVC pipe & fittings are **Fire Rated**

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Retrofitting: How Difficult Would This be in Steel?





UL Listed CPVC Material Properties:

In accordance with EN 13501-1:2007+A1:2009, CPVC is classed as Bs1d0, i.e.:

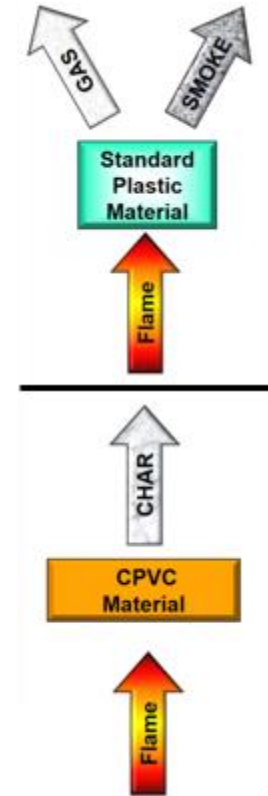
- Low Flammability
- No Contribution to Flashover
- Low Smoke Development
- No burning droplets



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Main Class	Subclass Smoke visibility	Subclass Burning droplets
Non-combustible materials: No contribution to fire at any stage of the fire		
A1	Not applicable	Not applicable
Non-combustible materials: No significant contribution to fire at any stage of the fire		
A2	s1, s2 or s3	d0, d1 or d2
Combustible materials: very limited contribution to fire: Very limited heat release and flame spread during the growth stage of a fire		
B	s1 s2 or s3	d0 d1 or d2
Combustible materials: limited contribution to a fire: Limited heat release and flame spread during the growth stage of a fire.		
C	s1, s2 or s3	d0, d1 or d2
Combustible materials: medium contribution to a fire: Will resist a small flame attack for longer at the beginning of the fire and will exhibit sufficiently delayed and limited heat release during the growth stage of the fire.		
D	s1, s2 or s3	d0, d1 or d2
Combustible materials: highly contribution to a fire: Will resist only a small flame attack in the beginning of the fire		
E	Not applicable	d2
Combustible materials: easily flammable: Unacceptable fire behaviour		
F	Not applicable	Not applicable



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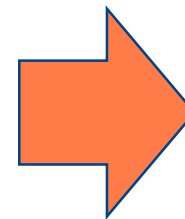
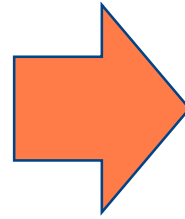


CPVC Manufacturers & Brand Names:

There are only 2 manufacturers of UL listed CPVC - Lubrizol & Spears

RAW CPVC MATERIAL

Lubrizol



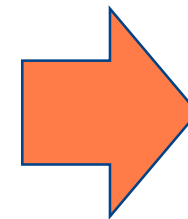
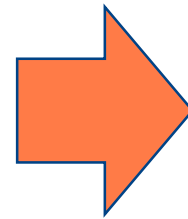


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RAW CPVC MATERIAL

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CPVC PIPE & FITTINGS



BlazeMaster[®]
FIRE PROTECTION SYSTEMS





CPVC Manufacturers & Brand Names:

There are only 2 manufacturers of UL listed CPVC, Lubrizol & Spears

CPVC Raw Material Manufacturers (ASTM D 1784 Cell Certification 23447)	Pipe & Fittings Manufacturers (Listed to UL1821, UL1887 & Approved to FM 1635)
Lubrizol®	JCI (Tyco) Blazemaster®
Lubrizol®	IPEX Blazemaster®
Lubrizol®	Viking Blazemaster®
Lubrizol®	GF Harvel Blazemaster®
Spears®	Spears Flameguard®

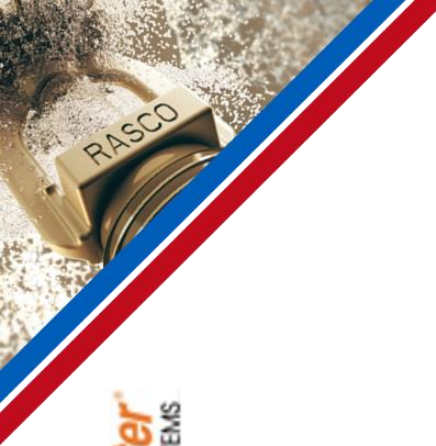
- Lubrizol® manufacture CPVC raw material only - **they do not manufacture any pipe or fittings**
- IPEX, JCI (Tyco), Viking, GF Harvel & others are Licensed by Lubrizol to use the Blazemaster® trade name to manufacture their pipe and/or fittings
- Spears Manufacturing Co., Inc. manufacture both the Raw Material and the Pipework & Fittings

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Spears
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CPVC Manufacturer Compatible Product Lists:

	Test Method:	Laboratory Type:	Charge For Testing?	Ongoing Verification
Lubrizol Blazemaster®	90 Day Exposure Test	3 rd Party	Yes	Product manufacturer must commit to not changing ingredients
Spears FlameGuard®	90 Day Exposure test	In-House	No	Product manufacturer must sign an annual statement that ingredients have not changed





CPVC Pipe & Fittings Manufacturer Warranties:

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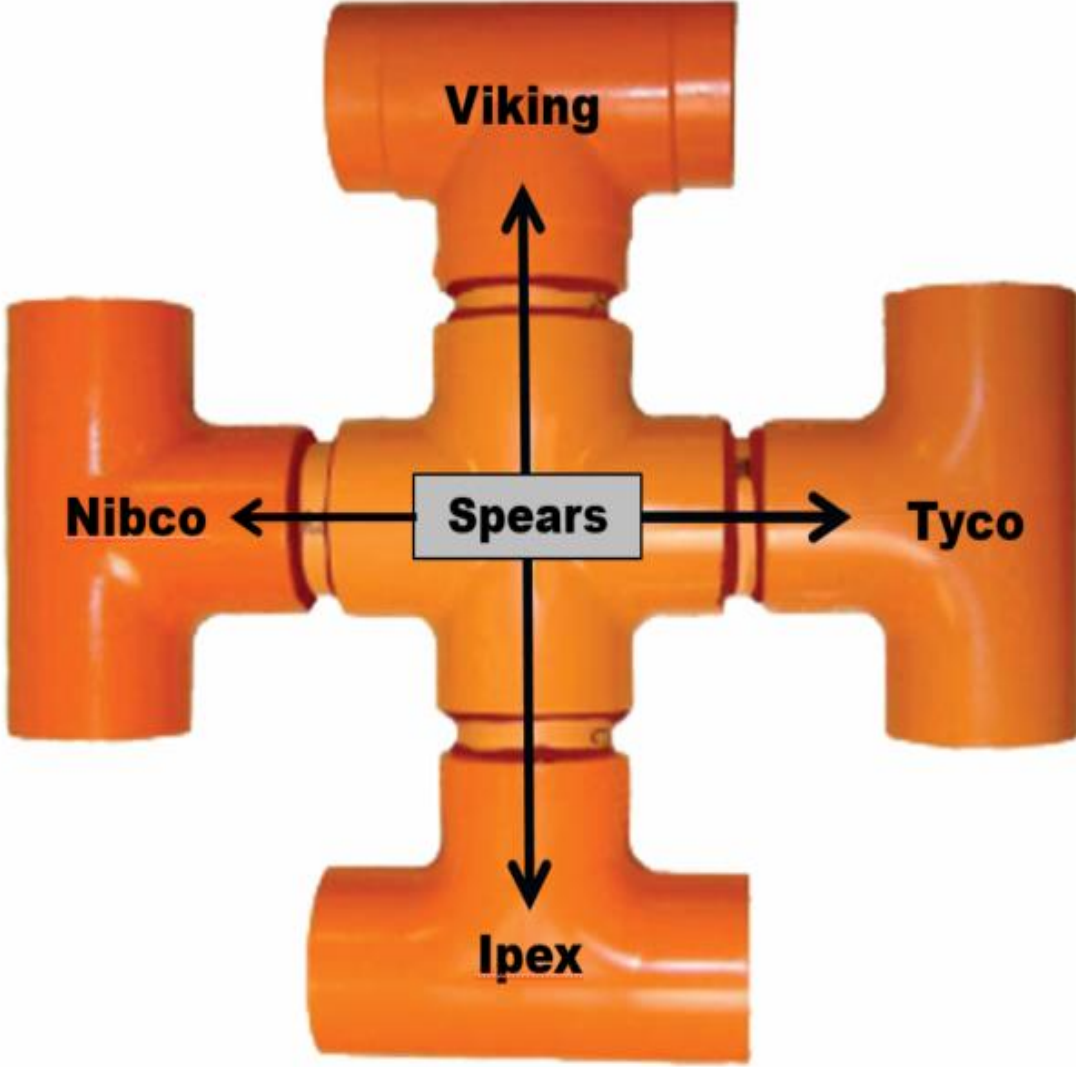
Spears FlameGuard®
CPVC FIRE SPRINKLER PRODUCTS



	Manufacturing Defects
Lubrizol Blazemaster®	10 Years
Spears Flameguard®	Lifetime



Spears is U.L. Cross-Listed With Lubrizol Blazemaster & Therefore Interchangeable...



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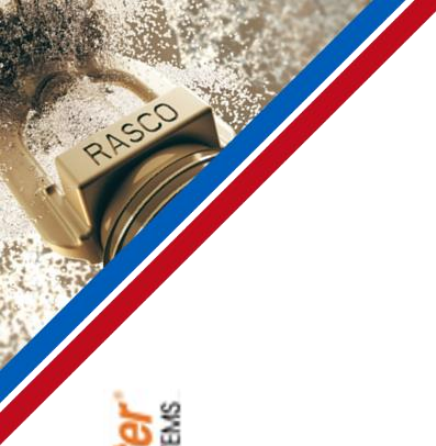
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CPVC Listings & Approvals:

[MFG Name] CPVC 4120 2" SDR13.5 ASTM F442 NSF-PW FM 175psi @ 150° F. Water [QC info] U.S.A.
Pipe Section

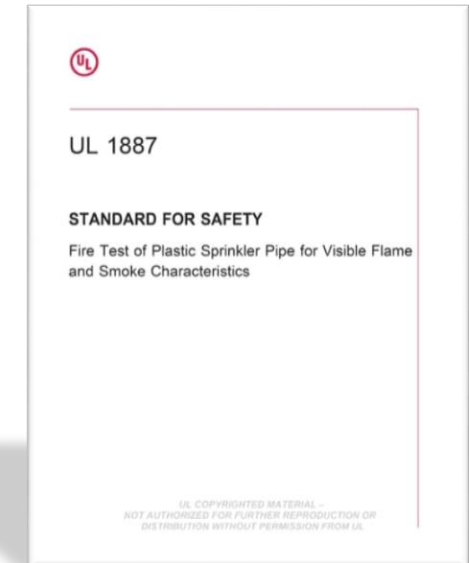
Print String Example



Spears® FlameGuard®

UL1821, UL1887 & FM 1635

ASTM D 1784
Cell
Classification
23447



Lubrizol® "BlazeMaster®"

BlazeMaster®
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- Pipe Coefficient Of Friction
- Fittings Equivalent Length
- Crushing, 2000 psi (138 bar)
- Flexural
- Impact
- Vibration
- Low Temperature Handling
- Temperature Cycling
- Pipe Assembly
- Material Identification
- Permanence of Marking
- UL1821, UL1887 & FM 1635
- Sprinkler Response Fire Exposure
- High Pressure Sprinkler Operation
- Crib Fire Exposure
- Hydrostatic Strength, 5 Times 175 psi (12bar)
5X = 875 psi (60 bar)
- Pressure Cycling, 100,000 Cycles, 0-175 psi (0-12 bar)
- Other Tests For Special Listing Applications



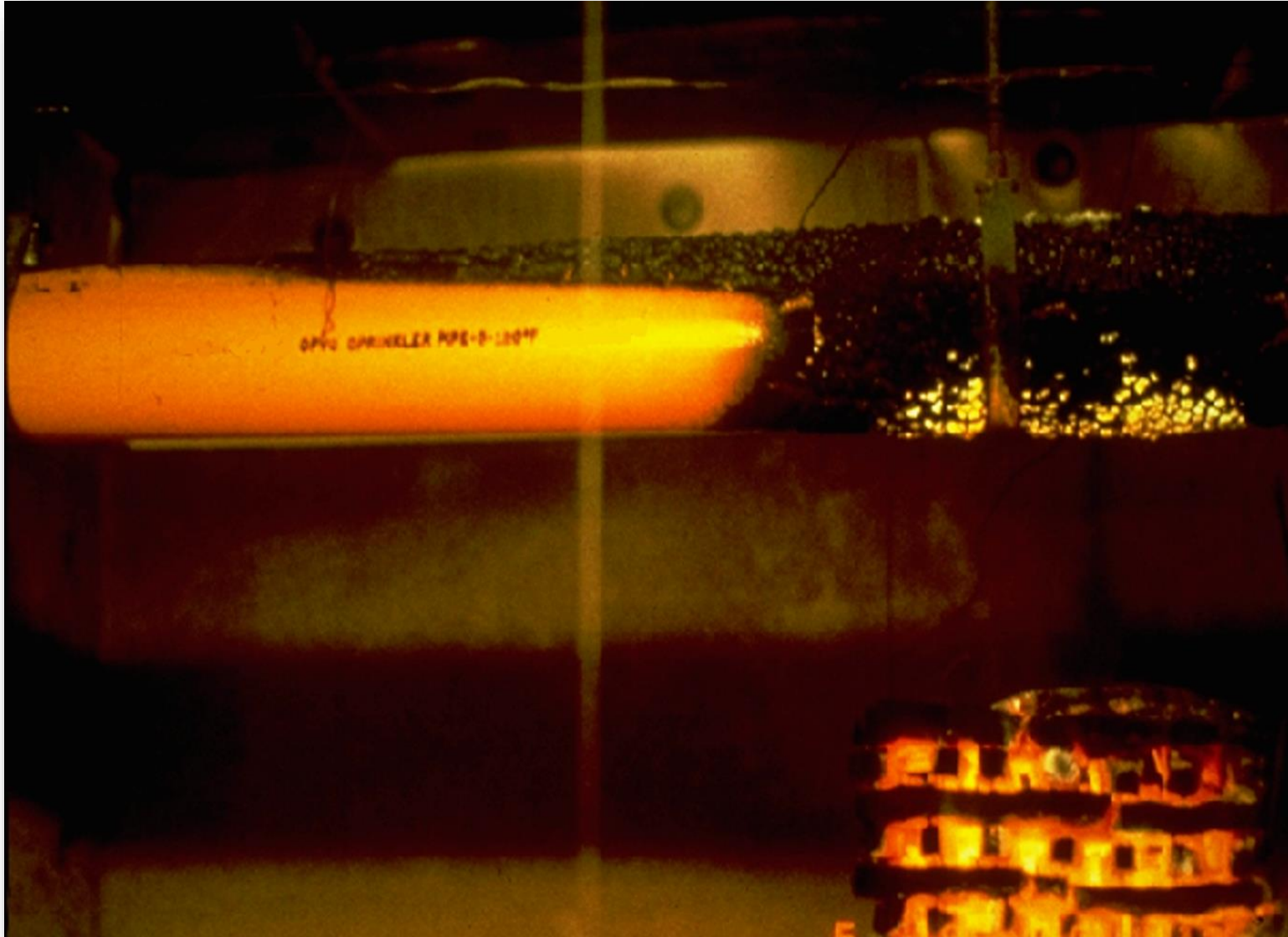


CPVC Listings & Approvals:

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Special CPVC Listings:

- UL Listed for use in Light Hazard Occupancies (NFPA 13)
- UL Listed for use in Ordinary Hazard rooms of otherwise light hazard occupancies where the room does not exceed 37m²
- UL Listed for use in Residential occupancies up to and including four stories in height, as defined in NFPA 13R
- UL Listed for use in Low Pressure Dry Pipe and Pre-action System applications in Light Hazard and Residential occupancies in accordance with NFPA 13, 13D and 13R
- UL Listed for use in specific light-hazard, combustible and non-combustible concealed spaces that require sprinkler protection (when installed with certain UL Listed specific application sprinklers)
- UL Listed for use in Combustible Attic Spaces with Specific Use Sprinklers
- UL Listed for use with Light Hazard Extended Coverage and Residential Sprinklers
- UL Listed for use in Unfinished Basements with Exposed Solid Wood Joist
- UL Listed for use in Return Air Plenum
- UL Listed for use in Domestic Garage Installations



N.B. – See Manufacturer's Installation Instructions For Details





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The Importance Training...



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Spears® Manufacturing Company
Technical Training Sign-in Sheet

Company Name: _____	Contact # _____
Address: _____	City: _____ State: _____ Zip Code: _____
Installer: _____	Date of Training: _____ Hours Completed: _____
Select an Option: <input type="checkbox"/> Card Only <input type="checkbox"/> Certificate Only <input type="checkbox"/> Card & Certificate <input type="checkbox"/> Card Only <input type="checkbox"/> Contact Person <input type="checkbox"/> Instructor	
The following individuals have attended, used, and been instructed in and successfully completed one or more of the following training courses listed below. (Please select the appropriate box for each individual.) <input type="checkbox"/> CPVC Fire Sprinkler System <input type="checkbox"/> CPVC Fire Sprinkler System <input type="checkbox"/> Thermoplastic Piping Systems Assembly <input type="checkbox"/> 111-1 Bender Training <input type="checkbox"/> CPVC 1/2" & 3/4" Piping Products	
Name (Print): _____	Signature: _____

Spears® Manufacturing Company P.O. Box 1000 Lubbock, TX 79401 Telephone 817-264-1411 Fax 817-264-4500 www.spearsmfg.com
While you are a licensee of the Spears® Technical Training Program you are the licensee of all rights and training in the Spears® Training Program.

Two Main Reasons For CPVC Failures...



Lack of Training



Interactions With Other Trades

Errors From Untrained Installers...



Incorrect Hangers



Incompatible Products



Too Little Cement



Too Much Cement



Insufficient Cement Cure Times



CPVC Manufacturers Offer Their Customers **Free** Installer Training...



The Importance Training...



**What's
Wrong Were?**

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The Importance Training...



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No Transit Protectors (glass-bulb elements)

Sprinklers must only be installed after cement has cured (what happens when drops are inserted into tees? – uncured cement could run and block sprinklers)

Pipe subject to unnecessary abrasion

Has the bucket been used to transport something incompatible with CPVC?

Main Training Topics...

Storage & Handling:



Tooling:

- Ratchet Cutter



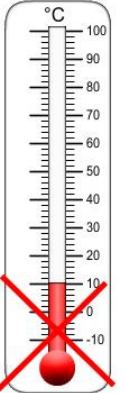
- Wheel Cutter



OR

- Fine Toothed Saw for Plastic
- Power "Chop-Saw" for Plastic

Spears® Does Not Recommend the Use of Ratchet Cutters Below 50°F (10°C).

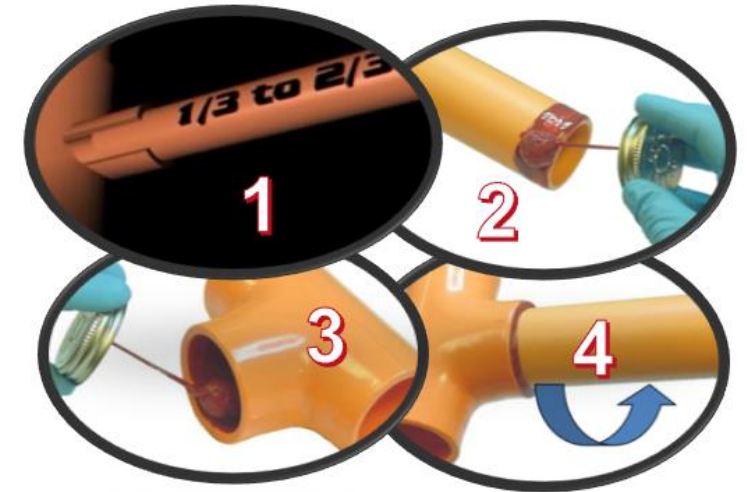


Do Not Thread, Groove or Drill CPVC

Joint Preparation:



Welding:



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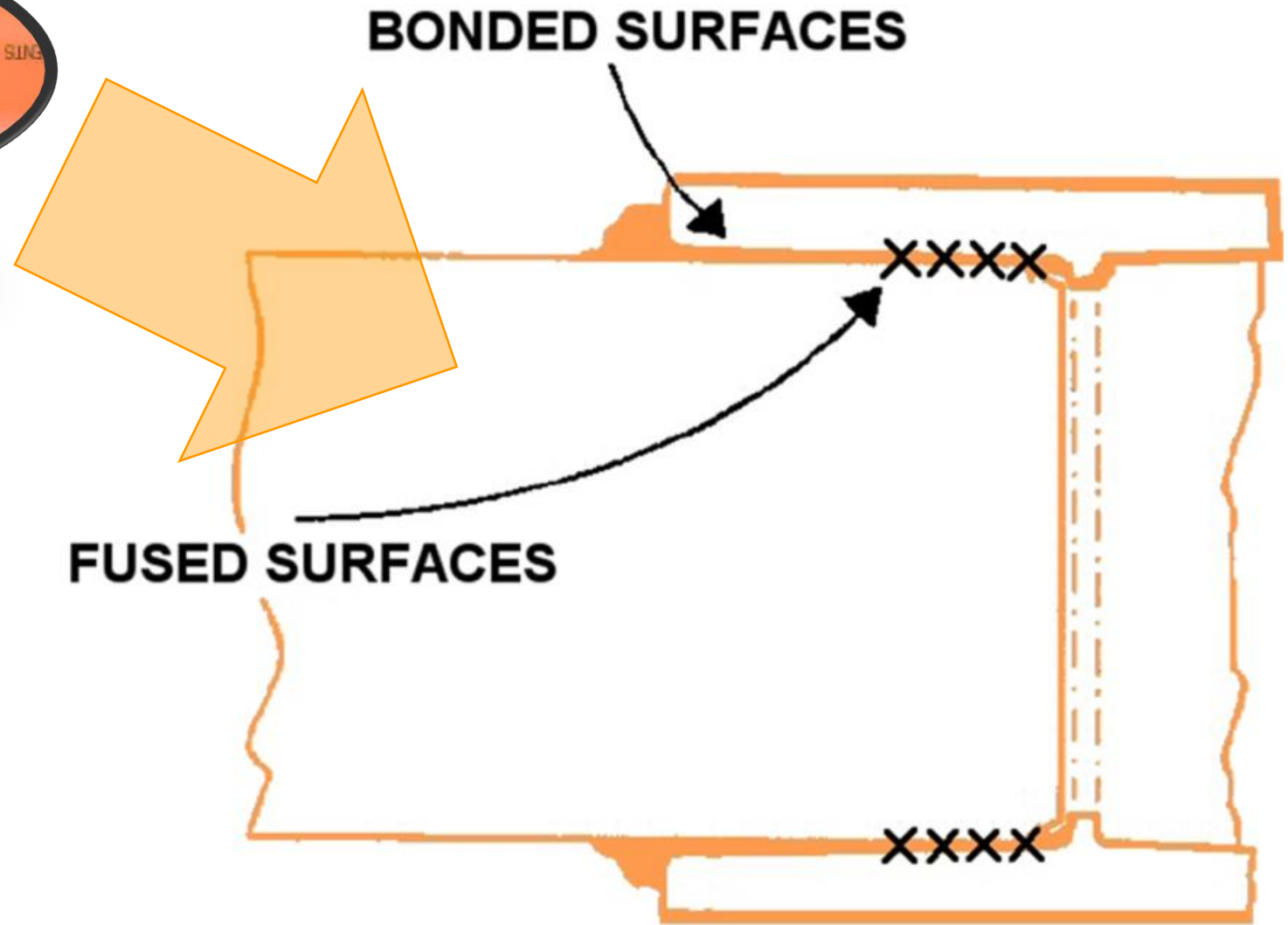
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It's Not Glue! It's a Chemical Weld!



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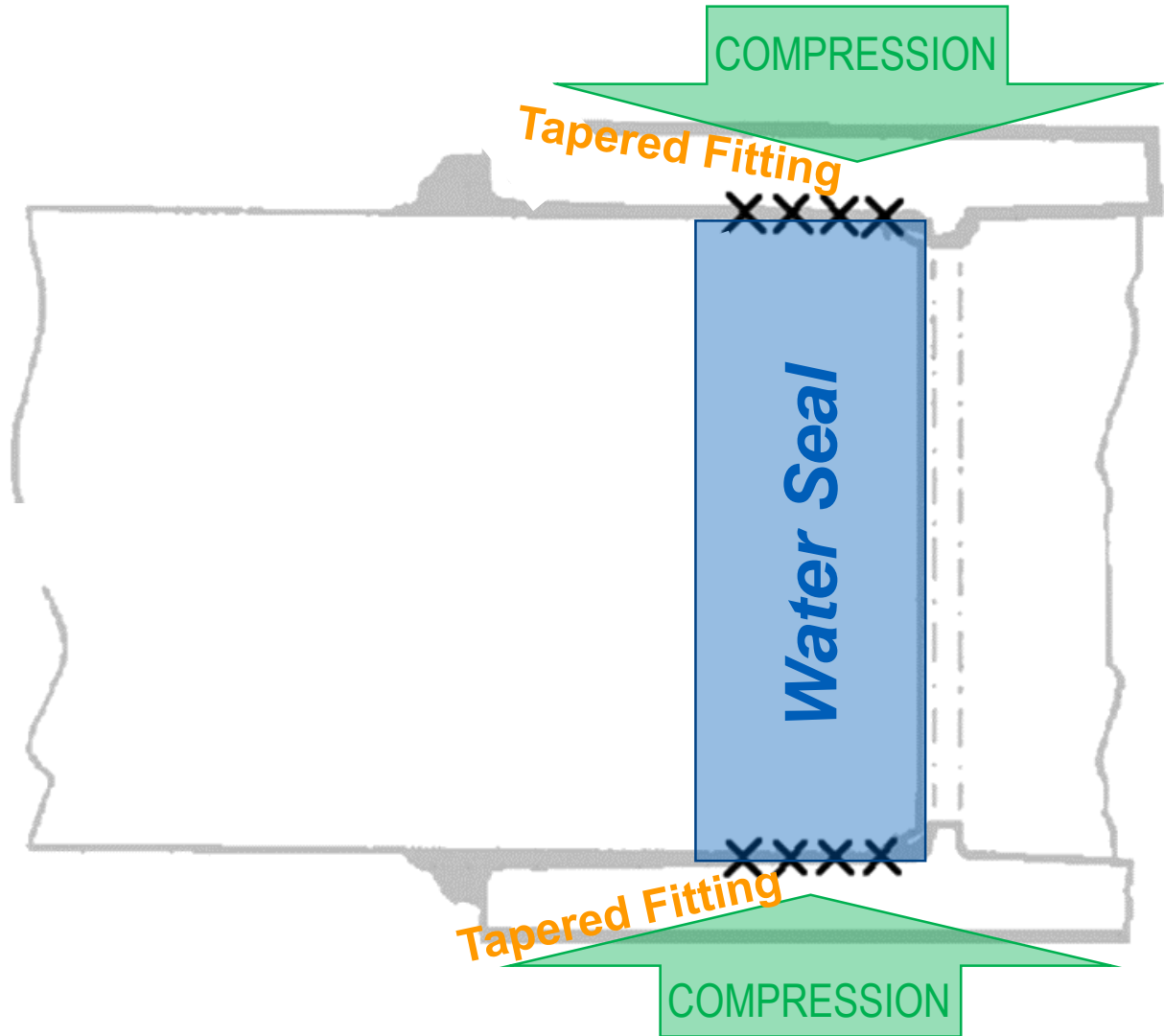
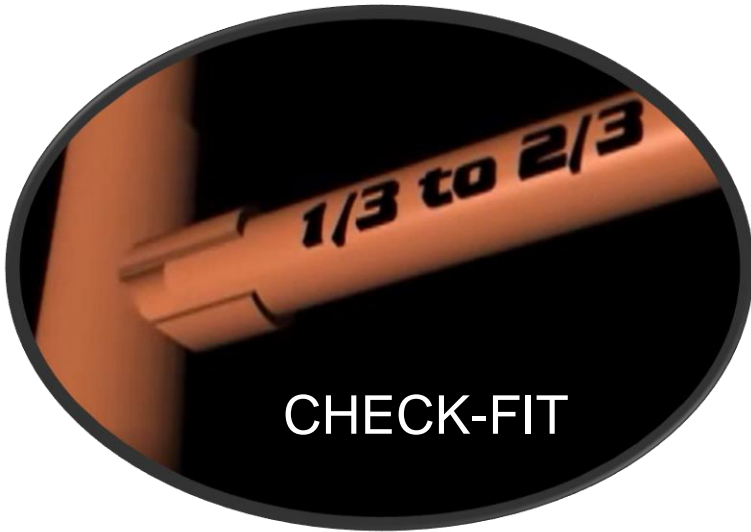
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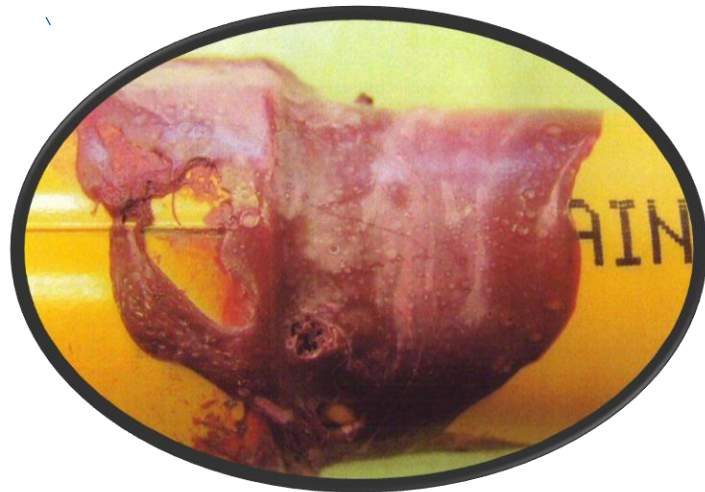
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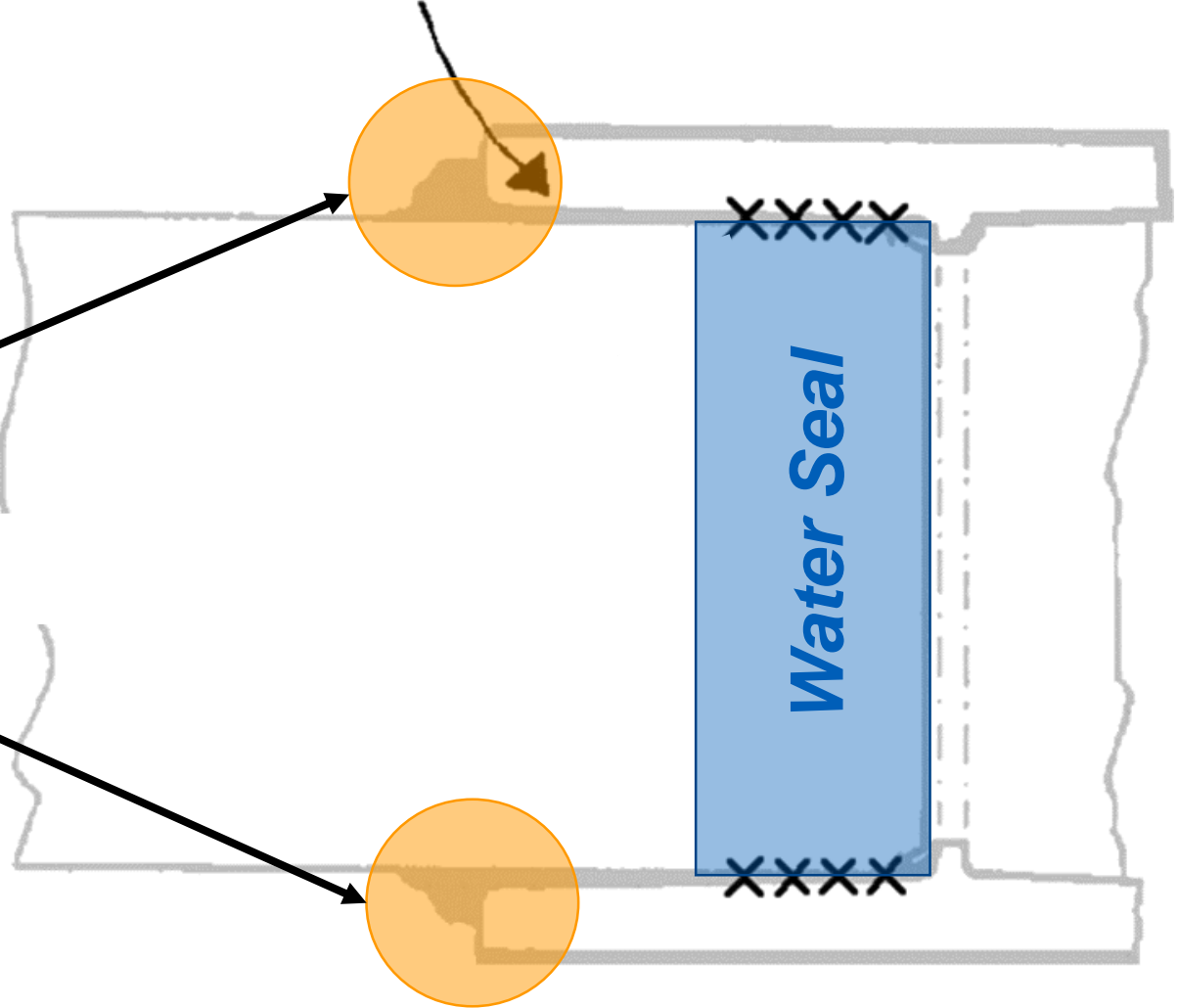
- Fittings Are Tapered
- This is Fundamental to the Chemical Weld Process
- Always do a Dry 'Check-Fit'
- Reject Loose Fittings



It's Not Glue! It's a Chemical Weld!



BONDED SURFACES



These Areas Do NOT Form a Permanent Water Seal!

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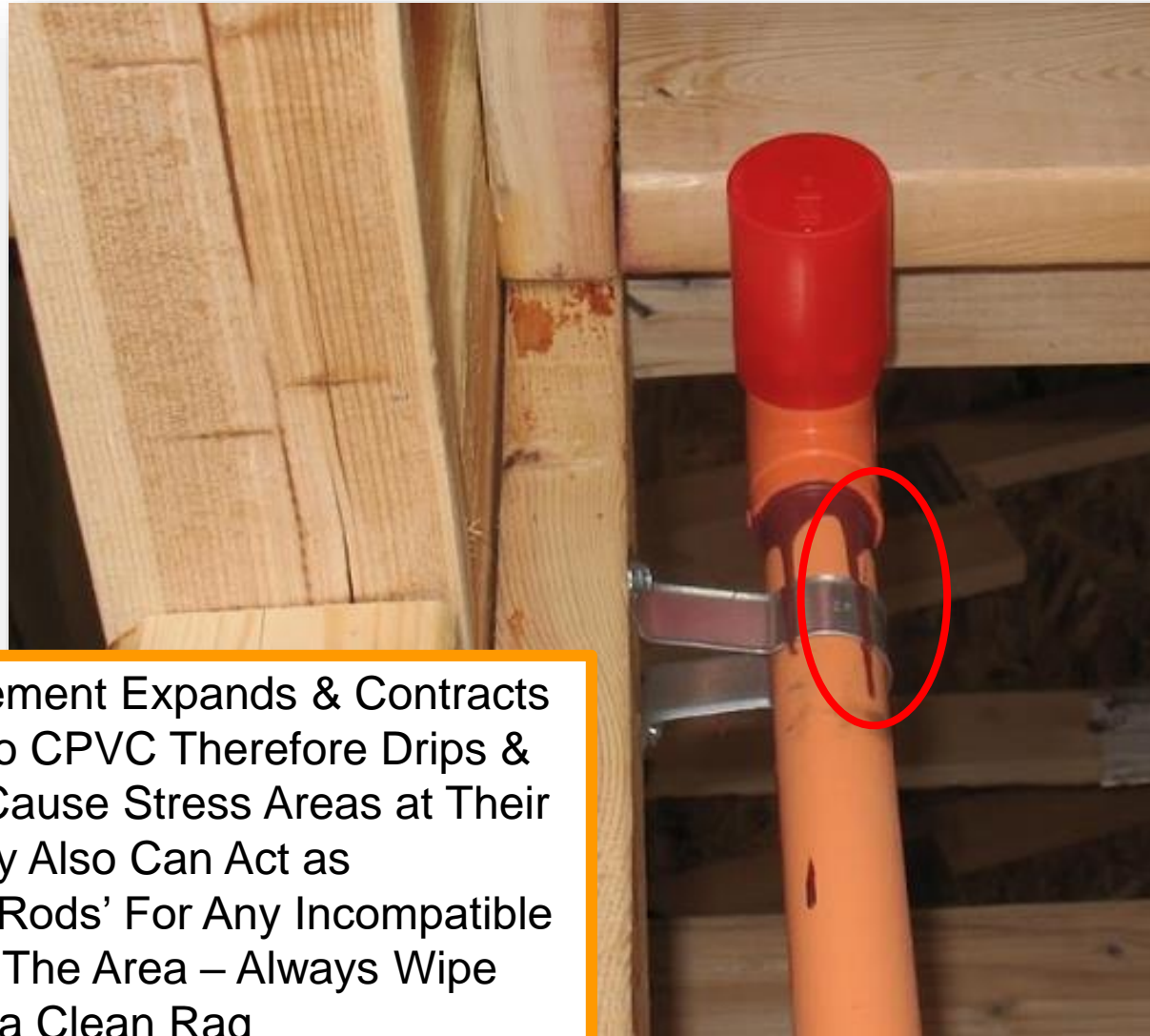
A Neat Joint is Usually a Good Joint!



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Uncured Cement Expands & Contracts Differently to CPVC Therefore Drips & Runs Can Cause Stress Areas at Their Edges. They Also Can Act as 'Lightning Rods' For Any Incompatible Products in The Area – Always Wipe Joints With a Clean Rag



It's Not Glue! It's a Chemical Weld!

Tooling:

• Ratchet Cutter



Cut Pipe Squarely

• Wheel Cutter



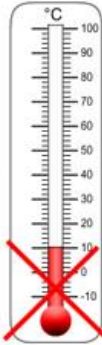
OR

• Fine Toothed Saw for Plastic

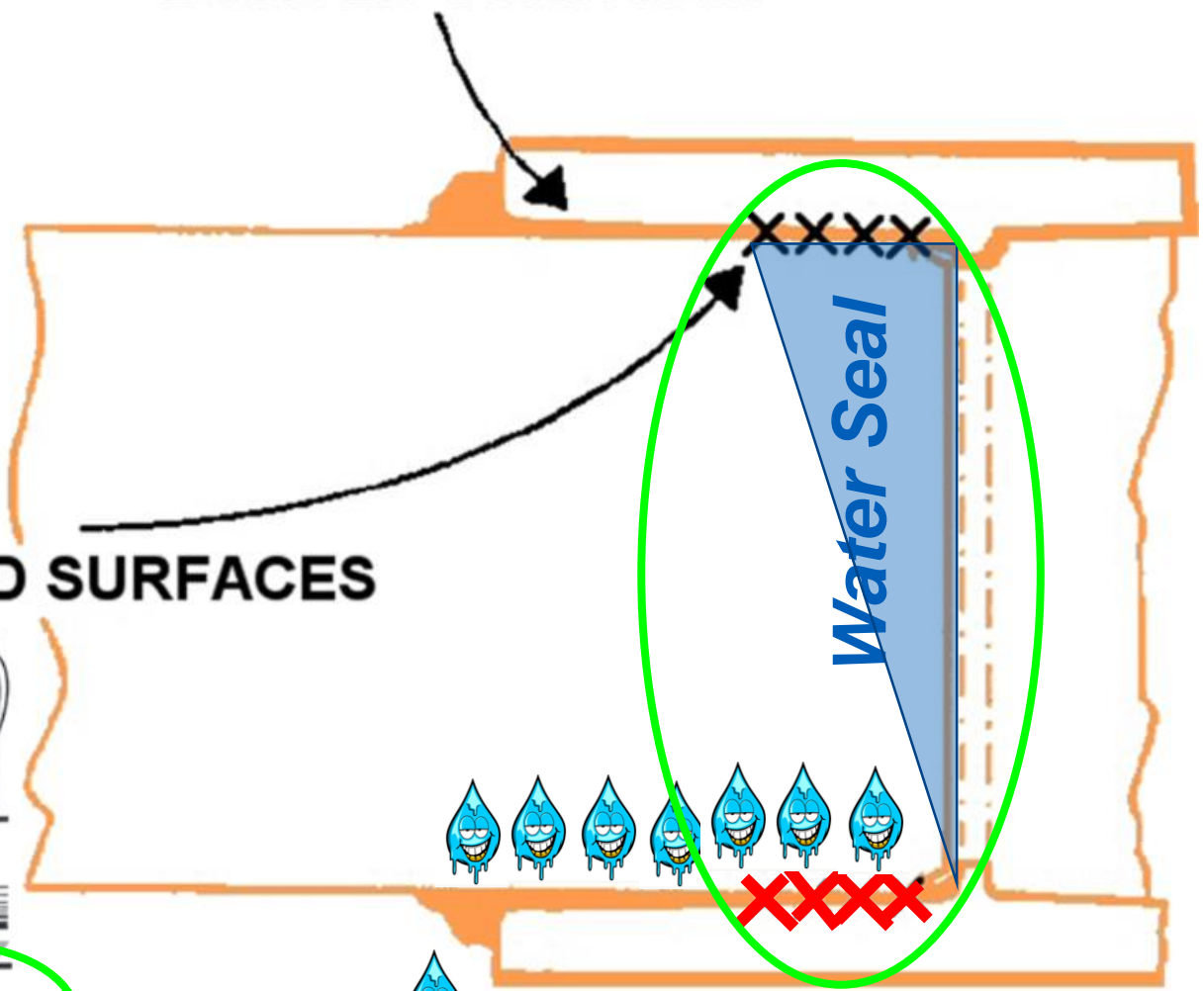
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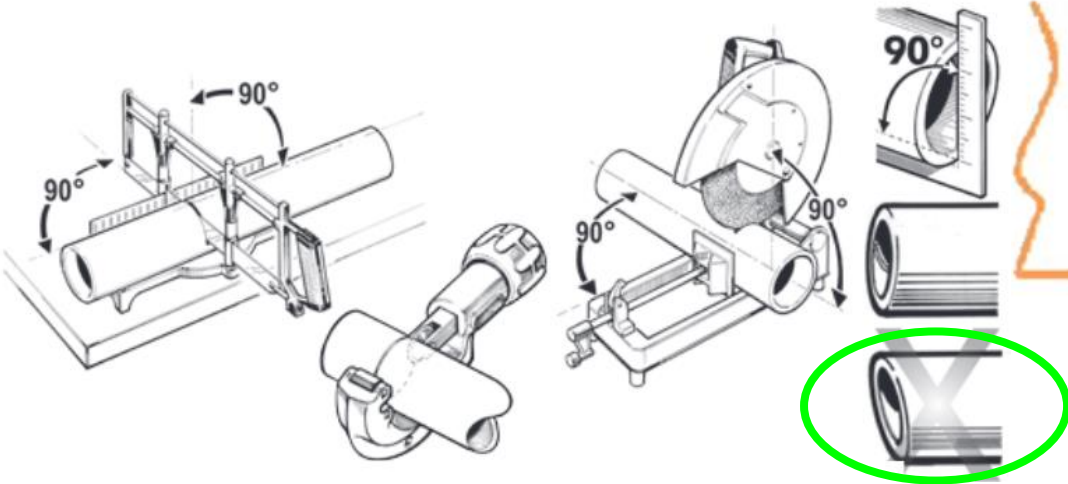
Do Not Thread, Groove or Drill CPVC



BONDED SURFACES



FUSED SURFACES



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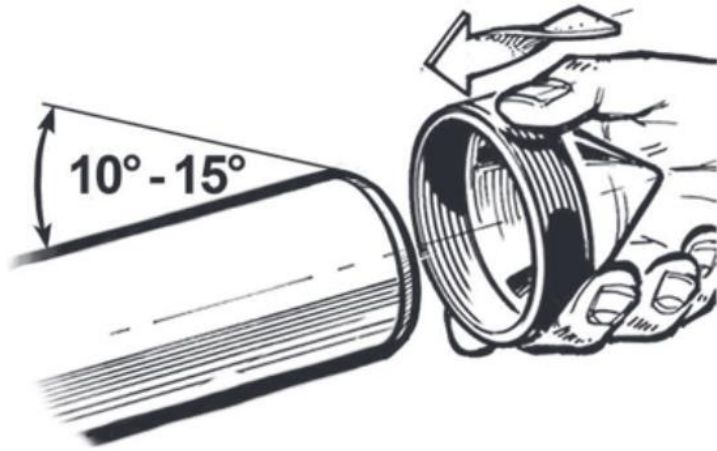
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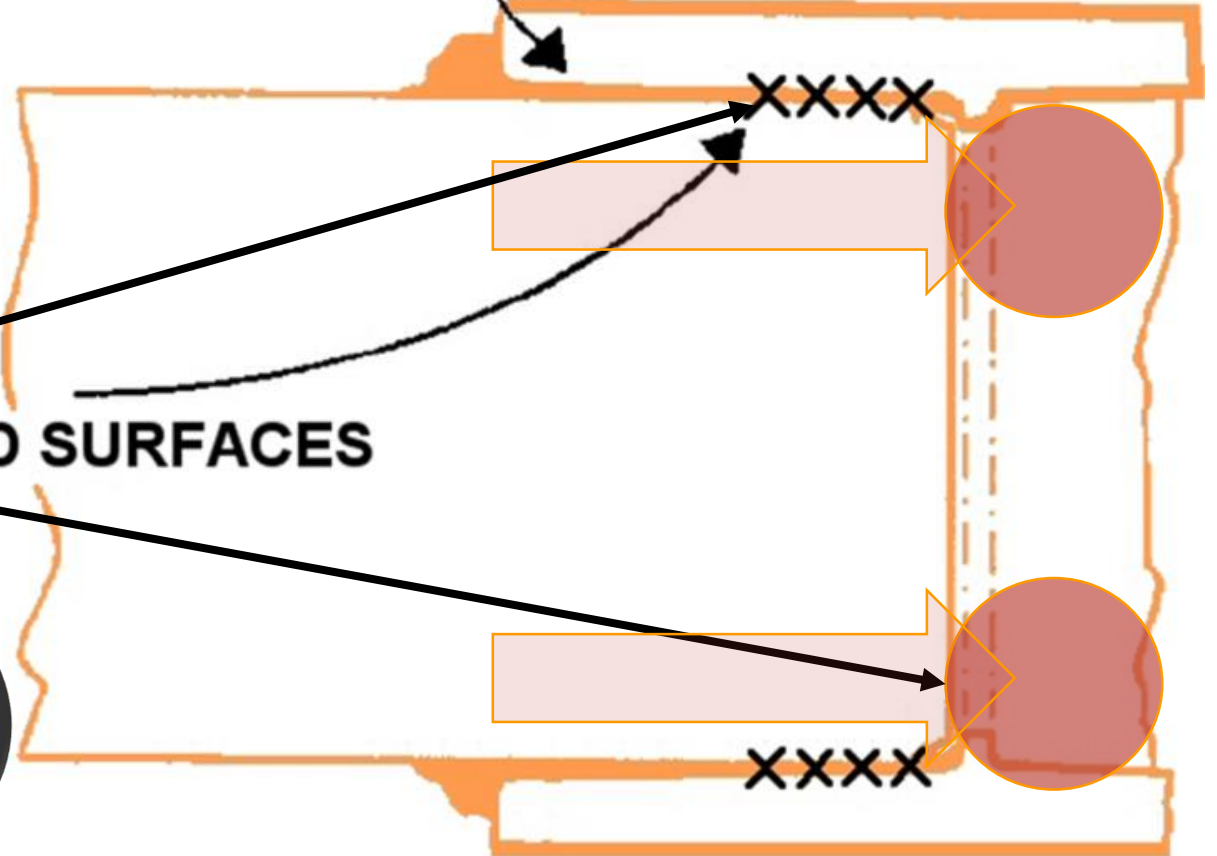




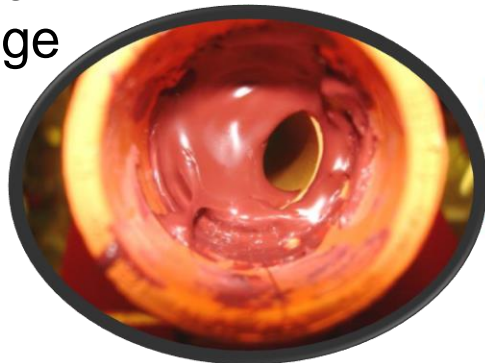
It's Not Glue! It's a Chemical Weld!



BONDED SURFACES



If The Pipe Isn't Chamfered, The Pipe Will Scrape Cement From Inside the Socket and Cause a Restriction or Blockage



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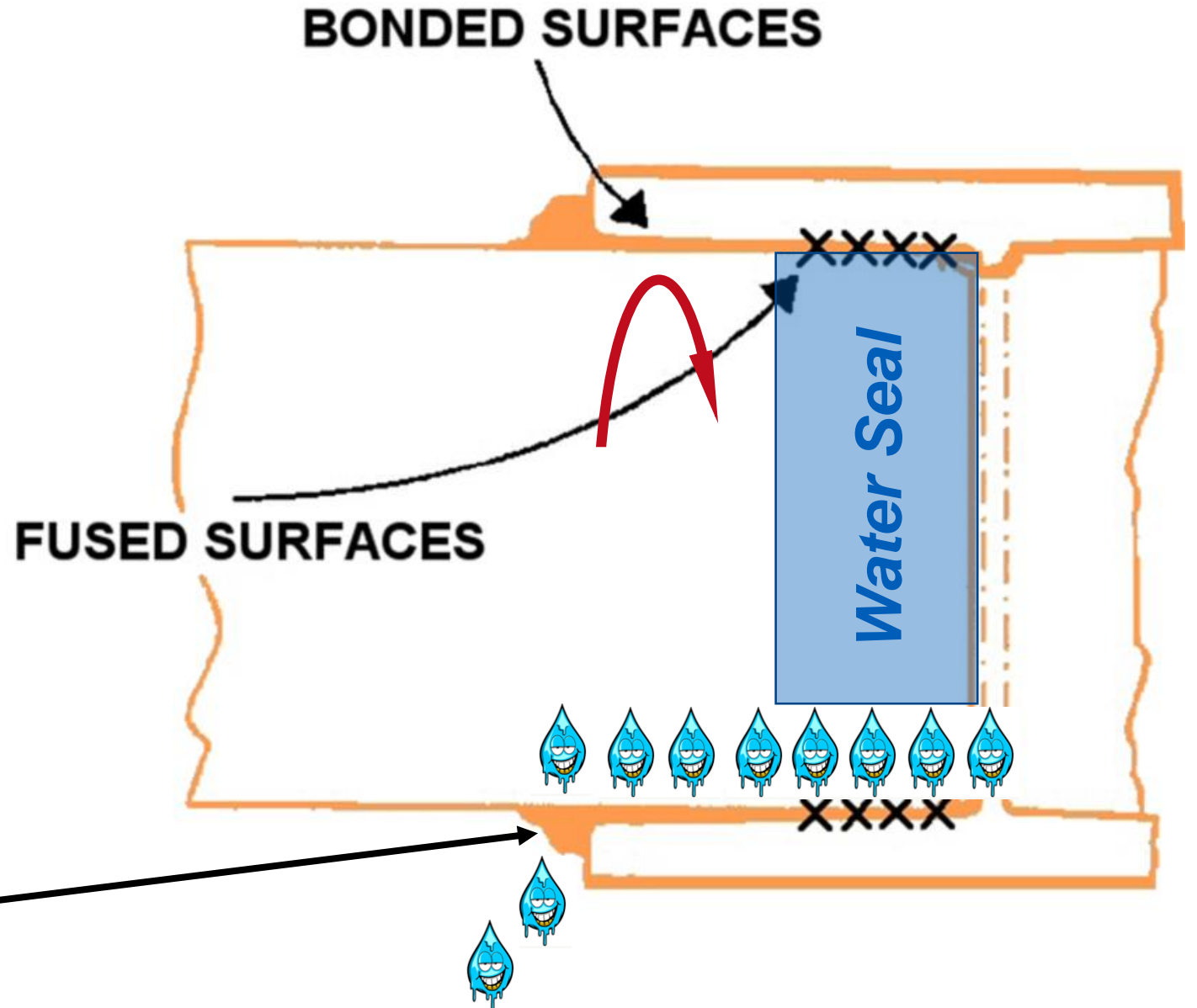
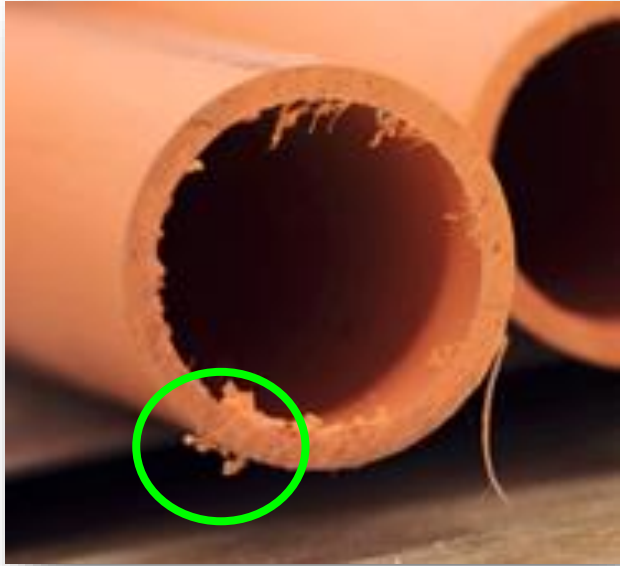
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It's Not Glue! It's a Chemical Weld!



*If The Pipe Isn't
Deburred, a 'Rifle
Groove' in the Cement
Which Could Breach
the Water Seal*

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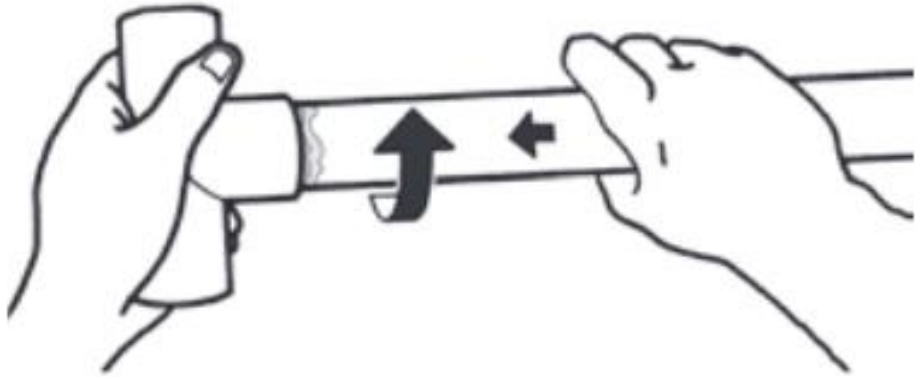
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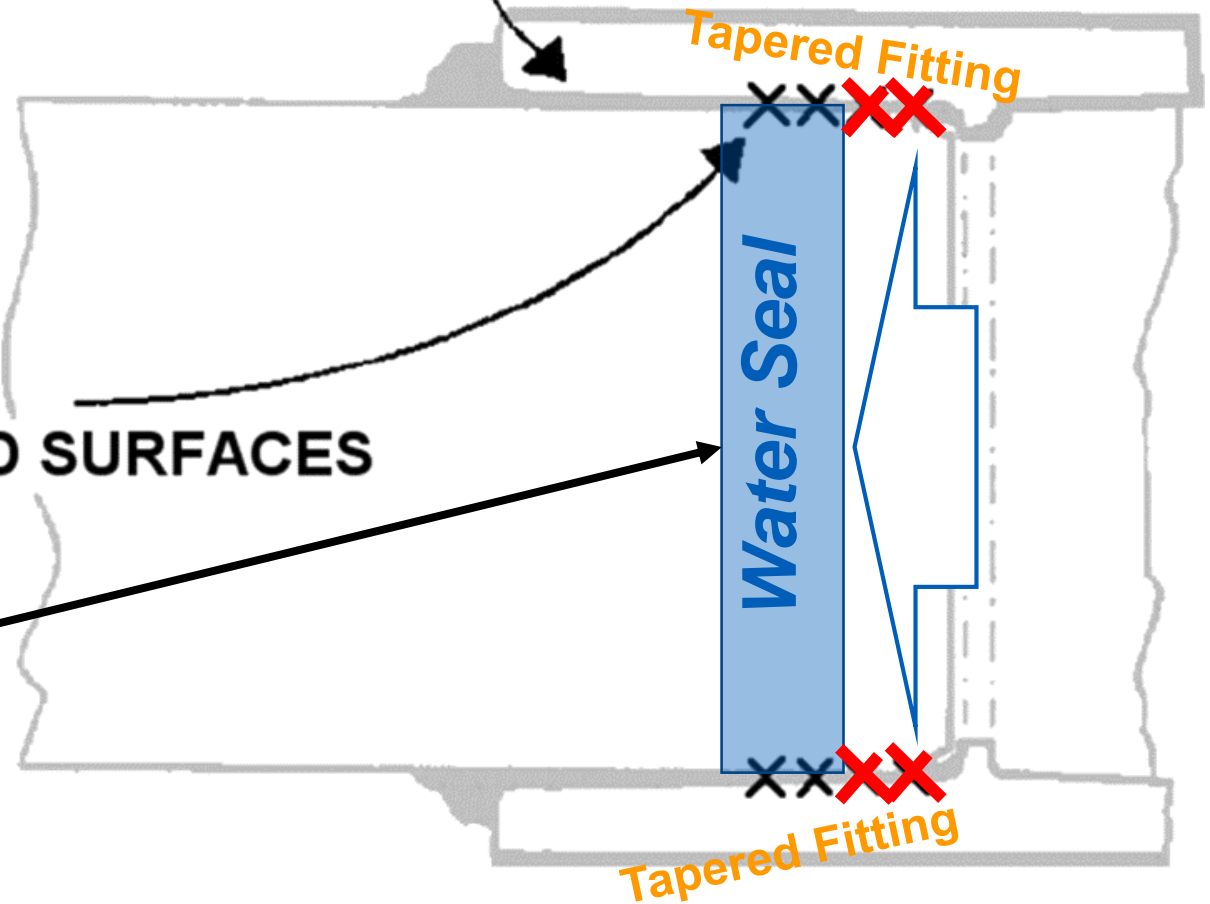




It's Not Glue! It's a Chemical Weld!



BONDED SURFACES



FUSED SURFACES

If The Pipe Isn't Held in Position for 30 Seconds, the Tapered Socket Could Push the Pipe Back Out, Reducing the Water Seal

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It's Not Glue! It's a Chemical Weld!

- Manufacturer's Minimum Cure Times **MUST** be Adhered to For Leak-Free Joints
- The Presence of ANY Moisture (e.g. Once Tested) Will Delay Evaporation of Solvent in the Cement = Longer Cure Times

Table 1: Minimum Cure Time Table for Pressure Test up to 225 psi (15.5 bar) Ambient Temperature During Cure

Nominal Pipe Sizes	60° F to 120° F (16° C to 49° C)	40° F to 59° F (4° C to 15° C)	0° F to 39° F (-18° C to 3° C)
3/4" (DN20)	1 hour	4 hours	48 hours
1" (DN25)	1-1/2 hours	4 hours	48 hours
1-1/4" & 1-1/2" (DN32 & DN40)	3 hours	32 hours	10 days
2" (DN50)	8 hours	48 hours	Note 1
2-1/2" & 3" (DN65 & DN80)	24 hours	96 hours	Note 1

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Some Typical Causes of CPVC Leaks

- **Poor Shipping & Handling**
 - Impact / Crushing / Abrasion
 - Exposure to sunlight / UV
 - Exposure to incompatible chemicals
 - More vulnerable when not shipped in manufacturer's packaging
- **Bad Workmanship - Poor Joint Preparation**
 - Pipe not cut straight
 - Pipe not bevelled / chamfered
- **Bad Workmanship - Poor Joint Assembly**
 - Not bottomed out
 - Not twisted ¼ turn
 - Too Much / Too Little Cement
 - Insufficient Curing Times – ESPECIALLY AFTER CUT-INS
 - No Allowance For Thermal Stresses
 - Incorrect Pipe Supports
 - Environmental Stress Cracking



Joint Failures Are Typically Caused by a Combination of 2 or More Factors – e.g. Contact With Incompatible Product & Poor Assembly



Other Training Topics...

- Incompatible Products
- Installation with Specific Use Sprinklers
- Ambient, High, Cold Temperature Considerations
- Fire Sprinkler System Risers
- Underground Use
- C-UL Listing Requirements
- Penetrating Fire-related Walls & Partitions
- Heat Sources & Open Ceiling Areas
- Painting Pipe & Fittings
- Cleaning
- Transition to Other Materials
- Flanged Connections
- Grooved Coupling Adapters
- Sprinkler Head Adapters
- Flushing & Venting
- Pre-Acceptance Testing (Pneumatic Tests)
- Acceptance Testing (Hydrostatic Pressure Test)
- System Modification and Repairs
- Hangers & Supports
- Exposed Installations
- Expansion & Contraction Joints

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WARNING
This Building Contains a FlameGuard®
CPVC Fire Sprinkler LIFE SAFETY SYSTEM

DO NOT ALLOW CHEMICALS OR CABLES TO COME IN CONTACT WITH THIS CPVC FIRE SPRINKLER SYSTEM!

IF YOU DAMAGE THIS SYSTEM YOU WILL BE HELD RESPONSIBLE FOR ALL DAMAGES

For additional information contact the General Contractor or Fire Sprinkler System Installer
-OR-
Spears® Technical Service Department at 1-800-862-1499

FUM-7



Important Information with Regards to Your CPVC Fire Sprinkler System

CONGRATULATIONS! your building structure contains a state of the art life safety system. Your CPVC fire sprinkler system will enhance the safety and security of your building when properly cared for. CPVC Fire Sprinkler Products resist attack from a wide range of chemicals that are sensitive to metallic piping. As with any piping material, there are however, certain chemicals that can be detrimental to CPVC. Occasionally some of these chemicals may be found in some construction products, site preparations and building maintenance. There are certain things that you need to be mindful of in caring for or working around your CPVC fire sprinkler system.

Keep your system clear from contact with the following products and chemicals unless product labels state materials are compatible with CPVC:

NOTICE	
<ul style="list-style-type: none"> • Solvents • Cleaning Products/Detergents: Oil, Lubricants, Greases, Rubbers Materials • Fire rated connectors & electrolytes • Composites • Glycol based antifreezes • Soluble Flux • Thread Sealants • Flexible Cable / Wiring (especially communications cabling) • Lead/Acid/Batteries • Adhesive Vinyl / Electrical Tape • Non-Approved Spray Foam Insulation: <ul style="list-style-type: none"> - Non-Flame Retardant Foam - Foam Thermax - Wood Products/Insulation 	<ul style="list-style-type: none"> • Property maintenance services • Fungicides • Mold Remediation • Chemicals • Termiticides

You should also avoid the following:

- Sitting, standing, hanging, leaning, or resting anything on the pipe, fittings, and sprinkler heads
- Grounding electrical wiring to the pipe or fittings
- Ambient temperatures below 40°F/4°C where your fire sprinkler system is installed (unless an approved compatible antifreeze or insulation method is installed)
- Hot work around the pipe, i.e. blow torches, soldering, etc.

Be certain that this document is reviewed and understood by anyone working on or around your CPVC life safety system. If you have any questions or need assistance in chemical compatibility with your CPVC fire sprinkler system, contact the manufacturer listed on the pipe.

Proper care will help your CPVC fire sprinkler system provide protection for years to come.

FOR ADDITIONAL INFORMATION CONTACT:
FlameGuard® CPVC FIRE SPRINKLER PRODUCTS COMPANY AT 1-800-862-1499
 SPEARS MANUFACTURING COMPANY AT 1-800-862-1499

CPVC Fire Sprinkler Technical Document Rev 2 (10-01-07)

New Solutions...



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Adjustable
Sprinkler
Drop

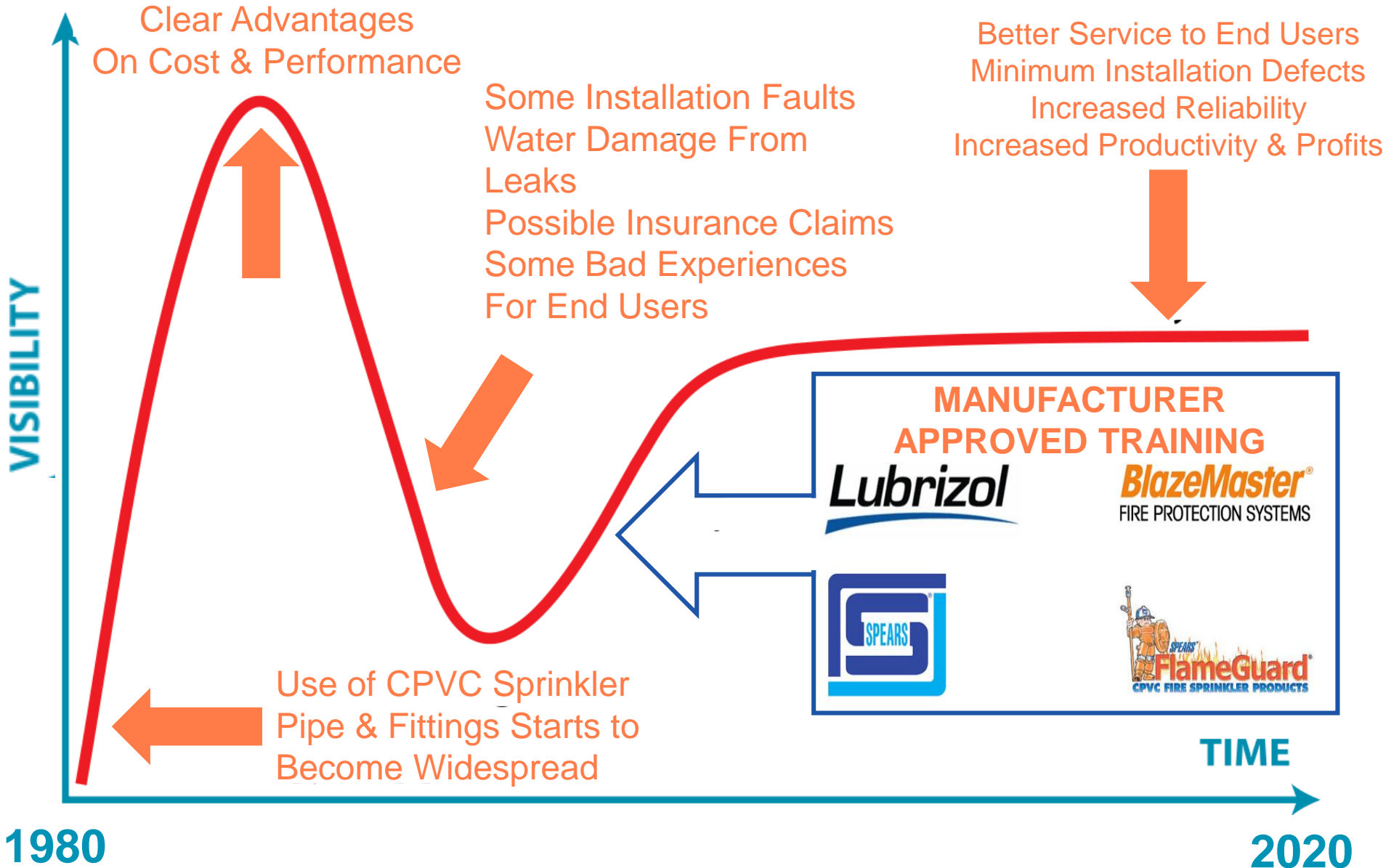


Telescopic
Repair
Pipe



Push-Fit
Test
Blank

The Importance Training...



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CPVC Technical Update - Agenda:

- Introduction
- Properties
- Applications, Approvals & Listings
- Manufacturers & Brands
- The Importance of Training
- **Summary**

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CPVC Technical Update

FlameGuard CPVC FIRE SPRINKLER PRODUCTS

Lubrizol **BlazeMaster** FIRE SPRINKLER SYSTEMS

Guy Watson GIFrE, IRM Cert
Director of Technical Services
for Europe, Middle East
& North Africa



Summary...

- CPVC Has Been Successfully Used in The USA For Over 35 Years in NFPA13 (LH), 13D & 13R
- Correctly Installed CPVC Sprinkler Systems Have Remained Leak Free For Decades
- Like Any High Performance Product – You Need to Know What You Are Doing
- Installation Isn't as Intuitive as Some Think – Read & Understand Manufacturer's Instructions – If in Doubt, Ask!
- All Installers Should Have Manufacturer Approved (Preferably Hands-on) Training Every 2 Years

If You Don't Fully Understand CPVC, (Like Any System), it Can Fail...



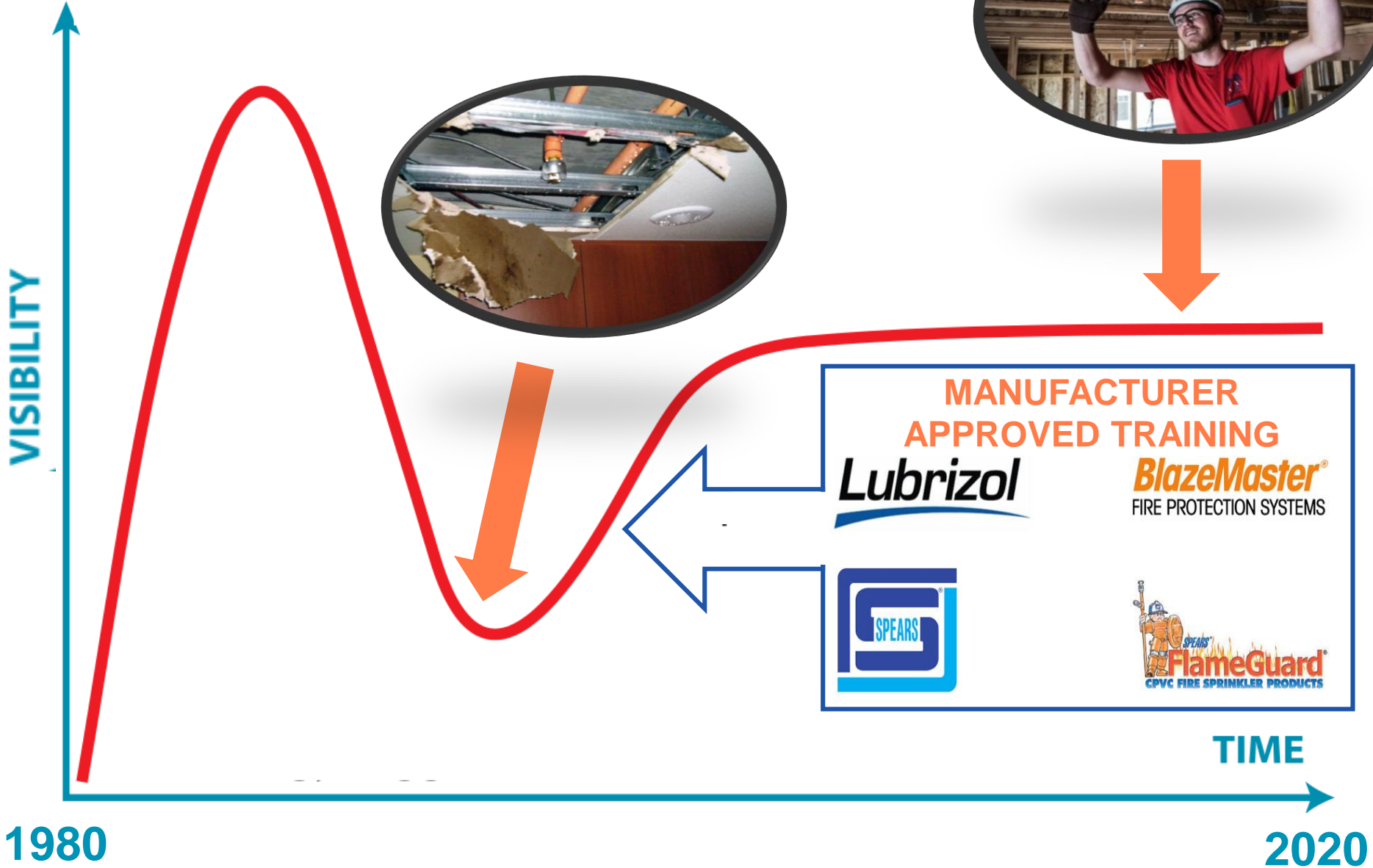
Summary...



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MANUFACTURER APPROVED TRAINING

Lubrizol **BlazeMaster**
FIRE PROTECTION SYSTEMS

SPEARS **SPEARS**
FlameGuard
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1980

2020



Summary...

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**Once Trained
It's Very Easy
to Get CPVC Right!**





Thank You For Your Attention

Any Questions?

