**Submittal item detail**

# #23 31 16-001-A-0: Fiberglass Pipe

| Status | Created on | Ball in court due date |
|---|---|---|
| **Closed** | Dec 10, 2024 | |

| | |
|---|---|
| **ID** | 18 |
| **Ball in court** | **Lake Shore Engineering** |
| **Manager** | **Luis Franco** (Barge Design Solutions) |
| **Responsible contractor** | **Lake Shore Engineering** |
| **Watchers** | **Barge Design Solutions**<br>**Lake Shore Engineering**<br>**Macon Water Authority** |
| **Spec section** | 23 31 16 Non-metal Ducts |
| **Spec sub section** | |
| **Description** | |
| **Final Response** | Reviewed / Exceptions Noted |
| **Final Response Attachments** | 23 31 16 001-A - FIBERGLASS PIPE_BARGE RESPONSE.PDF, Jan 6, 2025, 3:06 PM UTC |
| **Final Response Comments** | Please see attached. |
| **Package** | |

| Ball in court | Sent | Due | Returned | Response/Action | Attachments |
|---|---|---|---|---|---|
| **Submitted** | | | | | |
| **Lake Shore Engineering** | - | - | Dec 10, 2024 | **Submitted** | 23 31 16 001-A - Fiberglass Pipe.pdf |
| **Comments** | - | | | | |
| **Sent for review** | | | | | |
| **Luis Franco** (Barge Design Solutions) Sent by Luis Franco | Dec 10, 2024 | - | Dec 10, 2024 | **Sent for review** | 23 31 16 001-A - Fiberglass Pipe.pdf |
| **Comments** | - | | | | |
| **Review Step 1** | | | | | |
| **Patrick Javier** (Barge Design Solutions) Reviewed By Patrick Javier | Dec 10, 2024 | Dec 24, 2024 | Jan 3, 2025 | **Reviewed / Exceptions Noted** | 23 31 16 001-A - Fiberglass Pipe_Barge Response.pdf |
| **Comments** | Exhaust fan submittals have not been received yet. Mech-sub to coordinate final exhaust fan connection sizes with Perry Fiberglass. | | | | |
| **jherndon jherndon** (Macon Water Authority) Reviewed By jherndon jherndon | Dec 10, 2024 | Dec 24, 2024 | Dec 17, 2024 | **Reviewed / No Exceptions Taken** | |
| **Comments** | Approved | | | | |

**BARGE DESIGN SOLUTIONS**
**6525 THE CORNERS PKWY NW**
**NORCROSS, GA 30092 (678) 515-9411**

**COMMENTS TO SUBMITTAL DATA**
**LOWER POPLAR WATER RECLAMATION FACILITY**
**INFLUENT PUMP STATION IMPROVEMENTS**
**BARGE: 36181-21**
**SUBMITTAL NAME: 23 31 16-001-A Nonmetal Ducts Fiberglass Pipe**

| | |
|---|---|
| REVIEWED / NO EXCEPTIONS TAKEN | ☐ |
| REJECTED | ☐ |
| REVIEWED / EXCEPTIONS NOTED | ☒ |
| REVISE AND RESUBMIT | ☐ |
| NOT SUBJECT TO REVIEW | ☐ |

Review of this submittal is expressly limited as provided in the Contract Documents and are only to determine general conformance with information given in the Contract Documents and compatibility with the design concept for the completed project as a functioning whole as indicated in the Contract Documents. Corrections or comments made for this review do not relieve the Contractor from compliance with the Contract Documents. Contractor is, and Engineer is **NOT**, responsible for all matters relating to confirmation/correlation of dimensions at the jobsite, fabrication, shipping, handling, storage, assembly, installation, construction (including all safety aspects of performing the work), and for coordinating the Work.

Patrick Javier — 1/3/2025

BARGE DESIGN SOLUTIONS, INC. — DATE

**Comments**

1. Exhaust fan submittals have not been received yet. Mech-sub to coordinate final exhaust fan connection sizes with Perry Fiberglass.

END OF COMMENTS

# TRANSMITTAL OF SUBMITTAL

**DATE: 11-12-2024**

**TO: Barge Design Solutions**
6525 The Corners Pkwy
Suite 450
Peachtree Corners Ga 30092

**FROM: LAKESHORE ENGINEERING**
1259 Ellsworth Drive
Atlanta, GA 30318

**PROJECT: Lower Poplar Water Reclamation Facility**

**Submittal Title:**
Electrical Building MCC

New Submittal x Resubmittal

**Specification Section No.**: 9428-ST – 5.0

Supplier: Perry Fiberglass

Manufacturer: Perry Fiberglass

## The following items are hereby submitted:

| Number of Copies | Description of Item Submitted (Type, Size, Model Number, Etc.) | Submittal number | Submittal Type | Contains Variation to Contract | |
|---|---|---|---|---|---|
| | | | | No | Yes |
| Electronic | Insulation | 9428-ST – 5.0 | Product Information | x | |

Comments:

CONTRACTOR hereby certifies that (i) CONTRACTOR has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents. The CONTRACTOR has endeavored to list all deviations to the contract documents on this submittal cover page.

Approved By: Jose De La Parra

Jose De La Parra

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT

5415 VILLAGE DRIVE · ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com

# FRP DUCTWORK SUBMITTAL

## Specifications:

23 31 16 – Non-Metal Ducts

**Perry File:** 9428-ST

## Lower Popular Water Reclamation Facility Influent Pump Station Improvement

**Date:** 11/04/2024

**Revision:** 00

**Submitted To:**
Lake Shore Engineering
Attn: Garland Long
1101 Lower Popular Street
Macon, GA 31202
Telephone: (404)-906-9930
Email: glong@lakeshoreengineering.com

**Prepared By:**
Perry Fiberglass Products, Inc.
5415 Village Drive
Rockledge, FL 32955
Telephone: (321) 609-9036
Reese Dooley, Project Manager
E-mail: reese@perryfiberglass.com

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT
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# PERRY DUCTWORK & ACCESSORIES
# TABLE OF CONTENTS

# SECTION 0.0

# FORWARDING LETTER

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT
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11/04/2024

Perry File No. 9428-ST

Lake Shore Engineering
Attn: Garland Long
1101 Lower Popular Street
Macon, GA 31202
Telephone: (404)-906-9930
Email: glong@lakeshoreengineering.com

Garland,

Enclosed you will find (1) electronic copy of the FRP Ductwork and Accessories submittal for the Lower Popular Water Reclamation Facility Influent Pump Station Improvements project.

We have made a sincere attempt to provide all data requested and in accordance with the contract documents. We would be pleased to provide any additional information.

Sincerely,

*Reese Dooley*

Reese Dooley, Project Manager

# SECTION 1.0

# STATEMENT OF CONFIDENTIALITY

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT
5415 VILLAGE DRIVE • ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com

## STATEMENT OF CONFIDENTIALITY

# SECTION 2.0

# PRIMARY CONTACTS

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT
5415 VILLAGE DRIVE • ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com

**Lower Popular Water Reclamation Facility Influent Pump Station Improvements**

**Primary Contacts**

Description: FRP Ductwork and Accessories

Contractor: Lake Shore Engineering
Attn: Garland Long
1101 Lower Popular Street
Macon, GA 31202
Telephone: (404)-906-9930
Email: glong@lakeshoreengineering.com

Manufacturer: Perry Fiberglass Products, Inc.
5415 Village Drive
Rockledge, FL 32955
Telephone: (321) 609-9036
Reese Dooley, Project Manager
E-mail: reese@perryfiberglass.com

# SECTION 3.0

# SUBMITTAL CHECK SHEET

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT
5415 VILLAGE DRIVE • ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com

# Submittal Check Sheet

**Project Specifications:** Applicable specifications checked.

**Single Wall:** ☒

**Double Wall:** ☐

**Wall Thickness:** Standard, See Attached Submittal Sheet

**Resin:** See Construction Sheet

**Exterior Color:** See Construction Sheet

**Installation:** Industrial

**Shape:** ☒Round ☒Rectangular ☐Other: _____

**Joint Type:** ☒Wet Lay-Up ☐Coupling & Tape ☐Flanged ☐Bell & Spigot ☐Butt Joint

**Fittings:** ☒90 Degree Elbow ☐45 Degree Elbow ☐22.5 Degree Elbow ☐End Cap

☒Reducer ☒90 Degree Tap ☐45 Degree Lateral ☐Wye ☐Square-To-Round

☐Built-In Damper ☐90 Degree Cross ☐Gooseneck

**Factory Manifold:** ☒Yes ☐No **Drawings:** ☒Yes ☐No

**Engineer:**

**Project:** Lower Popular Water Reclamation Facility Influent Pump Station Improvements

**Location:** Macon, GA

**Contractor:** Lake Shore Engineering **Date:** 11/04/2024

# SECTION 4.0

# DUCTWORK CONSTRUCTION SHEET

Perry Fiberglass Products, Inc.
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# INDUSTRIAL DUCT SUBMITTAL

**GENERAL CORROSION**
**PERRY CLASS 1 DUCT**

## Ductwork

Single Wall
Ductwork, including fittings, shall be constructed of filament wound or contact molded fiberglass reinforced plastic as manufactured by Perry Fiberglass Products, Inc. per the specification. Manufactured per ASTM D 2996, ASTM D 3982, and industry standard PS 15-69 minimums. Designed for maximum 4" WC pressure and 4" WC vacuum. FRP ductwork shall be designed using a safety factor of 4 to 1 for pressure and 4 to 1 for vacuum service.

## Resins (Premium corrosion resistant and Fire Retardant Vinyl Ester)

10 mil liner & 90 mil corrosion barrier

- Interplastic Corezyn 8400, Reichold Dion 9300, Ashland Hetron 992, AOC Vipel K-022, Derakane 510B

Structural

- Interplastic Corezyn 8400, Reichold Dion 9300, Ashland Hetron 992, AOC Vipel K-022, Derakane 510B

The duct and fittings, as a composite, shall meet the Flame requirements (25) of a Class 1 duct per ASTM E-84.

Total wall thickness (liner, corrosion barrier, and structural) shall be furnished with the following minimum wall thickness:

- 16"Ø=0.140" •18"Ø=0.140" •22"Ø=0.188" •18"x18"=0.188" •24"x15"=0.188"

The inner surface shall contain a 10 mil thick "C" veil saturated with a premium resin from above, (approx. 90% by weight resin). This will be followed by a 90 mil corrosion barrier (2 layers of 1 ½ oz chopped mat) with the same resin as used on the 10 mil liner. The structural layer shall be as required for design service and shall be filament wound or contact molded using resin as detailed above. Duct exterior finish shall have a relatively smooth surface free of exposed fibers and shall have a final coating of gray gel coat with UV inhibitors. All resin and joint material is suitable for a 120°F service. Support spans shall not exceed 10 feet on center.

# SECTION 5.0

# WRAP JOINING INSTRUCTIONS

Perry Fiberglass Products, Inc.
LEADERS IN FIBERGLASS REINFORCED PLASTIC DUCT PRODUCTS

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# CATALYST AMOUNT TO RESIN

## HOW MUCH CATALYST FOR THIS AMOUNT OF RESIN?

To fabricate with polyester and/or vinyl ester resins, catalyze with (1%) concentration (by weight) of the catalyst to the resin. That would be 1 part catalyst to 100 parts of resin. For example, to catalyze five gallons of resin at a concentration of 1% by weight, you would use about 7 oz. (or 188 cc) of catalyst.

For faster curing, you can use up to 2% catalyst; for slower curing, as little as 0.5%. These limits should not be exceeded as a poor or ineffective cure may be the result.

| For this concentration of catalyst | Add this amount of catalyst to the resin | | |
|---|---|---|---|
| | 1 quart of resin | 1 gallon of resin | 5 gallons of resin |
| 0.5% | 0.2 oz (4.7 cc) | 0.72 oz (18.8 cc) | 3.6 oz (94.0 cc) |
| 1.0% | 0.4 oz (9.4 cc) | 1.44 oz (37.6 cc) | 7.2 oz (188.0 cc) |
| 1.5% | 0.54 oz (14.1 cc) | 2.2 oz (56.4 cc) | 10.8 oz (282.0 cc) |
| 2.0% | 0.72 oz (18.8 cc) | 2.9 oz (75.2 cc) | 14.4 oz (376.0 cc) |

*Note: Do not catalyze more resin than can be used in 15 minutes.*

# Perry Fiberglass Products, Inc.

**LEADERS IN FIBERGLASS REINFORCED PLASTIC DUCT PRODUCTS**

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## JOINING PROCEDURES FOR WET LAY-UP — PAGE 1

### JOINING PROCEDURES FOR FIBERGLASS REINFORCED PLASTIC (FRP) RESIN FABRICATORS WET LAY-UP BONDING INSTRUCTIONS

Job Preparation: Thoroughly clean and sand area to be joined.

Joining duct with catalyzed resin and cloth and/or mat may be effectively performed by placing cloth and/or mat on a sheet of waxed film or cellophane and saturating with resin after adding catalyst. The wet lay-up may then be applied to the ends to be joined and air pockets worked out by squeezing or rolling on the firm surface.

Wet field joints (mat and resin) shall be a minimum 4" in width and at least the same thickness as adjoining duct wall. Joint shall be minimum three wraps for duct up to 22"∅, four wraps for duct 22"∅ to 36"∅ and six wraps for duct 38"∅ to 60"∅. Joint material shall be thoroughly saturated with the same type resin as used in duct and fittings. Minimum joint overlap shall be 3" for all sizes.

Duct, fitting ends and field cuts shall be completely brush coated with catalyzed resin prior to joint wrap so no raw glass fibers are exposed. Resin used shall be same type as used in duct fitting filament winding.

An aluminum or cloth paint roller may be used to spread resin evenly and work out air bubbles. Additional layers of mat may be used in the same manner. Care should be taken to catalyze only the amount of resin than can be used during the pot life of the resin. A little experience will quickly determine the proper handling of the resin.

Mixing: The rate of curing of the resin is dependent on temperature. At low temperatures, most resins have a longer working life and require longer curing periods; working time is decreased and curing takes place more rapidly as the temperature increases. Decreasing the amount of catalyst prolongs working time.

**TABLE 1**

The following table gives approximate pot life for various temperature and catalyst proportions

| Amount Resin | Amount Hardener | Temperature | Approximate Pot Life |
|---|---|---|---|
| 1 qt | 2/3 oz | 50-60°F | 20 min. |
| 1 qt | 1/2 oz | 60-70°F | 20 min. |
| 1 qt | 1/3 oz | 70-80°F | 20 min. |
| 1 qt | 1/4 oz | 80-90°F | 20 min. |
| 1 qt | 1/6 oz | over 90°F | 20 min. or less |

The catalyst should be carefully proportioned to the amount of resin to be used, and thoroughly mixed to a uniform blend. Duct joints or repaired parts should be allowed to cure at least 24 hours before being used.

If additional lamination is to be made over a cured area, surface should be broken by sanding before application.

Clean Up: Preferably acetone or lacquer thinner may be used for cleaning tools and hands. Soap and hot water may be used, though not as effectively as acetone. Thorough clean up must be made before resin cures. Care should be exercised to keep catalyst and resin from contact with skin. We recommend wearing rubber gloves when working with resins and catalyst.

Keep away from open flame and use with adequate ventilation

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## JOINING PROCEDURES FOR WET LAY-UP — PAGE 2

### JOINING

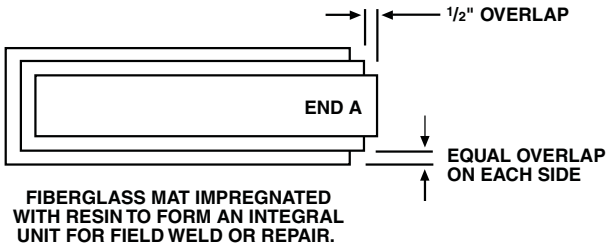
Coat all raw edges with resin mix, completely filling the joint and slightly squeezing the sections together. It is often preferable to add sufficient Cab-O Sil to resin for this step to produce a paste or light putty which will fill small voids and irregularities if there is not a good fit. It is often desirable to speed-up the hardening time for this step also by increasing the MEK peroxide required by 1 to 2 cc per pound. Insure that interior surface is relatively smooth but a light "bead" on the interior is desirable and acceptable.

Butted sections may be "hot patched" to hold alignment until complete joint can be made. A tab consists of 2-3" square of glass mat saturated with resin mix. Place prepared hot patch across joint to be made to form "tack weld." Three are usually sufficient. For this step, it is often desirable to speed-up the hardening time of the resin by increasing the MEK peroxide required by 1 to 2 cc per pound.

### PREPARATION OF STRAPPING

Prepare fiberglass mat (and woven roving, where required) according to vendor's specifications or cut sufficient quantity according to size and ply requirements (see Figure 1).

**FIGURE 1**




Tables 2 and 3 should only be used as guides for the minimum total width of joint overlays and minimum joint thickness. Joint thickness should be at least as thick as the pipe to be joined.

**TABLE 2**

| Duct Wall Thickness | Minimum Total Width of Overlays |
|---|---|
| 3/16" | 3" |
| 1/4" | 4" |
| 5/16" | 5" |
| 3/8" | 6" |
| 7/16" | 7" |
| 1/2" | 8" |
| 9/16" | 9" |
| 5/8" | 10" |
| 11/16" | 11" |
| 3/4" | 12" |

**TABLE 3**

| Duct Wall Thickness | Number of Plies of Strapping and Sequence* |
|---|---|
| 1/8" | 3m; v |
| 3/16" | 4m; v |
| 1/4" | 3m; 1wr; 2m; v |
| 5/16" | 3m; 1wr; 3m; v |
| 3/8" | 3m; 1wr; 2m; 1wr; 2m; v |
| 7/16" | 3m; 1wr; 3m; 1wr; 2m; v |
| 1/2" | 3m; 1wr; 3m; 1wr; 2m; 1wr; 1m; v |
| 9/16" | 3m; 1wr; 3m; 1wr; 2m; 1wr; 1m; v |
| 5/8" | 4m; 1wr; 4m; 1wr; 3m; 1wr; 1m; v |
| 11/16" | 4m; 1wr; 4m; 1wr; 3m; 1wr; 1m; v |
| 3/4" | 4m; 1wr; 4m; 1wr; 4m; 1wr; 1m; v |

*From surface of duct outward; m = 1(one) 1/2 oz. chopped strand mat; wr = 24 oz. woven roving; v = type c, 10 mil glass surfacing veil. Optional.

Perry Fiberglass Products, Inc.
LEADERS IN FIBERGLASS REINFORCED PLASTIC DUCT PRODUCTS

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# JOINING PROCEDURES FOR WET LAY-UP — PAGE 3

### PREPARATION OF STRAPPING *continued*

Two lay-ups may be required to prevent sag and overheating of the resin during hardening.

Where accessible, the inside surface of the joint should be covered with 1-2 plies of fiberglass mat 4-6" wide and 1 ply of 6-8" wide surfacing veil or mat saturated with resin.

Lay the widest section of mat on a flat surface treated with release agent or covered with releasing film. Wet the entire surface with resin mix, using paint brush and/or roller.

Position next ply of glass, offsetting about 1/2" on the length. Equal overlap on width is preferable but slight offset (staggered) is acceptable.

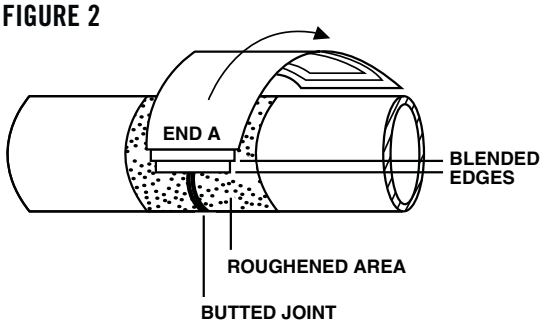
Wet out the layer with resin mix. Remove as much air as possible with brush and/or roller toward the edges of the laminate section. Care must be exercised to avoid to heavy pressure which would remove excessive resin from the area.

Repeat with proper sequence of glass until all plies have been saturated with resin and formed into one integral unit (see Figure 1).

### APPLICATION OF STRAPPING

Apply resin mix with brush and/or roller over all prepared areas of the joint. Take the entire strapping with the narrowest ply to the inside and place on resin coated joint. Make sure to center and position it properly (see Figure 2) over the butt seam. Wrap around the joint using and even forward pressure to form entire joint with offset ends overlapping smoothly. The releasing film, if used, can be lifted with the strapping composite and will help to form the wrapped joint. It must be removed before the next step.

**FIGURE 2**




**FOR USE WITH PROCEDURE FOR RESIN WRAPPED JOINTS**

Roll out as smooth as possible blending the edges of strapping into duct. Remove all wrinkles and entrapped air rolling from center of joint to outside edge. Additional resin may be applied to provide a resin-rich surface. Care must be taken to prevent the strapping from sagging at the bottom of the joint during hardening.

After the joint has been hardened, a layer of resin mix may be applied, if desired. If the joint is outdoors, this layer of resin may include the wax addition as per Table 1. If the duct was made using ultraviolet screener for protection, 1% UV9 ct 5411 must be added to resin for this final coat.

# Perry Fiberglass Products, Inc.

**LEADERS IN FIBERGLASS REINFORCED PLASTIC DUCT PRODUCTS**

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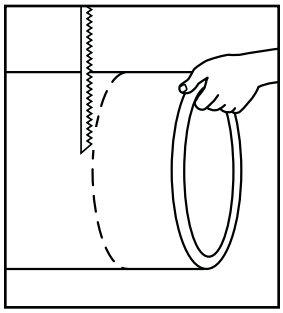
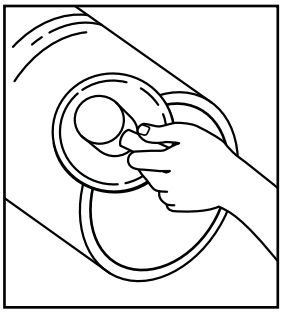
## JOINING PROCEDURES FOR WET LAY-UP — PAGE 4

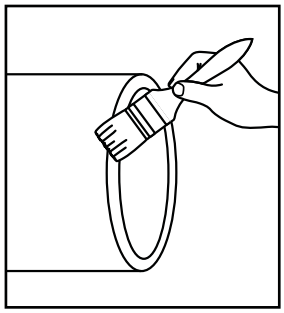
### WELDING PROCEDURES



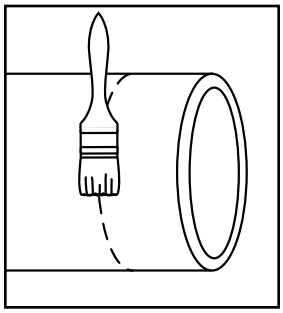
**1.** Firmly support pipe sections. Square the ends to be welded using saber saw.



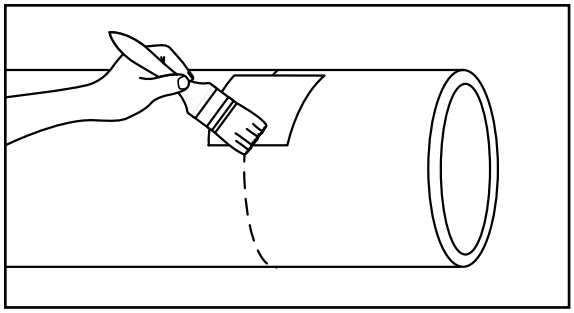
**2.** Rough the outside surfaces with sander approximately 1" farther in from the ends than the finished weld surface. Where inside welds are possible, interior surfaces should be sanded prior to assembly. Note: Some installations do not require sanding. Contact factory.



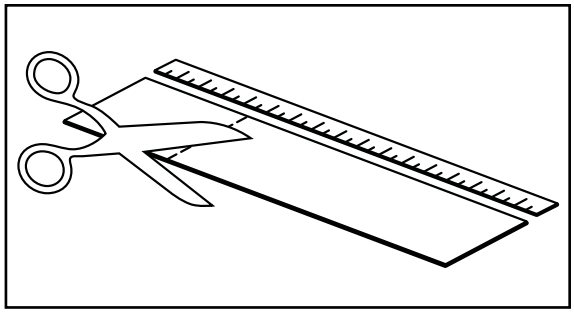
**3.** Coat roughened end edges of pipe with small amount of catalyzed resins. Any large voids may be filled with a silica-filled resin putty.



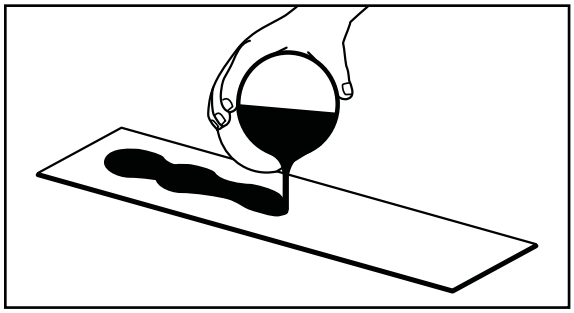
**4.** Support components in joint position as rigidly as possible so that no movement occurs while making the joint. Fill joint with resin.



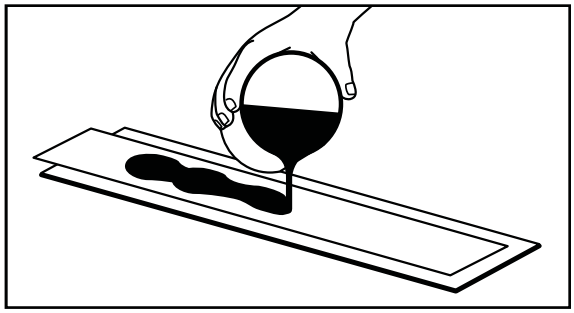
**5.** A “Hot Patch” technique may help prevent movement of pipe during the weld-cure period. Wet 2" squares of mat with a small amount of resin using three times normal amount of catalyst. Apply “Hot Patches” at intervals around joint. Curing or hardening in a matter of minutes, they secure pipe sections in proper alignment. Mix resin and catalyst for “Hot Patches” in a small paper cup and discard immediately after use to avoid contaminating welding resin.



**6.** Lay out fiberglass mat strips on the work table. Length of each strip should be 2" longer than circumference of pipe. Strips longer than 36" may be cut in half to simplify application. Mix prescribed amount of catalyst with required amount of resin in a separate clean container. Prepare only the amount of resin which can be used immediately (about 1 qt. per 6 sq. ft. of mat). Resin will harden in about 20-30 minutes.



**7.** After mixing in the catalyst thoroughly, pour the resin onto the widest mat first. Spread it over the entire mat strip, working it into the mat fibers manually. (Neoprene gloves are recommended.)



**8.** Place the next widest strip onto the first with one end of the second strip starting approximately 1" in from end of the first. Doing this with each successive strip results in a feathered edge (see Figure 1) to produce a smooth weld strip joint. Add more resin and work into the second strip.

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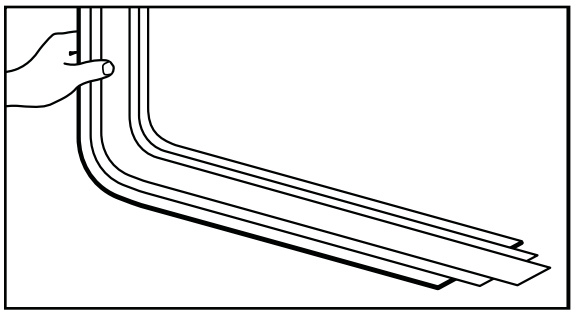
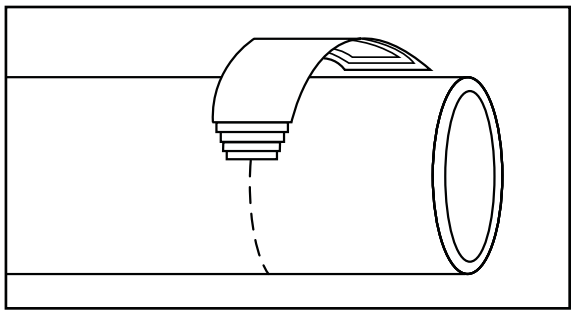
# JOINING PROCEDURES FOR WET LAY-UP — PAGE 5

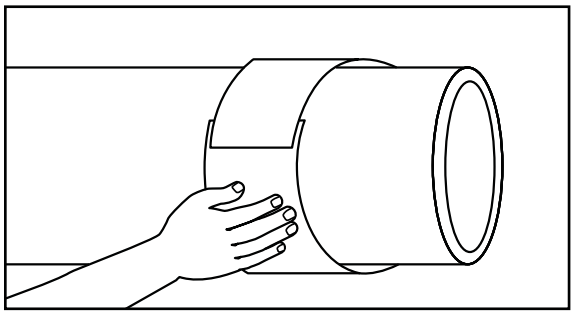
## WELDING PROCEDURES *continued*



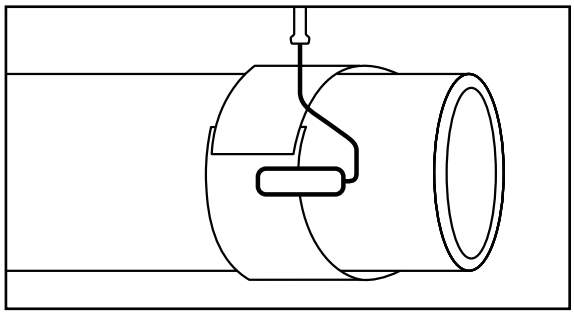
**9.** Add other strips in the same manner. In wetting each strip, it is best to be a little "lean" on resin at this stage rather than over-wetting. More resin may be added later, if necessary. After laying the final strip, compress strips together with glove-protected hand to remove large air bubbles and to make sure all layers are wetted with the resin.



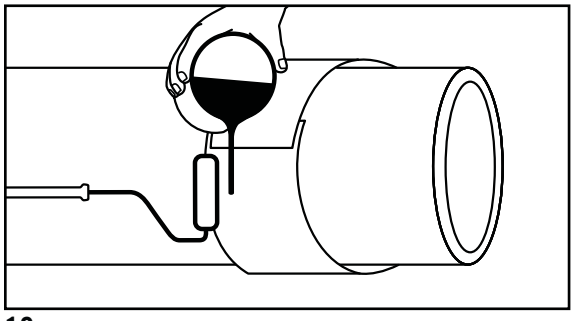
**10.** Pick up the completed weld strip by one end and center it carefully on the pipe joint. Apply the tapered end first with the narrowest strip on the pipe weld.



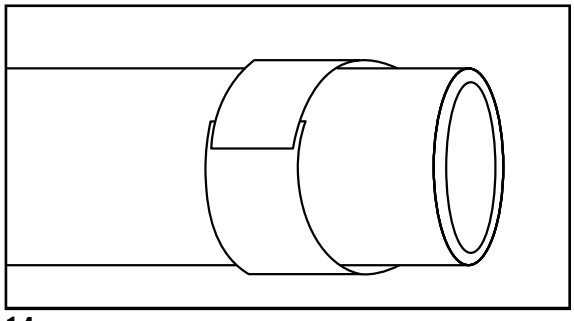
**11.** Be sure the weld is centered, with care taken to avoid wrinkles on the under or back side of the weld. Continue applying the strip around the joint until the free end overlaps the beginning. Lightly press out the air bubbles with gloved hands. (See Figure 2.)



**12.** Finish the application of the weld with the roller. Any remaining air bubbles will appear as light spots. These should be rolled to the edge of the weld where they will be released and disappear. If weld is not a straight butt joint, a little extra rolling and hand work to shape mat strips to structure configuration will eliminate bumps and ridges.



**13.** At this stage, resin may be added where necessary if any mat appears to be not thoroughly wetted. It is better to have too little resin on the weld strip, when initially applied, than too much. Over-wetting makes it difficult to keep the weld strips in place. Also coat the remaining sanded surface with resin.



**14.** Allow the completed weld to cure thoroughly tack free. Do not move or disturb weld until it is thoroughly cured. If temperature is below 55°F, keep weld area warm with heat lamps. For exterior installation, protect the weld from the weather.

# SECTION 6.0

# FITTINGS

## 6.1 ELBOWS

## 6.2 REDUCERS

## 6.3 TAPS

# SECTION 6.1

# ELBOWS

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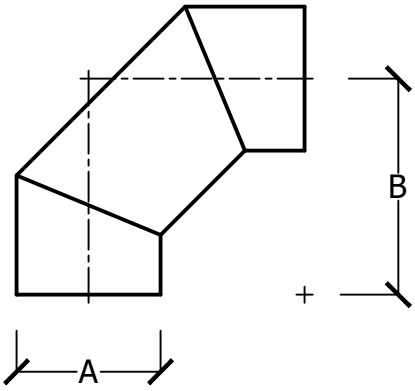
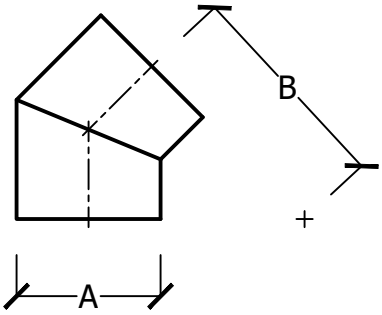



3 GORE 1.5xCL 90° ELBOW




2 GORE 1.5xCL 45° ELBOW

| Duct Diameter (A) | Centerline Radius (B) |
|---|---|
| 4"Ø | 6" |
| 6"Ø | 9" |
| 8"Ø | 12" |
| 10"Ø | 15" |
| 12"Ø | 18" |
| 14"Ø | 21" |
| 16"Ø | 24" |
| 18"Ø | 27" |
| 20"Ø | 30" |
| 22"Ø | 33" |
| 24"Ø | 36" |
| 26"Ø | 39" |
| 28"Ø | 42" |
| 30"Ø | 45" |
| 32"Ø | 48" |
| 34"Ø | 51" |
| 36"Ø | 54" |
| 38"Ø | 57" |
| 40"Ø | 60" |
| 42"Ø | 63" |
| 44"Ø | 66" |
| 46"Ø | 69" |
| 48"Ø | 72" |
| 50"Ø | 75" |
| 52"Ø | 78" |
| 54"Ø | 81" |
| 56"Ø | 84" |
| 58"Ø | 87" |
| 60"Ø | 90" |
| 62"Ø | 93" |
| 64"Ø | 96" |
| 66"Ø | 99" |
| 68"Ø | 102" |
| 70"Ø | 105" |
| 72"Ø | 108" |

Note:
Custom degree elbows 1°-45° will be 2 gore and 46°-90° 3 gore unless noted otherwise.

# SECTION 6.2

# REDUCERS

# Perry Fiberglass Products, Inc.

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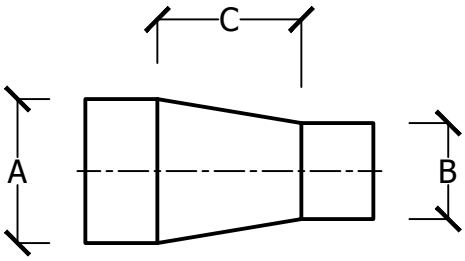
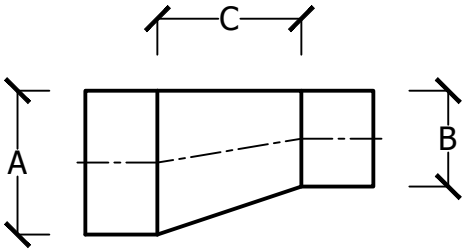



CONCENTRIC REDUCERS




ECCENTRIC REDUCERS

| Reduction (A-B) | Reducer Length (C) |
|---|---|
| 1" | 3" |
| 2" | 6" |
| 3" | 9" |
| 4" | 12" |
| 5" | 15" |
| 6" | 18" |
| 7" | 21" |
| 8" | 24" |
| 9" | 27" |
| 10" | 30" |
| 11" | 33" |
| 12" | 36" |
| 13" | 39" |
| 14" | 42" |
| 15" | 45" |
| 16" | 48" |
| 17" | 51" |
| 18" | 54" |
| 19" | 57" |
| 20" | 60" |

Note:
Loose reducers will include 6" of straight duct on both sides to ease installation.

# SECTION 6.3

# TAPS

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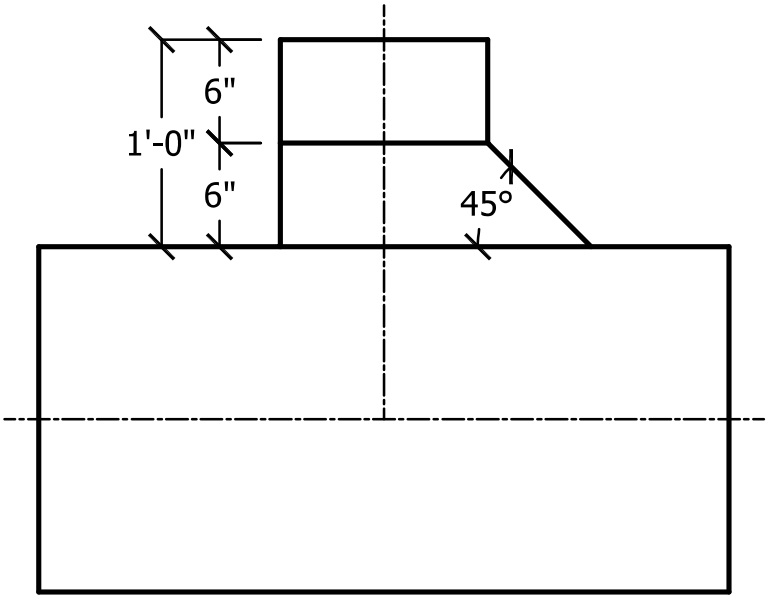


SHOE TAP

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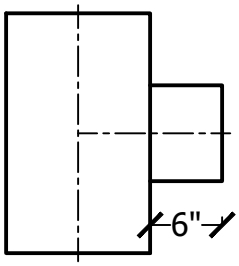
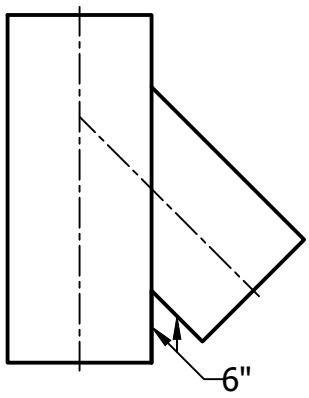
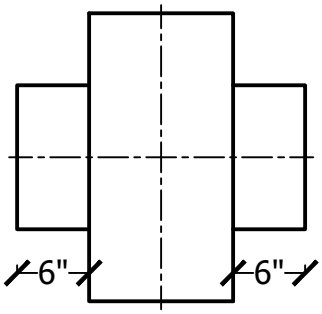


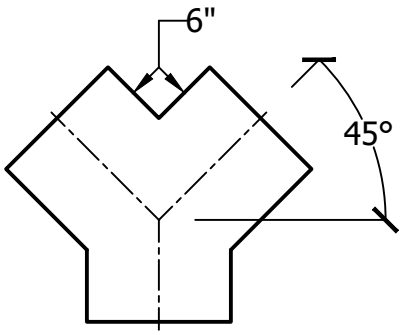

90° TAP




45° LATERAL




90° CROSS




TRUE WYE

Custom degree Laterals and Wyes are available upon request.

# SECTION 7.0

# FLANGES

# Perry Fiberglass Products, Inc.

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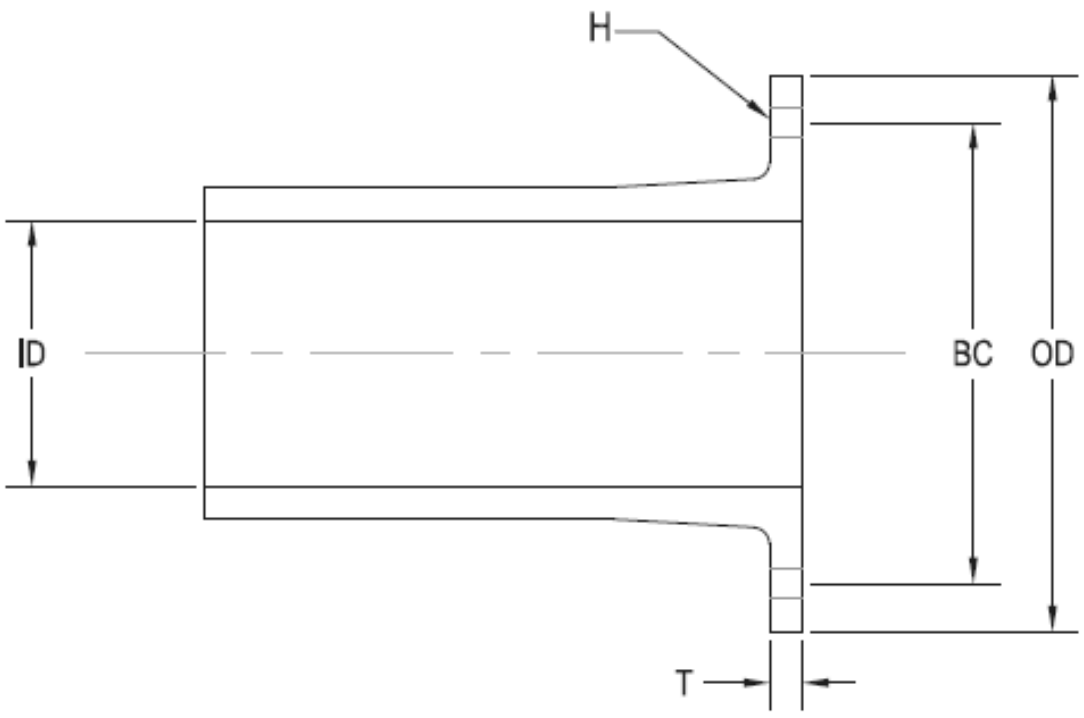
## Duct Flange Dimensions per PS15-69 (Field Drilled)

### Perry Standard Unless Otherwise Noted on Spool Drawings

**(For rectangular ductwork the longest dimension shall be considered equivalent to diameter)**




| Diameter "ID" | Thickness "T" | Outside Diameter "OD" | Bolt Circle "BC" | Bolt Hole Diameter "H" | # of Holes | Bolt Size |
|---|---|---|---|---|---|---|
| 3" | 1/4" | 7-3/8" | 6" | 7/16" | 4 | 3/8" |
| 4" | 1/4" | 8-3/8" | 7" | 7/16" | 4 | 3/8" |
| 6" | 1/4" | 10-3/8" | 9" | 7/16" | 8 | 3/8" |
| 8" | 1/4" | 12-3/8" | 11" | 7/16" | 8 | 3/8" |
| 10" | 3/8" | 14-3/8" | 13" | 7/16" | 12 | 3/8" |
| 12" | 3/8" | 16-3/8" | 15" | 7/16" | 12 | 3/8" |
| 14" | 3/8" | 18-3/8" | 17" | 7/16" | 12 | 3/8" |
| 16" | 1/2" | 20-3/8" | 19" | 7/16" | 16 | 3/8" |
| 18" | 1/2" | 22-3/8" | 21" | 7/16" | 16 | 3/8" |
| 20" | 1/2" | 24-3/8" | 23" | 7/16" | 20 | 3/8" |
| 22" | 1/2" | 26-3/8" | 25" | 7/16" | 20 | 3/8" |
| 24" | 1/2" | 28-3/8" | 27" | 7/16" | 20 | 3/8" |
| 26" | 1/2" | 30-3/8" | 29" | 7/16" | 24 | 3/8" |
| 28" | 1/2" | 32-3/8" | 31" | 7/16" | 28 | 3/8" |
| 30" | 1/2" | 34-3/8" | 33" | 7/16" | 28 | 3/8" |
| 32" | 1/2" | 36-3/8" | 35" | 7/16" | 32 | 3/8" |
| 34" | 1/2" | 38-3/8" | 37" | 7/16" | 32 | 3/8" |
| 36" | 1/2" | 40-3/8" | 39" | 7/16" | 32 | 3/8" |
| 38" | 5/8" | 42-3/8" | 41" | 7/16" | 36 | 3/8" |
| 40" | 5/8" | 44-3/8" | 43" | 7/16" | 36 | 3/8" |
| 42" | 5/8" | 46-3/8" | 45" | 7/16" | 36 | 3/8" |
| 44" | 5/8" | 50-3/8" | 48" | 9/16" | 44 | 1/2" |
| 46" | 5/8" | 52-3/8" | 50" | 9/16" | 44 | 1/2" |
| 48" | 5/8" | 54-3/8" | 52" | 9/16" | 44 | 1/2" |
| 50" | 5/8" | 56-3/8" | 54" | 9/16" | 44 | 1/2" |
| 52" | 5/8" | 58-3/8" | 56" | 9/16" | 44 | 1/2" |
| 54" | 5/8" | 60-3/8" | 58" | 9/16" | 44 | 1/2" |
| 56" | 5/8" | 62-3/8" | 60" | 9/16" | 52 | 1/2" |
| 58" | 5/8" | 64-3/8" | 62" | 9/16" | 52 | 1/2" |
| 60" | 5/8" | 66-3/8" | 64" | 9/16" | 52 | 1/2" |
| 62" | 5/8" | 68-3/8" | 66" | 9/16" | 60 | 1/2" |
| 64" | 5/8" | 70-3/8" | 68" | 9/16" | 60 | 1/2" |
| 66" | 5/8" | 72-3/8" | 70" | 9/16" | 60 | 1/2" |
| 68" | 5/8" | 74-3/8" | 72" | 9/16" | 60 | 1/2" |
| 70" | 5/8" | 76-3/8" | 74" | 9/16" | 60 | 1/2" |
| 72" | 5/8" | 78-3/8" | 76" | 9/16" | 60 | 1/2" |
| 74" | 5/8" | 80-3/8" | 78" | 9/16" | 72 | 1/2" |
| 76" | 5/8" | 82-3/8" | 80" | 9/16" | 72 | 1/2" |
| 78" | 5/8" | 84-3/8" | 82" | 9/16" | 72 | 1/2" |
| 80" | 5/8" | 86-3/8" | 84" | 9/16" | 72 | 1/2" |
| 82" | 5/8" | 88-3/8" | 86" | 9/16" | 72 | 1/2" |
| 84" | 5/8" | 90-3/8" | 88" | 9/16" | 72 | 1/2" |
| 86" | 5/8" | 92-3/8" | 90" | 9/16" | 80 | 1/2" |
| 88" | 5/8" | 94-3/8" | 92" | 9/16" | 80 | 1/2" |
| 90" | 5/8" | 96-3/8" | 94" | 9/16" | 80 | 1/2" |
| 92" | 5/8" | 98-3/8" | 96" | 9/16" | 80 | 1/2" |
| 94" | 5/8" | 100-3/8" | 98" | 9/16" | 80 | 1/2" |
| 96" | 5/8" | 102-3/8" | 100" | 9/16" | 80 | 1/2" |

# SECTION 8.0

# BAROMETRIC DAMPERS

## 8.1 ROUND BAROMETRIC DAMPERS

## 8.2 RECTANGULAR BAROMETRIC DAMPERS

# SECTION 8.1

# ROUND BAROMETRIC DAMPERS

# Perry Fiberglass Products, Inc.

EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT

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## PERRY MODEL RBDD214
## PERRY ROUND FRP BACKDRAFT DAMPER

### STANDARD CONSTRUCTION

**FRAME**
Molded fiberglass channel with FRP blade stop. Vinyl Ester Resin. See table below for dimensions.

**BLADE**
Fiberglass, Vinyl Ester Resin. Blade seals available for low leakage (Option).

**AXLE**
Full-length 316SS. See table below for diameters.

**BEARINGS**
Molded, Graphite-Filled PTFE Sleeve Bearings

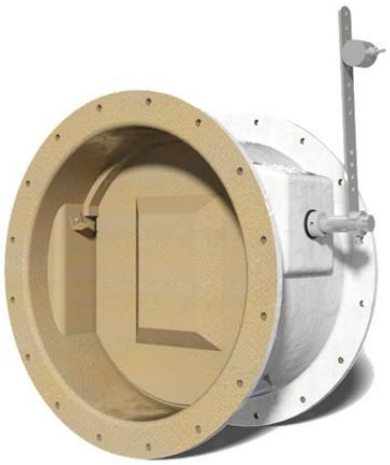
**COUNTERWEIGHT ASSEMBLY**
316SS arm with 316SS weights; to be positioned & secured in the field to satisfy systems conditions.

**SIZES (Diameters)**
6" - 72"

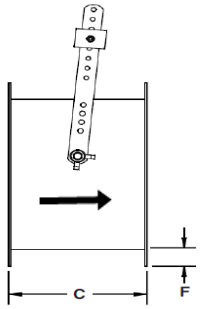
**MAXIMUM TEMPERATURE**
200°F (93°C)

**MAXIMUM SYSTEM PRESSURE**
10" w.g. (7.46 kPa)

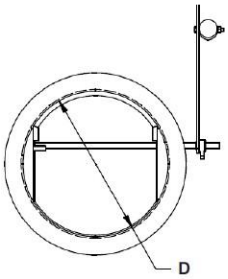
**MAXIMUM SYSTEM VELOCITY**
6000 fpm (30.48 m/s)



**Right-Hand** Counterweight Mount Showing Air Leaving Side of Damper (**Standard**)




Side View of Left-Hand Counterweight Mount (Opt)




- Additional variations/options to those listed in thable below are available. Consult Perry for details and costing.
  - -Wider and thicker flanges
  - -Non-standard resins
  - -Static grounding
  - -Exterior coatings
- -Damper to be installed with the shaft aligned with the horizontal plane.
- -Damper can be installed both horizontal and vertical air flow directions.
- -Airflow direction must be communicated in order to ensure proper design and pricing.

| Inside Diameter "D" | Flange Dimensions Thickness x "F" | Web Dimensions Thickness x "C" | Blade Edge Thickness | Axle Diameter |
|---|---|---|---|---|
| 6", 7", 8", 9" | 0.25" x 2.19" | 0.125" (3) x "D" | 0.25" | 0.75" |
| 10" | 0.375" x 2.19" | 0.125" x 10" | 0.25" | 0.75" |
| 12", 14" | 0.375" x 2.19" | 0.125" x 12" | 0.25" | 1.00" |
| 16", 18", 20" | 0.50" x 2.19" | 0.125" x 12" | 0.25" | 1.00" |
| 22", 24" | 0.50" x 2.19" | 0.187" x 12" | 0.25" | 1.00" |
| 26", 28", 30", 32", 36" | 0.50" x 2.19" | 0.187" x 12" | 0.25" | 1.50" |
| 42" | 0.625" x 2.19" | 0.25" x 12" | 0.50" | 2.00" |
| 48" | 0.625" x 3.19" | 0.25" x 12" | 0.50" | 2.00" |

| FRAME | BLADE | | BLADE SEALS (OPT) | | SHAFT SEALS (OPT) | | AXLE | | ACCESSORIES (OPT) | |
|---|---|---|---|---|---|---|---|---|---|---|
| MOLDED FIBERGLASS CHANNEL (SEE CONSTRUCTION TABLE) | FIBERGLASS; STIFFENED AS REQUIRED | | NEOPRENE | | INTEGRAL WITH BEARING | | 316-GRADE FULL LENGTH STAINLESS STEEL | | BOLT HOLES IN BOTH FLANGES | |
| FULL CIRCUMFERENCE BLADE STOP | | | SILICONE | | AXLE SHAFT SEAL WITH OUTBOARD BEARING | | FIBERGLASS ROD; FULL LENGTH (OPT) | ✓ | | |
| | | | EPDM | ✓ | | | | | | |
| | | | VITON | | | | | | | |

| QTY. | FRAME | | | | BOLT HOLE ORIENTATION | | COUNTERWEIGHT MOUNT RIGHT-HAND (STD) OR LEFT-HAND (OPT) | TAG |
|---|---|---|---|---|---|---|---|---|
| | D-DIA. | G Bolt Circle Diam. | No. of Holes | Hole Dia. | S Straddle | T Parallel | | |
| X | X | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

# SECTION 8.2

# RECTANGULAR BAROMETRIC DAMPERS

# Perry Fiberglass Products, Inc.

EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT

5415 VILLAGE DRIVE • ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com


## PERRY MODEL BDD214

# PERRY RECTANGULAR FRP BACKDRAFT DAMPER

**Groove Blade**

### STANDARD CONSTRUCTION

**FRAME**
Fiberglass Channel, Vinyl Ester Resin. See table for dimensions.

**BLADES**
Vinyl Ester Resin, Triple "V" Groove, 6 5/8" wide x 1/8" thick.

**AXLES**
3/4" diameter axles. 316SS axles on blades with counterweights; pultruded fiber-glass axles on all other blades (vinyl ester resin).

**BEARINGS**
Molded PTFE.

**LINKAGE**
316SS out of airstream.

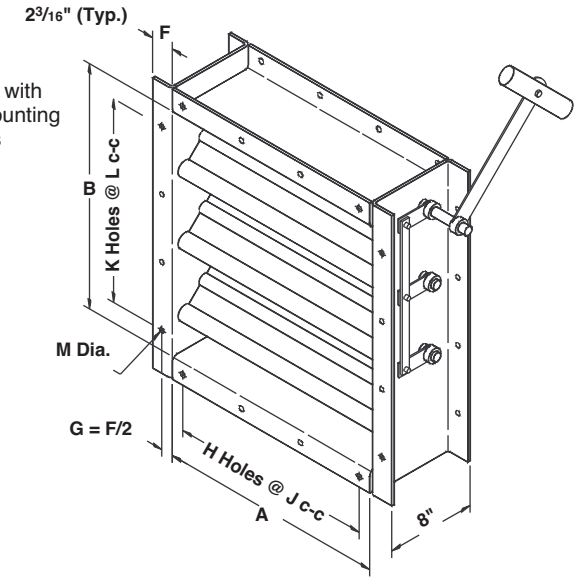
**COUNTERBALANCE ASSEMBLY**
316SS out of airstream.

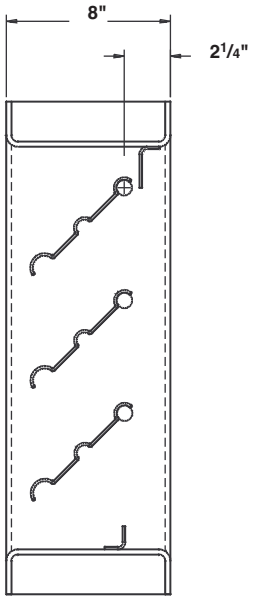
**MAXIMUM TEMPERATURE**
200°F (94°C).

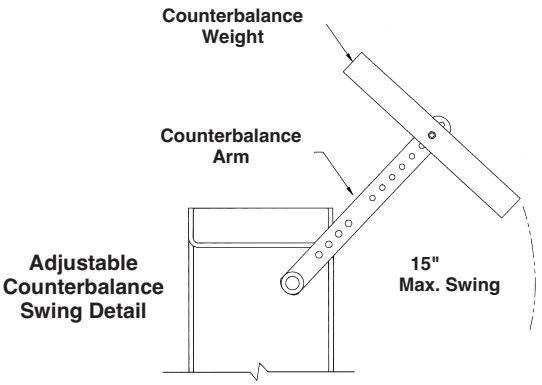
**MINIMUM SIZE**
6"w x 8"h

**MAXIMUM SIZE**
48"w x 72"h
Consult Perry for dampers larger than maximum size shown.

Illustrated with Optional Mounting Holes




| FRAME | | BLADES | | SEALS (Optional) | | AXLES | | BEARINGS | | LINKAGE | | ACCESSORIES (Optional) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8" x 2 3/16" x 1/4" (203 x 56 x 6) Fiberglass Channel | ✓ | 6 5/8" wide, V-Groove shape | ✓ | EPDM Blade Seal | ✓ | 3/4" diameter fiberglass rod | ✓ | Molded PTFE | ✓ | 316SS side linkage | ✓ | Bolt Holes - 1 Flange | |
| | | | | Viton Blade Seal | | | | | | | | Bolt Holes - 2 Flanges | |
| | | | | Neoprene Blade Seal | | 3/4" diameter 316 SS (Opt) | | | | | | | |
| | | | | SS Jamb Seal | | | | | | | | | |
| | | | | Polycarbonate Jamb Seal | | | | | | | | | |
| | | | | | | | | | | | | | |

| QTY. | DIMENSIONS | | | | | | | | | | TEMP. °F | COMMENTS | TAG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | F | G | H | J | K | L | M | | | |
| | | | | | | | | | | | | | D-101 |
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# SECTION 9.0

# COORDINATION DRAWINGS

| REVISIONS | | | |
|---|---|---|---|
| REVISION # | DATE | DESCRIPTION | REV. BY |
| 0 | 28OCT2024 | INITIAL DESIGN | SSH |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# LOWER POPLAR WRF INFLUENT PUMP STATION IMPROVEMENTS GEORGIA

## GENERAL NOTES:

1. ALL FIELD DIMENSIONING IS TO BE PERFORMED BY OTHERS. ALL DIMENSIONS SHALL BE PROVIDED PRIOR TO ANY FABRICATION.
2. ANY MODIFICATIONS TO EXISTING SITE ITEMS ARE BY OTHERS.
3. SUBMITTAL DRAWINGS ARE BASED ON CONTRACT DRAWINGS AND SPECIFICATIONS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL APPROVED DRAWINGS BEFORE FABRICATION AGAINST EACH OTHER AND FIELD CONSTRAINTS. PERRY WILL NOT BE RESPONSIBLE FOR ANY EQUIPMENT FABRICATED THAT REQUIRES FIELD MODIFICATION IF BUILT IN ACCORDANCE WITH ANY APPROVED AND VERIFIED DRAWINGS.
4. EXTERIOR COATING : **GRAY GEL COAT**
5. PURCHASED PARTS CARRY THE WARRANTY OF THE ORIGINAL MANUFACTURER ONLY.
6. MAKE NO REPAIRS OR MODIFICATIONS WITHOUT CONTACTING YOUR SERVICE REPRESENTATIVE, WARRANTY MAY BE VOIDED.

## REVISION:

△# REVISION

## ABBREVIATIONS:

TYP. = TYPICAL
CL = CENTERLINE
SYM. = SYMMETRIC
O.D. = OUTSIDE DIMENSION
I.D. = INSIDE DIMENSION
R = RADIUS
T.O. = TOP OF ....
B.O. = BOTTOM OF .....
DWG. = DRAWING
SS = STAINLESS STEEL
HHB = HEX HEAD BOLT
THK = THICKNESS
CC = CENTER TO CENTER
MIN = MINIMUM
U.N.O. = UNLESS NOTED OTHERWISE
ϕ = DIAMETER
FLG = FLANGE
FNPT = FEMALE NATIONAL PIPE THREAD
COUP. = COUPLING
FOB = FLAT ON BOTTOM
FOT = FLAT ON TOP

## DRAWING NOTES:

1. ALL DIMENSIONS ARE FROM THE CLEAR I.D. OF THE DUCT
2. ALL ELBOWS ARE $1\frac{1}{2}$ x CENTERLINE UNLESS NOTED OTHERWISE
3. ALL TAPS ARE 6" LONG FROM THE I.D. UNLESS NOTED OTHERWISE
4. ⌖←THIS SYMBOL INDICATES A WET LAY-UP FIELD JOINT

## QUALITY CONTROL ENGINEER INSPECTOR NUMBERS:

1. CHIP FAYER
2. JEREMY GEIGER
3. SAMMY OLIVA
4. AARON STAHL
5. TODD LIDYARD

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ELYRIA, OHIO 44035
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Perry Fiberglass Products, Inc.
321.609.9036

DUCTWORK, PIPING, STORAGE TANKS, SCRUBBERS, CARBON ADSORBERS, AIR STRIPPERS, FANS, DAMPERS, & ADVANCED FABRICATIONS



**COVER PAGE**

| DRAWN BY/DATE: | PERRY PROJECT #: | SHEET SIZE: | REVISION: |
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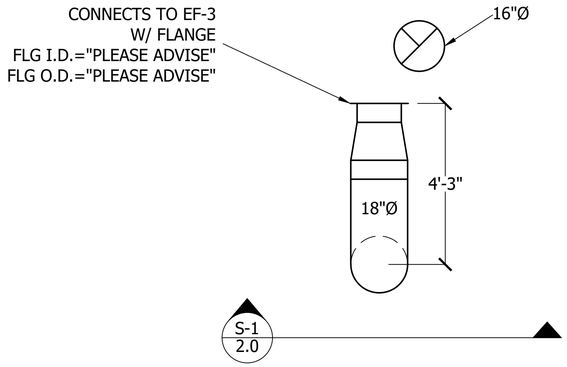
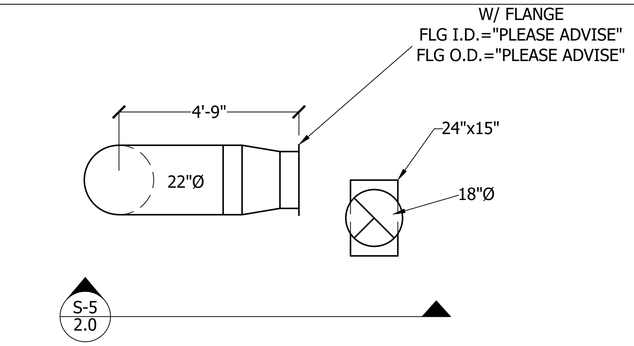
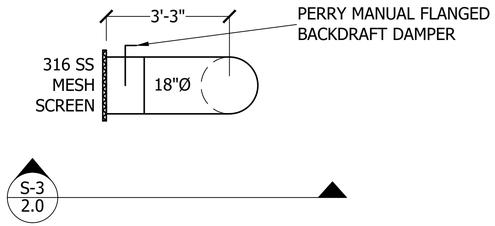
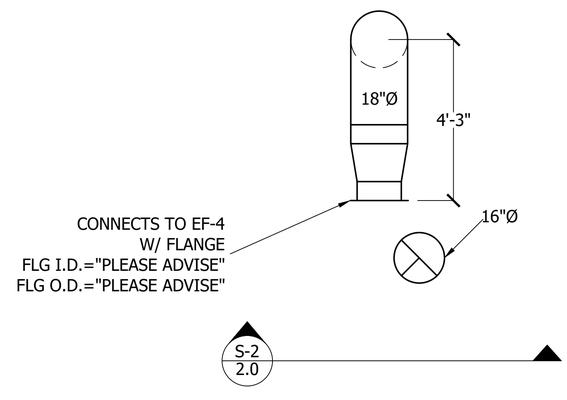
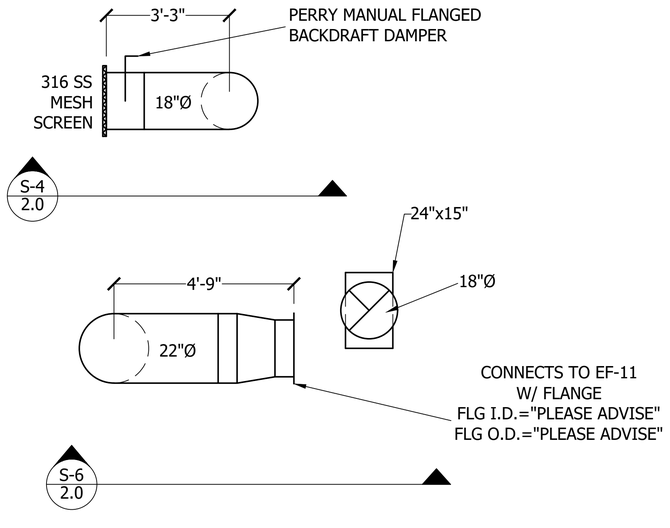
| DESIGNED BY: | CHECKED BY: | DRAWING #: | |
| | ARH | 0.0 | |

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***LOWER POPLAR WRF INFLUENT PUMP STATION IMPROVEMENTS***

***PLAN VIEW***

| DRAWING SCALE: | DRAWN BY/DATE: | PERRY PROJECT #: | SHEET SIZE: | REVISION: |
|---|---|---|---|---|
| 1/2" = 1'-0" | ***SSH/28OCT2024*** | ***9428*** | ***D*** *(22x34)* | ***0*** |
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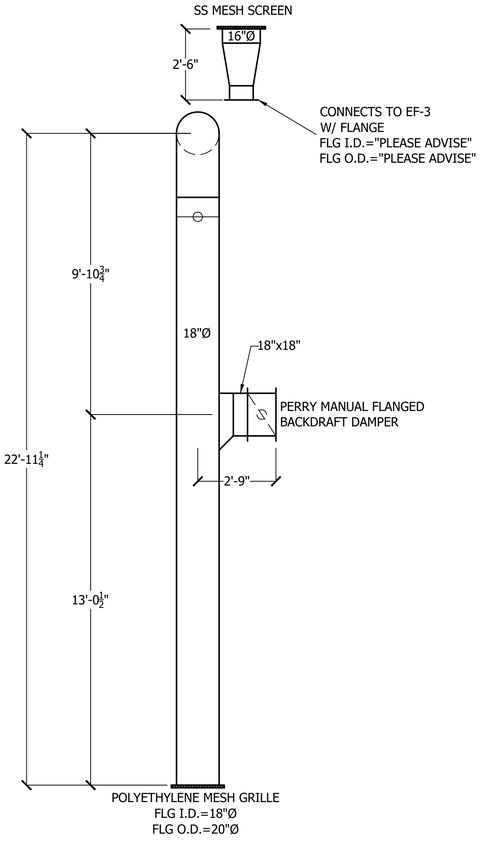
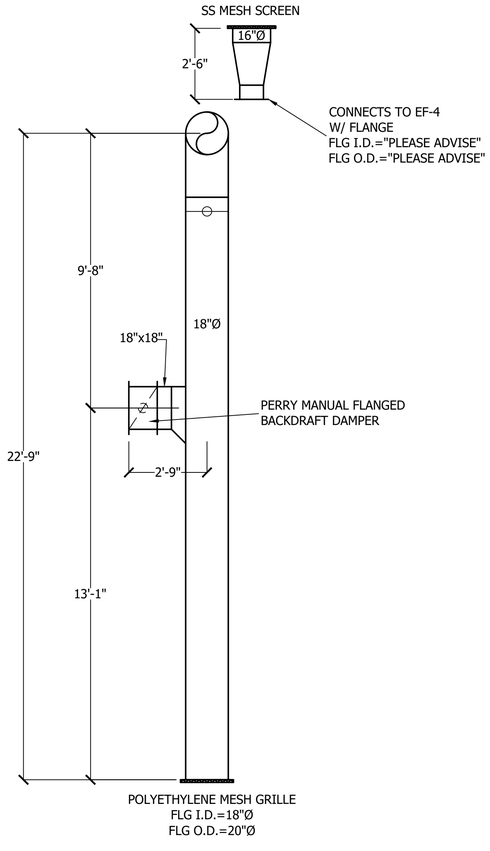
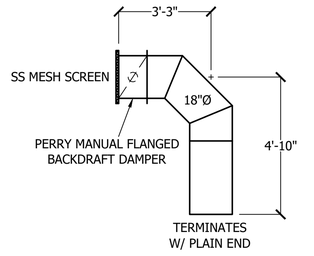


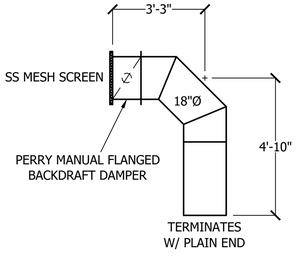

S-1 1.0 ELEVATION VIEW



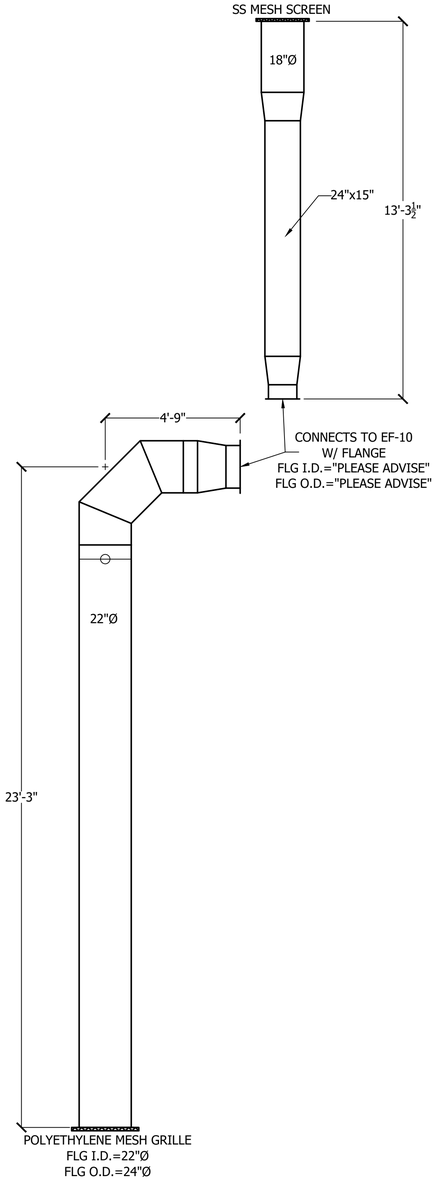

S-2 1.0 ELEVATION VIEW



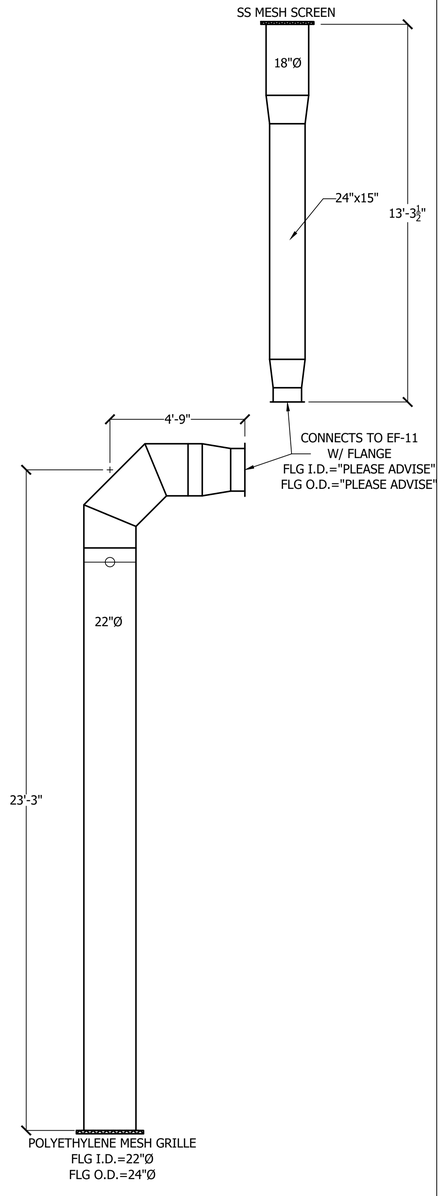

S-3 1.0 ELEVATION VIEW




S-4 1.0 ELEVATION VIEW




S-5 1.0 ELEVATION VIEW




S-6 1.0 ELEVATION VIEW

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***LOWER POPLAR WRF INFLUENT PUMP STATION IMPROVEMENTS***

***ELEVATIONS VIEW***

| DRAWING SCALE: | DRAWN BY/DATE: | PERRY PROJECT #: | SHEET SIZE: | REVISION: |
|---|---|---|---|---|
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| | DESIGNED BY: | CHECKED BY: | DRAWING #: | |
| | | ***ARH*** | **2.0** | |

# SECTION 10.0

# WARRANTY

Perry Fiberglass Products, Inc.
EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT

5415 VILLAGE DRIVE • ROCKLEDGE, FLORIDA 32955 PHONE: 321-609-9036 FAX: 321-609-9003 www.PerryFiberglass.com

# WARRANTY

**1. Warranty Period**
The Seller warrants the Equipment supplied under this Agreement shall be free from defect in workmanship and materials and shall conform to the requirements of the Contract Documents. This warranty shall apply and commence only if the Purchaser makes all payments required of it under the Contract Documents, to the Seller, in a timely manner. This warranty shall terminate one (1) year from the date of substantial completion or eighteen (18) months after shipment of the Seller's Equipment, whichever occurs first.

**2. Remedy**
In the event of non-compliance with this warranty, the Seller shall, at its option, modify, adjust, repair or replace F.O.B. point of shipment any part or parts of the Equipment which fails to conform to such Warranty.

**3. Performance of Remedy**
If the Seller cannot or does not modify, adjust, repair or replace a defective part within a reasonable time after written notice of such defect is received by the Seller, or if an emergency exists rendering it impossible or impractical for the Seller to perform the modification, adjustment, repair or replacement, in which case the Seller will reimburse the Purchaser for the reasonable cost thereof (on a straight time basis only).

**4. Wear and Tear**
This warranty does not cover the effects of normal wear, tear, deterioration or abuse of the Equipment; or the effects of abrasion, erosion, or corrosion; or the effects of extreme temperature, improper storage or installation; or operation or maintenance not in accordance with generally accepted industry standards and practices and/or with the Seller's operating instructions and other conditions of service specified.

**5. Availability of Equipment**
The Seller shall have no obligation hereunder until the Purchaser has made the Equipment available for any modification, adjustment, repair or replacement required. Further, the Seller shall not be responsible for equipment or parts furnished by others or repairs or work done by others unless the same is specifically ordered and authorized in writing by the Seller.

**6. Adjustment to Contract Price**
In lieu of the modification, adjustment, repair or replacement of defective workmanship or material set forth above, the Purchaser may decide to accept such defective workmanship or material, in which event the Contract Price shall be subject to an equitable adjustment as determined by the Purchaser and the Seller. Adjustments to the Contract Price shall be made by the issuance of a written Change Order. If acceptance of defective workmanship or materials occurs after final payment, or if the amount specified in the Change Order exceeds the amount due on final payment, an equitable amount, as determined by the Seller and the Purchaser, shall be paid by the Seller to the Purchaser.

**7. Sole Liability / Exclusive Remedy**
The sole liability of the Seller and the exclusive remedy of the Purchaser arising out of the manufacture, sale, furnishing or installation of the Equipment hereunder or its use whether arising under contract, tort (including negligence), strict liability, or otherwise, shall be the modification, adjustment, repair or replacement of the defective Equipment, or revision to the Contract Price as set forth above.

**8. Limitation of Liability**
In any event, and subject to the remedy provided in the preceding paragraph, Purchaser acknowledges that Seller's liability shall be strictly limited to the dollar amount of the Equipment purchased by Purchaser from Seller. Purchaser expressly agrees that its purchase of the Equipment is subject to this provision and the sole remedy in the preceding paragraph, both of which are material terms for the sale of Equipment by seller - without which Seller would not otherwise sell the Equipment to Purchaser.

**9. Warranty Disclaimer**

THE SELLER AND THE PURCHASER AGREE THAT, IN CONSIDERATION OF THE ABOVE EXPRESSED WARRANTY AND THE PERFORMANCE GUARANTEE, IF ANY, SET FORTH IN THE PERFORMANCE GUARANTEE SECTION OF THE SELLER'S PROPOSAL OR QUOTATION. ALL OTHER WARRANTIES AND GUARANTEES, OTHER THAN TITLE, EITHER EXPRESSED OR IMPLIED, WHETHER ARISING UNDER LAW OR EQUITY OR CUSTOM OF TRADE, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED FROM THIS AGREEMENT.

Date:_____ Date**:**_____

Purchaser:_____ Perry Fiberglass Products, Inc.

by _____

# SECTION 11.0

# FIELD SERVICES

# Perry Fiberglass Products, Inc.

5415 Village Drive Rockledge, Florida 32955

Phone: 321.609.9036
Fax: 321.609.9003

E-mail: FRP@perryfiberglass.com

CALL PERRY FIBERGLASS FOR:

PARTS AND ACCESSORIES
TECHNICAL ASSISTANCE
ON-SITE REPAIR & SERVICE

# SECTION 12.0

# CORROSION GUIDE

# CORVE8401P

## Fire Retardant Vinyl Ester Resin

### Technical Data Sheet

CORVE8401P is a promoted, fire retardant, vinyl ester resin. This resin has a flame spread rating of ≤ 25 (Class 1) per ASTM E84 Tunnel Test without additives. Contact your Interplastic Corporation representative for specific corrosion recommendations.

| FEATURES | BENEFITS |
|---|---|
| • Flame Spread Rating 25 per ASTM E84 | • No additives to cloud laminates; easy inspections |
| • Highly Corrosion Resistant | • Resists acid, alkali, and oxidizing chemical environments |
| • Excellent Physical Properties | • Suitable for tanks, pipe, and process equipment |

| LIQUID PROPERTIES | RESULTS |
|---|---|
| Viscosity, Brookfield Model LV #3 Spindle @ 60 rpm, 77°F (25°C), cps | 400-500 |
| 100 grams resin @ 77°F (25°C), initiated with 1.2% MEKP-925H by volume * | |
| Gel Time, min:sec | 16:00-19:00 |
| Gel to Peak Exotherm Time, min:sec | 9:00-16:00 |
| Peak Exotherm | 310-360°F (154-182°C) |
| HAP Content, % (Styrene) | 40.5-42.0 |
| Specific Gravity | 1.14-1.17 |

**TYPICAL PROPERTIES**

| Thickness | 1/8 inch (3.2 mm) Casting | | | | 1/8 inch (3.2 mm) Laminate | | | |
|---|---|---|---|---|---|---|---|---|
| **Construction** | **Not Applicable** | | | | **4 Plies 1.5 oz/ft$^2$, 33% Glass Mat** | | | |
| Flexural Strength, ASTM D790 | 22,000 | psi | 150 | MPa | 25,400 | psi | 175 | MPa |
| Flexural Modulus, ASTM D790 | 5.6 x 10$^5$ | psi | 3,800 | MPa | 11.0 x 10$^5$ | psi | 7,586 | MPa |
| Tensile Strength, ASTM D638 | 13,000 | psi | 89 | MPa | 13,900 | psi | 85.8 | MPa |
| Tensile Modulus, ASTM D638 | 5.1 x 10$^5$ | psi | 3,500 | MPa | 12.8 x 10$^5$ | psi | 8,828 | MPa |
| Tensile Elongation, ASTM D638 | 6.4 | % | 6.4 | % | 1.4 | % | 1.4 | % |
| Barcol Hardness, 934-1 gauge, ASTM D2583 | 34 | | 34 | | 44-48 | | 44-48 | |
| Heat Distortion Temperature, ASTM D648 | 220 | °F | 104 | °C | -- | °F | -- | °C |

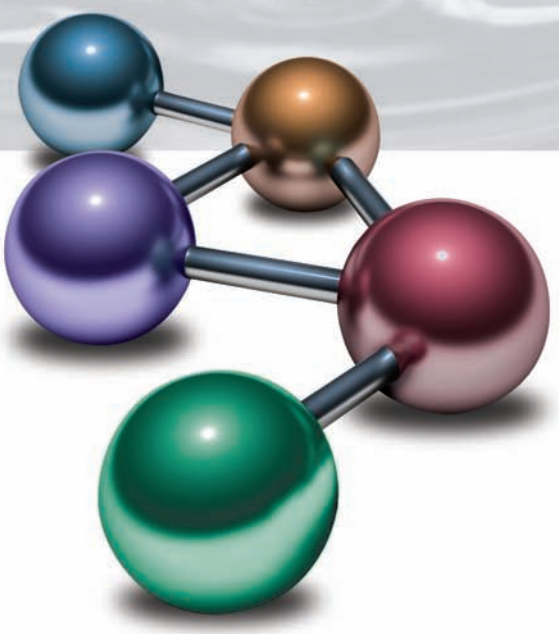
* Gel time and reactivity will vary due to the type and concentration of Free Radical Initiator (catalyst), shop temperature, humidity, and type of fillers used. In order to meet your individual needs consult our technical sales representative for assistance. If using methyl ethyl ketone peroxide (MEKP) to gel and cure CoREZYN vinyl esters, we recommend only these four brands: Cadox® L-50a (Akzo Nobel); Luperox® DHD-9 (Arkema); Hi-Point® 90 (Pergan); or Norox® MEKP-925H (United Initiators). These must be used at the appropriate percentage and suitable temperature. Contact your Interplastic Corporation representative for assistance.

**FLAME TEST PROPERTIES**

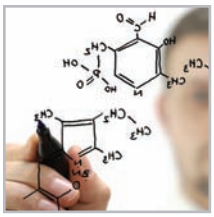
| Thickness | 1/8 inch (3.2 mm) Laminate |
|---|---|
| **Construction** | **4 Plies 1.5 oz/ft$^2$, 33% Glass Mat** |
| ASTM D635, Horizontal Burn Rate | < 1” |
| ASTM E84, Flame Spread | 25 |
| UL 94 **This is not to imply UL warranty | (V-O) (HB < 1”) (5V Pass) |
| HLT 15 | 100 |

CoREZYN®

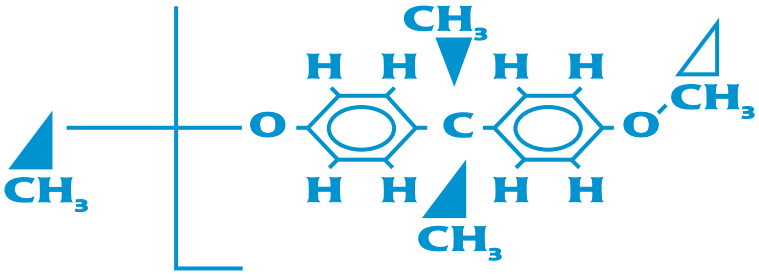
INTERPLASTIC CORPORATION
Thermoset Resins Division



The Right Chemistry.
That's What We Bring
To Vinyl Ester Resins.



# CoREZYN®
# Vinyl Ester Resins



# All You Need to Know About Vinyl Ester Resins

Vinyl ester resins are epoxy-based, thermosetting resins that are cured by free-radical initiation of polymerization, similar to the curing mechanism of conventional polyester resins. There are numerous types of reactants that make up the vinyl esters so that each resin has its own characteristic properties. However, the chemistry can be typified by the most versatile of these resins. This vinyl ester is the reaction product of a Bisphenol-A (BPA) epoxy and methacrylic acid.

The terminal carbon-carbon double bonds cross-link in a free-radical initiated polymerization. In effect, this structure allows an epoxy to react like a polyester. This by itself is very important since epoxy reactions in general are very sluggish compared to the polyester free-radical reactions. Another important feature of this structure is that it is styrene soluble; the styrene also enters into the free-radical reactions. Since styrene solutions of vinyl ester resins have low viscosity, the resultant resin solution is easily worked in the reinforced plastic processes. Epoxy resins, on the other hand, are high-viscosity materials and require more difficult and expensive processing methods.

Compared to epoxies, the vinyl esters are fast and easy to work with, quick curing and versatile. At the same time, they have been designed to retain most of the desirable properties of epoxy resins. Tensile strength, elongation and fatigue resistance of BPA vinyl esters, for example, are very close to that of the premium aromatic amine-cured epoxies, and are significantly greater than a typical orthophthalic resin, as shown in Graphs 1–4.

Because of the versatility when building from an epoxy molecule, other useful modifications become obvious when building vinyl esters for composite use.


## Novolac Epoxies

Beginning with a Novolac, in contrast to the BPA epoxy, gives (after proper design of the molecule and manufacturing in sophisticated resin reactors) a vinyl ester with superior properties at elevated temperatures, and higher capabilities in resistance to solvents and corrosive blends or mixtures of chemicals. These Novolac vinyl esters, while more costly compared to the BPA vinyl esters, are among the most corrosion-resistant unsaturated polymers available with the unbeatable vinyl ester capabilities of relative ease of gel and cure.

# Fire-Resistant and Corrosion-Resistant Vinyl Esters

These are designed from intermediates already containing the halogen (fire-resistant) component. Hence, when the scientists are "building" the vinyl ester from a BPA epoxy, they can build in the fire-resistant component by reacting it to the epoxy. Of course, the familiar additives, such as antimony compounds and halogenated waxes, also work similarly in these fire-resistant vinyl esters, as they do in fire-resistant polyesters.

The excellent adhesive characteristics of this BPA epichlorohydrin vinyl ester are the same as the adhesive properties epoxies are well known for. This is demonstrated by the compatibility with and bond strength of vinyl esters to glass, graphite fibers and to the newer high-strength organic fibers such as Kevlar®.

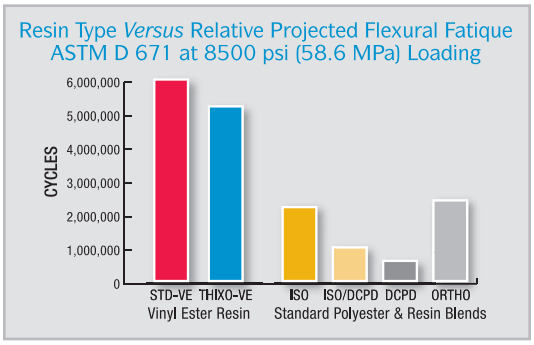
The chemical resistance of vinyl esters represents the best of the two worlds: the excellent alkali resistance of the epoxy, and the acid and oxidizing chemical resistance of the polyester. The alkali resistance is retained since there are relatively few ester linkages – only as terminal groups. These terminal ester groups are made hydrolytically stable by the hindrance afforded by the methyl group of the methacrylic acid. See our award-winning research paper, "15-Year Study of the Effective Use of Permeation Barriers in Marine Composites to Prevent Corrosion and Blistering," which graphically shows the results of water immersion tests on a variety of resins, including the thixotropic marine composite vinyl ester, and dramatically demonstrates this characteristic.

The 8400 resin does not include thixotropic agents

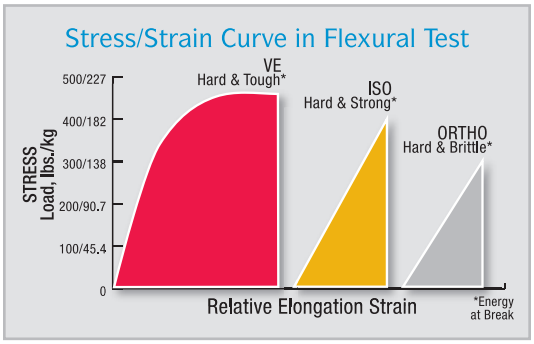
In addition, the copolymerized styrene offers steric hindrance protection to acid and oxidizing chemical attack on the ester groups. Further enhancing the overall chemical resistance of the vinyl ester, the reactive double bond sites are present only as terminal groups. These easily accessible terminal groups leave minimal residual reactive sites that would be subject to attack by corrosive chemicals in service. In contrast, conventional polyester resins have reactive double-bond sites and ester linkages throughout their molecular structure. The resulting widespread structural vulnerability greatly reduces their corrosion resistance when compared to the premium vinyl ester products.

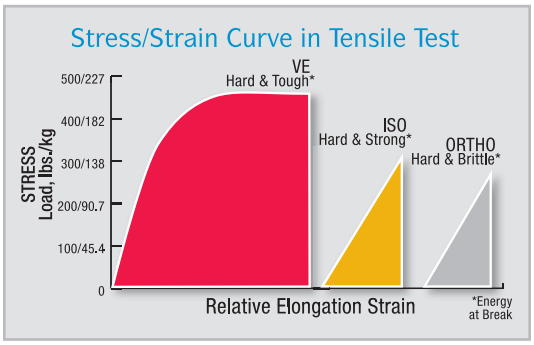
Generally speaking, corrosive attack on unsaturated resins occurs through unreacted double bonds in the resin or though hydrolysis of the ester linkage. The great advantage of vinyl ester is that the only reactive double carbon-carbon bonds are at the ends of the molecule and hence very susceptible to reaction with the double bonds (the "vinyl unsaturation") of the styrene monomer or (another great advantage of vinyl esters over polyesters) to itself. The ester linkages in polyesters occur throughout the molecule, leaving those resins much more susceptible to attack at those sites than are vinyl esters, which only have one ester linkage at each end of the molecule.

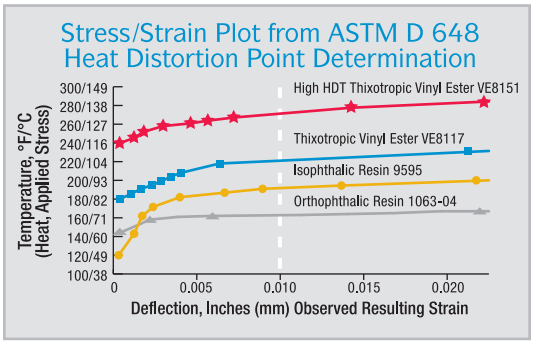
In summation, in epoxy-based vinyl ester resins, we have manufactured a polyester-type resin with all the advantages in handling characteristics, plus the superiority in physical properties and corrosion resistance the epoxy molecule imparts. Heat resistance, superior corrosion resistance, fatigue and binding resistance, as well as superior reinforcement adhesion are all obtained when designing with vinyl ester resins.




*Graph 1: Vinyl esters for outstanding fatigue resistance.*




*Graph 2, 3 and 4: Mechanical properties.*

# Vinyl Ester Products



## Typical VE Liquid Properties

| Property | VE 8100 | VE 8300 | VE 8360 | VE 8400 | VE 8450 | VE 8510 | VE 8515 | VE 8550 | VE 8710 | VE 8730 | VE 8770 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| % Non-Volatile | 50 | 55 | 63 | 60 | 60 | 60 | 66 | 60 | 55 | 63 | 60 |
| Brookfield Viscosity cps at 77°F/25°C #3 spindle at 60 rpm | 100 | 500 | 500 | 500 | 325 | 500 | 400 | 500 | 500 | 350 | 500 |
| Density in gm/ml | 1.02 | 1.03 | 1.06 | 1.17 | 1.13 | 1.03 | 1.04 | 1.05 | 1.03 | 1.03 | 1.03 |
| Flash Point Setaflash °F/°C | 86/30 | 86/30 | 86/30 | 86/30 | 86/30 | 86/30 | 86/30 | 86/30 | 100/38 | 86/30 | 100/38 |
| Reactivity: Gel Time at 77°F/25°C (min.)* | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18*** | 18 |
| Reactivity: SPI Gel Time at 180°F/82°C (min.)** | 13 | 13 | 11 | 10 | 8 | 11 | 10 | 10 | 13 | 13 | 13 |

* Test Method Only: 1 2 phr (50%) MEKP / 0.20% (12%) Cobalt / 0.50 Dimethylaniline unless otherwise noted.
** Test Method Only: 1 0 phr BPO.
*** Test Method Only: 1 2 phr (50%) MEKP / 0.15% (12%) Cobalt.

## Typical Clear Casting Properties

| Property | VE 8100 | VE 8300 | VE 8360 | VE 8400 | VE 8450 | VE 8510 | VE 8515 | VE 8550 | VE 8710 | VE 8730 | VE 8770 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tensile Strength, psi/MPa | 11,800/81.4 | 11,600/80 | 12,600/86.9 | 12,750/87.9 | 11,700/80.7 | 9,500/65.5 | 8,000/55.2 | 11,100/75.9 | 11,000/75.9 | 11,000/75.9 | 7,100/49.0 |
| Tensile Modulus, psi/GPa | 530,000/3.66 | 470,000/3.24 | 500,000/3.45 | 470,000/3.24 | 80,000/3.31 | 440,000/3.03 | 380,000/2.62 | 470,000/3.24 | 500,000/3.45 | 500,000/3.45 | 480,000/3.31 |
| Tensile Elongation, % | 4.5 | 5.0 | 4.1 | 2.5 | 4.0 | 10.0 | 15.0 | 7.0 | 2.0 | 2.5 | 1.5 |
| Flexural Strength, psi/MPa | 21,200/146 | 19,400/134 | 20,500/141 | 19,500/134 | 20,600/142 | 15,000/103 | 14,000/96.6 | 17,800/123 | 18,100/125 | 18,000/124 | 11,900/82.1 |
| Flexural Modulus, psi/GPa | 520,000/3.59 | 450,000/3.10 | 500,000/3.45 | 470,000/3.24 | 510,000/3.52 | 390,000/2.69 | 380,000/2.62 | 447,000/3.08 | 480,000/3.31 | 480,000/3.31 | 470,000/3.24 |
| Heat Distortion Temp., °F/°C | 220/104 | 210/99 | 240/115 | 225/106 | 230/109 | 175/80 | 140/60 | 189/87 | 220/104 | 270/132 | 300/149 |
| Barcol Hardness, 934-1 | 30–38 | 30–38 | 32-38 | 32–38 | 36-42 | 24–30 | 15–23 | 30–40 | 32–38 | 32–38 | 40–48 |
| Specific Gravity | 1.12 | 1.12 | 1.14 | 1.26 | 1.21 | 1.12 | 1.13 | 1.11 | 1.26 | 1.15 | 1.13 |
| % Volumetric Shrinkage | 7.9 | 7.8 | 7.0 | 7.0 | 7.0 | 7.7 | 7.6 | 6.5 | 8.6 | 9.2 | 9.4 |

## Table 5: Typical Properties of Laminates*

| Property (ASTM C-581 laminate) | VE 8100 | VE 8300 | VE 8360 | VE 8400 | VE 8450 | VE 8510 | VE 8515 | VE 8550 | VE 8710 | VE 8730 | VE 8770 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Flexural Strength, psi/MPa | 19,500/134 | 19,500/134 | 20,900/144 | 19,500/134 | 17,700/122 | 19,500/134 | 19,700/136 | 21,700/150 | 19,000/131 | 19,500/134 | 14,500/100 |
| Flexural Modulus, psi/GPa | 840,000/5.79 | 870,000/6.00 | 940,000/6.48 | 870,000/6.00 | 790,000/5.45 | 680,000/4.69 | 560,000/3.86 | 764,000/5.27 | 910,000/6.28 | 930,000/6.41 | 10,500,000/72.41 |
| Tensile Strength, psi/MPa | 13,700/94.5 | 13,800/95.2 | 14,820/102 | 13,800/95.2 | 14,500/100 | 14,200/97.9 | 14,200/97.9 | 15,000/103 | 16,200/112 | 11,800/81.4 | 11,200/77.2 |
| Tensile Modulus, psi/GPa | 1,000,000/6.90 | 980,000/6.76 | 1,340,000/9.2 | 980,000/6.76 | 1190,000/8.21 | 890,000/6.14 | 820,000/5.66 | 1,020,000/7.03 | 1,020,000/7.03 | 1,070,000/7.38 | 1,090,000/7.52 |
| Tensile Elongation, % | 1.8 | 1.9 | 1.5 | 1.9 | 1.5 | 2.2 | 2.5 | 2.1 | 1.5 | 1.6 | 1.2 |

* Construction: V/M/M/V
V = Synthetic Veil
M = 1.5 oz. Mat

## Physical Properties Retention at Various Temperatures

| Property | °C | °F | VE 8100 | VE 8300 | VE 8360 | VE 8400 | VE 8450 | VE 8510 | VE 8515 | VE 8550 | VE 8710 | VE 8730 | VE 8770 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flexural Strength, psi/MPa | -29 | -20 | 37,000/255 | 36,700/253 | 45,700/31 | 38,500/266 | ,800/240 | 37,000/255 | 42,300/292 | 37,100/256 | 39,100/270 | 39,000/269 | 30,300/209 |
| | 25 | 77 | 32,000/221 | 33,700/232 | 46,800/32 | 36,100/249 | ,900/220 | 32,100/221 | 31,700/219 | 35,600/246 | 35,700/246 | 29,800/206 | 29,000/200 |
| | 66 | 150 | 31,500/217 | 32,500/224 | 30,600/21 | 28,500/197 | ,800/199 | 17,000/117 | 12,500/86.2 | 29,500/203 | 28,900/199 | 25,400/175 | 27,000/186 |
| | 93 | 200 | 29,000/200 | 28,300/195 | 28,700/19 | 27,900/192 | ,700/177 | 5,500/37.9 | 3,200/22.1 | 17,200/119 | 27,200/188 | 25,100/173 | 25,600/177 |
| | 121 | 250 | 3,500/24.1 | 3,300/22.8 | 11,600/80 | 11,900/82.1 | ,000/55.2 | — | — | 2,700/18.6 | 11,500/79.3 | 21,000/145 | 22,100/152 |
| | 149 | 300 | — | — | — | 4,600/31.7 | | — | — | — | 5,000/34.5 | 14,900/103 | 17,000/117 |
| | 177 | 350 | — | — | — | — | | — | — | — | — | 5,600/38.6 | 9,900/68.3 |
| | 204 | 400 | — | — | — | — | | — | — | — | — | 4,700/32.4 | 6,800/46.9 |
| Flexural Modulus, psi | -29 | -20 | 1,220,000 | 1,210,000 | 1,320,00 | 1,260,000 | 1,110,000 | 1,3130,000 | 1,280,000 | 1,140,000 | 1,240,000 | 1,690,000 | 1,240,000 |
| | 25 | 77 | 1,170,000 | 1,110,000 | 1,370,00 | 1,190,000 | 1,270,000 | 1,260,000 | 1,110,000 | 1,120,000 | 1,180,000 | 1,130,000 | 1,180,000 |
| | 66 | 150 | 1,150,000 | 1,010,000 | 990,000 | 1,050,000 | 220,000 | 760,000 | 540,000 | 910,000 | 2,080,000 | 1,100,000 | 1,140,000 |
| | 93 | 200 | 960,000 | 930,000 | 900,000 | 1,010,000 | 920,000 | — | — | 600,000 | 990,000 | 1,060,000 | 1,010,000 |
| | 121 | 250 | 190,000 | 150,000 | 550,000 | 510,000 | 500,000 | — | — | 180,000 | 470,000 | 970,000 | 860,000 |
| | 149 | 300 | — | — | — | 270,000 | | — | — | — | 290,000 | 610,000 | 710,000 |
| | 177 | 350 | — | — | — | — | | — | — | — | — | — | 510,000 |
| | 204 | 400 | — | — | — | — | | — | — | — | — | — | 460,000 |
| Flexural Modulus GPa | -29 | -20 | 8.41 | 8.34 | 9.10 | 8.69 | 7.66 | 9.03 | 8.83 | 7.86 | 8.55 | 11.6 | 8.55 |
| | 25 | 77 | 8.07 | 7.66 | 9.45 | 8.21 | 8.76 | 8.69 | 7.66 | 7.72 | 8.14 | 7.79 | 8.14 |
| | 66 | 150 | 7.93 | 6.97 | 6.83 | 7.24 | 1.52 | 5.24 | 3.72 | 6.28 | 14.34 | 7.59 | 7.86 |
| | 93 | 200 | 6.62 | 6.41 | 6.21 | 6.97 | 6.34 | — | — | 4.14 | 6.83 | 7.31 | 6.97 |
| | 121 | 250 | 1.31 | 1.03 | 3.79 | 3.52 | 3.45 | — | — | 1.24 | 3.24 | 6.69 | 5.93 |
| | 149 | 300 | — | — | — | 1.86 | — | — | — | — | 2.00 | 4.21 | 4.90 |
| | 177 | 350 | — | — | — | — | — | — | — | — | — | — | 3.52 |
| | 204 | 400 | — | — | — | — | — | — | — | — | — | — | 3.17 |
| Tensile Strength, psi/MPa | -29 | -20 | 26,800/185 | 27,700/191 | 26,100/18 | 22,000/152 | ,800/192 | 25,000/172 | 22,400/154 | 24,600/170 | 21,900/151 | 22,800/157 | 23,700/163 |
| | 25 | 77 | 26,100/180 | 25,600/177 | 25,000/17 | 21,100/146 | ,700/170 | 19,400/134 | 20,500/141 | 26,700/184 | 20,400/141 | 18,000/124 | 19,500/134 |
| | 66 | 150 | 23,500/162 | 23,900/165 | 21,200/14 | 19,900/137 | ,000/166 | 19,000/131 | 19,200/132 | 27,400/189 | 20,100/139 | 17,300/119 | 19,300/133 |
| | 93 | 200 | 22,600/156 | 22,500/155 | 23,500/16 | 19,500/134 | ,000/152 | — | 18,300/126 | 22,000/152 | 19,700/136 | 16,600/114 | 18,800/130 |
| | 121 | 250 | 13,000/89.7 | 12,700/87.6 | 20,300/14 | 18,500/128 | ,300/126 | — | — | 15,300/106 | 16,800/116 | 15,800/109 | 17,900/123 |
| | 149 | 300 | — | — | — | 16,900/117 | | — | — | — | 17,100/118 | 15,000/103 | 17,600/121 |
| | 177 | 350 | — | — | — | — | | — | — | — | — | 14,100/97.2 | 17,100/118 |
| | 204 | 400 | — | — | — | — | | — | — | — | — | 9,900/68.3 | 12,300/84.8 |
| Tensile Modulus, psi | -29 | -20 | 2,010,000 | 1,960,000 | 2,020,00 | 1,820,000 | 1,840,000 | 1,950,000 | 1,860,000 | 1,090,000 | 1,730,000 | 2,210,000 | 1,960,000 |
| | 25 | 77 | 1,750,000 | 1,510,000 | 1,790,00 | 1,590,000 | 1,620,000 | 1,560,000 | 1,490,000 | 1,050,000 | 1,480,000 | 1,750,000 | 1,840,000 |
| | 66 | 150 | 1,520,000 | 1,610,000 | 1,600,00 | 1,240,000 | 1,430,000 | 1,090,000 | 980,000 | 1,120,000 | 1,280,000 | 1,490,000 | 1,410,000 |
| | 93 | 200 | 1,330,000 | 1,530,000 | 1,410,00 | 1,160,000 | 1,220,000 | — | — | 880,000 | 1,190,000 | 1,310,000 | 1,360,000 |
| | 121 | 250 | 620,000 | 1,360,000 | 690,000 | 1,090,000 | 1,080,000 | — | — | 610,000 | 110,000 | 1,240,000 | 1,310,000 |
| | 149 | 300 | — | 590,000 | — | 990,000 | | — | — | — | 950,000 | 990,000 | 1,180,000 |
| | 177 | 350 | — | — | — | — | | — | — | — | — | 980,000 | 1,120,000 |
| | 204 | 400 | — | — | — | — | | — | — | — | — | 820,000 | 1,090,000 |
| Tensile Modulus, GPa | -29 | -20 | 13.9 | 13.5 | 13.9 | 12.6 | 12.7 | 13.4 | 12.8 | 7.52 | 11.9 | 15.2 | 13.5 |
| | 25 | 77 | 12.1 | 10.4 | 12.3 | 11.0 | 11.2 | 10.8 | 10.3 | 7.24 | 10.2 | 12.1 | 12.7 |
| | 66 | 150 | 10.5 | 11.1 | 11.0 | 8.55 | 9.86 | 7.52 | 6.76 | 7.72 | 8.83 | 10.3 | 9.72 |
| | 93 | 200 | 9.17 | 10.6 | 9.72 | 8.00 | 8.41 | — | — | 6.07 | 8.21 | 9.03 | 9.38 |
| | 121 | 250 | 4.28 | 9.38 | 4.76 | 7.52 | 7.45 | — | — | 4.21 | 0.76 | 8.55 | 9.03 |
| | 149 | 300 | — | 4.07 | — | 6.83 | — | — | — | — | 6.55 | 6.83 | 8.14 |
| | 177 | 350 | — | — | — | — | — | — | — | — | — | 6.76 | 7.72 |
| | 204 | 400 | — | — | — | — | — | — | — | — | — | 5.66 | 7.52 |

Construction: V/M/M/WR/M/WR/M; 40% glass to 60% resin.
V = Synthetic Veil
M = 1.5 oz. Mat
WR = 24 oz. Woven Roving
Conversions: psi/145 = MPa; 1 GPa = 1000 MPa

## 1. Room Temperature Curing

By adjusting the promoter-catalyst levels, CoREZYN vinyl ester resins can be cured under a wide variety of room temperature cure conditions.

The cobalt-N, N-dimethylaniline (DMA)-methyl ethyl ketone peroxide (MEKP) system is generally the most satisfactory promoter catalyst system since:

- All components are liquid, making them easy to weigh, measure or meter, and mix.
- The promoters, Co-DMA, can be premixed in drums of resin or large resin batches since the stability of the mix is 90 days from the date of manufacture.
- There is more air inhibition with this system than the DMA-BPO room temperature cure system.

The benzoyl peroxide is typically stirred in first due to the difficulty of incorporation. The DMA is added just before use;* at the same time the catalyst would be added in an MEKP system.

Unless otherwise noted, all CoREZYN vinyl ester resin corrosion resistance published data is based on the Co-DMA-MEKP cure system.

***PRECAUTION: The cobalt, DMA, and then the MEKP must be separately and thoroughly mixed into the resin. Any contact of unmixed DMA or cobalt with MEKP may lead to fire or explosion. Likewise, the BPO must be thoroughly mixed into a resin before the addition of a promoter (DMA, DEA, etc.). Any contact of BPO and a promoter can result in fire or explosion.**

### MEKP Selection

Catalyzing for room temperature curing of CoREZYN vinyl ester resins requires certain considerations that may not be applicable to other classes of polyester resins. There are four brands of methyl ethyl ketone peroxide (MEKP) that seem best suited for curing CoREZYN vinyl ester resins:

- L-50 (Akzo® Nobel)
- DHD-9 (Arkema)
- Hi-Point 90 (Chemture Corporation)
- MEKP-925 (Norac® Company)

All brands of MEKP do not react at the same rate with these vinyl ester resins, even though they may contain the same percentage of MEKP and active oxygen.

**The densities of MEKP can vary. The amount of MEKP used may need to be altered. Consult your peroxide supplier for their most current information.**

A gel time check should be made with the same MEKP that will be used in production. Usually only minor changes in promoter or catalyst levels will compensate for the differences in MEKP reactivities.

### Table 9: Typical 100 Gram Cup Gel Times BPO-DMA System*

CoREZYN VE8100, VE8300, VE8360, VE8440 VE8400, VE8510, VE8515, VE8550, VE8710, VE8770

| | | Gel Time, Minutes | | |
|---|---|---|---|---|
| Temperature | Chemical | 10–20 | 21–30 | 31–40 |
| 60–69°F (15–20°C) | BPO | 2.00 | 2.00 | 2.00 |
| | DMA | 0.25 | 0.15 | 0.10 |
| 70–79°F (21–26°C) | BPO | 1.50 | 1.50 | 1.50 |
| | DMA | 0.30 | 0.20 | 0.10 |
| 80–89°F (27–32°C) | BPO | 1.00 | 1.00 | 1.00 |
| | DMA | 0.30 | 0.20 | 0.10 |

Gel times are run in 100 gram mass.
* Minimum levels of BPO and DMA in a room temperature cure system are 1 0% of active BPO and 0 075% of DMA by weight.

### Table 10: Typical 100 Gram Cup Gel Times MEKP-Cobalt System

CoREZYN VE8100, VE8300, VE8360, VE8440, VE8400 VE8510, VE8515, VE8550, VE8710, VE8770

| | | Gel Time, Minutes | | |
|---|---|---|---|---|
| Temperature | Chemical | 10–20 | 21–30 | 31–40 |
| 60–69°F (15–20°C) | MEKP | 2.00 | 2.00 | 1.50 |
| | 12% Cobalt | 0.20 | 0.20 | 0.20 |
| | DMA | 0.17 | 0.10 | 0.05 |
| | 2,4-PD* | — | — | — |
| 70–79°F (21–26°C) | MEKP | 1.50 | 1.50 | 1.25 |
| | 12% Cobalt | 0.20 | 0.20 | 0.20 |
| | DMA | 0.05 | 0.05 | 0.05 |
| | 2,4-PD* | — | 0.05 | 0.05 |
| 80–89°F (27–32°C) | MEKP | 1.25 | 1.25 | 1.25 |
| | 12% Cobalt | 0.20 | 0.20 | 0.20 |
| | DMA | 0.05 | — | — |
| | 2,4-PD* | — | — | 0.05 |

*2,4-Pentanedione (acetyl acetone).
Gel times are run in 100 gram mass.
Longer gel times can be achieved with additional 2,4-Pentanedione.
Catalyst is (50%) MEKP by volume.
**The densities of MEKP can vary. The amount of MEKP used may need to be altered. Consult your peroxide supplier for their most current information.**

The maximum level of 12% cobalt that should be used with any of the CoREZYN vinyl ester resins is 0.25%. If 6% cobalt is used, the maximum level is 0.50%.

Cobalt levels above this limit will not only inhibit the cure, but will decrease the physical properties and corrosion resistance of the resin and laminates.

Under normal conditions of fabrication, a minimum level of 0.05% DMA is recommended to ensure complete cure. This is especially true when working with thin films or thin laminates. A minimum of 0.05% to 0.075% DMA should always be used in these applications. With higher temperature fabrication (over 90°F/32°C), DMA may be eliminated since the high ambient temperature will ensure complete cure. Inclusion of DMA under these conditions may shorten the pot life excessively.

In the fabrication of exceptionally thick sections, even at normal ambient temperatures, DMA may be eliminated, as the exothermic heat generated will ensure complete cure. Inclusion of DMA with such fabrications may cause excessive exothermic heat leading to delamination and possible warping.

Cure temperatures below 60°F/15°C should be avoided to ensure complete cure. When this is not possible, it may be necessary to post-cure to obtain the required Barcol hardness. The Barcol hardness should attain at least 90% of the value given in Table 4, "Typical Clear Casting Properties," (page 7) for the resin used.

Often the resin temperature will be appreciably different from the temperature of the mold being used in the fabrication. When this is the case, the pot life of the resin will be considerably different from the gel time of the laminate on the mold. Compensations for this will need to be made by adjusting the catalyst-promoter levels.

Tables 9 through 13 will be useful in determining catalyst-promoter levels.

ArmorGRIP® panels by Insituform are assembled to rehabilitate a large sewer line.

## 2. Elevated Temperature Curing

The same catalysts that are used with polyesters at elevated temperatures can be used with CoREZYN vinyl esters.

Benzoyl peroxide is commonly used for elevated temperature curing. Used at a level of 1–2% of active BPO, the pot life is several days, yet rapid cures are obtained at temperatures over 180°F/82°C. The half-life data published by the manufacturers of the many available catalysts can be used as a guide for comparative time-temperature reactivities. Combinations of catalysts are recommended to obtain optimum properties and to reduce cure time schedules.

## 3. Air Inhibition

CoREZYN vinyl esters are subject to air inhibition similar to conventional polyesters. To eliminate this, a recommended solution of wax-in-styrene can be added. Consult your Thermoset Resins Division representative for complete information.

**PRECAUTION should be taken to eliminate the use of any wax in the laminate where subsequent laminating or overcoating will be used. The migration of the wax to the surface will prevent adhesion and delamination may occur. Where secondary bonding operations are to be performed, special care should be taken to ensure that all wax has been removed from the bonding surfaces.**

## 4. Reinforcement Compatibility

CoREZYN vinyl ester resins are compatible with a wide variety of fiberglass finishes. For specific recommendations, check with suppliers of fiberglass reinforcement materials.

CoREZYN vinyl esters show exceptional compatibility and inter-laminar shear strength when used with carbon, graphite, boron, and high-strength organic fibers like KEVLAR.

## Gel Time Adjustment

Gel times of vinyl esters can be adjusted with several chemicals. The addition of these chemicals can greatly decrease the shelf life of these products, so care should be taken to monitor the resin after the addition of any chemicals. If the additives are not thoroughly mixed into the resin, it can also cause the resin to have a dramatically shorter shelf life. These chemicals should be uniformly mixed into the resin before it is used.

A recommended procedure for making additions to drums or other large quantities is to incorporate the additives individually into a small portion of the resin, mix it thoroughly, then add the mixture to the rest of the resin, and mix it to a uniform consistency. The gel time should be checked on the mixture before using to ensure the desired results.

A 100 gram gel time can be checked on the mixture to ensure it has the desired gel and a laminate tested for cure properties. The chemicals noted in Table 11 can be used to adjust the gel time of the vinyl ester resins.

## Post-Cure

When post-curing fiber-reinforced plastics, dwell time at specific temperatures is critical to ensure you are sufficiently curing the composite. The times/temperatures listed are the minimum times recommended for curing the composite after the whole mass has reached the specific temperature.

| | |
|---|---|
| 125°F (52°C) | 48 hours |
| 140°F (60°C) | 24 hours |
| 150°F (66°C) | 16 hours |
| 200°F (93°C) | 4 hours |
| 250°F (121°C) | 2 hours |

Post-curing should be done with hot air or radiant heat. Hot water can attack the composite to degrade the physical properties and corrosion resistance.

## Table 11: Promoters and Inhibitors Used for Gel Time Adjustments

| Chemical | Typical Levels Weight Percent | Effects | Problems |
|---|---|---|---|
| 12% Cobalt[1,2] (12% Co) | 0.025–0.25 | Shortens gel time. | Resin can gel but not cure properly if too much is added. |
| N, N-Dimethylaniline[1] (DMA) | 0.01–0.25 | Shortens gel time, improves cure development. | Increases exotherm and decreases shelf life. |
| N, N-Diethylaniline[1] (DEA) | 0.01–0.25 | Shortens gel time, improves cure development. | Increases exotherm and decreases shelf life. |
| 2,4-Pentanedione[1] (2,4-PD) | 0.01–0.25 | Lengthens gel time without increasing the gel-to-cure interval. | Increases exotherm and decreases shelf life. |
| 10% solution of T-Butyl Catechol[1] | 0.01–0.30 | Lengthens gel time. | Gel time may lengthen over time. |

1. Resins may already have these present, so care must be taken not to exceed the maximum in the resin.
2. N, N-DMA is preferred to shorten the gel time.

## Table 12: MEKP/Promoter—Thin Laminate Construction

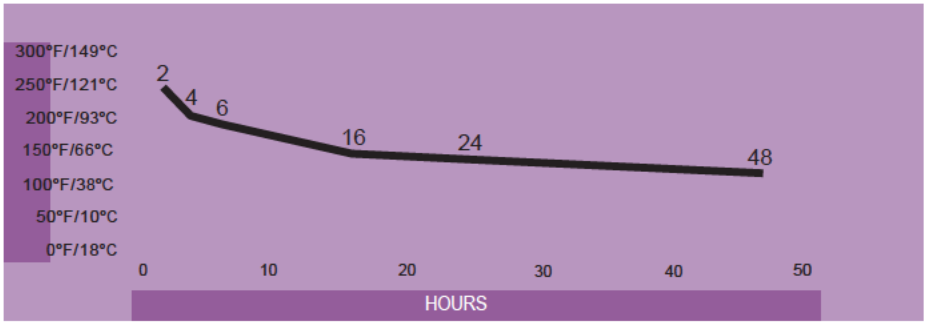
CoREZYN VE8100, VE8300, VE8440,VE8400, VE8510, VE8710, VE8770

| | | Gel Time Minutes | | |
|---|---|---|---|---|
| Temperature | Chemical | 10-20 | 21-30 | 31-40 |
| 60–69°F (15–20°C) | MEKP | 2.00 | 2.00 | 2.00 |
| | 12% Cobalt | 0.20 | 0.20 | 0.15 |
| | DMA | 0.17 | 0.10 | 0.075 |
| | 2,4-PD | — | — | — |
| 70–79°F (21–26°C) | MEKP | 2.00 | 2.00 | 1.75 |
| | 12% Cobalt | 0.12 | 0.15 | 0.15 |
| | DMA | 0.075 | 0.05 | 0.05 |
| | 2,4-PD | — | 0.05 | 0.05 |
| 80–89°F (27–32°C) | MEKP | 1.75 | 1.75 | 1.75 |
| | 12% Cobalt | 0.15 | 0.15 | 0.15 |
| | DMA | 0.05 | 0.05 | 0.05 |
| | 2,4-PD | 0.02 | 0.05 | 0.075 |

Gel times are run in 100 gram mass.
Longer gel times can be achieved with additional 2,4-Pentanedione.
Catalyst is (50%) MEKP by volume.

**The densities of MEKP can vary. The amount of MEKP used may need to be altered. Consult your peroxide supplier for their most currect information.**

RECOMMENDATIONS FOR A POST-CURE SCHEDULE



# VE Chemical Resistance

The guidelines that follow are intended to cover only parts and equipment manufactured according to industry standards such as The Society for the Plastic Industry's *Quality Assurance Report, RTP Corrosion-Resistant Equipment.*

## Table 14: Chemical Resistance of CoREZYN Vinyl Ester Resins

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| **A** | | | | | | | | |
| Acetaldehyde | | NR | NR | NR | – | – | NR | NR |
| Acetic Acid | 1–10 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 150 / 66 | 140 / 60 | 140 / 60 |
| | 11–25 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 150 / 66 | 140 / 60 | – |
| | 26–50 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 75 / 24 | – |
| | 51–75 | 150 / 6 | 150 / 66 | 80 / 82 | 150 / 66 | 125 / 52 | 75 / 24 | – |
| Acetic Anhydride | | NR | NR | 00 / 38 | 100 / 38 | NR | NR | NR |
| Acetone | 100 | NR | NR | NR | NR | NR | NR | NR |
| Acrylic Acid (4) | 25 | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | 80 / 27 | NR | 80 |
| Acrylonitrile | All | NR | NR | NR | NR | NR | NR | NR |
| Alcohol, Butyl | All | 100 / 3 | 100 / 38 | 20 / 49 | 120 / 49 | 120 / 49 | NR | NR |
| Alcohol, Ethyl | 10 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 120 / 49 | 120 / 49 |
| | 95 | 80 / 27 | 80 / 27 | 00 / 38 | 100 / 38 | 100 / 38 | NR | NR |
| Alcohol, Isopropyl | 10 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 140 / 60 | 140 / 60 |
| | 100 | 100 / 3 | 100 / 38 | 20 / 49 | 120 / 49 | 120 / 49 | NR | NR |
| Alcohol, Methyl | 5 | 120 / 4 | 120 / 49 | 20 / 49 | 120 / 49 | 120 / 49 | NR | 100 / 38 |
| | 20 | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | 100 / 38 | NR | NR |
| | 100 | NR | NR | NR | 90 / 32 | 90 / 32 | NR | NR |
| Alcohol, Secondary Butyl | All | 100 / 3 | 100 / 38 | 20 / 49 | 120 / 49 | 120 / 49 | NR | NR |
| Allyl Chloride | All | NR | NR | NR | 80 / 27 | 80 / 27 | NR | NR |
| Alum | All | 210 / 9 | 210 / 99 | 20 / 104 | 250 / 121 | 210 / 99 | 140 / 60 | 140 / 60 |
| Aluminum Chloride | All | 210 / 9 | 210 / 99 | 20 / 104 | 250 / 121 | 210 / 99 | 140 / 60 | NR |
| Aluminum Fluoride (2) | All | 80 / 27 | 80 / 27 | 80 / 27 | 80 / 27 | 80 / 27 | NR | 140 / 60 |
| Aluminum Hydroxide (2) | All | 180 / 8 | 180 / 82 | 00 / 93 | 200 / 93 | 150 / 66 | 140 / 60 | 140 / 60 |
| Aluminum Nitrate | All | 160 / 7 | 160 / 71 | 80 / 82 | 180 / 82 | 180 / 82 | 100 / 38 | 160 / 71 |
| Aluminum Potassium Sulfate | All | 210 / 9 | 210 / 99 | 20 / 104 | 250 / 121 | 220 / 104 | 140 / 60 | 160 / 71 |
| Ammonia, Aqueous | 20 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 120 / 49 | 120 / 49 | 150 / 66 |
| Ammonia, Gas (Dry) | 100 | 100 / 3 | 100 / 38 | 80 / 82 | 100 / 38 | 100 / 38 | 100 / 38 | 100 / 38 |
| Ammonia, Liquified Gas | | NR | NR | NR | NR | NR | NR | NR |
| Ammonium Acetate | 65 | 80 / 27 | 80 / 27 | 80 / 27 | 80 / 27 | 80 / 27 | NR | NR |
| Ammonium Bicarbonate | 1–50 | 160 / 7 | 160 / 71 | 60 / 71 | 160 / 71 | 140 / 60 | 140 / 60 | 140 / 60 |
| Ammonium Bisulfite (Black Liquor) | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 120 / 49 | NR | – |
| Ammonium Carbonate | All | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 120 / 49 | 120 / 49 |
| Ammonium Chloride (2) | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ammonium Citrate | All | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 120 / 49 | 120 / 49 |
| Ammonium Fluoride (2) | All | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 120 / 49 | 120 / 49 |
| Ammonium Hydroxide (2) | 5 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 140 / 60 | – |
| | 10 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 120 / 49 | 120 / 49 | – |
| | 20 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 120 / 49 | 120 / 49 | – |
| | 29 | 100 / 3 | 100 / 38 | 50 / 66 | 180 / 82 | 100 / 38 | NR | NR |
| Ammonium Nitrate | All | 210 / 9 | 210 / 99 | 20 / 104 | 250 / 121 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ammonium Persulfate | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | 160 / 71 |

# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | E8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Ammonium Phosphate | 65 | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 180 / 82 | 140 / 60 | 160 / 71 |
| Ammonium Sulfate | All | 210 / 99 | 210 / 99 | 0 / 104 | 250 / 121 | 210 / 99 | 140 / 60 | 160 / 71 |
| Amyl Acetate | 100 | NR | NR | 0 / 21 | 120 / 49 | 120 / 49 | NR | NR |
| Aniline | All | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| Aniline Hydrochloride | All | 150 / 66 | 150 / 66 | 80 / 82 | 180 / 82 | 150 / 66 | 140 / 60 | – |
| Aniline Sulfate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | – |
| Arsenic Acid | All | 100 / 38 | 100 / 38 | 00 / 38 | 100 / 38 | 80 / 27 | NR | NR |
| Arsenious Acid | All | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | – | 120 / 49 |
| **B** | | | | | | | | |
| Barium Acetate | All | 190 / 88 | 190 / 88 | 90 / 88 | 190 / 88 | 150 / 66 | 140 / 60 | – |
| Barium Carbonate | All | 210 / 99 | 210 / 99 | 0 / 104 | 250 / 121 | 250 / 121 | 140 / 60 | 160 / 71 |
| Barium Chloride | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Barium Hydroxide (2) | 1–10 | 150 / 66 | 150 / 66 | 80 / 82 | 150 / 66 | 120 / 49 | 100 / 38 | 120 / 49 |
| Barium Sulfate | All | 210 / 99 | 210 / 99 | 10 / 99 | 250 / 121 | 210 / 99 | 140 / 60 | 160 71 |
| Barium Sulfide | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | – |
| Beer | 100 | 120 / 4 | – | – | – | – | – | – |
| Benzene (4) | 100 | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| 5% Benzene in Kerosene | | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | – |
| Benzene Sulfonic Acid | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Benzoic Acid | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| O-Benzoyl Benzoic Acid | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | – |
| Benzyl Alcohol | 100 | NR | NR | 0 / 27 | 100 / 38 | 100 / 38 | NR | NR |
| Benzyl Chloride | 100 | NR | NR | NR | 80 / 27 | NR | NR | NR |
| Black Liquor Recovery (furnace gasses) | | 325 / 16 | 325 / 163 | 0 / 177 | 400 / 204 | 350 / 177 | – | – |
| Brass Plating Solution: 3% Copper Cyanide 6% Sodium Cyanide 1% Zinc Cyanide 3% Sodium Carbonate | | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | – | 160 / 71 |
| Brine | All | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 130/54 |
| Bromic Acid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Bromine, Liquid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Bromine Water (2) | 5 | 180 / 82 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | 120 / 49 | – |
| Bronze Plating Solution: 4% Copper Cyanide 5% Sodium Cyanide 3% Sodium Carbonate 4.5% Rochelle Salts | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | – | – |
| Butanol (see Alcohol, Butyl) | | | | | | | | |
| Butyl Acetate | All | NR | NR | NR | 80 / 27 | 80 / 27 | NR | NR |
| Butyl Benzyl Phthalate | 100 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | – | – |
| Butyl Carbitol | 100 | – | – | 00 / 38 | 100 / 38 | 100 / 38 | – | – |
| Butyl Cellosolve | 100 | NR | NR | 00 / 38 | 100 / 38 | 100 / 38 | – | – |
| Butylene Glycol | 100 | 160 / 71 | 160 / 71 | 80 / 82 | 180 / 82 | 180 / 82 | – | NR |
| Butyric Acid | 1–50<br>100 | 210 / 99<br>NR | 210 / 99<br>NR | 10 / 99<br>00 / 38 | 210 / 99<br>100 / 38 | 210 / 99<br>NR | –<br>NR | –<br>NR |
| **C** | | | | | | | | |
| Cadmium Chloride | All | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | 160 / 71 |

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# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Cadmium Cyanide Plating Solution 3% Cadmium Oxide 10% Sodium Cyanide 1% Caustic Soda | | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | – | 160 / 71 |
| Calcium Bisulfite | All | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | 160 / 71 |
| Calcium Carbonate | All | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | 160 / 71 |
| Calcium Chlorate (2) | All | 210 / 99 | 210 / 99 | 220 / 104 | 250 / 121 | 210 / 99 | – | 160 / 71 |
| Calcium Chloride (2) | All | 210 / 99 | 210 / 99 | 220 / 104 | 250 / 121 | 210 / 99 | 140 / 60 | 160 / 71 |
| Calcium Hydroxide (2) | All | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | – | 160 / 71 |
| Calcium Hypochlorite (1) (2) | All | 160 / 71 | 180 / 82 | 180 / 82 | 150 / 66 | 140 / 60 | 100 / 38 | 120 / 49 |
| Calcium Nitrate | All | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Calcium Sulfate | All | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Calcium Sulfite | All | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | 160 / 71 |
| Cane Sugar Liquor | All | 180 / 82 | – | – | – | – | – | – |
| Caprylic Acid (Octanoic Acid) | 100 | 180 / 82 | 180 / 82 | 210 / 99 | 210 / 99 | 180 / 82 | – | 160 / 71 |
| Carbon Dioxide Gas | | 210 / 99 | 210 / 99 | 240 / 116 | 350 / 177 | 350 / 177 | 140 / 60 | 160 / 71 |
| Carbon Disulfide | 100 | NR | NR | NR | NR | NR | NR | NR |
| Carbon Monoxide Gas | | 210 / 99 | 210 / 99 | 240 / 116 | 350 / 177 | 350 / 177 | 140 / 60 | 160 / 71 |
| Carbon Tetrachloride | 100 | 100 / 38 | 100 / 38 | 150 / 66 | 150 / 66 | 150 / 66 | – | – |
| Carbonic Acid | All | 100 / 38 | 100 / 38 | 150 / 66 | 150 / 66 | – | – | – |
| Carbowax | 100 | 100 / 38 | 100 / 38 | 100 / 38 | 100 / 38 | 100 / 38 | – | – |
| Carboxy Ethyl Cellulose | 10 | 150 / 66 | 150 / 66 | 150 / 66 | 150 / 66 | 150 / 66 | – | 120 / 49 |
| Carboxy Methyl Cellulose | 10 | 150 / 66 | 150 / 66 | 150 / 66 | 150 / 66 | 150 / 66 | – | 120 / 49 |
| Castor Oil | 100 | 75 / 24 | 75 / 24 | 100 / 38 | 120 / 49 | 120 / 49 | – | 120 / 49 |
| Caustic (2) (See Sodium Hydroxide) | | | | | | | | |
| Chlorinated Brine Liquors (2)(5) (caustic chlorine cell) | | | | Consult Laboratory | | | | |
| Chlorinated Wax | All | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | – |
| Chlorine Dioxide/Air | 5/95 | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | – | – |
| Chlorine Dioxide, Wet Gas | 5 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | – |
| Chlorine, Dry Gas | 100 | 210 / 99 | 210 / 99 | 210 / 99 | 200 / 93 | 200 / 93 | 140 / 60 | 160 / 71 |
| Chlorine, Wet Gas | 100 | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | 140 / 60 | 160 / 71 |
| Chlorine Liquid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Chlorine Water (2) | Sat. | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | NR |
| Chloroacetic Acid | 25<br>50<br>Conc | 120 / 49<br>100 / 38<br>NR | 120 / 49<br>100 / 38<br>NR | 120 / 49<br>100 / 38<br>NR | 120 / 49<br>100 / 38<br>NR | –<br>–<br>NR | NR<br>NR<br>NR | NR<br>NR<br>NR |
| Chlorobenzene (4) | 100 | NR | NR | 90 / 32 | 100 / 38 | 100 / 38 | NR | NR |
| Chloroform | 100 | NR | NR | NR | NR | NR | NR | NR |
| Chlorosulfonic Acid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Chrome Plating Bath 19% Chromic Acid Sodium Fluorosilicate Sulfate | | – | – | 140 / 60 | – | – | – | – |
| Chromic Acid | 10<br>20<br>30 | 150 / 66<br>120 / 49<br>NR | 150 / 66<br>120 / 49<br>NR | 150 / 66<br>150 / 66<br>120 / 49 | 150 / 66<br>150 / 66<br>NR | NR<br>NR<br>NR | NR<br>NR<br>NR | –<br>100 / 38<br>NR |
| Chromium Sulfate | All | 150 / 66 | 150 / 66 | 180 / 82 | 180 / 82 | 150 / 66 | – | – |
| Citric Acid | All | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |

Conc – Concentrated
Sat'd – Saturated
NR – Not Recommended
– No Data on Environment
(1) BPO/DMA Cure Recommended
(2) Synthetic Veil Recommended
(3) C-Glass Recommended
(4) Post-Cure Recommended
(5) Consult Laboratory for Specific Recommendation

All services within 20°F/11°C maximum service temperature should be post-cured to ensure a long service life.

# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Coconut Oil | 100 | 180 / 8 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | 140 / 60 | 160 / 71 |
| Copper Brite Plating (2) Caustic-Cyanide | | 160 / 7 | 160 / 71 | 90 / 88 | 160 / 71 | – | – | – |
| Copper Chloride | All | 210 / 9 | 210 / 99 | 50 / 121 | 250 / 121 | 250 / 121 | 140 / 60 | 160 / 71 |
| Copper Cyanide | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | 160 / 71 |
| Copper Fluoride (2) | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | – |
| Copper Matte Dipping Bath: 30% Ferric Chloride 19% Hydrochloric Acid | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | – |
| Copper Nitrate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | – | |
| Copper Pickling Bath: 10% Ferric Sulfate 10% Sulfuric Acid | | 200 / 9 | 200 / 93 | 00 / 93 | 200 / 93 | – | – | – |
| Copper Plating Solution: Copper Cyanide 10.5% Copper 14% Sodium Cyanide 6% Rochelle Salts | | 160 / 7 | 160 / 71 | 90 / 88 | 160 / 71 | – | – | |
| Copper Plating Solution: 45% Copper Fluoroborate 19% Copper Sulfate 8% Sulfuric Acid | | 160/7 | 180 / 82 | 80 / 82 | 200 / 93 | 180 / 82 | – | – |
| Copper Sulfate | All | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | – | – | 160 / 71 |
| Corn Oil | 100 | 210 / 9 | 190 / 88 | 10 / 99 | 210 / 99 | 210 / 99 | – | – |
| Corn Starch, Slurry | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | – |
| Corn Sugar | All | 210 / 9 | – | – | – | – | – | 120 / 49 |
| Cottonseed Oil | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | – | NR |
| Cresylic Acid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Crude Oil, Sour | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | 210 / 99 | – | 120 / 49 |
| Crude Oil, Sweet | 100 | 210 / 9 | 210 / 99 | 210 / 99 | 250 / 121 | 210 / 99 | 120 / 49 | – |
| Cumene | 100 | 80 / 2 | 80 / 27 | 00 / 38 | 120 / 49 | 120 / 49 | NR | – |
| Cyclohexane | 100 | 120 / 4 | 120 / 49 | 20 / 49 | 150 / 66 | 150 / 66 | – | – |
| Cyclohexanone | 100 | 100 / 3 | 100 / 38 | 00 / 38 | 120 / 49 | 120 / 49 | NR | – |
| **D** | | | | | | | | |
| Deionized Water | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Demineralized Water | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Detergents, Sulfonated | All | 210 / 9 | 210 / 99 | 10 / 99 | 220 / 104 | 220 / 104 | – | – |
| Diallyl Phthalate | 100 | 180 / 8 | 180 / 82 | 10 / 99 | 210 / 99 | 210 / 99 | – | 120 / 49 |
| Diammonium Phosphate | 65 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Dibromophenol (2) | 100 | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| Dibutyl Ether | 100 | 80 / 27 | 80 / 27 | 80 / 27 | 150 / 66 | 150 / 66 | NR | – |
| Dichlorobenzene | 100 | NR | NR | 20 / 49 | 120 / 49 | 120 / 49 | NR | NR |
| Dichloroethylene | 100 | NR | NR | NR | NR | NR | NR | NR |
| Dichloromonomethane | 100 | NR | NR | NR | NR | NR | NR | NR |
| Dichloropropane | 100 | NR | NR | NR | 100 / 38 | – | NR | NR |
| Dichloropropene | 100 | NR | NR | NR | 80 / 27 | – | NR | NR |
| Diesel Fuel | 100 | 180 / 8 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | NR | 120 / 49 |
| Diethanolamine | 100 | 80 / 27 | 80 / 27 | 00 / 38 | 120 / 49 | 100 / 38 | NR | NR |
| Diethylamine | 100 | NR | NR | NR | NR | NR | NR | NR |

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# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Diethylbenzene | 100 | 80 / 27 | 80 / 27 | 00 / 38 | 120 / 49 | 120 / 49 | NR | NR |
| Diethyl Carbonate | 100 | NR | NR | NR | 80 / 27 | – | NR | NR |
| Diethylene Glycol | 100 | 180 / 82 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | NR | 150 / 66 |
| Diethylhexyl Phosphoric Acid (in Kerosene) | 20 | 120 / 49 | 120 / 49 | 50 / 66 | 150 / 66 | 120 / 49 | 100 / 38 | – |
| Diethyl Sulfate | 100 | NR | NR | 00 / 38 | 100 / 38 | 100 / 38 | – | – |
| Diisobutylene | 100 | 100 / 38 | 100 / 38 | 00 / 38 | 120 / 49 | 100 / 38 | – | – |
| Diisobutyl Phthalate | 100 | 150 / 66 | 150 / 66 | 30 / 82 | 200 / 93 | 200 / 93 | 100 / 38 | – |
| Diisopropanolamine | 100 | 100 / 38 | 100 / 38 | 50 / 66 | 150 / 66 | 150 / 66 | NR | NR |
| Dimethyl Formamide | 100 | NR | NR | NR | NR | NR | NR | NR |
| Dimethyl Morpholine | 100 | NR | NR | NR | 100 / 38 | – | NR | NR |
| Dimethyl Phthalate | 100 | 150 / 66 | 150 / 66 | 30 / 82 | 180 / 82 | 180 / 82 | 100 / 38 | – |
| Dioctyl Phthalate | 100 | 150 / 66 | 150 / 66 | 50 / 66 | 200 / 93 | 200 / 93 | 100 / 38 | 120 / 49 |
| Dipropylene Glycol | 100 | 180 / 82 | 180 / 82 | 00 / 93 | 210 / 99 | 210 / 99 | 100 / 38 | 120 / 49 |
| Distilled Water (see Water, Distilled) | | | | | | | | |
| DMA 4 Weed Killer, 2,4D | 100 | – | – | 20 / 49 | – | – | – | – |
| DMA 6 Weed Killer | 100 | – | – | 20 / 49 | – | – | – | – |
| Dodecyl Alcohol | 100 | 150 / 66 | 150 / 66 | 30 / 82 | 180 / 82 | 180 / 82 | – | – |
| **E** | | | | | | | | |
| EDTA | All | 100 / 38 | 100 / 38 | 00 / 38 | 100 / 38 | 100 / 38 | NR | NR |
| Electrosol | 5 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | – | – |
| Epichlorohydrin | 100 | NR | NR | NR | – | – | NR | NR |
| Epoxidized Soybean Oil | 100 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 100 / 38 | 120 / 49 |
| Esters, Fatty Acids | 100 | 180 / 82 | 180 / 82 | 30 / 82 | 180 / 82 | 180 / 82 | – | 120 / 49 |
| Ethanol, (see Alcohol, Ethyl) | | | | | | | | |
| Ethyl Acetate | 100 | NR | NR | NR | – | – | NR | NR |
| Ethyl Acrylate | 100 | NR | NR | NR | NR | NR | NR | NR |
| Ethyl Benzene | 100 | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| Ethyl Bromide | 100 | NR | NR | NR | NR | NR | NR | NR |
| Ethyl Chloride | 100 | NR | NR | NR | – | – | NR | NR |
| Ethyl Ether | 100 | NR | NR | NR | NR | NR | NR | NR |
| Ethylene Chlorohydrin | 100 | NR | NR | 00 / 38 | 100 / 38 | – | NR | NR |
| Ethylene Glycol | 100 | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Ethylene Glycol Monobutyl Ether | 100 | – | – | 00 / 38 | 100 / 38 | 100 / 38 | NR | NR |
| Ethyl Sulfate | All | 80 / 27 | 80 / 27 | 00 / 38 | 100 / 38 | 100 / 38 | NR | NR |
| **F** | | | | | | | | |
| Fatty Acids | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Ferric Chloride | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ferric Nitrate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ferric Sulfate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ferrous Chloride | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ferrous Nitrate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Ferrous Sulfate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| 8-8-8 Fertilizer | | 120 / 49 | 120 / 49 | 20 / 49 | 120 / 49 | 120 / 49 | – | 120 / 49 |
| Fertilizer-Urea Ammonium Nitrate | All | 120 / 49 | 120 / 49 | 20 / 49 | 120 / 49 | 120 / 49 | – | – |
| Flue gas | | 325 / 163 | 325 / 163 | 0 / 171 | 340 / 171 | 340 / 171 | – | – |

Conc – Concentrated
Sat'd – Saturated
NR – Not Recommended
– No Data on Environment
(1) BPO/DMA Cure Recommended
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(3) C-Glass Recommended
(4) Post-Cure Recommended
(5) Consult Laboratory for Specific Recommendation

All services within 20°F/11°C maximum service temperature should be post-cured to ensure a long service life.

# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | E8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Fluoboric Acid | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | – | 120 / 49 |
| Fluosilicic Acid | 10 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | 120 / 49 |
| | 20 | 100 / 38 | 100 / 38 | 00 / 38 | 100 / 38 | – | – | NR |
| Formaldehyde | All | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | – | – |
| Formic Acid | 10 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | 120 / 49 |
| | 85 | 90 / 32 | – | – | 100 / 38 | 100 / 38 | 100 / 38 | 100 / 38 |
| Freon 11 | 100 | 80 / 27 | 80 / 27 | 0 / 27 | 80 / 27 | 80 / 27 | – | 120 / 49 |
| Fuel Oil | 100 | 180 / 82 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | 140 / 60 | 120 / 49 |
| Furfural | 5 | 120 / 49 | 120 / 49 | 50 / 66 | 150 / 66 | 150 / 66 | – | NR |
| | 100 | NR | NR | NR | NR | NR | NR | NR |
| **G** | | | | | | | | |
| Gallic Acid | Sat'd | – | – | – | 100 / 38 | – | – | – |
| Gas, Natural | 100 | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | – |
| Gasohol (5) | | | Cons t Laboratory | | | | | |
| Gasoline, Auto (leaded and unleaded) | 100 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | – |
| Gasoline, Aviation | 100 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | 120 / 49 |
| Gasoline, Ethyl | 100 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | – |
| Gasoline, Sour | 100 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | – |
| Gluconic Acid | 50 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | – |
| Glucose | All | 210 / 99 | 210 / 99 | 10 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | – |
| Glutaraldehyde | 50 | 120 / 49 | 120 / 49 | 20 / 49 | 120 / 49 | 120 / 49 | – | 100 / 38 |
| Glutaric Acid | 50 | 120 / 49 | 120 / 49 | 20 / 49 | 120 / 49 | – | – | – |
| Glycerine | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Glycol, Ethylene | 100 | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Glycol, Propylene | 100 | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Glycolic Acid | 10 | 180 / 82 | 180 / 82 | 00 / 93 | 200 / 93 | – | – | – |
| (Hydroxyacetic Acid) | 70 | 80 / 27 | 80 / 27 | 00 / 38 | 100 / 38 | – | – | – |
| Glyoxal | 40 | 80 / 27 | 80 / 27 | 0 / 27 | 80 / 27 | 80 / 27 | – | – |
| Gold Plating Solution: 63% Potassium Ferrocyanide 0.2% Potassium Gold Cyanide 0.8% Sodium Cyanide | | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | 140 / 60 |
| **H** | | | | | | | | |
| Heptane | 100 | 200 / 93 | 200 / 93 | 00 / 93 | 200 / 93 | 200 / 93 | 140 / 60 | 150 / 66 |
| Hexane | 100 | 160 / 71 | 160 / 71 | 60 / 71 | 160 / 71 | 160 / 71 | 120 / 49 | – |
| Hexylene Glycol | 100 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | 140 / 60 | 140 / 60 |
| Hot Stack Gasses | | 340 / 171 | 340 / 171 | 0 / 171 | 340 / 171 | 340 / 171 | – | – |
| Hydraulic Fluid | | | | | | | | |
| Organic | 100 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | 120 / 49 |
| Synthetic | 100 | – | – | – | 120 / 49 | – | – | – |
| Hydrazine | 70 | NR | NR | NR | NR | NR | NR | NR |
| Hydrobromic Acid (2) | 25 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 140 / 60 | – | 160 / 71 |
| | 48 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | 120 / 49 | – | 120 / 49 |
| | 60 | 100 / 38 | 100 / 38 | 00 / 38 | 100 / 38 | 80 / 27 | – | NR |
| Hydrochloric Acid (2) | 10 | 180 / 82 | 180 / 82 | 00 / 93 | 230 / 110 | 180 / 82 | 140 / 60 | 140 / 60 |
| | 20 | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | 120 / 49 | 140 / 60 | 140 / 60 |
| | 37 | 150 / 66 | 150 / 66 | 80 / 82 | 180 / 82 | – | – | 100 / 38 |
| Hydrochloric Acid (saturated with Chlorine gas) (2) | 30 | 180 / 82 | 180 / 82 | 80 / 82 | 220 / 104 | 180 / 82 | – | – |

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# VE Chemical Resistance, continued

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| | | Maximum Recommended Temperature °F/°C | | | | | | |
| Hydrocyanic Acid | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 140 / 60 | 150 / 66 |
| Hydrofluoric Acid | 10 | 130 / 5 | 130 / 54 | 30 / 54 | 130 / 54 | 130 / 54 | – | 120 / 49 |
| | 20 | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | 100 / 38 | – | NR |
| Hydrofluosilicic Acid (2) | 10 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | – | 120 / 49 |
| | 35 | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | 100 / 38 | – | NR |
| Hydrogen Bromide (2), Wet Gas | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | – |
| Hydrogen Chloride (2) | | | | | | | | |
| Dry Gas | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 300 / 149 | 210 / 99 | – | 160 / 71 |
| Wet Gas | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 300 / 149 | 210 / 99 | – | 160 / 71 |
| Hydrogen Fluoride (2), Vapor | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | – |
| Hydrogen Peroxide | 30 | 150 / 6 | 150 / 66 | 50 / 66 | 150 / 66 | 150 / 66 | – | 120 / 49 |
| Hydrogen Sulfide, Aqueous | 5 | 180 / 8 | 180 / 82 | 00 / 93 | 200 / 93 | 200 / 93 | – | 160 / 71 |
| Hydrogen Sulfide, Dry Gas | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | – | 160 / 71 |
| Hydrosulfite Bleach | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | – |
| Hypochlorous Acid (1)(2)(4) | 10 | 180 / 8 | 180 / 82 | 60 / 71 | 160 / 71 | 120 / 49 | 140 / 60 | 140 / 60 |
| | 20 | 140 / 6 | 140 / 60 | 40 / 60 | 140 / 60 | 100 / 38 | 80 / 27 | 80 / 27 |
| **I** | | | | | | | | |
| Iron Plating Solution: (2) 45% $FeCl_3$: 15%$CaCl_2$ 20% $FeSO_4$: 11% $(NH_4)_2SO_4$ | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | 160 / 71 |
| Iron and Steel Clean Bath: (2) 9% Hydrochloric Acid 23% Sulfuric Acid | | – | – | 00 / 38 | – | – | – | – |
| Isopropyl Alcohol (see Alcohol, Isopropyl) | | | | | | | | |
| Isopropyl Amine | All | 100 / 3 | 100 / 38 | 20 / 49 | 120 / 49 | 120 / 49 | – | – |
| Isopropyl Palmitate | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 230 / 110 | 230 / 110 | 140 / 60 | 140 / 60 |
| **J** | | | | | | | | |
| Jet Fuel (JP-4) | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | – |
| **K** | | | | | | | | |
| Kerosene | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | – | 120 / 49 |
| **L** | | | | | | | | |
| Lactic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Lasso* (50% Chlorobenzene) NR | | | NR | NR | 120 / 49 | 120 / 49 | 120 / 49 | NR |
| Latex | All | 120 / 4 | 120 / 49 | 20 / 49 | 120 / 49 | 120 / 49 | NR | 120 / 49 |
| Lauric Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Lauryl Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Lead Acetate | All | 210 / 9 | 210 / 99 | 10 / 99 | 230 / 110 | 230 / 110 | 140 / 60 | – |
| Lead Nitrate | All | 210 / 9 | 210 / 99 | 10 / 99 | 230 / 110 | 230 / 110 | 140 / 60 | – |
| Lead Plating Solution: 8% Lead 0.8% Fluorboric Acid 0.4% Boric Acid | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | – |
| Linseed Oil | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 230 / 110 | 230 / 110 | 140 / 60 | 140 / 60 |
| Lithium Bromide (2) | Sat'd | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Lithium Chloride | 30 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| | 50 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Lithium Sulfate | Sat'd | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| **M** | | | | | | | | |
| Magnesium Bisulfite | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | 150 / 66 |

Conc – Concentrated
Sat'd – Saturated
NR – Not Recommended
– No Data on Environment
(1) BPO/DMA Cure Recommended
(2) Synthetic Veil Recommended
(3) C-Glass Recommended
(4) Post-Cure Recommended
(5) Consult Laboratory for Specific Recommendation

All services within 20°F/11°C maximum service temperature should be post-cured to ensure a long service life.

* Lasso is made by Monsanto.

# VE Chemical Resistance, continued

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| | | Maximum Recommended Temperature °F/°C | | | | | | |
| Magnesium Carbonate | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | 150 / 66 |
| Magnesium Chloride (2) | All | 210 / 9 | 210 / 99 | 10 / 99 | 240 / 116 | 240 / 116 | 120 / 49 | 150 / 66 |
| Magnesium Hydroxide (2) | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Magnesium Sulfate | All | 210 / 9 | 210 / 99 | 10 / 99 | 240 / 116 | 240 / 116 | 140 / 60 | 150 / 66 |
| Maleic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 240 / 116 | 240 / 116 | 140 / 60 | 140 / 60 |
| Mercuric Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Mercurous Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Methyl Alcohol | 100 | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| Methanol (see Alcohol, Methyl) | | | | | | | | |
| Methylene Chloride | 100 | NR | NR | NR | NR | NR | NR | NR |
| Methyl Ethyl Ketone | 100 | NR | NR | NR | NR | NR | NR | NR |
| Methyl Isobutyl Carbitol | 100 | NR | NR | NR | NR | NR | NR | NR |
| Methyl Isobutyl Ketone | 100 | NR | NR | NR | – | – | NR | NR |
| Methyl Styrene | 100 | NR | NR | NR | – | – | NR | NR |
| Mineral Oils | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 240 / 116 | 240 / 116 | 140 / 60 | 140 / 60 |
| Molybdenum Disulfide | 100 | 200 / 9 | 200 / 93 | 00 / 93 | 200 / 93 | – | – | – |
| Monochloroacetic Acid | 100 | NR | NR | NR | NR | NR | NR | NR |
| Monoethanolamine | 100 | NR | NR | NR | 80 / 27 | – | NR | NR |
| Motor Oil | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 140 / 60 |
| Muriatic Acid | 37 | 150 / 6 | 150 / 66 | 80 / 82 | 180 / 82 | – | – | 100 / 38 |
| Myristic Acid | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 180 / 82 | 140 / 60 | 120 / 49 |
| **N** | | | | | | | | |
| Naphtha | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Naphthalene | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Nickel Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Nickel Nitrate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Nickel Plating:<br>11% Nickel Sulfate<br>2% Nickel Chloride<br>1% Boric Acid | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | 100 / 38 | 150 / 66 |
| Nickel Plating:<br>44% Nickel Sulfate<br>4% Ammonium Chloride<br>4% Boric Acid | | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | 100 / 38 | 150 / 66 |
| Nickel Sulfate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Nitric Acid | 5<br>20<br>52 | 150 / 6<br>120 / 4<br>NR | 150 / 66<br>120 / 49<br>NR | 50 / 66<br>40 / 60<br>0 / 27 | 150 / 66<br>140 / 60<br>80 / 27 | –<br>–<br>NR | 100 / 38<br>NR<br>NR | 140 / 60<br>120 / 49<br>NR |
| Nitric Acid Fumes | 10-60 | 160 / 7 | 160 / 71 | 80 / 82 | 180 / 82 | – | – | 150 / 66 |
| Nitrobenzene | All | NR | NR | NR | 100 / 38 | – | NR | NR |
| **O** | | | | | | | | |
| Oakite Rust Stripper | 100 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 140 / 60 | – |
| Octanoic Acid | 100 | 180 / 8 | 180 / 82 | 10 / 99 | 210 / 99 | – | 140 / 60 | – |
| Oil, Sour Crude | 100 | 210 / 9 | 210 / 99 | 0 / 121 | 250 / 121 | 210 / 99 | 140 / 60 | 140 / 60 |
| Oil, Sweet Crude | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | 210 / 99 | 140 / 60 | 150 / 66 |
| Oleic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 160 / 71 |
| Oleum (Fuming Sulfuric) | | NR | NR | NR | NR | NR | NR | NR |
| Olive Oil | 100 | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 160 / 71 |
| Oxalic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | – |

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# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | E8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| **P** | | | | | | | | |
| Perchloric Acid (2) | 10 | 150 / 66 | 150 / 66 | 0 / 66 | 150 / 66 | 150 / 66 | – | – |
| | 30 | 100 / 38 | 100 / 38 | 0 / 38 | 100 / 38 | 100 / 38 | – | NR |
| Perchloroethylene | | 80 / 27 | 80 / 27 | 0 / 38 | 100 / 38 | – | – | – |
| Peroxide Bleach (1) (2) 2% Sodium Peroxide, 96% 0.025% Epsom Salts, 5% Sodium Silicate, 42° BE 1.4% Sulfuric Acid, 66° BE | | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 140 / 60 |
| Phenol | 100 | NR | NR | NR | – | – | NR | NR |
| Phenol Sulfonic Acid | 100 | NR | NR | NR | – | – | NR | NR |
| Phosphoric Acid | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| (Super Phosphoric Acid 76% $P_2O_5$ ) | 105 | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Phosphoric Acid Fumes | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Phosphorous Pentoxide | 1-54 | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 140 / 60 |
| Phosphorous Trichloride | 100 | NR | NR | NR | NR | NR | NR | NR |
| Phthalic Acid | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | – | – |
| Pickle Liquor (5) | | | Cons t Laboratory | | | | | |
| Picric Acid, Alcoholic | 10 | 100 / 38 | – | 0 / 38 | 100 / 38 | – | – | NR |
| Polymer (Aqueous Acrylic Emulsion) | All | 120 / 49 | 120 / 49 | 0 / 49 | 120 / 49 | – | – | 100 / 38 |
| Polymer (Polyester Water Reducible) | All | 120 / 49 | 120 / 49 | 0 / 49 | 120 / 49 | – | – | 100 / 38 |
| Polyvinyl Acetate Latex | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | – | – |
| Polyvinyl Alcohol | 100 | 100 / 38 | 100 / 38 | 0 / 49 | 120 / 49 | 120 / 49 | – | – |
| Polyvinyl Chloride Latex with 35 parts DOP | | 120 / 49 | 120 / 49 | 0 / 49 | 120 / 49 | 120 / 49 | – | – |
| Potassium Aluminum Sulfate | All | 210 / 99 | 210 / 99 | 0 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 150 / 66 |
| Potassium Bicarbonate | 1-50 | 150 / 66 | 150 / 66 | 0 / 66 | 150 / 66 | – | – | 150 / 66 |
| Potassium Bromide | All | 160 / 71 | 160 / 71 | 0 / 71 | 160 / 71 | – | – | 150 / 66 |
| Potassium Carbonate | All | 150 / 66 | 150 / 66 | 0 / 66 | 150 / 66 | – | – | 150 / 66 |
| Potassium Chloride | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Potassium Dichromate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Potassium Ferricyanide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Potassium Ferrocyanide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Potassium Hydroxide (2)(4) | 1-10 | 150 / 66 | 150 / 66 | 0 / 66 | 150 / 66 | 150 / 66 | – | – |
| | 15 | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | – |
| Potassium Nitrate (2) (4) | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Potassium Permanganate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | – | 150 / 66 |
| Potassium Persulfate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Potassium Sulfate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Propionic Acid | 20 | 200 / 93 | 200 / 93 | 0 / 93 | 200 / 93 | – | 140 / 60 | 140 / 60 |
| | 50 | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | NR |
| | 100 | NR | NR | NR | 80 / 27 | – | – | NR |
| Propylene Glycol | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Pulp Paper Mill Effluent (5) | | | Cons t Laboratory | | | | | |
| Pyridine | 100 | NR | NR | NR | NR | NR | NR | NR |
| **Q** | | | | | | | | |
| Quaternary Amine Salts Aqueous | All | 120 / 49 | 120 / 49 | 0 / 66 | 150 / 66 | – | – | – |

Conc – Concentrated
Sat'd – Saturated
NR – Not Recommended
– No Data on Environment
(1) BPO/DMA Cure Recommended
(2) Synthetic Veil Recommended
(3) C-Glass Recommended
(4) Post-Cure Recommended
(5) Consult Laboratory for Specific Recommendation

All services within 20°F/11°C maximum service temperature should be post-cured to ensure a long service life.

# VE Chemical Resistance, continued

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | E8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| | | Maximum Recommended Temperature °F/°C | | | | | | |
| Quaternary Amine Salts Non-aqueous (5) | | – | – | – | – | – | – | |
| **S** | | | | | | | | |
| Salicylic Acid | All | 160 / 71 | 160 / 71 | 60 / 71 | 160 / 71 | – | – | – |
| Sebacic Acid | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | – |
| Salt Water (see Water, Salt) | | | | | | | | |
| Sea Water (see Water, Sea) | | | | | | | | |
| Selenius Acid | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | – |
| Silver Nitrate | All | 210 / 99 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | – |
| Silver Plating Solution: 4% Silver Cyanide 7% Potassium Cyanide 5% Sodium Cyanide 2% Potassium Carbonate | | 180 / 82 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | – |
| Soaps, Aqueous | All | 200 / 93 | 200 / 93 | 0 / 93 | 200 / 93 | 200 / 93 | 140 / 60 | – |
| Sodium Acetate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Sodium Akyl Aryl Sulfonates | All | 150 / 66 | 150 / 66 | 0 / 66 | 180 / 82 | 150 / 66 | 100 / 38 | 120 / 49 |
| Sodium Aluminate | All | 160 / 71 | 160 / 71 | 0 / 71 | 160 / 71 | – | – | 100 / 38 |
| Sodium Benzoate | 100 | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Bicarbonate (2) | All | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | 100 / 38 | 150 / 66 |
| Sodium Bifluoride (2) | All | 120 / 49 | 120 / 49 | 0 / 49 | – | – | – | 100 / 38 |
| Sodium Bisulfate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Bisulfite | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Bromate (2) | 10 | 140 / 60 | 140 / 60 | 0 / 60 | 140 / 60 | – | 140 / 60 | 150 / 66 |
| Sodium Bromide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Sodium Carbonate | 1-25 | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | 150 / 66 |
| | 35 | 160 / 71 | 160 / 71 | 60 / 71 | 160 / 71 | – | – | 150 / 66 |
| Sodium Chlorate (2) | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| Sodium Chloride | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Chlorite (1) (2) (4) pH 4-8 | 10 | 150 / 66 | 150 / 66 | 50 / 66 | 150 / 66 | – | 100 / 38 | 100 / 38 |
| | 50 | 100 / 38 | 100 / 38 | 00 / 38 | 120 / 49 | – | – | – |
| Sodium Chromate | 50 | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Citrate | Sat | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Cyanide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Sodium Dichromate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Di-Phosphate | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Ferricyanide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Ferrocyanide | All | 210 / 99 | 210 / 99 | 0 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Fluoride (2) | All | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Fluorosilicate (2) | All | 150 / 66 | 150 / 66 | 0 / 66 | 120 / 49 | – | – | 100 / 38 |
| Sodium Hexametaphosphates | All | 120 / 49 | 120 / 49 | 20 / 49 | 120 / 49 | – | – | 100 / 38 |
| Sodium Hydrosulfide | All | 180 / 82 | 180 / 82 | 0 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Hydroxide (2) (4) | 1 | 180 / 82 | 180 / 82 | 0 / 93 | 150 / 66 | – | 120 / 49 | NR |
| | 5 | 180 / 82 | 180 / 82 | 00 / 93 | 150 / 66 | – | – | NR |
| | 10 | 150 / 66 | 150 / 66 | 00 / 93 | 120 / 49 | – | – | NR |
| | 25 | 180 / 82 | 180 / 82 | 00 / 93 | 150 / 66 | – | – | NR |
| | 50 | 200 / 93 | 200 / 93 | 00 / 93 | 180 / 82 | – | – | NR |
| Sodium Hypochlorite (1)(2)(4) | 1–5 | 180 / 82 | 180 / 82 | 0 / 82 | 150 / 66 | – | – | – |
| | 10–15 | 150 / 66 | 150 / 66 | 50 / 66 | 130 / 54 | – | – | – |
| Sodium Lauryl Sulfate | All | 180 / 82 | 180 / 82 | 0 / 82 | 150 / 66 | – | – | – |

Visit www.ResinWizard.com for general recommendations for CoREZYN vinyl ester, modified vinyl ester and isophthalic resins based on basic inputs from you. It is simple and fast to use.

# VE Chemical Resistance, continued

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8540 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| | | Maximum Recommended Temperature °F/°C | | | | | | |
| Sodium Monophosphate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Nitrate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Nitrite | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sodium Persulfate | 20 | 130 / 5 | 130 / 54 | 30 / 54 | – | – | – | 100 / 38 |
| Sodium Silicate | All | 210 / 9 | 210 / 99 | 10 / 99 | – | – | – | 150 / 66 |
| Sodium Sulfate | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | 150 / 66 |
| Sodium Sulfide | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | 150 / 66 |
| Sodium Sulfite | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | 150 / 66 |
| Sodium Tetraborate | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Thiocyanate | 57 | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Thiosulfate | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | – | – | 150 / 66 |
| Sodium Tripolyphosphate | Sat | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | – | 150 / 66 |
| Sodium Xylene Sulfonate | All | 210 / 9 | 210 / 99 | 10 / 99 | – | – | – | – |
| Sorbitol Solutions | All | 150 / 6 | 150 / 66 | 50 / 66 | – | – | – | – |
| Sour Crude Oil (see Crude Oil, Sour) | | | | | | | | |
| Soya Oil | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Stannic Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Stannous Chloride | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Stearic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Styrene (4) | 100 | NR | NR | NR | 100 / 38 | 100 / 38 | NR | NR |
| Succinonitrile | All | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | – | – | NR |
| Sugar, Beet and Cane Liquor | All | 180 / 8 | 180 / 82 | 80 / 82 | 180 / 82 | 180 / 82 | 120 / 49 | – |
| Sugar, Sucrose | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | – |
| Sulfamic Acid | 1–10 | 200 / 9 | 200 / 93 | 00 / 93 | 200 / 93 | 200 / 93 | – | 150 / 66 |
| Sulfanilic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 150 / 66 |
| Sulfated Detergents | All | 200 / 9 | 200 / 93 | 00 / 93 | 200 / 93 | 200 / 93 | 120 / 49 | 120 / 49 |
| Sulfur Dioxide Gas, Dry or Wet | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Sulfur Trioxide Gas/Air | All | 210 / 9 | 210 / 99 | 10 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 150 / 66 |
| Sulfuric Acid | 1–49<br>50–60<br>75<br>93 | 200 / 9<br>180 / 8<br>100 / 3<br>NR | 200 / 93<br>180 / 82<br>100 / 38<br>NR | 00 / 93<br>80 / 82<br>20 / 49<br>NR | 200 / 93<br>180 / 82<br>120 / 49<br>NR | 200 / 93<br>180 / 82<br>100 / 38<br>NR | 140 / 60<br>120 / 49<br>NR<br>NR | 150 / 66<br>150 / 66<br>NR<br>NR |
| Sulfurous Acid | All | 100 / 3 | 100 / 38 | 00 / 38 | 100 / 38 | – | – | 100 / 38 |
| Superphosphoric Acid, 76% $P_2O_5$ | | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | – | 140 / 60 | 150 / 66 |
| **T** | | | | | | | | |
| Tall Oil | 100 | 150 / 6 | 150 / 66 | 50 / 66 | 200 / 93 | – | – | – |
| Tannic Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Tartaric Acid | All | 210 / 9 | 210 / 99 | 10 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Tetrachloroethylene | 100 | 80 / 27 | 80 / 27 | 80 / 27 | 100 / 38 | 100 / 38 | NR | NR |
| Tetrasodium Ethylene Diamine Tetraacetic Acid | All | 120 / 4 | 120 / 49 | 20 / 49 | 150 / 66 | – | – | 150 / 66 |
| Thioglycolic Acid | 10 | NR | NR | NR | 100 / 38 | – | – | NR |
| Thionyl Chloride | 100 | NR | NR | NR | NR | NR | NR | NR |
| Tin Plating: 18% Stannous Fluoroborate 7% Tin 9% Fluorboric Acid 2% Boric Acid | | 200 / 9 | 200 / 93 | 00 / 93 | 200 / 93 | – | – | – |

Conc – Concentrated
Sat'd – Saturated
NR – Not Recommended
– No Data on Environment
(1) BPO/DMA Cure Recommended
(2) Synthetic Veil Recommended
(3) C-Glass Recommended
(4) Post-Cure Recommended
(5) Consult Laboratory for Specific Recommendation

All services within 20°F/11°C maximum service temperature should be post-cured to ensure a long service life.

# VE Chemical Resistance, continued

Maximum Recommended Temperature °F/°C

| Chemical | Concentration Percentage by Weight | VE8100 VE8300 VE8360 | VE8400 VE8440 VE8450 | VE8710 | VE8730 | VE8770 | VE8515 | VE8550 |
|---|---|---|---|---|---|---|---|---|
| Toluene (4) | 100 | NR | NR | 80 / 27 | 100 / 38 | 100 / 38 | NR | NR |
| Toluene Sulfonic Acid | All | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Transformer Oils: | | | | | | | | |
| Mineral Oil Types | 100 | 210 / 99 | 210 / 99 | 210 / 99 | 300 / 149 | 300 / 149 | 140 / 60 | 140 / 60 |
| Chloro-Phenyl Types | 100 | NR | NR | NR | – | – | NR | NR |
| Trichloroacetic Acid | 50 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 140 / 60 | 140 / 60 |
| Trichloroethane | 100 | – | – | 100 / 38 | 120 / 49 | 120 / 49 | – | NR |
| Trichloroethylene | 100 | NR | NR | NR | NR | NR | NR | NR |
| Trichloromonofluorome hane (2) | 100 | 80 / 27 | 80 / 27 | 100 / 38 | 100 / 38 | 100 / 38 | – | NR |
| Trichlorophenol | 100 | NR | NR | NR | NR | NR | NR | NR |
| Tricresyl Phosphate | 100 | 100 / 38 | 100 / 38 | 120 / 49 | 120 / 49 | – | – | – |
| Tridecylbenzene Sulfonate | All | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | – | – |
| Triethanolamine | 100 | 120 / 49 | 120 / 49 | 120 / 49 | 120 / 49 | 120 / 49 | – | NR |
| Trimethylene Chlorobromide | 100 | NR | NR | NR | NR | NR | NR | NR |
| Trisodium Phosphate | All | 210 / 99 | 210 / 99 | 210 / 99 | 250 / 121 | – | – | 150 / 66 |
| Turpentine | 100 | 100 / 38 | 100 / 38 | 150 / 66 | 150 / 66 | 150 / 66 | NR | NR |
| **U** | | | | | | | | |
| Urea | 1–50 | 150 / 66 | 150 / 66 | 150 / 66 | 150 / 66 | – | – | 120 / 49 |
| Urea Formaldehyde Resin | 100 | 100 / 38 | 100 / 38 | 100 / 38 | 120 / 49 | 120 / 49 | – | NR |
| **V** | | | | | | | | |
| Vegetable Oils | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | – |
| Vinegar | 100 | 210 / 99 | 210 / 99 | 210 / 99 | 210 / 99 | – | 140 / 60 | 120 / 49 |
| Vinyl Acetate | 100 | NR | NR | NR | – | – | NR | NR |
| Vinyl Toluene (4) | 100 | 80 / 27 | 80 / 27 | 80 / 27 | 120 / 49 | 120 / 49 | – | NR |
| **W** | | | | | | | | |
| Water | | | | | | | | |
| Deionized | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Demineralized | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Distilled | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Fresh | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| Salt | 100 | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | 150 / 66 | 120 / 49 | 150 / 66 |
| Sea | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | 150 / 66 | 120 / 49 | 150 / 66 |
| White Liquor (Pulp Mill) | 100 | 180 / 82 | 180 / 82 | 180 / 82 | 180 / 82 | – | – | 150 / 66 |
| **X** | | | | | | | | |
| Xylene (4) | 100 | NR | NR | 80 / 27 | 100 / 38 | 100 / 38 | NR | NR |
| **Z** | | | | | | | | |
| Zinc Chlorate | All | 210 / 99 | 210 / 99 | 210 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 150 / 66 |
| Zinc Nitrate | All | 210 / 99 | 210 / 99 | 210 / 99 | 250 / 121 | 250 / 121 | 140 / 60 | 150 / 66 |
| Zinc Plating Solution: 9% Zinc Cyanide 4% Sodium Cyanide 9% Sodium Hydroxide | | 160 / 71 | 160 / 71 | 160 / 71 | 160 / 71 | – | – | – |
| Zinc Plating Solution 49% Zinc Fluoborate 5% Ammonium Chloride 6% Ammonium Fluoroborate | | 200 / 93 | 200 / 93 | 200 / 93 | 200 / 93 | – | – | – |
| Zinc Sulfate | All | 210 / 99 | 210 / 99 | 210 / 99 | 250 / 121 | – | – | 150 / 66 |

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# SECTION 13.0

# BROCHURE

# Perry Fiberglass Products, Inc.

EXPERTS IN DESIGNING AND MANUFACTURING ODOR CONTROL AND AIR POLLUTION CONTROL EQUIPMENT

## *OFFERS A FULL LINE OF FRP COMPOSITE SYSTEMS*

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**CHEMICAL SCRUBBERS**

- Vertical and horizontal

**FRP DUCTWORK, STACKS, TANKS AND PIPING**

- Round and Rectangular

**FRP DAMPERS**

- Round and rectangular
- Control and balancing
- AMCA certified

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- Round and rectangular
- NSF-61 compliant

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Established in 1984

# ABOUT PERRY FIBERGLASS

Perry Fiberglass Products, Inc. was established in 1984 by Thomas Pulliam. Thomas Pulliam sold the company to his son Chad Pulliam in 2005. Perry Fiberglass is headquartered in Rockledge, Florida and manufactures all of its FRP products in Elyria, Ohio.

We develop, design and manufacture equipment for the treatment of odorous compounds in air-streams. We remain set apart from other odor control companies by providing a complete turn-key system.

Perry Fiberglass is in the business of supporting owners and engineers by providing technologically developed and improved odor control and air pollution control equipment.

Our mission is to provide quality engineered products at a competitive price and in compliance with recognized codes and standards. Our emphasis on quality and excellent customer service by trained personnel is paramount to our success.

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