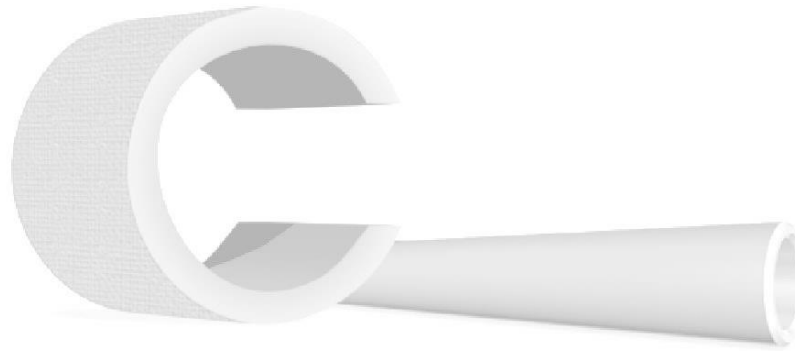


# Composite Repair Compliance Review Program



David M. Wilson

CRUG Board Member

Phillips 66 Pipeline LLC (Retired)

09/25/2015



# What is Involved?

- The use of the word 'compliance' by this voluntary program constitutes an expression of a professional opinion regarding documents and information which are submitted by composite repair system manufacturers which are the subject of the compliance review using the requirements of ASME PCC-2 as the compliance standard, and does not constitute a warranty or guarantee, either expressed or implied.
- The Evaluation Team shall be composed of at least three **non-manufacturer** Board Members that are proficient in their understanding of the requirements of Articles 4.1 and 4.2 of ASME PCC-2.
- There will be no remuneration for reviewers.



# Who is Involved?

- Review Team Members
- Approved by the CRUG Board of Directors on 09/03/2014:
  - **David M. Wilson, operator, Compliance Review Team Chairman**
  - **Chris Alexander, consultant, Compliance Review Team Secretary**
  - **Tom Walsh, consultant, Compliance Review Team Member**
  - **Mike Collins, operator, Compliance Review Team Member**
  - **Stan Parrish, operator, Compliance Review Team Member**



# The Process

- Manufacturer submits submittal form and lab results to Compliance Review Team Secretary
- Compliance Review Team Secretary distributes packet of information to Evaluation Team and places Evaluation Meeting on Calendar.
  - Evaluation Team meetings are scheduled bi-annually in February and September. Any packets submitted less than 30 days before an Evaluation Team Meeting will be placed on the calendar before the SUBSEQUENT Evaluation Team Meeting in order to give the Evaluation Team sufficient time to review the packet of information.
- Each member of the Evaluation Team reviews the packet independently





## Composite Repair Compliance Review Program

### Composite Repair Submittal Form and Checklist

Company Name: (Insert Name Here)  
 Contact Name: (Insert Name Here)  
 Address: (Insert Address Here)  
 Phone: (Insert Phone Number Here)  
 Email: (Insert Email Address Here)

Composite System(s) Name: (Insert Composite System(s) Name Here)  
 To be evaluated for Leaking, Non-Leaking Repairs or Both (Leaking Repairs, Non-Leaking Repairs or Both)

**GENERAL:**

The use of the word 'compliance' by this voluntary program constitutes an expression of a professional opinion regarding documents and information which are submitted by composite repair system manufacturers which are the subject of the compliance review using the requirements of ASME PCC-2 as the compliance standard, and does not constitute a warranty or guarantee, either expressed or implied.

The Evaluation Team shall be composed of at least three non-manufacturer Board Members that are proficient in their understanding of the requirements of Articles 4.1 and 4.2 of ASME PCC-2.

**COST STRUCTURE:**

Fee of \$1,500 for first system submitted for compliance review. Term of the Compliance Review Certificate will be for two years.

Fee of \$750 for each additional system submitted for review by the same manufacturer at the same time. Term of the Compliance Review Certificate will be for two years.

Fee of \$500 for each system submitted for renewal of Compliance Review Certificate at the end of the two year term.

Fee of \$250 for each system submitted for review where changes have been made to the repair system in which additional testing is required by Section 3.6 of PCC-2.

The original term of the Certificate will not change.

Once a system has met the requirements for the Composite Repair Certification Program, it will be listed on the website and also include an announcement to CRUG members / meeting attendees

Number	Cost	Total
	\$1,500 for first system submitted for initial compliance review	\$ -
	\$750 for each additional system submitted for initial compliance review	\$ -
	\$500 for each system submitted for renewal	\$ -
	\$250 for each system submitted with changes to previous review	\$ -
		\$ -

Make check payable to **Composite Repair Users Group** or request invoice.

Submit transmittal sheets and test data to:  
**Composite Repair Users Group**  
 c/o Chris Alexander  
 Stress Engineering Services  
 13800 Westfair East Drive  
 Houston, Texas 77041-1101  
 281-955-2900



### Testing Results Checklist

Check	Property	Test Type	Detail Properties	Minimum Values	Test Methods
X	Tensile Strength ( $S_{wa}, S_{wt}$ ) Tensile modulus ( $E_c$ )	Mandatory	Tensile strength ( $s$ ), modulus ( $E$ ), Poisson's ratio (for leaking pipes and some design cases; strain to failure in both hoop and axial directions)	strain to failure must be greater than 1%	ISO 527 ASTM D 3039
X	In Plane shear modulus	Mandatory for leaking pipes only	Modulus only ( $G_{31}$ )	none	ASTM D 5379
X	Per ply thickness	Mandatory	Thickness per ply	None	None, may be determined from the tensile tests above
X	Hardness	Mandatory	Barcol or Shore hardness data	None	BS EN 59 ISO 868 ASTM D 2583 ASTM D 2240
X	Coefficient of thermal expansion	Mandatory	CTE value	None	ISO 11359-2 ASTM E 831
X	Fiber Type:	(Insert Fiber Type Here)			
X	Resin Type:	(Insert Resin Type Here)			
X	Filler Material:	(Insert Filler Material Type Here)			



### Testing Results Checklist

Check	Property	Test Type	Detail Properties	Minimum Values	Test Methods
X	Pre-pregnated:	(Y or N)			
X	Pre-formed composite:	(Y or N)			
X	Glass Transition Temperature ( $T_g$ )	Mandatory or use HDT below	Glass transition temperature ( $T_g$ )	None except that this can determine the maximum operating temperature of the composite system	ISO 11357-2 ASTM E 831 ASTM E 1640 ASTM E 6604
X	Heat distortion temperature (HDT) (Note A)	Mandatory or use $T_g$ above	Heat distortion temperature (HDT)	None except that this can determine the maximum operating temperature of the composite system	ISO 75 ASTM D648
X	Lap shear adhesion strength (Note B)	Mandatory	Shear strength of composite bond to substrate	4NM/m <sup>2</sup> (580 psi)	BS EN 1485, ASTM D 3165, ASTM D 5868
X	Impact performance	Mandatory for leaking pipes only	Low velocity impact performance	Withstand drop test per appendix VI.	Appendix VI
X	Energy release rate ( $\gamma$ )	Mandatory for leaking pipes only	Toughness parameter, energy release rate ( $\square$ )	none	Appendix IV
X	Long term lap shear performance	Mandatory	Measurement of lap shear strength after 1000 hour heat exposure	30% of lap shear adhesion strength	Appendix II-2



### Testing Results Checklist

Check	Property	Test Type	Detail Properties	Minimum Values	Test Methods
X	Structural Strengthening Short-term Pipe Spool Survival Test	Mandatory	Wrapped pipe with defect must withstand a short-term pressure test	Wrap must not fail	Article 4.1 Appendix III
X	Validation for repair of leaking component	Mandatory	Wrapped pipe with defect must withstand a short-term pressure test	Wrap must not fail	Article 4.2 Appendix III
X	Long term strength (Note C)	Optional	Determine long -term (creep-rupture) strength of the wrap by either of three methods	None, note that this test qualifies the wrap pursuant to Table 5.	Appendix V, ASTM D2990, and ASTM D 2992
X	Cathodic Disbondment	Mandatory for cathodically protected pipes	Disbondment	None	ASTM G8 ASTM G42 ASTM G95
X	Cyclic Loading	Optional	None	None	ISO 14892 ISO 24817
X	Electrical Conductivity	Optional	None	None	ISO 14892 ASTM D149
X	Chemical Compatibility	Optional	None	None	ASTM D543 ASTM C581 ASTM D3881 ISO 10952





## Testing Results Checklist

Check	Property	Test Type	Detail Properties	Minimum Values	Test Methods
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### Other Required Documents

Installation Procedures

Training Requirements

Repair calculator results: Provide screen shots of input data and results for the following conditions as applicable:

Case #1 Substrate Yields, Straight Pipe

Case #2 Substrate Yields, Bend/Elbow, Pressure Cycles, External Loads

Case #3 Substrate Yields, Straight Pipe, Elevated Temperature

Case #4 Leaking, Tee, Hole

Case #5 Leaking, Pipe, Narrow Slot

Case #6 Leaking, Pipe, Wide Slot, Vacuum

Case #7 Leaking, Pipe, Axial Slot

Case #8 Substrate Load Sharing, Pipe

Case #9 Performance Testing, Pipe

Case #10 Performance Testing, Pipe, Lower Pressure

Design data sheet 3.3(b), 3.3.1, 3.3.2, 3.3.3

# Proof of calculations

- Rather than obtain actual calculators from manufacturers, it was decided to use screen shots of input data and results.
  - Some manufacturers only use the software internally
  - My company has an extensive review process for 3<sup>rd</sup> party software
- Tried to cover most important conditions where calculations may change



# Some Questions

- Should strict compliance with ASTM testing standard be required?
  - For example, Shore or Barcol hardness testing standard required calibration and testing documentation for a property that has no direct bearing on design calculations
- When Brand X composite system is submitted for review, how can the reviewer know that the tests results for Components A, B, and C are what is actually being used in the Brand X system?
- How can manufacturer information that is submitted be kept confidential if it is considered to be a trade secret?



# The Process

- If any of the Evaluation Team Members believe that additional information is required, that Team Member shall submit the request for additional information to the Compliance Review Team Secretary.
  - The Compliance Review Team Secretary shall forward the request for additional information to the Manufacturer. Additional information not received less than 30 days before the Evaluation Team Meeting date will result in the evaluation of that packet being delayed until the next Quarterly Evaluation Team Meeting.
- Evaluation Team will discuss the completeness of the information submitted for each system.
  - A majority vote of the Team members will result in a certificate of compliance being issued for the system.
  - Systems not receiving a majority vote will be sent a letter explaining the reason the system was deemed non-compliant.



# The Result

- Once a system has met the requirements for the Composite Repair Certification Program, it will be listed on the CRUG website and also included in announcements to CRUG members / meeting attendees
- A Compliance Review Certificate will be issued to the Manufacturer for acceptable repair systems
- The term of the Certificate will be two years.



# COMPLIANCE REPAIR CERTIFICATION

The following Composite Repair System has been reviewed and found to be compliant with ASME PCC2 Specifications:

**Composite Repair System Name**

***Composite Repair Company Name***

Signed: \_\_\_\_\_  
Compliance Review Team Chairman

Signed: \_\_\_\_\_  
Compliance Review Team Secretary

Date of Review: 09/11/2014

Expiration: 09/11/2016



# What does it cost?

- Fee of \$1,500 for first system submitted for compliance review. Term of the Compliance Review Certificate will be for two years.
- Fee of \$750 for each additional system submitted for review by the same manufacturer at the same time. Term of the Compliance Review Certificate will be for two years.
- Fee of \$500 for each system submitted for renewal of Compliance Review Certificate at the end of the two year term.
- Fee of \$250 for each system submitted for review where changes have been made to the repair system in which additional testing is required by Section 3.6 of PCC-2. The original term of the Certificate will not change.



# What does it cost?

- As a benefit for a Manufacturer's Annual \$750 CRUG membership, one system may be submitted for compliance review. Term of the Compliance Review Certificate will be for two years as long as the CRUG membership is maintained in good standing.
- Fee of \$750 for each additional system submitted for review by the same manufacturer at the same time. Term of the Compliance Review Certificate will be for two years as long as the CRUG membership is maintained in good standing.
- Fee of \$500 for each system submitted for renewal of Compliance Review Certificate at the end of the two year term as long as the CRUG membership is maintained in good standing.
- Fee of \$250 for each system submitted for review where changes have been made to the repair system in which additional testing is required by Section 3.6 of PCC-2. The original term of the Certificate will not change.





# What does it cost?

- It was decided at the CRUG Board Meeting yesterday that a E&O insurance policy would need to be secured to protect CRUG against legal actions should any dispute about the Compliance Review Process be raised.
- The cost of the E&O insurance policy would make the Compliance Review Process financially unsustainable.
- The future of the Compliance Review Program is in suspense.



# Questions?

