BELZONA SUPERWRAP II

PURSUANT TO ASME PCC-2 ARTICLE 401 NONMETALLIC COMPOSITE REPAIR SYSTEMS: HIGH-RISK APPLICATIONS

BBH 4640

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ExxonMobil

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Prepared on: August 29, 2022

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Disclaimer

This Belzona SuperWrap II design has been carried out and signed by a trained and validated Belzona SuperWrap designer to comply with the requirements of ISO 24817 and ASME PCC-2. This document must also be signed by the client representative. The data used for the design has been provided by the client on the Belzona SuperWrap Application Survey Report with the same reference number as that of this document. Designs can only be carried out to the data given. Any deviation may invalidate the design and the compliance of such a repair.

Belzona SuperWrap II repairs are specifically designed for the individual application to which they are intended, thus cannot be used on other pipework, facilities, geometries or defects. Where the client instructs the use of figures other than those used in this design, it is the client's full responsibility to ensure that this does not affect current or future design of their entire system.

Application of a Belzona SuperWrap II repair must be solely carried out by Belzona trained and validated SuperWrap II Installers and Supervisors in accordance with the requirements of ISO 24817 and ASME PCC-2 Article 4.1.

Compliance to ISO 24817 and ASME PCC-2 Article 4.1

SuperWrap II is deemed a compliant composite repair system upon successful achievement of the following main four areas.

Product Testing and Qualification

The pre-qualification testing program for SuperWrap II was completed prior to the product being launched and made available to purchase. It was carried out internally by Belzona and externally by an independent laboratory party.

Design

The design of the SuperWrap II repair is carried out by authorized designers who have been trained and validated by Belzona. They are responsible for reviewing all the data provided by the client and designing the repair to the requirements of the mathematical methodology set forth in ISO 24817 and ASME PCC-2 Article 4.1.

Application & Supervision

The application and supervision of SuperWrap II repairs can only be carried out by applicators and supervisors trained and validated by Belzona. This status is only achieved by successfully completing the SuperWrap Installer and/or Supervisor Training Courses.

Quality Control

Control is required throughout the whole SuperWrap process from maintaining training records, collecting and storing design data to completing relevant QA/QC reports and sharing with Belzona. Upon review of all these reports, Belzona will issue a Certificate of Compliance that fully validates the repair as compliant to the requirements of ISO 24817 and ASME PCC-2 Article 4.1.

Data from Application Survey Report

Application Details	
Job Reference	BBH 4640
Required Compliance	ASME PCC-2
Contact	Brandon Boudreaux
Company	ExxonMobil

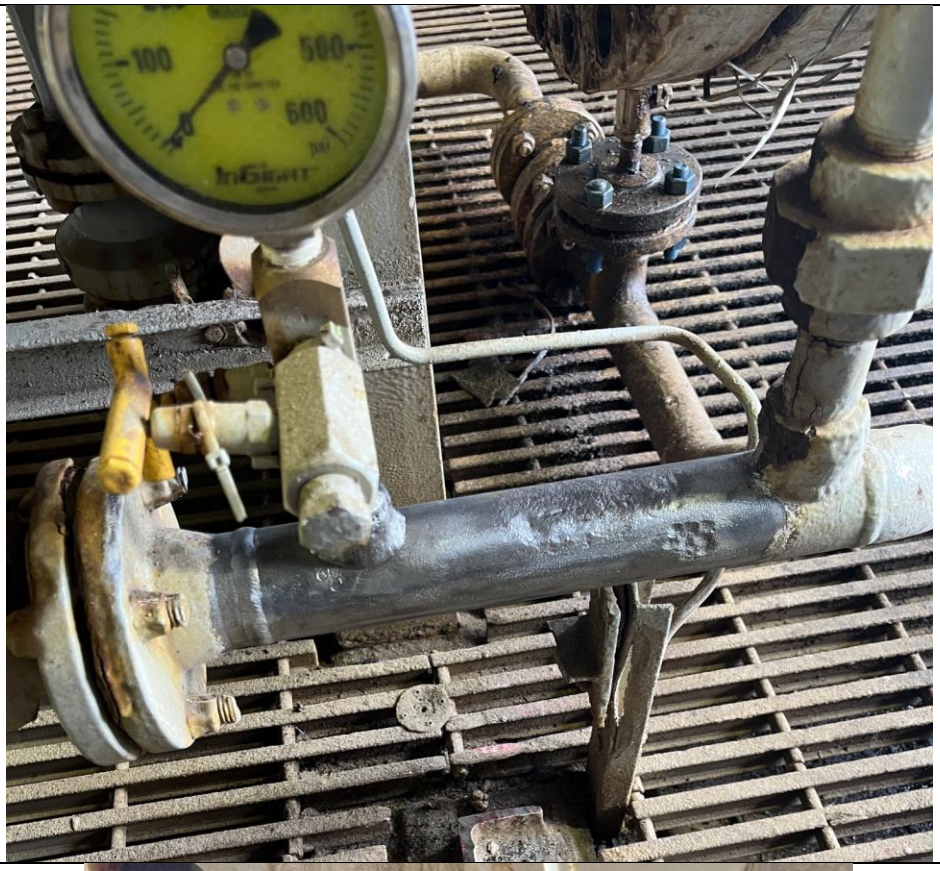
Asset Details	
Location	GOM
Asset Reference / Identification	MBM-141 Produced Water Hydrocyclone
Asset Type	Pipe
Material / Grade	ASTM A106B
Geometry	Nozzle/Flange
Asset Contents	Produced Water
Surface Cleanliness	SSPC-SP 11
Repair Type	Circumferential Wrap
Repair Recertification Inspection	10 Years

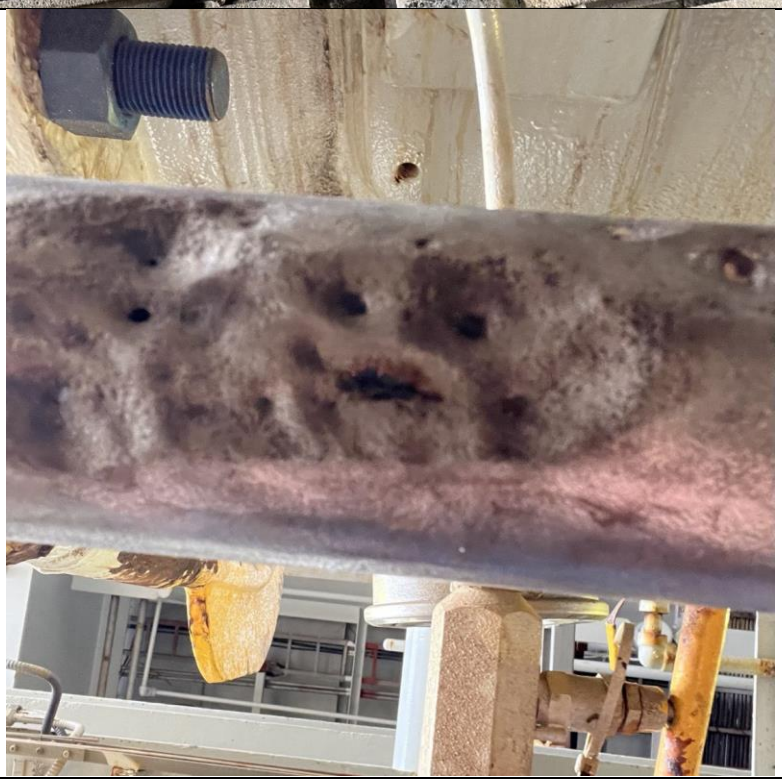
Asset Data	Value	Units
External Diameter	2.375	in
Original Wall Thickness	0.218	in
Minimum Remaining Wall Thickness	0.00	in
Operating Temperature	120.00	°F
Design Pressure	250.00	psi

Defective Area Details	
Type of Defect	Type B
Substrate Condition	Substrate Yields
Shape of Most Critical Defect	Circular or Near Circular
Damage Source	Corrosion
Damage Origin	External

Defective Area Data	Value	Units
Longitudinal Length of Critical Defect	0.125	in
Circumferential Length of Critical Defect	0.125	in
Total Length of Defective Area	3.00	in

Conditions During Repair	Value	Units
Substrate Temperature	100.00	°F
Ambient Temperature	100.00	°F
Internal Pressure	0.00	psi





Defective Area

SuperWrap II Data

SuperWrap II Properties			
Variable	Description	Value	Source
E_c	Circumferential Modulus of Repair Laminate (psi)	5.60E+06	ASTM 3039, Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
E_a	Axial Modulus of Repair Laminate (psi)	2.25E+06	
ν	Poisson's Ratio of Repair Laminate in Hoop Axis	0.26	
ν	Poisson's Ratio of Repair Laminate in Axial Axis	0.13	
G	Shear Modulus of Repair Laminate (psi)	1.11E+06	ASTM D5379, Standard Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method
τ	Lap Shear Adhesion (psi)	815	EN 1465 Lap Shear Strength, Adhesives, Rigid to Rigid Bonded Assemblies
γ_{LCL}	Energy Release Rate (in lb/in^2)	0.07	ASME PCC-2 Appendix 404-IV, Measurement of γ for Leaking Defect Calculation
ε_{lt}	Lower Confidence Long Term Allowable Strain	0.002	ISO 24817 Annex E, Measurement of performance test data, E.2.1 Survival Testing
s_{lt}	95% Lower Confidence Limit of long-term strength (psi)	13634	ASME PCC-2 Appendix 401-V, Measurement of Performance Test Data, 401-V-2.1, Survival Testing
α_c	Thermal Expansion Coefficient of repair laminate in Circumferential Direction (in/in°F)	6.26E-06	ISO 11359, Plastics -- Thermomechanical Analysis (TMA) -- Part 2: Determination of Coefficient of Linear Thermal Expansion and Glass Transition Temperature
α_a	Thermal Expansion Coefficient of repair laminate in Axial Direction (in/in°F)	1.15E-05	

ASME PCC-2 Section 3.4.2 Service Temperature Effects			
Variable	Description	Value	Source
T_{live}	Temperature of Substrate During Implementation of Repair Laminate (°F)	100.00	ASR
T_{after}	Curing Temperature (°F)	120.00	ASR
T_d	Design Temperature (°F)	120.00	ASR
T_g	Glass Transition Temperature (°F) (Based on Curing Temperature)	190.92	Tested via ISO 11357
T_m	Upper Temperature Limit (°F) (Tm must be > Td)	136.92	Table 2

ASME PCC-2 Section 3.4.4 Allowable Repair Laminate Strains			
Variable	Description	Value	Source
ε_c	Allowable Repair Laminate Strain in Circumferential Direction	0.0018	Equation (10a)
ε_a	Allowable Repair Laminate Strain in Axial Direction	0.00062	Equation (10b)
ε_{c0}	Allowable Repair Laminate Circumferential Strain Neglecting Temperature Effects	0.0025	Table (3), ASME PCC-2
ε_{a0}	Allowable Repair Laminate Axial Strain Neglecting Temperature Effects	0.001	Table (3), ASME PCC-2
α_s	Thermal Expansion Coefficient (in/in°F)	6.50E-06	http://www.engineeringtoolbox.com/pipes-temperature-expansion-coefficients-d_48.html
ΔT	Difference Between Operating and Installation Temperature (°F)	20	Calculated
f_T	Temperature de-rating Factor	0.72	Equation (2)

$$\varepsilon_c = f_T\varepsilon_{c0} - |\Delta T(\alpha_s - \alpha_c)| \qquad (10)$$

$$\varepsilon_a = f_T\varepsilon_{a0} - |\Delta T(\alpha_s - \alpha_a)| \qquad (10)$$

$$f_T = 2 \times 10^{-5}(T_m - T_d)^2 + 0.0006(T_m - T_d) + 0.7014 \qquad (2)$$

Detailed Calculations for Type A Defects

ASME PCC-2 Section 3.4 Design Based off of Repair Laminate Allowable Stress			
Variable	Description	Value	Source
$t_{min,c}$	Minimum Thickness Required for Hoop Stresses Based on Short Term Strength Test (in)	0.03	Equation (8)
$t_{min,c}$	Minimum Thickness Required for Hoop Stresses Based on Long Term Pressure Test (in)	0.04	Equation (11)
$t_{min,a}$	Minimum Thickness Required for Axial Stresses Short Term Strength Test (in)	0.08	Equation (9)
F	Equivalent Axial load (lbf)	1107.53	Calculated
s	Minimum Yield of Substrate (psi)	35000.00	ASME B31.3

$$t_{min} = \frac{1}{\varepsilon_c}\left(\frac{PD}{2}\frac{1}{E_c} - \frac{F}{\pi D}\frac{\upsilon_{ca}}{E_c}\right) \qquad (8)$$

$$t_{min} = \frac{1}{\varepsilon_a}\left(\frac{F}{\pi D}\frac{1}{E_a} - \frac{PD}{2}\frac{\upsilon_{ca}}{E_c}\right) \qquad (9)$$

$$t_{min} = \frac{PD}{2}\cdot\left(\frac{1}{f \cdot s_{lt}}\right) \qquad (11)$$

$$F = \frac{\pi}{4}pD^2 + \sqrt{{F_{ax}}^2 + 4{F_{sh}}^2} + \frac{4}{D}\sqrt{{M_{ax}}^2 + {M_{to}}^2}$$

Detailed Calculation for Type B Defects

ASME PCC-2 Section 3.4.6 Calculation for Circular or Near Circular Type B Defects			
Variable	Description	Value	Source
P	Pressure Withstood by Repair Thickness (psi)	250.00	Equation (13)
t_{min}	Minimum repair laminate Thickness (in)	0.0258	Equation (13)
d	Defect Diameter (in)	0.125	ASR
f	Service Factor	0.33	ASME PCC-2 Section 3.4.6
E_{ac}	Combined Modulus	3.55E+06	Section 401-3.4.5-1
y_{lcl}	Energy Release Rate (J/m^2)	0.07	ASME PCC-2 Appendix 404-IV

$$E_{ac} = \sqrt{E_a E_c}$$

$$p = f_T f \sqrt{\frac{\gamma_{LCL}}{\frac{(1-\upsilon^2)}{E_{ac}}\left(\frac{3}{512t_{min}^3}d^4 + \frac{1}{\pi}d\right) + \frac{3}{64Gt_{min}}d^2}} \qquad (13)$$

Calculated Minimum Required Repair Thickness

t_{design} Shall be the Greater Calculated Required Thickness to Withstand Loading			
Variable	Description	Value	Source
t_{min}	Minimum Thickness Required for Type A Defects (in)	0.16	ASME Design Methodology & Testing / Belzona Best Practices
t_{min}	Minimum Thickness Required for Type B Defects (in)	0.23	
t_{design}	Composite Design Thickness (in)	0.23	Calculated

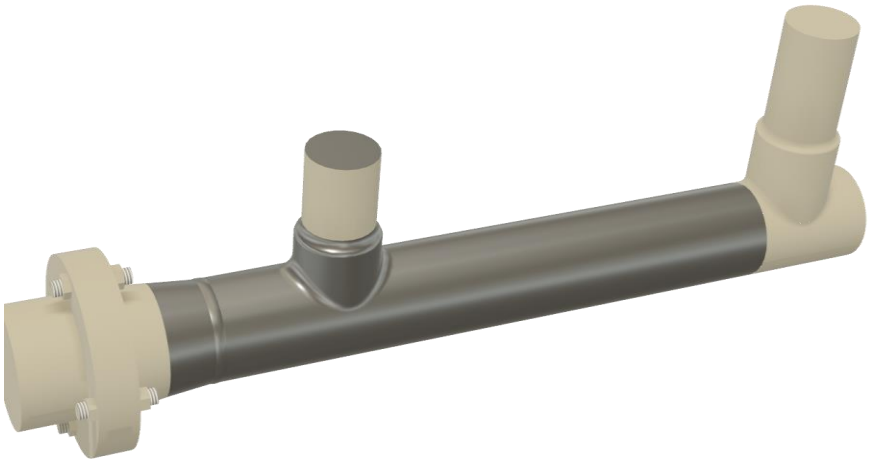
Axial Extent of Repair

ASME PCC-2 Section 3.4.8 Axial Length of Repair			
Variable	Description	Value	Source
l_{over}	Axial Extent of Repair Beyond Defective Area (in)	2.00	Equation (18)
l_{taper}	Taper Length (in)	1.50	5:1 Ratio with t_{design}
l_{defect}	Length of Defective Area (in)	3.00	ASR
l	Total Length of Repair (in)	10.00	Equation (19)

$$l_{over} \geq \left(2.5\sqrt{Dt/2} \quad or \quad \frac{E_a \varepsilon_a t_{design}}{\tau}\right) \qquad (18)$$

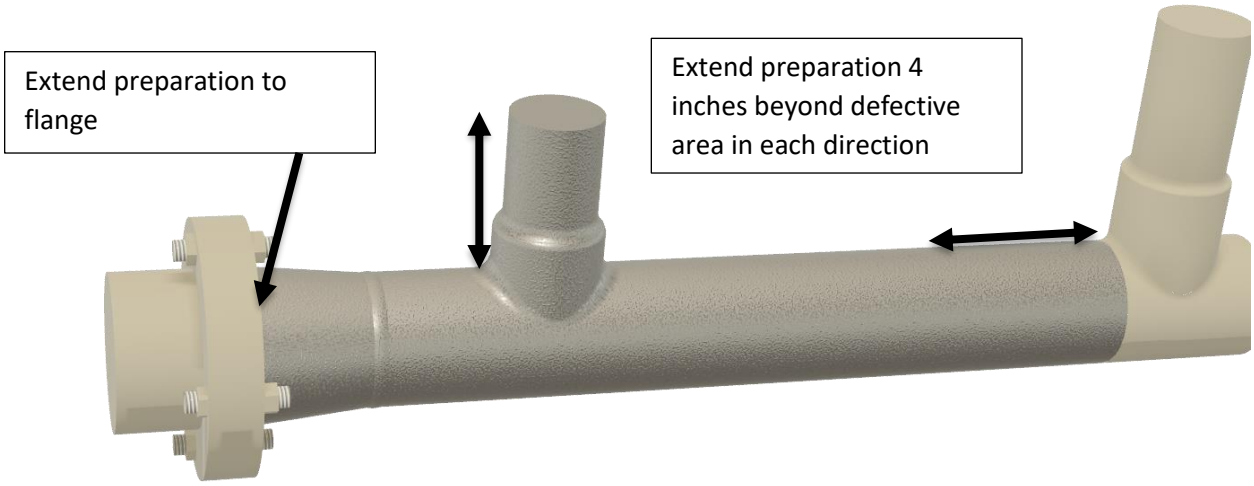
$$l = 2l_{over} + l_{defect} + 2l_{taper} \qquad (19)$$

Repair Sketch



Defective Asset

- Pinhole defect and localized pitting



Surface Preparation

- Power Tool Clean repair area to an SSPC-SP 11 (Power Tool Clean to Bare metal) surface cleanliness level
- Achieve and record a minimum 1 mil anchor profile
- Extend preparation 4 inches beyond defective area in each direction

Rebuilding

- Use Belzona 1161 to fill in through wall defect
- Use Belzona 1161 to fill in any pitting
- Use Belzona 1161 to chamfer any transition for composite

Belzona SuperWrap

- Apply 3wraps (6 layers) of Belzona SuperWrap II using Belzona 1982 resin
- Repair shall only land on properly prepared substrate
- Repair shall extend a minimum 3.5 inches beyond defective area in each direction

Final Design Outputs

t_{design}	Thickness of repair laminate (in)	**0.23**
	Number of wraps	**3.00**
	Layers of reinforcement	**6.00**
l_{over}	Axial extent of repair beyond defect including taper (in)	**3.50**
l	Total Axial Extent of Repair (in)	**10.00**
Matrix	Suitable Resin	**Belzona 1982**

	Belzona Designer	***Client***
Name	Alex Tzamtzis	Brandon Boudreaux
Company	Belzona Houston	ExxonMobil
Position	Chemical Engineer	
Signature		

Product	**Product Quantities**
Volume of Resin (Belzona 1982)	**1 Unit**
Length of Reinforcement (Belzona 9381) (XX mm Width Cloth	**1 Unit**
Length of Release Film (Belzona 9382)	**1 Unit**

Health and Safety

SuperWrap II is a combination of several products, each with its own associated hazards. As manufacturers of these products, Belzona has the responsibility to communicate these hazards to end-users by providing H&S labels on the products and safety data sheets (SDS). It is important to review the SDSs of each product prior to commencement of any application. Furthermore, it is paramount to remember that SDSs list the minimum safety requirements, quite often work on site will have much stricter PPE policies.

Work Procedure

Foreword:

- This work procedure or method statement is intended for use by factory-trained installers and supervisors with valid ID cards. It covers the basic requirements for surface preparation, application, and inspection of the Belzona SuperWrap composite repair system.
- Any requirements stated in this work procedure are in addition to those stipulated in the “Instructions for Use” leaflets of the impregnated resins used as part of the Belzona SuperWrap composite repair system.
- This work procedure shall supersede any existing recommendation in the case of questions or vagaries concerning the proper surface preparation, application, and inspection of the Belzona materials included in this document
- The composite repair system is hereinafter defined as the combination of a resin and a reinforcement fabric. Resin choices are Belzona 1981, 1982, and 1983. The reinforcement fabric and release film are Belzona 9381 and Belzona 9382, respectively.

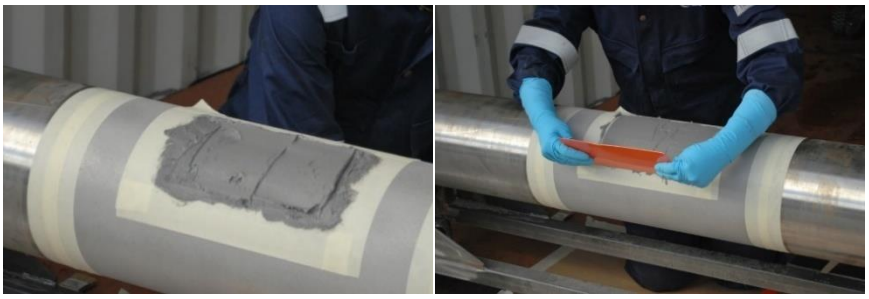
Step No.	*Step*
1.0	**Pre-Surface Preparation**
1.1	ENSURE that the geometry and defective area to be repaired are as per design. LIMIT the repair area (plus at least 3 inches beyond either side of the repair area) with Masking tape. Bear in mind that the repair area shall include the defect, the total overlay axial extent and the taper length. ENSURE that the right quantities of products and accessories are available. LOG batch numbers of all products onto Application Report or related QA/QC documents.
CAUTION	MASK OFF any specific section within the defective area which must not be abrasive blasted.

Step No.	*Step*
2.0	**Leak Sealing (If Required)**
2.1	Identify through hole defect
2.2	Abrade area surrounding through hole defect, preparing about a 3 inch diameter circle surrounding defect.
2.3	Knead Belzona 9611 in hand until material starts to warm.
2.4	Form Belzona 9611 into a cone shape.
2.5	Apply Belzona 9611 on top of leaking defect with force while simultaneously using tourniquet to wrap Belzona 9611 down to substrate.
2.6	Allow to harden for 25 minutes.
2.7	Remove tourniquet. If there is no visual leakage and the leak has been confirmed to be sealed, move on to step 3.

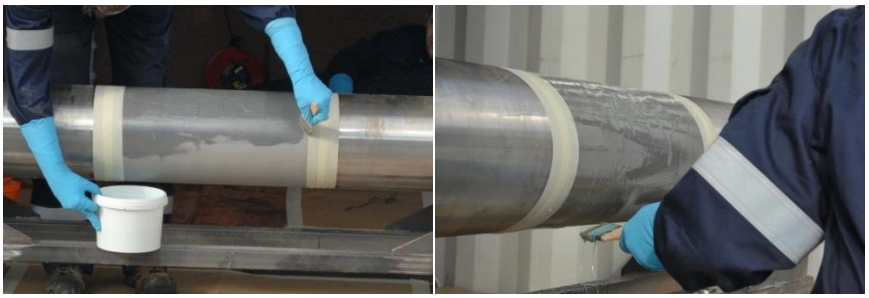
Step No.	*Step*
3.0	**Surface Preparation**
3.1	POWER TOOL CLEAN the repair area to achieve cleanliness levels in accordance with SSPC-SP- 11 (Power Tool Clean to Bare Metal) and an average minimum angular profile of 1 mil (25 µm). Use the Testex tape method to measure the substrate profile. It is recommended that the anchor profile be taken from at least 3 spots per linear foot, mostly from the areas in the 3-9 o'clock position.
NOTE	If the substrate is heavily contaminated, degreasing with Belzona 9111, acetone or MEK is highly recommended prior to any grit blasting operation.
3.2	DEGREASE AND CLEAN the substrate with available solvents such as Belzona 9111, acetone or MEK. It is recommended that the repair area be flooded with the solvent and swabbed with a clean short-bristle brush. Avoid the use of cloths or rags unless they are lint-free
3.3	Allow solvent to evaporate.
CAUTION	The implementation of the repair shall commence within 4 hours of the completion of the Power Tool Cleaning operation. If this time is exceeded, the substrate must be abraded again.

Step No.	*Step*

4.0	Dry Measurement of Reinforcement
4.1	PRIOR to any paste or resin application, DRY fit the reinforcement fabric (Belzona 9381) until the entire repair area is covered. Each wrap should overlap at least 50% of the previous wrap.
4.2	Use pre-measured Belzona 9381 to estimate the remaining wrap lengths. Each subsequent wrap should be at least 1 foot longer than the previous.

Step No.	*Step*
5.0	Substrate Preparation
5.1	FILL pitted areas with specified Belzona paste grade material PRIOR to application of the composite repair system. If a through wall, SEAL or COVER it to prevent any ingress of product into the pipe through the defect.
	
NOTE	The paste grade material should be used to re-build the substrate to its original wall thickness. The paste grade material must be mixed and applied in accordance with its relevant IFU
5.2	Use paste grade material to smoothen transition for SuperWrap II.
5.3	Allow paste grade material to stabilize and become touch dry.
CAUTION	AXIAL CRACKS shall be terminated prior to any Belzona SuperWrap II repair. Instructions for terminating cracks can be Belzona Know How System Leaflets.

Step No.	*Step*
6.0	Mixing Belzona SuperWrap II Resin
6.1	MIX the Belzona SuperWrap resin in accordance with its respective IFU. DO NOT leave the mixed product to stand. USE it as soon as the mixing operation is complete.
NOTE	Belzona SuperWrap II resins are conveniently packed with two mixing cups with a 2.5:1 base to solidifier volumetric ratio. For allowable substrate conditions refer to the relevant SuperWrap II resin IFU.

Step No.	*Step*
7.0	**Wetting Out Substrate**
7.1	APPLY Belzona SuperWrap resin to the repair substrate. MAKE sure that all the repair area is wetted out. PAY special attention to the 3-9 o' clock position.
	
NOTE	Environmental conditions shall be monitored through the application process. The temperature of the substrate shall always remain 3°F(5°C) higher than the dew point temperature.
7.2	ENSURE that 100% coverage of the substrate area to be repaired has been achieved.
NOTE	As the resin is fluid grade, it will spread quite easily and can be brushed in. The excess material will drip off the substrate.

Step No.	*Step*
8.0	**Wetting Out Belzona 9381 Reinforcement Sheets**
8.1	LAY pre-measured Belzona 9381 onto a rigid working surface in an organized manner.
8.2	Using an applicator, brush, roller, or rubber squeegee SATURATE Belzona 9381 with resin. For ease of application, it is recommended that the resin be applied onto the fiber glass side of Belzona 9381. Once the fiber is saturated, the fiber glass will become dark rather than translucent. Both sides of Belzona 9381 can be impregnated with the resin, if desired.
	
8.3	FOLD or ROLL fully wetted out Belzona 9381 in an organized manner to facilitate implementation of the reinforcement onto the section to be repaired.
NOTE	Resin should be used within its respective working life. Refer to relevant SuperWrap II resin IFU for working life times.

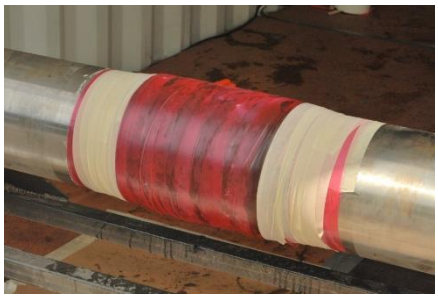
Step No.	*Step*

9.0	Implementing Wrap onto Piping System (For Nozzles)
9.1	Use" skirt" method where a strip of Belzona 9381 has "teeth" cut into it. With this method the strip can be wrapped around the bottom of the nozzle while the teeth transition onto the larger pipe. These sheets should be precut, wetted out and overlapped to complete transition. Each wrap will use this transition piece.

9.2	Starting from either end of the repair area, lay down fully wetted Belzona 9381 onto connecting pipe substrate applying hand pressure. Each wrap shall have two layers of reinforcement across repair areas.

	 
9.3	Starting from either end of the repair area, APPLY fully wetted Belzona 9381 around the nozzle applying hand pressure with a 50% overlap.
	 
NOTE	Apply moderate tension onto the repair. There should be resin exuding through the fibers. When wrapping around the repair area, the reinforcement should not be sliding. Using one hand to hold the wrap in place while using the other hand to pull Belzona 9381 may help in the wrapping process.
CAUTION	The only masking tape that should be on the substrate at this point is the masking tape marking the two ends of the repair.
NOTE	At times, to avoid creases in the wrap, more than 50% overlap will be required. Air bubbles and creases should also be worked out with free gloved hand during each wrap. While keeping wrap in tension use free gloved hand to press repair onto and around pipe.
NOTE	The subsequent wraps should start where the previous one finished and end where the previous one began
NOTE	The same technique used in the first wrap shall be used for all succeeding wraps until proper repair thickness (number of wraps) as per the design outputs has been achieved
NOTE	Each wrap shall be applied along the circumference in the same direction.
	 

CAUTION	Each wrap shall be applied within the maximum overwrapping time. Refer to relevant Belzona SuperWrap II resin IFU for overwrapping windows.

Step No.	*Step*
10.0	Belzona 9382 Release Film Implementation
10.1	USE Belzona 9382 to consolidate the repair. BEGIN wrapping from the end of the final wrap.
NOTE	Taping Belzona 9382 to the substrate adjacent to one end of the repair will help in securing the release film in place.
	
NOTE	Belzona 9381 should be spiraled around the repair in the same direction as the reinforcement sheet.
10.2	APPLY at least TWO wraps of Belzona 9382 across the repair area with a minimum 75% overlap.
	
CAUTION	It is recommended that high hand pressure tension be applied to Belzona 9382 for effectively consolidating the repair.

Step No.	*Step*
11.0	Clean Up
11.1	All mixing tools and accessories must be cleaned with Belzona 9111, MEK or any suitable cleaner degreaser. Uncleansed containers for the bases and solidifiers of all products used must be disposed of in accordance with Section 13 of each product's SDS Each repair should be identified by design reference number

Step No.	*Step*

12.0	Cure Schedule and Inspection
12.1	FOLLOW Section "Completion of the Molecular Reaction" of specified resin's IFU for solidification times. Once cured, REMOVE Belzona 9382.
12.2	ENSURE that the total axial extent of repair and repair thickness are as per the design outputs specified.
12.3	Check for delamination, dry spots (un-impregnated fibers) and cracks.
CAUTION	There should be no delamination, dry spots (un-impregnated fibers) or cracks that penetrate the repair laminate.
12.4	Check for wrinkles, pits and foreign matter.
CAUTION	Pits and wrinkles should not have depths equal to or larger than 1 mm. Foreign matter shall not exceed 10 mm in width or 1.5 mm in height.
12.5	CONFIRM that the repair laminate has passed the inspection requirements discussed in steps 11.2 through 11.4.

Quality and Control

The proper QA/QC forms shall be completed during and after the application. The documents should then be returned to Belzona. Upon review of such forms, Belzona will provide a certificate of conformance which validates the repair as compliant with ISO 24817 and ASME PCC-2.

APPLICATION REPORT

Belzona SuperWrap II

Please note that this form and relevant appendices must be completed and submitted to Belzona for compliance with ASME PCC-2 and/or ISO 24817.

APPLICATION INFORMATION			
PROJECT TITLE		REPAIR THICKNESS PER DESIGN	
ASSET OWNER		NUMBER OF WRAPS PER DESIGN	
ASSET TYPE		REPAIR LENGTH PER DESIGN	
ASSET REFERENCE		DATE	

ENVIRNMENTAL READINGS DURING SURFACE PREPARATION							
Application Phase	Date	TIME	AMBIENT TEMP (°F)	SUBSTRATE TEMP. (°F)	RELATIVE HUMIDITY (%)	DEW POINT (°F)	WEATHER CONDITONS

SURFACE PREPARATION			
START DATE		START TIME	
END DATE		END TIME	
SURFACE PREP METHOD	GRIT BLAST ☐	POWER TOOL ☐	
PREP SPECIFICS			
PROFILE TEST METHOD		AVERAGE PROFILE (mils)	
NOTES			

APPLICATION REPORT

Belzona SuperWrap II

COATING APPLICATION							
Application Phase	Date	BELZONA PRODUCT	BASE BATCH NO.	SOLIDIFIER BATCH NO.	TIME STARTED	TIME FINISHED	DETAILS

ENVIRNMENTAL READINGS DURING APPLICATION							
Application Phase	Date	TIME	AMBIENT TEMP (°F)	SUBSTRATE TEMP. (°F)	RELATIVE HUMIDITY (%)	DEW POINT (°F)	WEATHER CONDITONS

NOTES

INSTALLER / SUPERVISOR QUALIFICATION CRITERIA			
INSTALLER NAMES	ID NUMBER ON CARD	EXP DATE	SIGNATURE
SUPERVISOR NAMES	ID NUMBER ON CARD	EXP DATE	SIGNATURE

INSPECTION REPORT

Belzona SuperWrap II

SURFACE PREPARATION		
SPECIFIED SURFACE CLEANLINESS ACHIEVED	YES ☐	NO ☐
SPECIFIED AVERAGE PROFILE ACHIEVED	YES ☐	NO ☐
METAL DEGREASED AFTER SURFACE PREPARATION	YES ☐	NO ☐
IF NO FOR ANY OF THE ABOVE, EXPLAIN		

SUPERWRAP APPLICATION CHECK OFF		
SCOPE OF WORK FOLLOWED	YES ☐	NO ☐
BATCH NUMBERS IN DATE	YES ☐	NO ☐
ENVIRONMENTALS THROUGHOUT APPLICATION IN SPEC	YES ☐	NO ☐
ANY PITTING OR THROUGH WALL DEFECT PROPERLY FILLED IN	YES ☐	NO ☐
SUBSTRATE WET OUT WITH RESIN	YES ☐	NO ☐
PRODUCTS MIXED CORRECTLY AND CURED	YES ☐	NO ☐
REINFORCEMENT FULLY WETTED OUT	YES ☐	NO ☐
PROPER NUMBER OF WRAPS/REPAIR THICKNESS ACHIEVED	YES ☐	NO ☐
REPRAIR LENGTH AS PER DESIGN	YES ☐	NO ☐
REPAIR CONSOLIDATED AND WRAPPED CORRECTLY	YES ☐	NO ☐
ALL PRODUCTS APPLIED WITHIN OVERCOAT WINDOWS	YES ☐	NO ☐
PROPER CURING TEMPERATURE AND TIME	YES ☐	NO ☐
NO DRY SPOTS WITHIN REPAIR	YES ☐	NO ☐
ENDS OF REPAIR BONDED WELL ONTO PREPED METAL	YES ☐	NO ☐
IF NO FOR ANY OF THE ABOVE, EXPLAIN		

	APPLICATION	*INSPECTION*	*CLIENT*
COMPANY			
NAME			
POSITION			
DATE			
SIGNATURE			