

Project: Emergency sealing of leaking pipes – **low pressure repair up to 75psi**

System: Polymeric Engineered Solutions Composite Repair Systems with manual surface preparation

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1. INTRODUCTION

This document details the requirements for surface preparation, application procedure and inspection of Polymeric Engineered Solutions composite repair systems used for emergency sealing of fluid process pipework.

The document draws attention to the need for special attention when selecting suitable repair materials for operation on low pressure pipework and as such may differ from other documents governing the selection and application of organic repair materials.

Any requirements stated in this document are in addition to those stipulated in the Technical Data Sheet for the following composite repair materials -

1. Power Metal 301 Epoxy Resin and Hardener
2. Power Metal 302 Epoxy Repair Cement
3. Power Metal 701/702/703 Glass Tape

2. HEALTH & SAFETY

2.1. Safety Data Sheets

2.1.1 MSDS information shall be provided for all material supplied and shall comply with the relevant regulatory information regardless of where coating application takes place.

2.1.2. As well as supplying the above information for the coating material to be applied, the same information shall be made available for any ancillary materials involved in the repair process, e.g. cleaner/degreasers, etc.

2.2. GENERAL HEALTH AND SAFETY

2.2.1. The personnel responsible for application of the repair material shall be responsible for ensuring that all documentation pertaining to the safe use of any of the materials used within the coating process is available for review, and a copy is located at the application site for use in an emergency.

2.2.2. The personnel responsible for application of the coating material shall also ensure that all requirements for Personal Protective Equipment (PPE) are carried out and in addition any other regulations, such as those governing Occupational Exposure Limits, are also met.

2.2.3. All surface preparation, application and inspection shall be carried out within the prescribed Health and Safety framework of the site at which such work takes place.

2.2.4. All regulations pertaining to Permit to Work systems in operation at the application site shall be strictly observed.

2.2.5. Any special workplace requirement relating to the application site shall be noted and acted upon accordingly.

3. INITIAL PREPARATION

TOOL BOX TALKS ARE TO BE CARRIED OUT BETWEEN THE SUPERVISORY TEAM AND THE REPAIR TEAM PRIOR TO COMMENCING ANY PHASE OF THE APPLICATION.

3.1 Ensure the damaged pipe is isolated and drained of any material.

3.2 Unless being carried out in an enclosed space, prior to preparation of the surface all adjoining equipment and structures shall be fully protected from mechanical damage and ingress of dust from the surface cleaning process.

3.3 Prior to commencing work adequate lighting shall be made available.

3.4 All traces of oil and grease contamination shall be removed by a suitable cleaner/degreaser, e.g. MEK, prior to cleaning of the surface.

4. MANUAL SURFACE PREPARATION

4.1. Definition of manual preparation covers, wire brushing, sanding or scouring of the surface

4.2 As a general rule for holed pipe surfaces the repair should cover at least 8 inches either side of the hole. For cracks or weeping surfaces the entire length of pipe from flange face to flange face should be prepared.

4.3 Using a circular hand motion prepare the surface using the wire brush or sand paper. Clear any loose material, coatings or corrosion from the surface.

4.4 Where any hard surface corrosion is still in place use a hammer and chisel to ensure any potentially loose surface contamination is cleaned from the surface

4.5 Once the area has been cleaned it should be wiped down with a suitable cleaner or degrease such as MEK.

4.6 If the repair surface is badly pitted or scarred it may require the application of 302 Epoxy Repair Cement to smooth out the surface of the pipe. Please see appendix section 1 for further details.

5. APPLICATION OF 1ST COAT OF 301 EPOXY RESIN AND HARDENER

5.1 The repair is based on GRP technology and relies on layering of resin and glass tape to form a composite barrier around the steel pipe surface.

5.2 Mix the 301 Epoxy Resin and Hardener in line with the instructions described in the technical data sheet provided.

5.3 Brush apply a 20-30 Mil layer of resin on the repair surface. Ensure you have a uniform layer of material. Please note it is better to have too much resin than too little.

6. APPLICATION OF 1ST WRAP OF GLASS TAPE

6.1 The glass tape system provided by PES comes in various widths, a general rule for which tape width to use is as follows –

2 inch	up to 6 inch diameter
4 inch	up to 12 inch diameter
6 inch	up to 18 inch diameter
8 inch	up to 30 inch diameter

6.2 Start at one end of the repair and wind the glass tape around the pipe several times and pull as tight as possible. This will create tension in the tape and serve as an anchor point for the remainder of the 1st wrap of material.

6.3 Wrap the glass tape tightly around the pipe ensuring there is a 50% overlap.

6.4 Once you reach the end of the repair, wrap the tape around the pipe twice and cut the glass tape. Please ensure extra 301 Epoxy Resin and Hardener is brushed onto the end wrap of glass tape material to keep it in place on the pipe surface.

7. EXTRA WRAPS OF GLASS TAPE AND APPLICATION OF 301 EPOXY RESIN AND HARDENER

- 7.1 To complete the repair sections 5 and 6 should be repeated twice more, to ensure the leaking pipe surface is sealed.
- 7.2 Once the final wrap of glass tape has been completed allow the system 1-2 hours to cure before you apply a final layer of 301 Epoxy Resin and Hardener at approx. 20-30 mils.
- 7.3 Once cured the system will have a thickness of at least 1mm and has been tested to give 75psi pressure tolerance.
- 7.4 The system should be given at least 24 hours curing time at 68°F before the system is switched back on.
- 7.5 The PES pipe repair system can be post cured to speed up the back in service time, apply heat uniformly to the surface. Curing times will be reduced significantly by post curing

86°F	12 HOURS
104°F	6 HOURS

APPENDIX 1: APPLICATION OF 302 EPOXY REPAIR CEMENT

If the repair surface has been badly corroded and has excessive pitting and scarring a thin layer of 302 Epoxy Repair Cement can be applied to the pipe surface.

1. Mix the material as per the mixing instructions set out in the technical data sheet.
2. Using the spatula or applicator tool provided press the material into any deep pitting or scars on the surface of the pipe.
3. Once the product has tacked off a thin layer of material can be applied to the entire repair surface if required. Use the applicator tool provided to apply approx. 16-28 mils of material to the pipe surface.
4. Once the product is sufficiently hard to take another coat apply the 301 Epoxy Resin and Hardener as stated in section 5.

APPENDIX 2: INSPECTION REQUIREMENTS OF COATING APPLICATION

Test	Test method	Frequency	Acceptance Criteria	Consequence
ENVIRONMENTAL CONDITIONS	AMBIENT AND STEEL TEMPERATURE RELATIVE HUMIDITY	START OF EACH SHIFT + HOURLY THROUGHOUT SHIFT.	MINIMUM OF 5°F ABOVE DEW POINT <85% R.H.	NO REPAIR WORK TO BE CARRIED OUT
	STEEL TEMPERATURE	START OF EACH SHIFT THEN CONSTANTLY	>50°F <140°F	HEATERS TO BE USED TO RAISE SURFACE AND PRODUCT TEMP PRODUCT NOT TO BE USED ON SURFACES HIGHER THAN 140°F DUE TO EFFECTS OF THERMAL SHOCK*
VISUAL EXAMINATION	VISUAL FOR PINHOLES AND MISSES	100% OF ALL SURFACES	NO DEFECTS	ALL DEFECTS TO BE REMEDIED DURING

				APPLICATION WHEREVER POSSIBLE.
PRODUCT IDENTIFICATION	RECORDING OF BATCH NUMBERS		ALL BATCH NUMBERS SHALL BE RECORDED.	

*For repair systems to be applied to surface temperatures higher than 140°F please contact Plant Equipment and Services @ pes1@pes-solutions.com

Appendix 3: Photographic evidence of manually prepared pipe repair systems

There are many areas where PES composite repair systems can be used, please see below various areas where these systems have been used.



100's of feet of pipework completed at power stations in the UK, manual surface prep with three wraps of glass tape and 301 Epoxy Resin and Hardener.



1000s of feet pipework completed on board vessels worldwide manual surface prep with three wraps of glass tape and 301 Epoxy Resin and Hardener.

