

Standard for Preventative Maintenance, Repair and In-situ Construction of Petroleum Sumps

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PREFACE

Petroleum sumps need to remain water tight to properly contain and detect spills at fuel dispensing facilities. Water ingress into sumps is a common issue. Water passes into sumps through penetrations for piping and conduits, sump lids that do not seal adequately, seepage from manufactured seams, poor installation practices, and through cracks, holes and other defects that develop over time. Sump removal and replacement is expensive and, due to local or State regulations, may require the removal and replacement of all product piping at a site.

A standardized approach for performing preventative maintenance activities and repairs to sumps is necessary so that retail fuel distribution facilities can have an option to extend the serviceable life of existing sumps in a way that is both economical and protective of the environment. Additionally, as methods have been developed to utilize an existing sump as a mold for the fabrication of a new sump without need for removal of the existing sump or disturbing the existing piping, it is prudent to standardize this in-situ approach for the manufacturing of sumps in place.

KWA Associates can provide third party verification of the conformance of methods and procedures of a manufacturer or service provider to the requirements of this standard.

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INTRODUCTION

The purpose of this standard is to provide a standardized approach to petroleum sump preventative maintenance and repair, and to provide minimum requirements for the in-situ manufacturing of petroleum sumps at retail petroleum facilities. There are three parts to this standard:

- (1) Sealing/caulking of sump seams and penetrations;
- (2) Providing a water-tight lid assembly to existing sumps; and
- (3) Construction in place of a new single or double wall sump without need for removal of the existing sump.

It should be noted that a key element of this practice requires that the materials used must meet the requirements described section 6.0 - Required Material Approvals and Testing. **Failure to meet the requirements of section 6 of this standard will invalidate the approval of any sump maintenance, repair or in-situ construction system under review.**

1.0 Scope

1.1 This standard describes procedures and material requirements for sump preventative maintenance, repair and in-situ construction at retail petroleum dispensing facilities. This standard does not address other maintenance activities performed within the sump such as the servicing of equipment contained within the sump, simple boot replacement, or leak detection methods.

1.2 Three processes are described in this standard.

1.2.1 Application of sealants and caulks as either a preventative maintenance procedure or to correct minor defects.

1.2.2 Attaching a water-tight lid assembly to an existing sump.

1.2.3 Constructing a new single or double wall sump utilizing the existing sump as a fabrication mold.

1.3 Intent.

1.3.1 Sealants and caulks may be applied to sumps either with or without an accompanying water-tight lid assembly.

1.3.2 The water tight lid assembly may be provided to intact non-leaking sumps, sumps which have been sealed/caulked or repaired, and to in-situ manufactured sumps.

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1.3.3 In-situ manufactured sumps may be of either single wall or double wall construction.

1.4 Safety and Compliance

1.4.1 This standard does not purport to address the safety concerns associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.4.2 Sumps should be considered to be confined spaces as regulated under OSHA regulations of Subpart AA – Confined Spaces in Construction (29 CFR 1926.1200 et seq.). The user of this standard is responsible for compliance with all OSHA regulations including those provided in 29 CFR Part 1910 and 29 CFR Part 1926.

1.4.3 The user of this standard is responsible for compliance with State OSHA regulations, where they exist, which may be more stringent than Federal OSHA regulations cited in Section 1.4.2 above.

1.4.4 Petroleum fuels are flammable and toxic. The user of this standard is responsible for implementing all necessary exposure controls.

1.4.5 State and/or local regulations may limit the options available under this standard. The user of this standard is responsible for compliance with all State and local regulations and requirements.

2.0 Referenced Documents

2.1 The most recent version of the following documents should be consulted as references by those using this standard:

2.1.1 US Code of Federal Regulations:

- 29 CFR Part 1910, Occupational Safety and Health Regulations
- 29 CFR Part 1926, Safety and Health Regulations for Construction
- 40 CFR Part 280, Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)

3.0 Terminology

3.1 Descriptions of Terms:

3.1.1 Flood Coat – a resin-rich coat applied to the surface of a laminate.

3.1.2 FRP – fiberglass reinforced plastic. Fiberglass strands or mat are saturated with a resin at specified ratios. The resultant laminate is stronger than a laminate composed solely of resin materials.

3.1.3 In-Situ Construction – fabrication at the location of installation.

3.1.4 NWGLDE – the National Work Group on Leak Detection

3.1.5 Primary Sump Wall – in a double wall tank, the primary sump wall is the interior wall of the sump. The primary sump wall is intended to contain any fluid within the sump to prevent it from reaching the monitored interstice between the primary and secondary sump walls.

3.1.6 Sealing/Caulking – sealing and caulking are methods used to seal around sump penetrations and seams either to stop groundwater and surface water ingress or as a preventative measure. Caulks are thickened or filled resins which are applied as a thick paste-like material to the surface of the sump and allowed to cure. Sealants are resinous materials with a consistency of a thick paint. Sealants may be applied with or without fiberglass reinforcement to the surface of the sump.

3.1.7 Secondary Sump Wall – in a double wall tank, the secondary sump wall is the exterior wall of the sump. The secondary sump wall is intended to prevent external fluids, such as groundwater, from reaching the monitored interstice between the primary and secondary sump walls. The secondary sump wall also serves to contain any fluid which breaches the primary sump wall to prevent environmental damage.

3.1.8 Water-tight FRP Lid Assembly – a replacement lid intended to be attached to an existing or newly constructed sump using FRP materials. The lid has a built-in access which seals mechanically to prevent water ingress.

4.0 Significance and Use

4.1 This standard provides a method for performing sealing/caulking of sumps as a preventative maintenance measure.

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4.2 This standard provides a method for performing sealing/caulking of sumps as a repair measure.

4.3 This standard provides a method for installing a water-tight FRP lid assembly on existing and newly fabricated sumps.

4.4 This standard provides a method for fabricating a new single wall sump using the existing sump as a fabrication mold.

4.5 This standard provides a method for fabricating a new double wall sump using the existing sump as a fabrication mold.

5.0 Permits, Plans and Leak Testing

5.1 Prior to engaging in any activities relating to the preventative maintenance, alteration, repair, or upgrade of any UST system, consult all necessary authorities to obtain any required permits.

5.2 Hydrostatic tightness testing shall be performed as required by the local implementing agency and in accordance with the requirements of Section 12 of this standard.

6.0 Required Material Approvals and Testing

6.1 Materials used to seal/caulk, repair or fabricate sumps must satisfy one of the requirements of section 6.1.1 through 6.1.2 of this standard.

6.1.1 Approval in accordance with section 6.2 of this standard

6.1.2 Approval in accordance with section 6.3 of this standard

6.2 A resin/resin laminate which has been tested through Underwriters Laboratories and which has obtained an UL component listing for use in components for UL 1316 tanks, UL 1746 tanks or both.

6.3 A resin/resin laminate which has been tested by a certified laboratory for compatibility with petroleum fuels, alcohol blended petroleum fuels, alcohol fuels and environmental fluids. The testing shall include:

6.3.1 Immersion conditioning of representative samples. All samples shall be applied to surfaces similar to the surface of intended application, except for samples to be used in the testing of flexural strength which shall be comprised exclusively of resin/resin laminate material.

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6.3.1.1 Samples shall be immersed in the liquids listed in 6.3.1.2 at either 38° (100°F.) for periods of three and six months, or 23°C. (74°F.) for periods of six and 12 months.

6.3.1.2 Immersion liquids shall include:

- Unleaded gasoline
- No. 2 fuel oil or diesel fuel
- Gasohol (10 percent ethanol)
- Gasoline and five percent ethanol with appropriate co-solvent
- 85 percent ethanol with 15 percent gasoline
- Distilled water

6.3.2 Post-immersion testing of samples. Each of the following tests shall be performed on representative samples at the end of each specified immersion periods and in as-received condition. Any sample result exhibiting a loss of greater than 50% of the tested condition as compared to the as-received sample shall be considered to have failed the test. All tests must pass in order to receive approval under this section of the standard.

6.3.2.1 ASTM D4541-85

Purpose = Bonding strength

Pull-off strength of coatings using portable adhesion tester;

6.3.2.2 ASTM D790-86,

Purpose = Flexural strength

Flexural strength Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials;

6.3.2.3 ASTM D256-81,

Purpose = Izod impact

Test methods for impact resistance of plastics and electrical insulating materials;

6.3.2.4 ASTM D2583-81

Purpose = Hardness

Indentation Hardness of Rigid Plastics; and

6.3.2.5 ASTM D543-87, Procedure 1

Purpose = Film integrity

Resistance of Plastics to Chemical Reagents

7.0 Sump Evaluation

Sump Evaluation – the sump shall be evaluated prior to performing the procedures contained in this standard. Stated deformation and damage limits for sumps shall not be exceeded under this standard unless approved by a registered professional engineer. The source of water ingress must be established and the ingress of water stopped prior to implementing the procedures provided in this standard.

7.1 Out-of-Round – sumps which are designed to be round shall not be more than 2% out-of-round as measured by two perpendicular measurements at both the center and near the top of the sump.

7.2 Misshapen – sumps of a square or rectangular design shall have no corner in excess of +/- 9 degrees from perpendicular.

7.3 Cracked – small cracks in FRP sumps with a separation distance of ¼ inch or less and a length not exceeding 12 inches may be repaired using a fiberglass reinforced resin laminate extending a minimum of 6 inches in all directions from the edge of the repair. Larger cracks in FRP sumps and any crack in polyethylene sumps cannot be repaired except where the existing sump is to be used as a fabrication mold for the manufacture of a new sump in accordance with the requirements of section 11 of this standard.

7.4 Holes, Punctures and Missing Sections - small holes, punctures or missing sections in FRP sumps not exceeding 2.5 inches may be repaired using a fiberglass reinforced resin laminate extending a minimum of 6 inches in all directions from the edge of the repair. Larger holes, punctures or missing sections in FRP sumps and any hole, puncture or missing section in polyethylene sumps cannot be repaired except where the existing sump is to be used as a fabrication mold for the manufacture of a new sump in accordance with the requirements of section 11 of this standard.

9.0 Application of Sealant/Caulking Materials to FRP Sumps

Note: this procedure is not applicable to polyethylene sumps as sealant/caulking materials do not bond well to polyethylene.

9.1 No work is to be performed in the sump until the sump interior has been monitored to assure a safe working atmosphere. Where a hazard is detected or could develop, ventilation of the sump can be implemented to make the

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atmosphere safe. Monitoring should be continuous throughout entry and occupation of the sump.

Note: materials used for preventative maintenance, sump repair and sump fabrication may be toxic or flammable prior to curing.

9.2 Shut off and isolate all equipment.

9.3 All water ingress must be stopped prior to proceeding to section 9.4. Acceptable methods for eliminating water ingress include drilling a well point to lower the water table and the application of water-stopping materials in the vicinity of sump penetrations. If necessary for access to the sump exterior, the concrete surrounding the containment sump may be saw cut to provide a minimum of 6" of working space outside of the containment sump on any sides with penetrations through the sump wall.

9.4 Remove and protect components within the sump as necessary.

9.5 The entire surface of the sump interior must be thoroughly cleaned of all residues.

9.6 The interior sump surface shall be abraded until the surface gel coat has been removed for a minimum of 1 inch in all directions from all seams that are to be sealed or caulked. The sealant or caulking system shall not be applied to a surface which has not been abraded and must cover the entire abraded surface.

9.7 The sealant or caulking materials must meet the material qualifications as provided in section 6 of this standard.

9.8 Testing shall be conducted to assure that all sealant or caulking materials are fully cured.

9.9 The sump shall be tested in accordance with section 12 of this standard prior to being returned to service.

10.0 Addition of a Water-tight FRP Lid Assembly to Sumps

Note: this procedure is not applicable to polyethylene sumps as fiberglass bonding materials do not bond well to polyethylene. Sumps fabricated in accordance with section 11 of this standard using the existing polyethylene sump as a fabrication mold may be fitted with water-tight lid assemblies in accordance with the requirements of this section.

10.1 No work is to be performed in the sump until the sump interior has been monitored to assure a safe working atmosphere. Where a hazard is detected or could develop, ventilation of the sump can be implemented to make the

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atmosphere safe. Monitoring should be continuous throughout entry and occupation of the sump.

Note: materials used for preventative maintenance, sump repair and sump fabrication may be toxic or flammable prior to curing.

10.2 A water-tight FRP lid assembly may be attached to (1) an existing sump which has been sealed or caulked in accordance with section 9 of this standard; (2) a sump which has been constructed using the existing sump as a fabrication mold in accordance with section 11 of this standard; or (3) to an existing FRP sump which has not been modified.

10.3 Shut off and isolate all equipment.

10.4 The lid assembly shall be fabricated from materials tested in accordance with section 6 of this standard if made from plastic materials. Portions of the lid assembly fabricated from stainless steel, aluminum, brass and similar metals shall be deemed to meet the compatibility requirements of this standard. Metallic components which are in contact with soil or water should be protected from corrosion.

10.5 The lid assembly shall fit snugly to the sump prior to permanent attachment.

10.6 The sump interior surface within a minimum of 6 inches of the point of connection for the water-tight lid shall be cleaned of any residual materials, dirt or other foreign materials, and abraded sufficiently to remove any existing gel coat.

10.7 The water-tight FRP lid assembly shall be permanently connected to the sump from the sump interior using a minimum of 3 layers of 1.5 oz fiberglass cloth saturated with resin. The first layer of fiberglass cloth shall extend no less than 2 inches onto the interior sump wall and 2 inches onto the sump lid assembly. Each successive layer of fiberglass cloth shall extend a minimum of 2 inches beyond the previous layer onto both the sump interior surface and the sump lid assembly. Each layer of resin saturated fiberglass cloth shall be rolled or otherwise treated to remove entrapped air bubbles prior to the application of a successive layer.

10.8 Testing shall be conducted to assure that all resin materials are fully cured.

10.9 The sump shall be tested in accordance with section 12 of this standard prior to being returned to service.

11.0 In-Situ Construction of a New Sump Utilizing the Existing Sump as a Fabrication Mold

The following procedures apply to the in place construction of both single and double wall sumps utilizing the existing sump as a fabrication mold. The existing sump is not removed. Suitable sump types for this procedure include fiberglass (FRP), polyethylene (PE) and steel.

11.1 No work is to be performed in the sump until the sump interior has been monitored to assure a safe working atmosphere. Where a hazard is detected or could develop, ventilation of the sump can be implemented to make the atmosphere safe. Monitoring should be continuous throughout entry and occupation of the sump.

Note: materials used for preventative maintenance, sump repair and sump fabrication may be toxic or flammable prior to curing.

11.2 Shut off and isolate all equipment.

11.3 All water ingress must be stopped prior to proceeding to section 11.4. Acceptable methods for eliminating water ingress include drilling a well point to lower the water table and the application of water-stopping materials in the vicinity of sump penetrations. If necessary for access to the sump exterior, the concrete surrounding the containment sump may be saw cut to provide a minimum of 6" of working space outside of the containment sump on any sides with penetrations through the sump wall.

11.4 Remove and protect components within the sump as necessary.

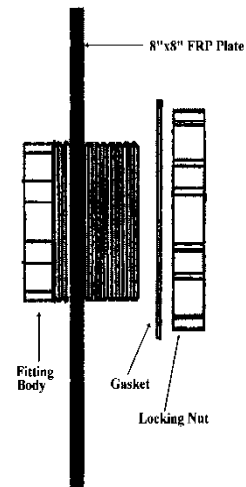
11.5 The entire surface of the sump interior must be thoroughly cleaned of all residues.

11.6 Piping and Conduits

11.6.1 Flexible piping must be cut from the existing sump wall and connected to minimum 8" x 8" laminate plates with a minimum nominal thickness of 150 mils (0.15") using compression fittings.

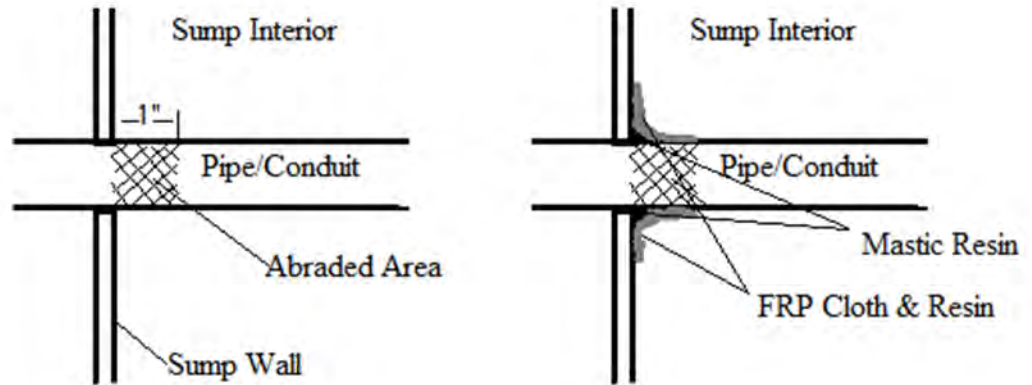
11.6.2 Fiberglass (FRP) Piping

11.6.2.1 FRP piping which is known to extend as straight pipe for a minimum of 4 feet prior to entering through the sump wall can be permanently attached to the new sump wall using 3 layers



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of 1.5 oz fiberglass cloth saturated with resin and rolled to remove entrapped air. FRP piping must be sanded to remove any contaminants from the surface and to remove the gloss from the surface prior to sealing.



11.6.2.2 FRP piping which does not meet the requirements of section 11.6.2.1 must be cut from the existing sump wall and connected to minimum 8" x 8" laminate plates with a minimum nominal thickness of 150 mils (0.15") using compression fittings or standard boots.

11.6.3 Other piping types must be cut from the existing sump wall and connected to minimum 8" x 8" laminate plates with a minimum nominal thickness of 150 mils (0.15") using compression fittings or standard boots.

11.6.4 Metallic conduit shall be permanently attached to the new sump laminate as shown in the figure shown in section 11.5.2.1. Metallic conduit must be sanded to remove any corrosion, dirt, paint or other contaminants from the surface prior to sealing.

11.7 Single Wall Sump Fabrication

11.7.1 No work is to be performed in the sump until the sump interior has been monitored to assure a safe working atmosphere. Where a hazard is detected or could develop, ventilation of the sump can be implemented to make the atmosphere safe. Monitoring should be continuous throughout entry and occupation of the sump.

Note: materials used for preventative maintenance, sump repair and sump fabrication may be toxic or flammable prior to curing.

11.7.2 The sump interior surface must be abraded. Abrasion of the sump interior surface will allow fiberglass cloth saturated with resin to form a mechanical bond to polyethylene sump molds and both a mechanical and

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chemical bond to FRP sump molds when applied to the surface of the sump mold. As the applied materials will form a self-supportive structure, the bond so formed need only be sufficient to hold the resin saturated fiberglass cloth in place long enough to cure.

11.7.3 The thickness of the newly constructed sump wall shall not be less than 250 mils (0.25 inches) upon completion and all materials used in the manufacture of the new sump must meet the approval requirements of section 6 of this standard.

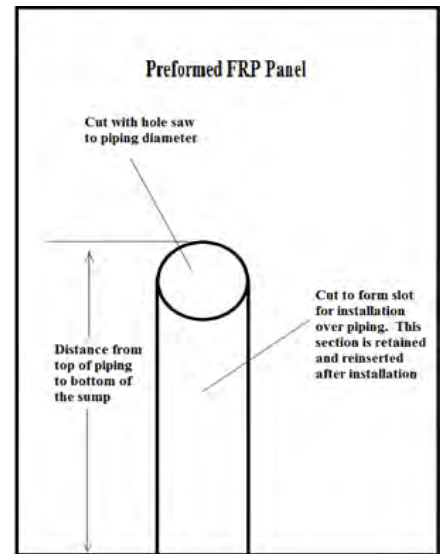
11.7.4 The full thickness can be achieved using multiple layers of resin saturated 1.5 oz fiberglass cloth rolled or otherwise treated to remove entrapped air followed by a flood coat once full thickness has been achieved; or

11.7.5 Preformed FRP panels which conform closely to the shape of the existing sump mold may be inserted and joined as described.

11.7.5.1 Preformed FRP panels must be a minimum of 100 mils (0.1") in thickness.

11.7.5.2 Preformed panels shall be joined to one another at seams using two layers of fiberglass bi-directional tape. The first layer shall be a minimum of 3 inches in width and shall be centered over the seam. The second layer shall extend a minimum of 1 inch beyond the edges of the first layer in both directions.

11.7.5.3 Multiple layers of resin saturated 1.5 oz fiberglass cloth rolled or otherwise treated to remove entrapped air shall be applied over the preformed panels to achieve a minimum additional thickness of 150 mils (0.15') followed by a flood coat once full thickness has been achieved.



11.7.6 Piping shall be attached to the new sump as provided in section 11.9 of this standard.

11.7.7 Testing shall be conducted to assure that all resin materials are fully cured.

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11.7.8 The sump shall be tested in accordance with section 12 of this standard prior to being placed to service.

11.8 Double Wall Sump Fabrication

11.8.1 No work is to be performed in the sump until the sump interior has been monitored to assure a safe working atmosphere. Where a hazard is detected or could develop, ventilation of the sump can be implemented to make the atmosphere safe. Monitoring should be continuous throughout entry and occupation of the sump.

Note: materials used for preventative maintenance, sump repair and sump fabrication may be toxic or flammable prior to curing.

11.8.2 The sump interior surface must be abraded. Abrasion of the sump interior surface will allow fiberglass cloth saturated with resin to form a mechanical bond to polyethylene sump molds and both a mechanical and chemical bond to FRP sump molds when applied to the surface of the sump mold. As the applied materials will form a self-supportive structure, the bond so formed need only be sufficient to hold the resin saturated fiberglass cloth in place long enough to cure.

11.8.3 The thickness of the newly constructed secondary sump wall shall not be less than 150 mils (0.15 inches) upon completion and the thickness of the interior (primary) wall must not be less than 150 mils (0.15 inches) upon completion. All materials used in the manufacture of the new sump must meet the approval requirements of section 6 of this standard.

11.8.4 The methods described in section 11.7 of this standard may be used to construct both the interior (primary) and exterior (secondary) walls of the new sump.

11.8.5 Third party testing shall demonstrate that the interstice is open and that a leak of 0.10 gallons per hour will be detected in accordance with the annual tightness testing and monthly monitoring criteria set by EPA.

11.8.6 The interstice shall be monitored utilizing a sensor on the NWGLDE list of equipment that has been shown to operate as specified.

11.8.7 Testing shall be conducted to assure that all resin materials are fully cured.

11.8.8 The sump shall be tested in accordance with section 12 of this standard prior to being placed to service.

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11.9 Attachment of Piping and Conduit to the New Sump

11.9.1 FRP piping meeting the requirements of section 11.6.2.1 and metallic conduit shall be attached to the new sump wall at the time of sump wall construction by applying fiberglass onto the FRP piping or metallic conduit during the construction of the new sump wall.

11.9.2 Piping which has been connected to minimum 8" x 8" laminate plates shall be protected from resin application through the use of thread protectors so that the piping does not become attached to the new sump wall. The minimum 8" x 8" laminate plate is then connected to the interior surface of the new sump wall using a minimum of 3 layers of 1.5 oz fiberglass cloth saturated with resin. The first layer of fiberglass cloth shall extend no less than 2 inches onto the interior sump wall and 2 inches onto the minimum 8" x 8" laminate plate. Successive layers of resin saturated fiberglass cloth shall extend not less than 2 inches beyond the previous layer onto the interior sump wall. Care must be exercised to not apply resin or fiberglass directly to the piping or the piping connector.

11.9.3 Testing shall be conducted to assure that all resin materials are fully cured.

11.9.4 The sump shall be tested in accordance with section 12 of this standard prior to being placed to service.

12.0 Hydrostatic Testing

Prior to the sump being placed back in service, the following procedure shall be performed.

12.1 The sump shall be filled with water after sufficient cure of the laminate materials has been established to within 2" of capacity or to the minimum level required by local regulations and above the level of all sump penetrations.

12.2 The water level will be marked on the sump.

12.3 The water must maintain at the marked level for a minimum of 3 hours or for the period required by local regulations, whichever is longer.

12.4 If the water does not maintain its level, the source of the problem must be located and remedied. Testing is then repeated, starting with section 12.1, to ensure that the sump is tight.

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12.5 The sump shall be pumped out and dried. Test water must be disposed of in accordance with all Federal, State and local regulations.

12.6 Any additional testing of the sump system required by local or state agencies must be performed prior to the sump being placed in service.

15.0 Keywords:

caulking, in-situ construction, lid assembly, preventative maintenance, sealant, sealing, sump, testing, water-tight.

Contact Information:

NLPA – National Leak Prevention Association
P.O. Box 575
Tilton, NH 03276
PH: 815.301.2785
<http://nlpa-online.org>

KWA – Ken Wilcox Associates, Inc.
1125 Valley Ridge Drive
Grain Valley, MO 64029
PH: 816.443.2494
<http://www.kwaleak.com>