SPR™ PE Steel Reinforced Liner

Reline Done Right™
Contech® is your single source for rehabilitation of sanitary & storm sewers, culverts and bridges.

Contech Engineered Solutions has partnered with SEKISUI Rib Loc Australia to offer the most technologically advanced, environmentally friendly, trenchless solutions for small to large diameter pipe renewal.

**SPR™ PE** offers a fully structural solution using a spiral, machine wound, trenchless pipe renewal process. This technology can be utilized in a range of sizes (29” - 118”) for circular applications.

**SPR™ PE** is a spiral wound, steel reinforced HDPE product that is fusion-welded to form a continuous structural rehabilitation pipe.

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**SPR™ PE**

**Structural Internal Steel Reinforced HDPE Liner for Closed System Storm & Sanitary Sewers and Culverts with Limited Access**

The SPR™ PE pipe rehabilitation process is a solution for restoring the hydraulic efficiency, reliability and integrity of aging sewers, storm drains and culverts.

SPR™ PE liners can structurally rehabilitate existing brick, concrete, glass reinforced plastic or corrugated metal pipelines from 36 to 132 inches. SPR™ PE is a steel reinforced plastic pipe liner with a smooth internal surface. The liner is spirally wound into a circular pipe from within the base of the manhole of the pipeline to be rehabilitated. The liner is introduced into the host pipe at a fixed diameter and the annular space is subsequently grouted using a cellular, low strength cementitious grout. The plastic profile that forms the liner is reinforced with steel that is fully encapsulated within the HDPE material. The steel reinforcement is selected based on the individual project design requirements.

<table>
<thead>
<tr>
<th>SPR™ PE</th>
<th>Inside Diameter</th>
<th>29&quot; to 118&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>HDPE</td>
<td></td>
</tr>
<tr>
<td>Shape</td>
<td>Circular</td>
<td></td>
</tr>
<tr>
<td>Fixed diameter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SPR™ PE

World Wide Project Experience

SPR™ PE (known as Ribline in other parts of the world) has been used to rehabilitate gravity pipelines since 2005. What sets SPR™ PE apart from other traditional slip lining products is that the pipe is relined from the existing access point in a jointless fashion without excessive site disruption thanks to the ability to place equipment and profile through normal manhole castings. SPR™ PE is a proven technology and has been installed under difficult site conditions with minimal disruption to the public.

Mechanical Installation

The host pipeline is first cleared of debris and obstructions then inspected using closed circuit television (CCTV) inspection or other appropriate method. Once the host pipeline condition has been assessed and is ready for lining, the winding machine is lowered into the manhole or positioned at the access point. The steel reinforced HDPE profile is fed into the winding machine from a spool of material above ground. The winding machine then winds the profile to form a new pipe. The process continues until the liner reaches the terminating point. The ends of the liner are then sealed before the annulus between the liner and the host pipe is grouted using cellular, low strength cementitious grout.

Fast Installation with Small Construction Footprint

- Quick set-up time, minimal site disruption and less disruption to residences and businesses
- In most instances, there is no need to excavate launch pits or store pipes onsite
- Oval cages, in many cases, can be used to conform to the invert and minimize the need for bench removal
- Small construction footprint and fewer support vehicles required to install liner
- Can be installed in live flow conditions based on worker safety and other considerations. Other flow management techniques can be used to eliminate the need for onsite bypassing
- Difficult site and access installations are possible due to the portability of the installation equipment
- Custom diameter cages can be made to order
- NO BYPASS PUMPING!
**SPR™ PE at a glance**

- Structural liner, strong and lightweight
- Manufactured from pipe grade HDPE with embedded steel reinforcing
- Steel thickness can be varied to vary pipeline stiffness
- Liner diameters from 29 to 118 inches using six standard profiles
- Suitable for gravity flow sanitary sewer and storm water pipelines
- High chemical resistance
- Industrial applications
- Improved flow with smooth HDPE material (Manning’s n of 0.010)
- Installation can occur with up to 25% of the flow present

**Flow Advantages**
- Hydraulically efficient, smooth bore with circular cross section
- Usually greater hydraulic capacity than the host pipe - Manning’s “n” value of 0.010
- No ripples or wrinkles even when host pipe joints are offset
- Winds smoothly around large radius bends

**A Strong, Flexible Liner**
- Can be designed as structural stand-alone liner
- Structurally efficient circular cross section - even when the host pipe is misaligned or missing sections of pipe
- Constant wall thickness even when negotiating voids in the host pipe
- Manufactured and machine installed
- Environmentally safe - no chemicals or contaminated process waters to dispose

**Proven Pipe Materials**
- Made from similar grade HDPE as new sewer and drainage pipe
- Cell Classification of 335420C (or E) in accordance with ASTM D 3350
- Continuous welding process seals subsequent strip of profile creating a seamless pipe line of high stiffness
- Consistent material properties
- Structural stand alone liner - does not rely upon the grout for strength but only to transfer the load

**Design**
Industry specifications providing design methods applicable to SPR™ PE, include:
- ASTM F 1741: “Standard Practice for Installation of Machine Spiral Wound PVC Liner Pipe for Rehabilitation of Existing Sewers and Conduit” modified for SPR™ PE (HDPE) liner pipe
- Wrc Sewer Rehabilitation Manual, as a Type 2 liner, assuming no bond will exist between the liner and the host pipe

**HDPE Profiles and Sealant Materials**

<table>
<thead>
<tr>
<th>PROFILE</th>
<th>NOMINAL HEIGHT</th>
<th>TYPICAL PIPE DIAMETER</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>112-20PE</td>
<td>0.787</td>
<td>29 - 43</td>
<td>inches</td>
</tr>
<tr>
<td>112-30PE</td>
<td>1.181</td>
<td>43 - 65</td>
<td>inches</td>
</tr>
<tr>
<td>112-40PE</td>
<td>1.575</td>
<td>65 - 118</td>
<td>inches</td>
</tr>
<tr>
<td>112-20RL</td>
<td>0.787</td>
<td>29 - 43</td>
<td>mm</td>
</tr>
<tr>
<td>112-30RL</td>
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<td>1.575</td>
<td>65 - 118</td>
<td>mm</td>
</tr>
</tbody>
</table>

Note: Contact your local Contech Sales Engineer for a listing of available cage diameters.
TABLE 1

<table>
<thead>
<tr>
<th>Profile Type</th>
<th>Minimum Width</th>
<th>Minimum Height</th>
<th>Minimum Waterway Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>112-20R</td>
<td>112.0</td>
<td>4.40</td>
<td>19.0</td>
</tr>
<tr>
<td>112-30R</td>
<td>112.0</td>
<td>4.40</td>
<td>29.0</td>
</tr>
<tr>
<td>1617</td>
<td>1.6</td>
<td>0.630</td>
<td>17.0</td>
</tr>
<tr>
<td>1623</td>
<td>1.6</td>
<td>0.630</td>
<td>23.5</td>
</tr>
<tr>
<td>1625</td>
<td>1.6</td>
<td>0.630</td>
<td>32.5</td>
</tr>
<tr>
<td>2026</td>
<td>2.0</td>
<td>0.787</td>
<td>26.0</td>
</tr>
<tr>
<td>2133</td>
<td>1.2</td>
<td>0.647</td>
<td>33.5</td>
</tr>
<tr>
<td>1635</td>
<td>1.6</td>
<td>0.630</td>
<td>35.0</td>
</tr>
</tbody>
</table>

C. The nominal gauge, nominal height, minimum strip thickness and minimum moment of inertia of the individual steel reinforcing profiles shall conform to the following Table 2. Note that SPR™ PE profiles contain 3 strips of steel reinforcing.

TABLE 2

<table>
<thead>
<tr>
<th>Profile Type</th>
<th>Nominal Gauge</th>
<th>Nominal Height</th>
<th>Minimum Moment of Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>112-20R</td>
<td>112.0</td>
<td>4.40</td>
<td>19.0</td>
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<td>0.630</td>
<td>35.0</td>
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</table>

Note: Other steel reinforcing profiles can be employed within SPR™ PE profiles if required by the specific application.

D. Design stiffness values for a specific combination of HDPE profile strip and steel reinforcing profile are available from the manufacturer.

E. Interlocking of the edges of HDPE strip is achieved with a site applied HDPE weld, suitable for use in a sewer environment.

PART 2 - MATERIALS

2.1 MATERIAL COMPOSITION

A. The extruded profile strip shall be made from HDPE compounds meeting the minimum requirements for cell classification 335420C or higher, as defined in ASTM D 3350.

B. The CA3 steel reinforcing shall be fully encapsulated, preventing exposure to corrosive elements.

2.2 MATERIAL AND EQUIPMENT ACCEPTANCE

A. At the time of manufacture, each lot of extruded profile strip shall be inspected for defects and tested for physical properties as specified. A “lot” is defined as a continuous extrusion run of a given profile designation on a specific extrusion run.

B. The system consists of a single, one part HDPE profile strip with “I” shaped ribs on one side. The edges of the strip are HDPE welded as it is spirally wound to form a liner inside the host pipe.

C. The steel strips are inserted into the HDPE profile strip and encapsulated at the point of manufacture. The combination of the HDPE profile together with the steel strips form a composite structural liner.

D. A range of HDPE and steel strips are available with different profile, thickness and height configurations to match project design requirements.

E. The winding process is continuous until the complete length of the existing pipe between access points or manholes has been lined.

F. The liner is wound at a fixed diameter, leaving an annular space between the liner and host pipe wall. The annulus is filled with cementitious grout.

G. Grouting of the annulus is only necessary to provide a load path from the liner pipe to the host pipe and to position the liner within the existing pipeline. The liner is independently structural and does not rely on the reinforcing effect of the grout.

REFERENCES

E. ASTM D 2444 : Test for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
F. ASTM D 3350 : Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
G. ASTM F 2136 : Standard Test Method for Notched Constant Loading-Stress (NCLS) Test to Determine Slow-Crack Growth Resistance of HDPE Resins or HDPE Corrugated Pipe

PART 3 - EXECUTION

3.1 INSTALLATION AND FIELD INSPECTION

A. Installation of machine spiral wound HDPE liner pipe for rehabilitation of existing sewers shall comply with ASTM F 1741, except as modified herein.

B. The existing pipeline shall be cleaned of any obstructions, to a standard suitable for installation of the liner, and televised. All existing live service connections shall be precisely located longitudinally and radially, and logged for subsequent reinstatement following installation of the liner.

C. By-pass pumping is not mandatory for installation of the spiral wound liner. The Contractor shall be responsible for deciding the need for flow diversion to allowsuccessful liner installation. Spilling of any sewage in any situation will not be acceptable. The Contractor shall be responsible for the cost of all cleanup and associated activities that may be required to rectify the effects of any spillage due to the liner installation.

D. During installation the winding machine shall perform the following operations simultaneously:

- A continuous ribbed liner profile strip is supplied from a reel and fed down through the existing manhole to the winding machine positioned at the base of the manhole.
- The winding machine winds the HDPE strip into a liner pipe by welding the edges.
- Winding continues until the full length of the deteriorated pipe between manholes has been lined.

E. End seals between the first and the existing pipe shall be installed with a sealing material that is compatible with the liner pipe material.

F. If an annular space exists, grouting shall be introduced under pressure into the annulus. Grout can be injected into the annular space in a variety of ways, such as through openings in the end seals, or at reconnected service connections, or through grout holes drilled in the liner pipe at appropriate points. The grouting operation can take place either in a continuous stage or in lifts, depending on the condition of the host pipe, diameter and length. The grout should consist of the following: Portland cement, water, fly ash or lime and admixtures.

G. Any holes made in the liner for this operation shall be sealed in a manner approved by the Engineer.

H. The transition between the liner invert and the invert in the manhole base shall be rendered smooth to reestablish the sewer flow line.

3.2 SERVICE CONNECTIONS

A. The Contractor shall reinstate all live junctions immediately after installation of the liner. Service connections may be reinstated by excavation or internally.

B. The service connection openings shall conform to the shape and size of the inside diameter of the existing service connection. Service connection openings shall be reinstalled to 95 -100% of their diameter and free from rough edges or protrusions.

3.3 POST INSTALLATION INSPECTION

A. A closed circuit television (CCTV) inspection shall be carried out after installation to establish that the lining has been installed as specified and all live junctions have been reinstated.

B. The finished lining shall be free of defects that would affect long term strength or hydraulic performance.
Installation Site
Lakehurst Naval Air Station - Reline
Lakehurst, New Jersey

Materials
- SPR™ PE Structural Lining
- 786 LF for 48” dia. RCP
- 703 LF for 54” dia. RCP

Project Details
A number of reinforced concrete pipe (RCP) runs used to carry stormwater had deteriorated and were no longer hydraulically or structurally sufficient. The pipes needed to be replaced or repaired. The main challenges for this particular project were the extremely tight constraints and the narrow construction activity windows. After a discussion with Contech Engineered Solutions, the facilities engineer decided to reline the existing RCP with SPR™ PE, a polyethylene structural liner reinforced with steel. This would enable them to access the RCP through the manholes directly whereby they could then wind the structural liner directly into the host pipe. Disruptions to sensitive aircraft operations were avoided.

Installation Site
South Kansas River Pump Station
Topeka, Kansas

Materials
- SPR™ PE Structural Lining
- 453 LF for 78” dia. RCP

Project Details
The City of Topeka had scheduled the repair of several hundred feet of deteriorating reinforced concrete pipe (RCP) sanitary sewer line at their South Kansas River Pump Station. The City looked into optional rehabilitation and sliplining methods rather than a costly replacement and interruption to the high water flow during excavation.

They decided to utilize SPR™ PE which could reline the entire system completely from one access point (a 22” manhole opening) under live flow. This is an advantage of SPR™ PE over other reline technologies.
SPR™ PE Manufacturing Process

Cage & Equipment*

* Dimensions are in millimeters. For a full detail of the equipment and available sizes, contact your Contech Sales Engineer.
ENGINEERED SOLUTIONS

PIPE SOLUTIONS
Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness
- Corrugated Metal Pipe (CMP)
- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

STORMWATER SOLUTIONS
Helping to satisfy stormwater management requirements on land development projects
- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretention

STRUCTURES SOLUTIONS
Providing innovative options and support for crossings, culverts, and bridges
- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

COMPLETE SITE SOLUTIONS

To see SPR™ PE in action, visit: www.ContechES.com/SPR-PE

Contech Engineered Solutions is the nation’s leading provider of site solutions products and services for the Civil Engineering industry.

With more than 40 manufacturing facilities across the United States and around the world, Contech has the resources to support every site development need.