

PT/539/1124 (November 2024)

**Assessment Schedule for the Michigan
GRP Pipes as supplied by Welspun
Michigan Engineers Limited.**



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1. SCOPE

This schedule specifies the requirements for the Michigan GRP Pipes as supplied by Welspun Michigan Engineers Limited. for the rehabilitation of man-entry gravity sewer and storm water lines with discrete pipe liners between manholes.

It is applicable for circular and non-circular Type II structural design in accordance with the WRc Sewerage Rehabilitation Manual⁽¹⁾ for gravity sewer and storm water lines.

2. PRODUCT DESCRIPTION

2.1 Introduction

Welspun Michigan Engineers Limited. manufacture both helically and continuously wound TYPE-II (TYPE-B Liner) GRP (Glass Reinforced Plastic) pipes from 800mm to 2,700mm diameter in circular, egg-shape and horseshoe profile for the rehabilitation of man-entry gravity sewer and storm water lines.

A pre-lining inspection survey is undertaken to ensure the host structure has been adequately prepared. Typically, any lateral connections are diverted to the nearest manhole.

Individual discrete GRP liner sections are conveyed and located via trolleys from the access point to the furthest end of the sewer. They are restrained with wooden chocks, jointed to form a lining and the circumferential joints are sealed with a flexible sealing compound.

Further liner sections are added and at appropriate locations headwalls are constructed from mass-concrete to seal the annulus between the lining and host structure. Bleed-tubes are inserted into the isolated annulus and a suitable grouting

system is used to fill the annulus following the grouting plan lift requirements. The bleed-tubes minimise grout pressure, remove standing water and ensure that full annular void filling is achieved.

After grouting, the bleed-tubes are capped, and the lining is inspected to ensure that full joint sealing has been achieved and no grout infiltration has occurred into the lined section.

Any lateral connections that are unable to be diverted to a manhole and require reinstatement are re-opened and reinstated using a Sulphate Resisting Portland Cement, with a Tricalcium Aluminate (C₃A) content of less than 5%, and a C₄AF+2C₃A content of less than 25%, as per IS 12330:1988⁽²⁾.

On completion, a full CCTV inspection of the lining is undertaken.

2.2 Applicable standards

The following standards are applicable to this product:

- ASTM D3262-20⁽³⁾
- IGN 4-34-02⁽⁴⁾
- IS 14402:1996⁽⁵⁾

2.3 Approval History

This is the first approval of the Michigan GRP Pipes for gravity sewers and storm water lines.

3. REQUIREMENTS AND TESTING

3.1 Requirements

The Michigan GRP Pipes shall comply with the following requirement.

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Appearance:

The internal surface of the lining shall be smooth, clean and free from scoring, cavities and other surface defects that would prevent the Michigan GRP Pipes from meeting the general fitness for purpose requirement.

3.2 Structural design

The Michigan GRP Pipes is designed in accordance with the WRc Sewerage Rehabilitation Manual Type II design method for gravity sewer and storm water lines.

3.3 Type Testing

The GRP Sewer Lining Pipe System shall comply with the performance characteristics listed in Table 1.

Table 1 Testing Requirements

Test	Method	Declared Value
Short-term flexural modulus	ASTM D790 ⁽⁶⁾	11,893 MPa
Long-term flexural modulus	ASTM D790	5,000 MPa*
Short-term flexural strength	ASTM D790	208 MPa
Long-term flexural strength	ASTM D790	55 MPa*
Short-term tensile strength	ASTM D638 ⁽⁷⁾	239 MPa
Long-term tensile strength	ASTM D638	45 MPa*

Poisson's ratio	ASTM D638	0.30
Temperature of deflection under load (resin)	ASTM D648 ⁽⁸⁾	Tere UP 75°C, Iso UP 96°C
Long-term strain corrosion	ASTM D3681 ⁽⁹⁾	0.514%
Joint tightness	ASTM D4161 ⁽¹⁰⁾	1.0 kg/cm ² Bar

Note: MPa* Declared value, 10,000 hour results due in November 2025.

3.4 Marking

The Michigan GRP Pipes shall comply with the requirements of ASTM D3262-20, Clause 9.

3.5 Manufacture

To ensure the quality and performance of the Michigan GRP Pipes, the manufacturing process shall include appropriate systems for the:

- Specification of component materials.
- Verification component materials received are to specification.
- Handling and storage of all component materials and finished liner sections.
- Detailed drawing / schedule for manufacture.
- Manufacture / assembly of GRP liner sections, and
- Fabrication of liner sections and quality control of workmanship.

The production of the Michigan GRP Pipes and related quality control procedures shall comply with requirements to ensure the

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stated performance of the product is reliably achieved.

3.6 Installation

When installed in accordance with the installation documentation⁽¹¹⁾, the Michigan GRP Pipes shall be reasonably expected to perform as described.

4. APPROVAL

The GRP Lining Pipe System have been audited and successfully met all the requirements stated within this assessment schedule.

Signed:

A handwritten signature in black ink, appearing to be 'G.L.' with a horizontal line extending to the right.

Valid until 10th November 2029

5. REFERENCES

1. WRc Sewerage Rehabilitation Manual, 4th Edition, 2001.
2. IS 12330:1988 Specification for sulphate resisting Portland cement.
3. ASTM D3262-20 Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
4. IGN 4-34-02 Specification for Glassfibre Reinforced Plastics (GRP) Sewer Linings, Issue 1, April 1986.
5. IS 14402:1996 Glass Fibre reinforced Plastics (GRP) Pipes, Joints and Fittings for use for Sewerage, Industrial Waste and Water (other than potable) — Specification.
6. ASTM D790 - 17 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
7. ASTM D638 – 18 Standard Test Method for Tensile Properties of Plastics.
8. ASTM D648 - 18 Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
9. ASTM D3681 – 23 Standard Test Method for Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition.
10. ASTM D4161 - 14(2019) Standard Specification for "Fiberglass" (Glass Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals.
11. Installation Instructions – Work Methodology for Sewer Rehabilitation by GRP Liner.