

Clover Pipelines Pty Ltd

PRODUCT APPRAISAL REPORT No PA 1420

**SUPERLIT Filament Wound GRP Pressure Pipe and Non-Pressure Pipe for
Sewerage DN 300 – DN 3000**

**ISO 10467 – Plastic piping systems for pressure and non-
pressure drainage and sewerage - Glass-reinforced
thermosetting plastics (GRP) systems based on unsaturated
polyester (UP) resin**

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Overview of WSAA

The Water Services Association of Australia (WSAA) is the peak industry body that supports the Australian Urban Water Industry. Its members and associate members provide water and sewerage services to approximately 20 million Australians and many of Australia's largest industrial and commercial enterprises.

The Association facilitates collaboration, knowledge sharing, networking and cooperation within the urban water industry. It is proud of the collegiate attitude of its members which has led to industry-wide approaches to national water issues.

WSAA can demonstrate success in the standardisation of industry performance monitoring and benchmarking, as well as many research outcomes of national significance. The WSAA Executive retains strong links with policy makers and legislative bodies and their influences, to monitor emerging issues of importance to the urban water industry. WSAA is regularly consulted and its advice sought by decision makers when developing strategic directions for the water industry.

WSAA was formed in 1995 as a non-profit organisation to foster the exchange of information relating to the provision of urban water services between industry, government and the community, and to promote sustainable water resource management.

The Association's main activities focus on four areas:

1. Influencing national and state policies on the provision of urban water services and sustainable water resource management;
2. Promoting debate on environmentally sustainable development and management of water resources and the community health requirements of public water supplies;
3. Improving industry performance and establishing benchmarks and industry leading practices for water service processes; and
4. Fostering the exchange of information on education, training, research, water and wastewater management and treatment and other matters of common interest.

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1 EXECUTIVE SUMMARY

Clover Pipelines Pty Ltd has been appointed the Agent and Distributor for the range of SUPERLIT GRP filament wound pipes and fittings, for water supply, recycled water and sewerage applications for the Oceania region.

SUPERLIT GRP filament wound pipes and fittings are manufactured in Turkey by Süperlit Boru ve Levha Sanayi A.Ş. This Company was founded in 1961 and is a major manufacturer and exporter of GRP Filament wound pipes and fittings and their associated accessories within Europe, the Middle East and other countries. Süperlit Boru ve Levha Sanayi A.Ş. is a subsidiary company of Karmanci Holding who plays a large role in the commercial and industrial sectors of Turkey.

SUPERLIT GRP filament wound pressure and non-pressure pipes are manufactured with nominal pressure range of PN 1 to 32 in nominal pipe diameters ranging from DN 300 to DN 3000. However SUPERLIT GRP filament wound pressure and non-pressure pipes can be manufactured up to PN 40 and meet the requirements of ISO 10467 and as such is included in their product certification certificate issued by TUV.

Note: SUPERLIT pipes marked PN 1 are designated for non-pressure applications. For the purposes of this appraisal GRP pipes are manufactured with nominal pressure rating of PN 1 are typically used in gravity sewer applications.

SUPERLIT GRP filament wound pressure and non-pressure pipes are manufactured with nominal pipe stiffness ranging from SN1250 N/m² to SN10000 N/m² in nominal pipe diameters ranging from DN 300 to DN 3000 with any combination of the above pressure class of pipe. SUPERLIT GRP filament wound pressure and non-pressure pipes can also be manufactured with nominal stiffness up to SN20000 N/m² for deep trench application.

SUPERLIT pipe fittings are fabricated from sections of straight pipe, cut to length, joint wrapped externally and internally with additional fibre reinforcement. Fittings are supplied with spigot ends suitable for the SUPERLIT coupling.

While SUPERLIT can manufacture pipe to comply with a variety of international standards, for the Australia market, Clover Pipelines intends to import pipe conforming to the following ISO standards.

ISO 10467 – Plastic piping systems for pressure and non-pressure drainage and sewerage - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.

The spigot dimensions of SUPERLIT pipe to be imported into Australia will meet the following criteria:

DN 300 to DN 3000 ISO 10467 Series B1 (Table 5) and

DN 300 to DN 3000 AS 3571.1 Series B1 (Table 5) Appendix ZZ

Ductile iron and steel fittings with elastomeric seal are used in GRP pipelines. Ductile iron and steel fittings should have compatible performance capability and should be appropriately protected against internal and external corrosion.

This appraisal submission is in two parts and this report focuses on Part 2 only:

- Part 1 SUPERLIT® GRP pipes and fittings manufactured in accordance with ISO 10639 – Plastic piping systems for pressure and non-pressure water supply - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.
- Part 2 (This part) SUPERLIT® GRP pipes and fittings manufactured in accordance with ISO 10467 – Plastic piping systems for pressure and non-pressure drainage and sewerage - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.

The above ISO standards for GRP pipes and fittings are essentially the same except that SUPERLIT pipes designated for sewerage applications must comply with strain corrosion and abrasion resistance type tests and SUPERLIT pipes designated for water supply applications must comply with the national regulations on the quality of drinking water. For the Australian water industry products likely to come into contact with drinking water shall comply with the requirements of AS/NZS 4020.

This appraisal does not apply to GRP pipes with flexible joints intended to be installed using various trenchless installation methods e.g. slip lining, micro-tunnelling and pipe-jacking.

1.1 Recommendation

It is recommended that WSAA members and associates, subject to any specific requirements of the member or associate, accept or authorise the SUPERLIT GRP filament wound pipes and fittings as detailed in this report for use in pressure and non-pressure sewerage applications subject to the design, installation and commissioning being in accordance with specifications provided by Süperlit Boru ve Levha Sanayi A.Ş and relevant WSAA Sewerage Code or WSAA Members or Associated Members integrated WSAA Code editions.

2 THE APPLICANT

Clover Pipelines Pty Ltd has been appointed the Agent and Distributor for the range of SUPERLIT GRP filament wound pipes and fittings, for water supply, recycled water and sewerage applications for the Oceania region.

Clover Pipelines was established in January 2014 to provide a distribution network for a number of water industry product manufacturers.

Clover Pipelines Pty Ltd has large stock holdings in their local warehouses and major central warehouse in Victoria, with overnight delivers to all states. The office locations are indicated in Appendix C.

Clover Pipelines Pty Ltd is a Quality Endorsed Company which has been licensed by Global Mark Licensed No 102368 with certification to AS/NZS ISO 9001:2008, Design, purchasing, warehousing and distribution of pipes, conduits, valves and associated fittings for the water supply, sewerage, drainage, electrical, communication, mining, rural and gas industries.

2.1 The Manufacturer

Süperlit Boru ve Levha Sanayi A.Ş. was founded in 1961. It is a subsidiary company of Karmanci Holding who plays a large role in the commercial and industrial sectors of Turkey.

SUPERLIT is a major manufacturer and exporter of pressure and non-pressure pipes and their associated accessories. SUPERLIT currently manufactures Glass Fibre Reinforced Polyester Pipes in accordance with a variety of International Standards. Their modern factory is equipped with the latest production and control equipment which allows them to produce a range of pipes and makes them one of the major players in the pipe production industry in Eastern Europe.

The company's manufacturing facilities consists of two factories, the original plant in Turkey and a recently established factory in Romania. The plant in Turkey has the capacity to produce over 700 km of GRP pipe per year in the size range DN 300 to DN 3400.

A major proportion of all pipes installed in Turkey bear the SUPERLIT trademark and their products have been exported to a number of other countries including Afghanistan, Azerbaijan, Bahrain, Bosnia-Herzegovina, Bulgaria, Croatia, Cuba, Cyprus, Egypt, Ethiopia, France, Germany, Greece, Iran, Iraq, Italy, Jordan, Kazakhstan, Lebanon, Libya, Malta, Mauritania, The Netherlands, Nigeria, Norway, Oman, Qatar, Romania, Russia, Saudi Arabia, Serbia, Somalia, Spain, Sri Lanka, Sudan, Syria, Turkmenistan, Tanzania, Tunisia, U.A.E., U.K., Ukraine, Yemen.

3 THE PRODUCT

3.1 General

SUPERLIT GRP pipe is a flexible, structural, filament wound composite pipe that is designed to be used in buried and above ground applications for the transport of drinking water, sewage, sea water and aggressive chemicals under both pressure and gravity flow conditions. The pipes and fittings are manufactured under strict quality standards and are typified by their high strength, chemical and corrosion resistance and relatively low weight.

The “SUPERLIT GRP Filament Winding Product Guide” provides a more complete description of the range of fittings (Refer to Appendix A).

3.2 Manufacture of filament wound GRP

SUPERLIT GRP filament wound composite pipes are produced by winding continuous glass fibre rovings onto a mandrel resulting in a pipe with controlled internal dimensions. The resin is applied either to the rovings or the rovings directly to the mandrel, and additional chopped fibre reinforcement can be added if required. The orientation of the winding and their spacing control the final properties of the pipe. Sand and aggregates can be incorporated to increase the pipe wall stiffness if required.

3.2.1 Reinforcement

Ref: Clause 4.2.2 of ISO 10467:2004

The SUPERLIT plants use mainly E-glass and to a lesser extent ECR-glass to manufacture pipes for water supply and sewerage. Chopped strand and continuous rovings are used to provide both longitudinal and hoop strength. Approximately 50% of the fibre glass requirements are supplied from manufacturers in Turkey and the remainder is supplied by 8 producers in Europe and/or Far East Asia. All fibre glass materials orders are required to meet detailed specific quality requirements specified by SUPERLIT and samples of all orders are checked in the QC laboratory on delivery and prior to use.

3.2.2 Resin

Ref: Clause 4.2.3 of ISO 10467:2004

The SUPERLIT plants manufacture GRP pipes using orthophthalic polyester resin supplied by 3 specialist suppliers in Turkey. All resin orders are required to meet detailed specific quality requirements specified by SUPERLIT and samples of all orders are checked in the QC laboratory on delivery and prior to use. Different resins are purchased as required for specialized applications.

3.2.3 Aggregate and fillers

Ref: Clause 4.2.4 of ISO 10467:2004

Silica sand is used as the filler in SUPERLIT pipes. The sand is sourced locally and is required to meet specified grading and quality requirements. The sand is supplied in a dried condition and is stored in special containers to maintain this status. All sand deliveries are checked on receipt to confirm they meet the specified grading and dryness criteria. The dryness criteria is checked again prior to use.

3.3 Nominal Sizes

SUPERLIT GRP filament wound composite pipes are manufactured to the Australian market to ISO 10467, in nominal sizes ranging from DN 300 to DN 3000

The spigot dimension of SUPERLIT pipe to be imported into Australia will generally fit the following criteria:

DN 300 to DN 3000 ISO 10467 Series “B1” (Table 5)

DN 300 to DN 3000 AS 3571.1 Series B1 (Table 5) in Appendix ZZ

SUPERLIT GRP pipes, in the range DN 300 to DN 750 are manufactured with spigot dimensions as specified in AS 3571.1 Series B1 (Table 5) in Appendix ZZ, are generally compatible with the outside diameter dimensions of ductile iron pipe and fitting for pressure applications to AS/NZS 2280, with the exception of with the exception of DN 500 pipe size.

When specifying the use of ductile iron fittings with GRP pipes, care should be taken to ensure their dimensional compatibility with the GRP pipe.

Other ISO or ASTM pipe sizes are available if required.

3.4 Nominal Stiffness

SUPERLIT pipes are supplied in the following stiffness classes

TABLE 1: NOMINAL STIFFNESS (SN)

Stiffness Class (SN)	Stiffness (N/m ²)
From 1250 to 10000	From 1250 to 10000

Notes

1. These nominal stiffness correspond to the values specified in Clause 5 of ISO 10467 for the minimum initial specific ring stiffness in Newtons per square meter (N/m²)
2. SUPERLIT GRP filament wound pressure and non-pressure pipes can also be manufactured with nominal stiffness up to SN 20000 N/m² for deep trench application.

Intermediate and higher stiffness classes can be provided on request, however Clover Pipelines plans to stock SN10000 and SN20000 pipes into the Australian market.

3.5 Nominal Pressure

The SUPERLIT pipes for non-pressure (branch and trunk/main gravity sewer mains) sewerage applications are supplied with a standard nominal pressure of (PN) 1.

The SUPERLIT pipes for pressure sewer (rising mains) applications are supplied with a standard Nominal pressure range between (PN) 1 to 32.

SUPERLIT GRP filament wound pressure and non-pressure pipes can be manufactured up to PN 40 and meet the requirements of ISO 10467:2004 and as such is included in their product certification certificate issued by TUV.

3.6 Nominal Pipe Lengths

Ref: Clause 5.1.3.1 of ISO 10467:2004

The SUPERLIT filament winding pipe machines are capable of producing pipe lengths up to 15 m, but standard transport container sizes will limit the length to 5.8 m and 11.8 m.

The SUPERLIT pipe for gravity sewer applications are supplied in standard lengths, 3 or 5.8 m. Pipes can be supplied in other lengths for special orders.

The total length of each pipe is equal to the specified nominal length with a tolerance of ± 25 mm.

3.7 SUPERLIT Pipe Coupling

Ref: Clause 4.2.6 of ISO 10467:2004

The standard pipe jointing system is the SUPERLIT double socketed coupling. The couplings comprise a full face EPDM rubber membrane encased in a GRP collar. Refer to Figure 1.

Plain ended GRP pipes are joined with a sleeve coupling, factory fitted to one pipe end. Deflections permitted at joints vary in accordance with Table 2 below.



FIGURE 1: DOUBLE SOCKETED COUPLING

Collars are mounted on one end of each pipe at the manufacturing plant.

EPDM rubber rings are supplied pre-moulded to SUPERLIT specifications, and are in accordance with the requirements of BS EN 681.1. Refer to Section 6.2.13 for elastomeric seals.

3.8 Joint Deflection

The SUPERLIT coupling and jointing system has been tested and qualified in accordance with ASTM D 4261 and ISO DIS 8639. Maximum angular deflection at each coupling joint, measured as the change in adjacent pipe centrelines (Refer to Figure 2), is shown in Table 2 below.

TABLE 2: MAXIMUM ANGULAR DEFLECTIONS IN SUPERLIT COUPLING

Nominal Diameter	Pressure (PN)			
	≤ 16	20	25	32
	Angular Deflection (Degree) α_{max}			
≤ DN500	3°	2.5	2.0	1.5
DN500 ≤ DN900	2°	1.5	1.3	1.0
DN900 ≤ DN1800	1°		0.5	0.5
> DN 1800	Refer to manufacturer’s technical literature			

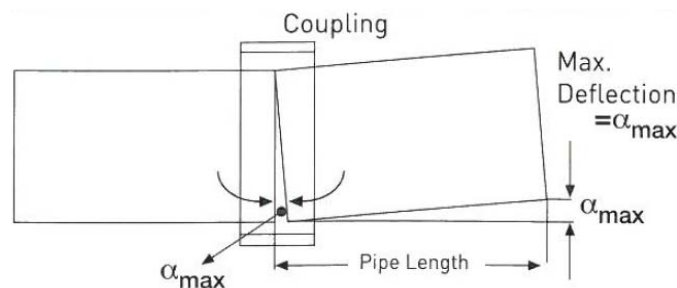


FIGURE 2: ANGULAR JOINT DEFLECTIONS

For proper sealing of the SUPERLIT coupling, a smooth, dimensionally accurate outside spigot surface is needed on each end of the pipe. SUPERLIT manufacturing equipment chamfers the edge of the pipe to avoid damage to the rubber gaskets, while simultaneously milling the external surface. This equipment rotates the pipe and mills both ends using water-cooled diamond-tipped tools.

External diameters of the SUPERLIT pipe may vary along its length. Pipes with an external diameter within tolerances for its full length are marked as ‘Adjustment Pipes’ and may be used on site as cut pipe. Sealing the ends of pipe is not required.

3.9 Pipe Fittings and Accessories

SUPERLIT pipe fittings are fabricated from sections of straight pipe, cut to length, joint wrapped externally and internally with additional fibre reinforcement. Fittings are supplied with spigot ends suitable for the SUPERLIT coupling.

The standard range of fittings include:

- Pipe couplings.

- Elbows 11°, 22.5°, 45°, and 90° (available angle range from 1° to 90°) with spigot, socket or flanged ends.

- Tees, either equal or reduced with spigot, socket or flanged ends.

- Reducers, concentric or eccentric spigot, socket or flanged ends.

- Wye's with spigot, socket or flanged ends.

- Other fittings can be manufactured to order.

- Flanges, slip-on or plain.

- Maintenance hole couplings with and without puddle flange.

Ductile iron and steel fittings with elastomeric seal are used in GRP pipelines. Ductile iron and steel fittings should have compatible performance capability and should be appropriately protected against internal and external corrosion.

The "SUPERLIT GRP Filament Winding Product Guide" provides a more complete description of the range of fittings.

3.10 Flanges

Flanges for the Australian market are manufactured to be compatible with sizes according to AS 4087, Figure B5 for Class PN 16 flanges and AS 4087 Figure B6 for PN 35 flanges.

Ancillary products such as flange gaskets, fasteners and jointing lubricant are also available from Clover Pipelines on request.

4 SCOPE OF THE APPRAISAL

The scope of this product appraisal application applies to the SUPERLIT GRP filament wound composite pipe range, joints, pipe fittings and accessories, specified in Section 3 above, for gravity and pressure sewerage applications and as listed Clover Pipelines' Schedule of imported certified products. Refer to Appendix 'C'.

This appraisal does not apply to GRP pipes with flexible joints intended to be installed using various trenchless installation methods e.g. slip lining, micro-tunnelling and pipe-jacking.

5 APPRAISAL CRITERIA

5.1 General

Appraisal criteria is determined by the WSAA Infrastructure Products and Materials (IPAM) Network and regularly reviewed to ensure that the criteria reflect the requirements of WSAA members.

WSAA Product Specifications relevant to this application and listed in Section 5.3 were revised by WSAA in August 2013.

The revised Product Specifications now adopt the revised Australian Standard AS 3571.2:2009 – Plastic piping systems –Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin Part 1: Pressure and non-pressure water supply.

The revised Australian Standard AS 3571.2:2009 is an adoption with national modifications and has been reproduced from ISO 10639:2004. The Australian modifications are listed in Appendix ZZ. Methods for demonstrating compliance with this Standard are specified in Appendix ZA. Enquiry, tendering and ordering guidelines for purchasers and suppliers are given in Appendix ZC.

5.2 Quality Assurance Requirements

The WSAA product appraisal network accepts GRP pipes and fittings manufactured under cover of a third party certified management system complying with AS/NZS ISO 9001 and having ISO Type 5 product certification in accordance with ISO 10467 by a JAS-ANZ accredited Certification Assessment Body (CAB) or by a CAB accredited by international accreditation system recognised by JAS-ANZ.

5.3 Performance Requirements

SUPERLIT GRP pipe and fittings have been appraised for compliance with the requirements of ISO 10467 – Plastic piping systems for pressure and non-pressure drainage and sewerage - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.

The following Product Specification is also relevant to this application:

- WSA PS – 205S Filament Wound Glass Reinforced Plastics (FW-GRP) Pipes and Fittings for Pressure and Non-Pressure Applications – Sewerage.

A copy of the above Product Specification can be found in Appendix D or downloaded from the WSAA website.

6 COMPLIANCE WITH APPRAISAL CRITERIA

6.1 Compliance with Quality Assurance Requirements

Clover Pipelines Pty Ltd holds an AS/NZS ISO 9001:2008 quality management system licence for Clover Pipelines to design supply pipes, fittings valves and accessories to the water industry.

Süperlit Boru ve Levha Sanayi A.Ş. holds an TS ISO 9001:2008 quality management system licence for design, production and sales of GRP (Glassfiber reinforcement plastic), PE (Polyethylene) and PE Corrugated Pipe and Accessories, issued by the TÜV SÜD Management Service GmbH, under License No 12 100 15302 TMS.

TÜV SÜD Management Service GmbH is a CAB accredited by a member of the International Accreditation Forum (IAF) Multilateral Recognition Agreement (MLA) recognised by JAS-NZS, which is also a signatory IAF MLA.

Clover Pipelines has also provided a copy of Confirmation Certificate (No Z_DGR-0036-QS-09-B-436) issued by TÜV SÜD Industrie Service GmbH confirming Sperlit Boru ve Levha Sanayi A.Ş. has implemented, operates and maintains a quality assurance system which is subject to periodical assessment by qualified auditors of TÜV SÜD Industrie Service GmbH.

The TÜV SÜD Confirmation Certificate reaffirms the manufacturing capability of Sperlit Boru ve Levha Sanayi A.Ş. to produce GRP (Glass-fiber Reinforced Plastic) pipes, joints and fittings (DN250 to 3500, PN1 to PN40 SN500 to SN 10000 pursuant to standards (listed on Certificate in Appendix B), including ISO 10467.

6.2 Compliance with Performance Requirements

Süperlit Boru ve Levha Sanayi A.Ş. engages the services of Bureau Vertis to conduct 3rd party inspection and conformity certification services for production of its glass-reinforced thermosetting plastics pipes and fittings, according to ISO 10467 and ISO 10639.

The Inspection Certificate Nr 281 issued by Bureau Vertis, **dated 1 October 2009** is accepted as sufficient conformance requirements for the glass-reinforced thermosetting plastics pipes

and fittings. This certificate is valid for 3 years with yearly periodic visits. This system corresponds to system 5 product certification as described in ISO/IEC Guide 67, for ISO 10639 and ISO 10467.

Copies of the Certificates can be found in Appendix B.

6.2.1 Production and type test requirements to ISO 10467

Quality Control is a key function of the company's manufacturing processes and the Quality Control system extends from the acquisition of raw materials and continues through the automated pipe production until the final dispatch of the products. The jointing, external load capacity, thermal conductivity, and environmental protection aspects of the pipes are continuously tested for full reliability. The finished products are subjected to all of the rigorous testing requirements prescribed by the relevant International Standards before being delivered to customers. As part of the GRP manufacturing process all pipes are individually pressure tested to 2 times the specified pressure rating of the pipe.

Süperlit Boru ve Levha Sanayi A.Ş has an internal Quality Control laboratory and the SUPERLİT Testing Laboratory which are accredited by Turkish National Testing Agency (TURKAK) in accordance with ISO/IEC 17025 – *General requirements for the competence of testing and calibration laboratories*. TURKAK is a signatory to the International Laboratory Accreditation Co-operation (ILAC) with mutual recognition arrangements (MRA) within the Asia Pacific Laboratory Accreditation Cooperation (APLAC).

WSAA accepts the results from testing and calibration laboratories that are accredited by accreditation bodies that are signatories to the ILAC Arrangement.

Copies of the Certificates can be found in Appendix B.

In order to provide ISO testing results, SUPERLİT have provided some unaudited Type Test results. These Type Tests have been carried out under audited conditions, but they are to an alternate Standard e.g. AWWA which have been verified by TÜV SÜD. Copies of these tests reports can be reviewed by contacting the Product Appraisal Manager.

6.2.2 Mechanical characteristics

Raw materials are delivered with vendor certifications demonstrating their compliance with SUPERLİT quality requirements. In addition, all raw materials are sample tested prior to their usage. These tests ensure that the pipe materials comply with the specifications as stated.

The manufactured pipe's hoop and axial load capacities are verified on a routine basis. In addition, pipe construction and composition are confirmed. All pipes are subjected to a range of quality control checks including the following:

- Materials used;
- Length;
- Wall thickness;
- Chamfering;
- Diameter; and
- Hydrostatic Leak Tightness Test (to x 2 rated pressure).

On a sampling basis, the following control checks are performed:

- Pipe stiffness;
- Deflection without damage or structural failure.

6.2.3 Load capacity values

Ref: Clause 5.2 of ISO 10467:2004

SUPERLIT pipe meets the specified stiffness and deflection requirements of the ISO standards.

Details are available in the "SUPERLIT GRP Filament Winding Product Guide".

6.2.4 Initial specific ring stiffness - Batch release test

Ref: Clause 5.2.1 of ISO 10467:2004 - Specifies ISO 7685 test procedure

The SUPERLIT pipe design program provides for an initial ring stiffness value higher than the minimum stiffness values specified in the relevant ISO standard. Initial stiffness testing is part of the daily quality control program and if during quality control testing the stiffness is measured to be less than the required minimum stiffness the product is rejected and downgraded to the next lower stiffness class. SUPERLIT Manufacturing Quality Control Laboratory (TURKAK accredited) carries out batch testing for the initial ring stiffness test, in accordance with their QC test procedures and Clause 5.2.1 of ISO 10467:2004.

A typical initial ring stiffness test for a section of DN 600, PN 16, SN1600 pipe (2 samples), which was tested in 2007, confirms the testing system used and shows the pipe met the ISO standards requirement as specified in ISO 10467:2004 and ISO 7685.

Note: This pipe was for the Sydney Water Spring Farm Sewer Carrier project.

6.2.5 Long-term specific ring stiffness (S50) and creep ratio - Type test

Ref: Clause 5.2.2 of ISO 10467:2004

The long-term specific ring stiffness of SUPERLIT pipe was checked using the long-term creep stiffness method in accordance with ISO 10467:2004 and ISO 10639:2004.

The tests are conducted in the SUPERLIT Laboratory, a type test report, for a section of DN 1200, PN 16, SN 10000 pipe dated 13 August 2004, confirms that the pipe fulfils the requirements of the ISO standard.

6.2.6 Initial resistance to failure in a deflected condition - Batch release test

Ref: Clause 5.2.3 of ISO 10467:2004 - Specifies ISO 10466 test procedure

The initial resistance to failure in a deflected condition of SUPERLIT pipe is part of routine quality control system. The test procedure used is based on ISO 10466 as nominated in ISO 10467 and ISO 10639 and the SUPERLIT test procedure used is CPT28. The QC testing involves deflecting the samples as shown in the Table 3 below and conducting a visual inspection for cracks, de-lamination, buckling or failure.

TABLE 3: INITIAL RESISTENCE TO FAILURE

Stiffness Class SN	Minimum Deflection (%)	
	No surface cracks	No failure
5000	12.2	18.9
10000	9	15

Testing of pipes on a regular basis has shown that pipes produced in the SUPERLIT factory meet the initial resistance to failure requirements of the ISO product standards. In the rare occurrence of pipe not meeting the requirements of this test the pipe is rejected and a thorough review of relevant processes is conducted.

6.2.7 Ultimate long-term resistance to failure in a deflected condition - Type test

Ref: Clause 5.2.4 of ISO 10467:2004- Specifies ISO 10471 test procedure

The long-term specific ring stiffness of SUPERLIT pipe has been measured under wet conditions in accordance with the requirements of ISO 10471. A copy of a test result (18

samples) for DN 600, PN 16, SN1600 pipe which started on 6 April 2004 shows the pipe met the ISO standards requirement.

The results in the report show that the deflection according to the requirements of ISO 10471 gives a deflection of 12.82%, which, when compared with the 9% minimum requirement for SN10000 pipe (see Table 12 of ISO 10467) shows a high level of compliance.

6.2.8 Initial specific longitudinal tensile strength - Batch release test

Ref: Clause 5.2.5 of ISO 10467:2004- Specifies ISO 8513:2000 test procedure

Testing for the initial specific longitudinal tensile strength is part of the routine quality control system testing. Testing is carried out in the SUPERLIT Manufacturing Quality Control Laboratory (TURKAK accredited) and the SUPERLIT test procedure used is CPT19 (report CPT11). The resultant initial axial strength values are required to be greater than the minimum values shown in Table 14 of ISO 10467. A copy of the test results for the pipe in Test 1 (5 samples), show the pipe met the ISO 8513 standards requirement.

The results in the report show that the longitudinal tensile strength according to the requirements of ISO 10467/10639 gives a strength of >300 N/mm, which, when compared with the ISO standards PN 16 pipe requirements of 255 N/mm, shows a high level of compliance.

6.2.9 Initial design and failure pressures for pressure pipes - Batch release test

Ref: Clause 5.2.6 of ISO 10467:2004- Specifies ISO 8521:1998 test procedure

Initial circumferential tensile strength testing is part of the SUPERLIT routine quality control system testing. The test procedure used is CPT19 (report CPT12). The resultant initial circumferential tensile strength values are required to be greater than the calculated value using the formula clause 5.2.6.2 of ISO 10467. A copy of test results for the pipe in Test 1 shows the pipe met the minimum standards requirement.

6.2.10 Long-term failure pressure - Hydrostatic Design Base (HDB)Test - Type test

Ref: Clause 5.2.7 of ISO 10467:2004- Specifies ISO 7509 test procedure

The SUPERLIT pipe pressure classes comply with the long term failure pressure requirements as specified in Clause 5.2.7 of ISO 10467. The nominal pressures are based on long term (50 year) strain values determined by testing with appropriate factors of safety.

Two test results are attached, the first from the SUPERLIT Laboratory, which tested DN 600 PN 16 SN10000 pipe to the ISO standards and the resultant pressure value at 50 years was 33.1 bar. The second is from the TUV Laboratory for DN 700 PN 10 SN 5000 pipe tested to the ASTM standard which gave a strain value at 50 years of >0.66%

The results in the SUPERLIT Laboratory report show that the long term failure pressure according to the requirements of ISO 10467 gives a long term failure pressure value (at 50 years) of 33 bar, which relates to a safety factor at 50 years of >2, which, when compared with the PN 16 pipe requirements for a minimum safety factor of 1.8, shows a high level of compliance.

6.2.11 Resistance of pressure pipes to cyclic internal pressure - Type test

Ref: Clause 5.3 of ISO 10467:2004- Specifies ISO 15306 test procedure

The resistance of SUPERLIT pipes to cyclic internal pressure up to 1 million pressure cycles has been verified through ongoing testing.

An example SUPERLIT Laboratory test report dated 9 April 2005 for DN 500, PN 16, SN10000 pipe shows details of the testing apparatus and the test procedures used. The test was conducted in SUPERLIT (TURKAK accredited) laboratory and the report verifies that the pipe fulfilled the 1 million cycles testing requirements of the ISO standards.

6.2.12 Resistance to strain corrosion - Type test

Ref: Clause 5.4 of ISO 10467:2004 - Specifies ISO 10952 test procedure

Turkish Standards Institution report number B02.2 TSE.O.14.01.54/906 results show the strain corrosion resistance of SUPERLIT pipes has been measured at 0.83%. Using the equation in Clause 10.6 of ISO 10952 as specified in ISO 10467 Clause 5.4.2.1 and a maximum allowable long-term deflection for buried SUPERLIT GRP pipe of 5%, this value can be converted to deflection and compared with the requirement. The test results show SUPERLIT pipe complies with the minimum requirement shown in ISO 10467 Table 17:

TABLE 4: INITIAL RESISTENCE TO FAILURE

Stiffness	SN2500	SN5000	SN 10000
Calculated deflection %	13.11	10.42	8.28
Allowable Minimum Deflection,% (83.3% of Table 17)	11.92	9.42	7.50

6.2.13 Elastomers - Type test

Ref: Clause 4.2.6 of ISO 10467:2004

The SUPERLIT coupling comprises a full-face EPDM rubber membrane (hardness 60 ±5) encased in a GRP collar. SBR compounds may be used as an alternative to EPDM if requested by the purchaser.

In accordance with the SUPERLIT purchasing requirements GRP pipe elastomeric joint sealing materials meet the requirements of EN 681-1:1996, EPDM for type WA (cold drinking water supply [up to 50°C) and WC (cold non-drinking water supply, drainage, sewerage and rainwater pipes for continuous flows up to 45°C and intermittent flows up to 95°C).

If SBR is required - ASTM F-477 is used.

Arsun Kaucuk is the manufacturers of the EPDM rubber membrane Superlit use. They have product certification to TS EN 681-1:1999 license number 14.31.34/TSE-2261-2, ISO 9001:2008 certification, certificate registration number 066674 QM08 and issue quality control reports for each despatched goods to Superlit.

The bactericidal jointing lubricant is supplied by Thomas Grozier & Son Pty Ltd. Thomas Grozier & Son Pty Ltd has StandardsMark Licence No WMKA00103 issued by SAI Global for compliance with ATS 5200.014-2004 *Technical Specifications for plumbing and drainage products – Jointing materials*.

6.2.14 Joint performance - Type test

Ref: Clause 7 of ISO 10467:2004

SUPERLIT have designs for flexible and rigid joints with or without end-load resisting capability.

The pipe to be imported by Clover Pipelines will be "Flexible non-end-load-bearing joints with elastomeric sealing rings" and therefore this application will deal only with this joint type. Clause 7.2.4 covers "Flexible non-end-load-bearing joints with elastomeric sealing rings" and a submitted test report dated 16-18/03/2004 which shows compliance with Clause 7.2.4.

The KIWA Laboratories conducted a double joint / three pipe deflection test on SUPERLIT pipe (to manufacturer's maximum joint deflection) as part of their Certification process using the test result requirements of Clause 7.2.4 and the SUPERLIT pipe passed all requirements.

This is part of KIWA's own standard test criteria for pipe manufacturers and is much more severe than the standard ISO test requirements.

Other jointing configurations available from SUPERLIT include:

- Flexible end-load-bearing joints with elastomeric sealing rings (Clause 7.2.5)
- Wrapped or cemented non-end-load-bearing and end-load-bearing joints (Clause 7.3.1)
- Bolted non-end-load-bearing and end-load-bearing joints (Clause 7.3.2)

If required, test results for these configurations are available on request. The test reports provided will be in accordance with Clause 7 of ISO 10467:2004.

6.2.15 Abrasion resistance

Ref: DIN 19565

The Istanbul Technical University, in conjunction with SUPERLIT's Long Term Test Laboratory, conducted an abrasion resistance test on a piece of DN 600, PN 10, SN 5000 GRP pipe in accordance with DIN 19565. This test determines the abrasion resistance using a Darmstadt rocker and a quantity of gravel in a bath of water which was continuously agitated to determine the wear rate. The average abrasion loss for SUPERLIT pipe was found to be 0.25 mm at 100,000 cycles and 0.4 at 200,000 cycles.

These test results on Test Report 04/3967 dated 9 Sept 2004 show minimal wear of the pipe and indicate a pipe life expectancy well beyond the requirements of most water agencies i.e. 100(+) years.

NOTE: The abrasion resistance of individual pipeline materials is difficult to determine because test methods do not duplicate the varied abrasion conditions found in sewers. Comparative Darmstadt rocker test results often show performance ratings of plastic pipe materials exceed other harder pipe materials.

6.2.16 Temperature and pressure re-rating

Temperature and pressure re-rating requirements vary according to the pipeline application and SUPERLIT can provide specialist recommendations on resin use and re-rating for abnormal applications. In general, pipelines carrying liquids 35°C and below require no pressure re-rating, but for temperatures 36°C to 50°C it is recommended that the pressure rating be dropped one class. For over 50°C contact SUPERLIT for a recommendation on resins and re-rating.

6.2.17 Resistance to ultraviolet degradation

SUPERLIT can, on request, use a UV stabilised resin as the external skin layer of their pipes, which increases the pipe's resistance to external effects.

Long term testing indicates that there is no evidence to suggest UV degradation affects the long term performance of SUPERLIT GRP pipe. The external surface may, after time, display some discoloration and in extreme cases "feathering" of the outermost surface, but this will not affect the long term performance of the pipe.

For aesthetic purposes the external surface of the pipe may be painted with a two part urethane paint compatible with GRP.

6.2.18 Other Technical Data

Summaries of the following design data and production testing are included in the SUPERLIT Filament Wound GRP Pipe Catalogue. Refer to Appendix A.

- Strain Corrosion Testing
- Hydrostatic Pressure Testing

Note: Many international and national standards for GRP pressure pipe require the manufacturer to factory hydrostatically test all pipes before shipment. In support of these requirements, SUPERLIT has designed its manufacturing process to accommodate hydrostatic testing of both the pipe and couplings to twice the rated pressure (for all diameters through DN 3400).

- Joint Testing and Maximum Joint Angular Deflection

- Initial Pipe Deflection
- Long-term Ultimate Deflection
- Surge Testing
- Hydrostatic Design Basis (HDB)
- Maximum Flow Velocity
- UV Resistance
- Poisson Ratio
- Thermal Coefficient of Expansion
- Permissible Operating Temperatures

7 FITTING INSTRUCTIONS, TRAINING AND INSTALLATION

Installation requirements for GRP pipe are similar in all respects to the requirements for rubber ring jointed PVC, DI and SCL pipe. The SUPERLIT GRP Installation Manual provides a comprehensive cover of all requirements including.

- Trenching;
- Shoring;
- Pipe Clearances;
- Bedding and Backfill;
- Soils Types;
- Jointing details including Joint Rotation;
- Restraints and Anchoring;
- Post Installation Testing.

Refer to Appendix A for details pertaining to SUPERLIT GRP Installation Manual.

8 UNDER PRESSURE TAPPING AND REPAIR

SUPERLIT cannot be directed tapped but will require either tapping band or mechanical flanged off-take clamp, depending on the diameter of the service connection.

The under pressure cut-in performed according to the method described in WSA 03:2011 Appendix C – Under Pressure Cut-In-Connections to Pressure Pipe \geq DN 80 can be carried out successfully on GRP pipe using a diamond impregnated shell cutter of the appropriate diameter.

Mechanical flanged off-take clamps complying with AS 4181-2013 *Repair and off-take clamps for water industry purposes* are recommended.

Mechanical flanged off-take clamps rated PN 16 are available as Type F and Type R. Type F flanged off-take clamps that are designed for application to flexible pipes with pressure classifications ranging from PN 9 to PN 16, should be specified.

The maximum offtake that can be installed using the under pressure tapping method is two sizes smaller than the host pipe. The table in Appendix J shows the most common host pipe and the maximum offtake that can be installed using the under pressure tapping method.

Refer to Appendix J for a list of permitted cutter sizes and flanged off-take clamp lengths for (CIOD) compatible host pipes.

For property service off take connections, only used approved tapping bands. There is no set list of authorised tapping bands although metallic and plastic composites are suitable for use as well as stainless steel clamps. Installation of tapping bands and clamps should be as per

the manufacturer's instructions. Pipe cutting equipment can consist of fine tooth saws and/or saws with carbide grit abrasive blades. Saw blades and hole saws typically used for wood are not suitable; however blades used for masonry and/or tiles are usually abrasive type blades that will be suitable for fibreglass pipe.

8.1 Repair for Pressure and Non-Pressure Pipe for Sewerage Applications

In service repairs can be easily carried out using standard Stainless Steel repair bands. Repairs and cutting into GRP are explained in the SUPERLIT installation manual. Localised repairs can be made using conventional mechanical clamps. Repairs and cutting into GRP are explained in the SUPERLIT installation manual.

9 PRODUCT MARKING

SUPERLIT pipes are labelled in accordance details to Clause 2.9 of AS 3571.1 (similar to ISO 10467 / 10639, AWWA C-950 and BS5480):

- Manufacturers name or identification;
- Nominal size (DN);
- Stiffness rating, SN;
- Pressure rating, PN; and
- Date of manufacture in text or code YYMMDD.

The SUPERLIT label also includes:

- The individual pipe number;
- Project name (if known);
- Pipe length; and
- Number of the applicable standard(s).

The pipe marking label shown in Appendix I is computer generated for each section of pipe length. The label is fixed to the pipe prior to the application of the external surface coating effectively encasing the label within the pipe structure.

External diameters of the pipe may vary along its length. Pipes with an external diameter within tolerances for its full length are marked as 'Adjustment Pipes' and may be used on site as cut pipe. Sealing the ends of pipe is not required.

Examples of the adjustment pipe marking is shown in Appendix I.

10 PACKAGING AND TRANSPORTATION

Because of the large number of international projects they support, SUPERLIT have established a specialised container packaging system incorporating special pipe supports and pipe nesting procedures to ensure all pipe arrives undamaged.

Clover Pipelines will unpack and check the pipe prior to repacking it in suitable timber cradles. Storage on site by the purchaser / contractor should be as per the instructions detailed in the SUPERLIT GRP "Installation Manual".

The Manual has sections covering Receiving, Unloading, Storing, Handling and Transporting the pipe.

11 PRODUCT WARRANTY

The products are covered by the normal commercial and legal requirements of the *Competition and Consumer Act 2010 (Cth)*, which covers manufacture to the relevant standard, and details of Clover Pipelines warranty is included in their terms and conditions of sale.

12 WATER AGENCY EXPERIENCE WITH THE PRODUCT OR FIELD TESTING REPORT

SUPERLIT GRP pipe and fittings were supplied for an order of pipe to Barwon Water for the Anglesea Borefield Project. This order project was for 9.7 km of DN 300 to DN 600 GRP pipe [water supply pipeline not sewer].

A field trial report has been provided for this installation in Appendix G.

Internationally, SUPERLIT has recently supplied large diameter/quantities of GRP pipe to Azerbaijan, Bulgaria, Croatia, The Netherlands, Romania, Russia, Syria, Ukraine, Yemen plus a large number of projects in Turkey. Details of the projects can be provided if required.

High-pressure water jetting of sewers and drains is being undertaken in the Australia using equipment which, under certain circumstances, can damage the internal surface of the pipe. It is recommended that Operators of high-pressure water jetting equipment comply with SUPERLIT guidelines while undertaking water jet cleaning of SUPERLIT GRP pipes.

13 DISCUSSION

The WSAA Appraisal Network requested that another GRP manufacturer answer the following questions relating to their GRP product and SUPERLIT has elected to provide the following answers to the same questions:

Q 1. Please confirm that flanged connectors can be provided which are compatible with the Australian water industry standard sizes to AS 4087, Figure B5.

Answer: The thickness of flanges meets the requirements of BS 4994. The drilling pattern or PCD of all flanges will comply with that required by AS 4087 Figures B1, B2, B5 and B7.

Q 2. Please provide details of the pipe construction layers with special reference to the inner liner / layer thickness(s) for sewerage in relation to wear and corrosion.

Answer: The SUPERLIT design criteria specifies a minimum thickness for each layer based on the fluid being transported, installation requirements and pressure ratings, but for applications where there is the potential for high wear rates the internal layer can be increased. Abrasion resistance testing (see Section 6.2.15) shows a wear rate of 0.4 mm after 200,000 oscillations using a gravel in water wearing compound.

Q 3. For pipes that are cut in the field, what action must the constructor undertake to ensure the spigot ends of the cut pipes are suitable for jointing?

Answer: SUPERLIT supply an agreed number of pipes for each project which meet the coupling dimensional requirement along their full length. These pipes are identified as "Adjustment Pipes". Constructors need only chamfer the cut end(s) of the pipe before jointing. Standard pipes that only meet spigot dimensional tolerances at each end will require field machining and chamfering before jointing if they are cut. Generally there is no reason why a constructor who manages his pipe stocks correctly will ever need to field machine cut pipes, but Clover Pipelines can arrange for the hire of field machining equipment for constructors should the need arise.

Sealing of the cut ends of the pipe is not required for SUPERLIT GRP pipe. The company's Testing Laboratories have demonstrated this aspect because all testing e.g. long term pressure and strain corrosion are carried out with the cut ends untreated with no adverse effects.

Q 4. Are there any limitations on the under-pressure cut-in connection of pressure pipe using flanged off-take clamps and the use of repair clamps?

Answer: Refer to Section 8 above. The connection should be made using an authorised, appropriately sized standard Stainless Steel Flanged Offtake that is two sizes down from the nominal diameter and making the under pressure cut-in using a diamond impregnated shell cutter of the appropriate diameter.

In service repairs can be easily carried out using standard Stainless Steel repair bands.

Q 5. Please provide recommendations for drilling and tapping pressure pipes, particularly the smaller sizes (\leq DN 375).

Answer: See answer to Question 4

Q 6. Is GRP pipe suitable/available for slip lining (rehabilitation) and pipe jacking? If it is please provide details of the joint used for lining and jacking.

Answer: GRP pipe is suitable for pipe jacking and slip lining, but require the use purpose manufactured flush or low profile coupling (respectively). Specific details on pipe sizes, machining and couplings are available from Clover Pipelines/SUPERLIT.

A new ISO standard applicable to GRP-UP piping systems, with flexible joints, intended to be installed using jacking techniques was published in April 2011. Clover Pipelines has made application for WSAA to appraise the SUPERLIT Centrifugal Cast GRP and Jacking Pipe against the performance requirements in ISO/FDIS 25780 - *Plastics piping systems for pressure and non-pressure water supply, irrigation, drainage or sewerage -- Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin -- Pipes with flexible joints intended to be installed using jacking techniques*. The WSAA product appraisal number is PA 1423.

Q 7. Please confirm that SUPERLIT pipe can be manufactured in outside diameter sizes compatible with AS/NZS 2280 — Ductile iron pressure pipes and fittings — to enable Australian ductile iron fittings to be used.

Answer: Clover Pipelines intend to stock pipes in the range DN 300 to DN 750 with an external diameter in accordance with AS 3571.1/3571.2 Table 5 which is compatible with AS/NZS 2280 ductile iron fittings in all diameters covered by the DI standard.

Q 8. Please advise transportation arrangements for GRP pipes and fittings.

Answer: SUPERLIT pipes and fittings will be transported to Australia in shipping containers. Where possible pipes will be nested with specialised chocking to prevent damage during transit. Pipes will be unpacked and checked by Clover Pipelines before being crated for transport to the site.

Q 9. Please advise what appearance acceptance criteria will be used for inspection and batch release of pipes and fittings?

Answer: SUPERLIT will use the "Guide to Surface Defects Table" (Annex D to AS 2634:1983). This is considered the most appropriate assessment tool available for pipe used in Australia. Should the requirements be upgraded following revision of AS 3571 the revised requirements will be adopted. Refer to Appendix ZC in AS 3751.2.

Q 10. What are the intentions with respect to the manufacture of fittings?

Answer: Fittings will be manufactured in the SUPERLIT factory in Turkey. For urgent supply of fittings Clover Pipelines plans to either airfreight fittings manufactured by Superlit or use local manufacturers (who have previous experience with the manufacture of GRP fittings). Fittings manufactured locally will use pipe supplied by Clover Pipelines or the contractor.

Q 11. The Australian water industry has experienced incidences of osmotic blistering of the internal Corrosion barriers (gel-coats) of other GRP pipes and to address that issue has developed requirements that limit the type of resin to orthophthalic polyester with specified properties. What comments are made with respect to this issue?

Answer: SUPERLIT is unaware of any incidences of osmotic blistering with SUPERLIT pipe. Their technical experts confirm that osmotic blistering is primarily caused by the PVA binders used on some types of glass reinforcement, which, in service, forms acetic acid that migrates to the resin interface and through a process of osmosis causes blisters to form. The glass fibre

used in the manufacture of SUPERLIT pipes and fittings uses no binders since the SUPERLIT process achieves complete wetting of the glass reinforcement by physical means.

Q 12. Can GRP pipes and fittings be colour coded?

Answer: The SUPERLIT pipe manufacturing process allows for the use of coloured tints (e.g. purple) in the resin used for the external surface layer of the pipe. This has the advantage that the colour is encapsulated within the walls of the pipe ensuring a permanent identification.

Q 13. It is understood that the Code letter "R" is marked on the pipe to indicate that the pipe is suitable for axial loading. This infers there is also pipe, which is not suitable for axial loading. Please comment.

Comment: GRP pipe must be specially manufactured with more reinforcement in the longitudinal direction to handle axial loading and is only manufactured for special orders e.g. pumping station pipe work. The majority of GRP pipe which will be imported into Australia will be non-axial loaded i.e. supplied with the standard SUPERLIT rubber ring joint. This pipe has sufficient axial strength to resist handling and soil loads, but it should not be used for high pressure piping and restrained joints where longitudinal loads are high. SUPERLIT can manufacture axial loading pipe if required. GRP pipe produced in the SUPERLIT factory in Turkey has been supplied and installed successfully around the world and initial supplies have now been delivered to Australia. There is no reason to doubt that the SUPERLIT factory in Turkey will be capable of producing pressure and non-pressure pipes and fittings that meet ISO standards requirements and are in sizes suitable for use by Australian and New Zealand water agencies.

14 OUTCOMES OF EXPERT PANEL PRODUCT REVIEW

Refer to Appendix E for information of the outcomes of the Expert Panel Product Review. The minutes of the meeting are available to WSAA Members Only.

15 LIFE EXPECTANCY

The comprehensive range of testing discussed in this report, but in particular:

- Ultimate long-term resistance to failure in a deflected condition
- Long-term failure pressure show that while SUPERLIT GRP pipe deteriorates with age it still retains a high level of performance at 50 years (the level of confidence period designated in ISO 10467/10639) and from the extrapolated results of the testing there is no reason to believe the pipe will not continue to perform successfully for 100(+) years.

16 FUTURE WORKS

It is required that Clover Pipelines Pty Ltd negotiate with SUPERLIT and request they amend the SUPERLIT Confirmation Certificate, issued by TUV Industries, to include product conformance to the recently published Australian Standard AS 3571.1:2009 which was adopted in WSAA Product Specification WSA PS 205S, in November 2011. The revised SUPERLIT Confirmation Certificate shall be submitted to WSAA before September 2015.

17 REPORT RECOMMENDATION

It is recommended that WSAA members and associates, subject to any specific requirements of the member or associate, accept or authorise the SUPERLIT GRP filament wound pipes and fittings as detailed in this report for use in non-pressure and pressure sewerage applications subject to the design, installation and commissioning in accordance with specifications provided by being Süperlit Boru ve Levha Sanayi A.Ş and relevant WSAA Water Supply Code or WSAA Members or Associated Members integrated WSAA Code editions.

18 DISCLAIMER

This Product Appraisal Report (Report) is issued by the Water Services Association of Australia Limited on the understanding that:

- This Report applies to the product(s) as submitted. Any changes to the product(s) either minor or major shall void this Report.
- To maintain the recommendations of this Report any such changes shall be detailed and notified to the Product Appraisal Manager for consideration and review of the Report and appropriate action. Appraisals and their recommendations will be the subject of continuous review dependent upon the satisfactory performance of products.
- WSAA reserves the right to undertake random audits of product manufacture and installation. Where products fail to maintain appraised performance requirements the appraisal and its recommendations may be modified and reissued. Appraisal reports will be reviewed and reissued at regular intervals not exceeding five (5) years.
- The following information explains a number of very important limits on your ability to rely on the information in this Report. Please read it carefully and take it into account when considering the contents of this Report.

Any enquiries regarding this report should be directed to the Program Manager, Carl Radford, Phone: 03 8605 7601 email carl.radford@wsaa.asn.au.

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The Report has been prepared for use within Australia only by technical specialists that have expertise in the function of products such as those appraised in the Report (the Recipients).

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APPENDIX A – TECHNICAL MANUALS BROCHURES

AVAILABLE FROM CLOVER PIPELINES OR THE SUPERLIT WEBSITE

Technical Manuals Brochures Manuals Documents Referenced

The “SUPERLIT GRP Filament Winding Product Guide” provides a more complete description of the range of fittings.

The “SUPERLIT Glass Reinforced Polyester (GRP) Pipelines TECHNICAL INFORMATION.

The “SUPERLIT Glass Reinforced Polyester (GRP) Pipe and Fittings INSTALLATION MANUAL.

Superlit website “www.superlit.com/grp_introduction.asp”.

Or www.cloverpipe.com.au

APPENDIX B - QUALITY CERTIFICATIONS

Copies of the following Quality Certification Certificates are available for downloading from the WSAA 'Members Only' IPAM Portal Website.

TABLE B1: CLOVER PIPELINES PTY LTD – MANAGEMENT SYSTEMS

Applicants Business Site Address: 141 National Boulevard, Campbellfield, Victoria 3061	
Quality Systems Standard	ISO9001:2008
Certification licence no.	102368
Certifying agency	Global Mark
First date of certification	12 May 2014
Current date of certification*	12 May 2015
Expiry date of certification**	14 April 2017

TABLE B2: SÜPERLIT BORU VE LEVHA SANAYİ A.Ş – MANAGEMENT SYSTEMS

Manufacturing Plant Address: Cele Mah. Duzce Cad. No:33 81900 Kaynasli DUZCE / TURKEY	
Quality Systems Standard	ISO 9001:2008
Certification licence no.	12 100 15302 TMS
Certifying agency	TUV SUD
First date of certification	2000/01 (Existing system converted to ISO9001:2000)
Current date of certification*	10 August 2007
Expiry date of certification**	19 October 2015

TABLE B3: SÜPERLIT BORU VE LEVHA SANAYİ A.Ş – PRODUCT CERTIFICATION

Manufacturing Plant Address: Cele Mah. Duzce Cad. No:33 81900 Kaynasli DUZCE / TURKEY	
Product Standard/Spec.	ISO 10467 /10639 (plus equivalent BS, AWWA, ASTM & DIN Stds)
Confirmation No.	Z-DGR-0036-QS-09-B-436
Issuing certification body	TUV SUD

TABLE B4: SÜPERLİT BORU VE LEVHA SANAYİ A.Ş – PRODUCT CERTIFICATION

Manufacturing Plant Site Address	
Product Standard/Spec.	ISO 10467 /10639
Inspection Certificate No.	Nr 281 Ref: IDD788.08.A41
Issuing certification body	Bureau Vertas

TABLE B5: SÜPERLİT BORU VE LEVHA SANAYİ A.Ş – OTHER CERTIFICATES

SUPERLİT Test Laboratory Certification	
SUPERLİT Test Laboratory Certification	TURKAK Accreditation to TS EN ISO/IEC 17025:2005 Valid until 5 October 2013 (see attachment)
Test Equipment Calibration Certification	UMS certification (TURKAK registered) example Certificate #600574 dated 5 Sep 2007 (Copy not attached)
Copy of other Certificates	(KIWA, AWWA and NSF) (Copy not attached)

TABLE B6: ARSEN KAUCUK Plastik – Makina Sanyı ve Ticaret A.S. – Supplier of Gaskets

Applicants Business (Attach all QA system certificates in full including schedules)	
Quality Systems Standard	ISO 9001:2008
Certification licence no.	066674 QM08
Certifying agency	DQS
First date of certification	
Current date of certification*	17 February 2009
Expiry date of certification**	16 February 2012

Manufacturing Plant: (Attach all QA system certificates in full including schedules and last audit report)

Type of Rubber		EPDM H880333S
Product Standard/Spec.	TS EN 681-1 / 14.4.1999	NEN- EN 681-1
Confirmation No.	14.31.34/TSE-2261-2 ,	K44584/01
Issuing certification body	TSE ,	KIWA

TÜV SÜD
 CERTIFIKAT ♦ CERTIFICATE ♦ 認證證書 ♦ CERTIFICADO ♦ CERTIFICAT



Management Service

CERTIFICATE

The Certification Body
 of TÜV SÜD Management Service GmbH
 certifies that

SUPERLIT BORU SAN. A.Ş.
 CUMHURİYET CAD. NO:155/3
 TR-34367 HARBIYE-İSTANBUL

has established and applies
 a Quality Management System for

**DESIGN, PRODUCTION AND SALES OF GRP (GLASSFIBER
 REINFORCED PLASTIC) PIPE, TANK AND FITTINGS**

including the sites and scope of application
 see enclosure

An audit was performed, Report No. 70021356
 Proof has been furnished that the requirements
 according to

ISO 9001:2008

are fulfilled. The certificate is valid until **2015-10-19**

Certificate Registration No. **12 100 15302 TMS**

M. Wegner

Munich, 2012-12-17

Page 1 of 2



QMS-TGA-ZM-07-92



INSPECTION CERTIFICATE Nr 281

BV Job Nr: IDD.788.08.A41

PROJECT: 3rd Party Inspections and Conformity Certification Services For Glass-reinforced Thermosetting Plastic Pipes Manufacturing by Superlit According to ISO 10639 and ISO 10467

Ref: IDD.788.08.A41

BV Client: Superlit Boru Sanayi A.Ş.

P/o nr:
(client to BV)

Manufacturer: Superlit Boru Sanayi A.Ş.

P/o nr:
(client to Manufacturer)

Inspection requested by: Superlit Boru Sanayi A.Ş.

SUPPLY / SUBJECT OF INSPECTION	ITEM / TAG Nr	QTY
3 rd Party Inspections for conformation of production Glass-reinforced thermosetting plastic pipes, according to ISO 10639 and ISO 10467		

Scope of inspection:

Further to periodic visit of the conformity certification according to ISO 10639 and ISO 10467 of Glass-reinforced thermosetting plastic pipes (up to 40bars and in the range of DN300 to DN3400), following activities were performed;

- Reviewing of quality control system.
- General production and material verification
- Marking control
- Visual and Dimensional control
- Witnessing of the pipe performance and quality control tests
- Reviewing joint performance and quality control tests

- **Reference documents used for inspection:** ISO 10639, ISO 10467
- **Place of inspection & date or period:** DUZCE - 04-05-08/09/2008
- **Annexes to this certificate:** 10 pages and the additional periodic visit inspection reports.
- **Result of the Inspection:** Satisfactory.

This system corresponds to system 5 product certification as described in ISO/IEC Guide 67, ISO 10639 and ISO 10467

This certificate is valid for 3 years with yearly periodic visits.

The undersigned, inspector to Bureau Veritas, certifies that the hereabove mentioned supply was inspected in conformity with the applicable requirements of the purchase order and the contractual requirements governing the mission entrusted to Bureau Veritas without any remarks.

Inspected by:

Name: Onur TOPUZ

Signature:

Date of issue: 01.10.2009

Inspection centre: BV Turkey/ Istanbul

**Checked by:**

Name: Mustafa EYÜBOĞLU

Signature:

Distribution: CLIENT MANUFACTURER

CONFIRMATION

The Manager of the Certification Body of
TÜV SÜD Industrie Service GmbH
(a Pressure Equipment Directive Notified Body)

confirms that

SUPERLİT BORU SAN.A.Ş.

Cele Mah. Düzce Cad. No: 33
81900 Kaynasli- Düzce-TURKEY

has implemented, operates and maintains a quality control and quality assurance system which is subject of periodical assessments by qualified auditors of TÜV SÜD Industry services.

Therefore, the company is qualified for manufacturing of GRP (Glass-fiber Reinforced Plastic) pipes, joints and fittings (DN 250 to 3.500, PN 1 to 40, SN 500 to 10.000 pursuant standards below and SN 12.500 to 1.500.000 for jacking application pursuant SUPERLİT standards)

According to:

BS 5480: Glass Reinforced Plastics (GRP) Pipes, Joints and Fittings for Use for Water Supply or Sewerage

AWWA C 950: Fiberglass Pressure Pipe

ISO 10639: Plastics Piping Systems for Pressure and Non-pressure Water Supply, Glass-Reinforced Thermosetting Plastics (GRP) Based on Unsaturated Polyester (UP) Resin

ISO 10467: Plastics Piping Systems for Pressure and Non-Pressure Drainage and Sewerage-Glass-Reinforced Thermosetting Plastics (GRP) Systems Based on Unsaturated Polyester (UP) Resin

EN 1796: Plastics Piping Systems for Water Supply with or Without Pressure-Glass-Reinforced Thermosetting Plastics (GRP) Based On Unsaturated Polyester Resin (UP)

EN 14364: Plastics Piping Systems for Drainage and Sewerage With or Without Pressure-Glass-Reinforced Thermosetting Plastics (GRP) Based on Unsaturated Polyester Resin (Up)-Specifications for Pipes, Fittings and Joints

DIN 16869: Centrifugally Cast and Filled Glass Fiber Reinforced Polyester Resin Pipes

ASTM D 3262: "Fiberglass" (Glass-Fiber-Reinforced Thermosetting - Resin) Sewer Pipe

ASTM D 3754: "Fiberglass" (Glass-Fiber-Reinforced Thermosetting - Resin) Sewer and Industrial Pressure Pipe

ASTM D 3517: "Fiberglass" (Glass-Fiber-Reinforced Thermosetting - Resin) Pressure Pipe

TS 4355: Cam Elyafı İle Takviyeli Plastik Borular ve Bağlantı Parçaları

AWWA M 45: Fiberglass Pipe Design

ATV-DVWK-A 127: Static Calculations for Waste Water canals and pipes

Confirm No.: Z-DGR-0036-QS-09-B-436

valid until August, 2012

İstanbul,02 . 09.2009



TÜRK AKREDİTASYON KURUMU

COPY OF THE ACCREDITATION CERTIFICATE

As a Testing Laboratory,

SUPERLİT BORU SAN. A. Ş.
Deney Laboratuvarı

Çele Mah. Düzce Cad. No:33
81900 DÜZCE / TÜRKİYE

is **accredited** in accordance with **TS EN ISO/IEC 17025:2005** within the scope given in Annex following the assessment conducted by **TÜRKAK**.

Accreditation Number : AB-0024-T

Accreditation Date : 10 October 2005

Revision Date / Number : 06 October 2009 / 05

This certificate shall remain in force until **05 October 2013**, subject to continuing compliance with the standard **TS EN ISO/IEC 17025:2005**, related regulations and requirements.

Atakan BAŞTÜRK
Secretary General

Accreditation Scope

	SUPERLİT BORU SAN. A. Ş. Deney Laboratuvarı	
	Accreditation Number: AB-0024-T Revision Number: 05 Date: 06 October 2009	
	Deney Laboratuvarı	
	Address: Çele Mah. Düzce Cad. No:33 81900 DÜZCE / TÜRKİYE	Phone : 0212 315 31 31 Fax : 0212 315 31 36 E-Mail : kalite@superlit.com Website: www.superlit.com

Tested Materials / Products	Name of Test	Testing Method (National, International standards, in house methods)
Polyethylene (PE) Material	Determination of density	TS EN ISO 1183-1 (December 2006) Method A ISO 1183-1(2004)Method A
	Determination of the Melt-Mass-Flow Rate (MFR) and the Melt Volume Flow Rate (MVR)	TS EN ISO 1133 (April 2007) Procedure A ISO 1133 (2005) Procedure A
	Determination of the tensile properties	TS EN ISO 6259-1 (January 2004) ISO 6259-1 (1997)
Glassfibre Reinforced Plastics (GRP) Pipe	Determination of Longitudinal tensile strength	TS 4355 (November 1985) Clause 2.1.6.2 BS 5480 (1990) App.-A ISO 8513 (2000) Method A EN 1393 (1996) Method A
	Determination of stiffness	BS 5480 (1990) Clause 6.3 (Method B) ISO 7685 (1998) Method B ASTM D2412 (2008) TS 4355 (November 1985) Clause 1.2.4 EN 1228 (1996) Method B
	Determination of circumferential tensile strength	TS 4355 (November 1985) Clause 2.1.7.1 & 2.1.7.3 BS 5480 (1990) App.-D ISO 8521 (1998) Method B & Method D EN 1394 (1996) Method B & Method D

End of Scope


Atakan BAŞTÜRK
Secretary General

APPENDIX C – PRODUCT SCHEDULE

The following pipes are the standards range to be handled by Clover Pipelines. Other pipe classes are available on request. Refer to SUPERLIT catalogue for details of other available classes.

TABLE C1: PIPE to ISO 10639 (WATER) and ISO 10467 (SEWER)

Nominal Diameter (DN)	Class(s)		ISO / AS Pipe Series/External Diameter (mm)	Length (m)	Remarks
	Pressure (PN) ¹	Stiffness (SN)			
DN 300	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B5" Series # / 345 ±2 AS Table 5 / 345mm	Up to 11.8m	RRJ Coupling fitted one end
DN 350	From PN 1 to PN 32	From SN 1250 to SN 20000	"B1" Series / 376.1	Up to 11.8m	RRJ Coupling fitted one end
DN375	From PN 1 to PN 32	From SN 1250 to SN 20000	AS Table 5 / 426mm	Up to 11.8m	
DN 400	From PN 1 to PN 32	From SN 1250 to SN 20000	"B1" Series / 427.1	Up to 11.8m	RRJ Coupling fitted one end
DN 450	From PN 1 to PN 32	From SN 1250 to SN 20000	"B5" Series # / 507 ±2 AS Table 5 / 507mm	Up to 11.8m	RRJ Coupling fitted one end
DN 500	From PN 1 to PN 32	From SN 1250 to SN 20000	"B5" Series # / 560 ±2	Up to 11.8m	RRJ Coupling fitted one end
DN525	From PN 1 to PN 32	From SN 1250 to SN 20000	AS Table 5 / 587mm	Up to 11.8m	
DN 600	From PN 1 to PN 32	From SN 1250 to SN 20000	"B5" Series # / 667 ±2 AS Table 5 / 667mm	Up to 11.8m	RRJ Coupling fitted one end
DN 700	From PN 1 to PN 32	From SN 1250 to SN 20000	"B1" Series / 718.3	Up to 11.8m	RRJ Coupling fitted one end
DN750	From PN 1 to PN 32	From SN 1250 to SN 20000	AS Table 5 / 826mm	Up to 11.8m	
DN 800	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 819.9	Up to 11.8m	RRJ Coupling fitted one end
DN 900	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 924.1 AS Table 5 / 924mm	Up to 11.8m	RRJ Coupling fitted one end

Nominal Diameter (DN)	Class(s)		ISO / AS Pipe Series/External Diameter (mm)	Length (m)	Remarks
	Pressure (PN) ¹	Stiffness (SN)			
DN 1000	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 1026.1 AS Table 5 / 1026mm	Up to 11.8m	RRJ Coupling fitted one end
DN 1100	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 1125	Up to 11.8m	RRJ Coupling fitted one end
DN 1200	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 1228.8 AS Table 5 / 1229mm	Up to 11.8m	RRJ Coupling fitted one end
DN 1300	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 1331.5	Up to 11.8m	RRJ Coupling fitted one end
DN 1400	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 1433.6 AS Table 5 / 1434mm	Up to 11.8m	RRJ Coupling fitted one end
DN 1500	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 1535.6	Up to 11.8m	RRJ Coupling fitted one end
DN 1600	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 1637.6 AS Table 5 / 1638mm	Up to 11.8m	RRJ Coupling fitted one end
DN1700	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 1739.4	Up to 11.8m	RRJ Coupling fitted one end
DN 1800	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 1841.7 AS Table 5 / 1842mm	Up to 11.8m	RRJ Coupling fitted one end
DN1900	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 1943.4	Up to 11.8m	RRJ Coupling fitted one end
DN 2000	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 2045.8 AS Table 5 / 2046mm	Up to 11.8m	RRJ Coupling fitted one end
DN2100	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 2147.9	Up to 11.8m	
DN 2200	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 2250.0 AS Table 5 / 2250mm	Up to 11.8m	RRJ Coupling fitted one end
DN2300	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 2351.4	Up to 11.8m	
DN 2400	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 2453.0 AS Table 5 / 2453mm	Up to 11.8m	RRJ Coupling fitted one end
DN2500	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 2555.0	Up to 11.8m	
DN2600	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 2657.0	Up to 11.8m	

Nominal Diameter (DN)	Class(s)		ISO / AS Pipe Series/External Diameter (mm)	Length (m)	Remarks
	Pressure (PN) ¹	Stiffness (SN)			
DN2700	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 2758.0	Up to 11.8m	
DN2800	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series / 2860.0	Up to 11.8m	
DN2900	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO "B1" Series (Table 3) / 2962.0	Up to 11.8m	
DN3000	From PN 1 to PN 32	From SN 1250 to SN 20000	"B1" Series / 2453.0 AS Table 5 / 3066mm	Up to 11.8m	

The spigot diameter of SUPERLIT GRP pipes, in the range DN 300 to DN 750 and manufactured to dimensions specified in AS 3571.1 Series B1 (Table 5) in Appendix ZZ, are generally compatible with outside diameter dimensions of ductile iron pipe and fitting for pressure applications to AS/NZS 2280, with the exception of with the exception of DN 500 pipe size.

Table C1 also contains other nominal diameter of SUPERLIT GRP pipes \geq DN 1000 which are not included in AS 3571.1 Series B1 (Table 5) in Appendix ZZ or ISO 10467 Series "B1" (Table 5).

Superlit GRP pipe is produced in the larger diameters ($>$ DN300) the pipe will primarily be used for transfer main applications and therefore the range of fittings will be to bends, tees, reducers and adaptors. Fitting connection can be spigot, socket (coupling) and flange. If flanges are required they are in the factory using the standard GRP tape winding connection process used to fabricate fittings.

NOTE 1 SUPERLIT GRP filament wound pressure and non-pressure pipes can be manufactured up to PN 40 and meet the requirements of ISO 10467 and as such is included in their product certification certificate issued by TUV.

APPENDIX D - WSAA PRODUCT SPECIFICATION

WATER SERVICES ASSOCIATION of Australia

PRODUCT SPECIFICATION

WSA PS - 205S FILAMENT WOUND GLASS REINFORCED PLASTICS (FW-GRP) PIPES AND FITTINGS FOR PRESSURE AND NON- PRESSURE APPLICATIONS - SEWERAGE

205S.1 SCOPE

This specification covers FW²-GRP pipes¹ and fittings for gravity and pressure sewerage.

205S.2 REQUIREMENTS

- (a) FW-GRP pipes and fittings shall comply with AS 3571.1:2009/Amdt 1:2009 (ISO 10467:2004/Amdt 1:2011).
- (b) FW-GRP pipes and fittings shall be manufactured using the following glass reinforcement types:
 - (i) Type "C"⁶.
 - (ii) Type "E" glass.
 - (iii) Type "ECR" and/or a
 - (iv) Combination of (i), (ii) and (iii) above.
- (c) Elastomeric joint seals shall be EPDM complying with AS 1646:2007 and AS 681.1:2008 (EN 681-1:1996).
- (d) Jointing lubricants shall have product certification (ISO Type 1) to AS/NZS 4020:2005.
- (e) FW-GRP pipes for gravity sewer applications shall be manufactured with an opaque inner resin liner layer.

205S.3 QUALITY ASSURANCE

- (a) FW-GRP pipes and fittings shall have product certification (ISO Type 5) to AS 3571.1:2009/ Amdt 1:2009.
- (b) Elastomeric joint seals shall have product certification (ISO Type 5) to AS 1646:2007 and AS 681.1:2008 (EN 681-1:1996).
- (c) All products shall be marked in accordance with the conformity assessment body's requirements.

205S.4 AGENCY OR PROJECT SPECIFIC REQUIREMENTS

Nominal size, DN	
Pressure Class ⁴ , PN	
Stiffness Class ³ , SN	
Fitting types (configurations)	
Joints and couplings ⁵	
Alternative glass type	
Alternative elastomeric material for joint seals	

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File Name: WSA_PS_205S_03
Doc Name: Product Specifications for Products & Materials

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Issue: 03

August 2013
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WATER SERVICES ASSOCIATION of Australia

NOTES:

- 1 Pressure and stiffness classes shall be as specified in the Project Specification or on the Design Drawings.
- 2 Manufactured using filament wound process for GRP pipe.
- 3 Pipes for gravity sewerage are classified by nominal stiffness, SN.
- 4 Pipes for pressure sewerage are classified by nominal stiffness, SN and nominal pressure, PN.
- 5 Flange gaskets and O-rings should be supplied to [WSA PS-312](#).
- 6 Type C glass is a non-structural glass used only as a tissue on the inner surface of the pipe.

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Issue: 03

August 2013

Doc Name: Product Specifications for Products & Materials

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APPENDIX E – OUTCOME OF EXPERT PANEL REVIEW

An expert panel meeting was conducted on the 8 April 2008 to progress the Product Appraisal application for SUPERLIT GRP Filament wound GRP pipe and fittings. The minutes of the meeting are available to WSAA website IPAM Portal (Members only).

The IPAM members and representatives from the Applicant participating in the Expert Panel review are listed in Table E1.

TABLE E1: EXPERT PANEL PARTICIPANTS

Expert Panel Members	
Grant Leslie – WSAA	
David Cox – WSAA	
David Moore – South East Water	
Kevin Dawson – Yarra Valley Water	
David Mavros – SA Water	
Lance Fletcher – Mid Coast Water	
Henry Pisanko – Sydney Water	

APPENDIX F - SUPPLIER CONTACTS

Victoria (Head Office)
141 National Boulevard,
Campbellfield, Victoria 3061
Telephone: +61 3 8373 8000
Fax: +61 3 8373 8099

South Australia
Locked Bag 2022,
Somerton Victoria 3062
Telephone: +61 8 8120 4600
Fax: +61 8 8120 4699

New South Wales
49-53 Newton Road,
Wetherill Park, New South Wales 2164
Telephone: +61 2 8279 8000
Fax: +61 2 8279 8099

Queensland
6/41 Bellrick Street,
Acacia Ridge, Queensland 4110
Telephone: +61 7 3073 7000
Fax: +61 7 3073 7099

Western Australia
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Somerton Victoria 3062
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Tasmania
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Somerton Victoria 3062
Telephone: +61 3 6111 9500
Fax: +61 3 6111 9599

Northern Territory
Locked Bag 2022,
Somerton Victoria 3062
Telephone: +61 8 7999 8400
Fax: +61 8 7999 8499

APPENDIX G – FIELD TRIAL REPORT

Our Ref: A2617801
Contact: Adam Cunningham

18 July 2011

Anthony Favero
Operations Manager – QA HSE
Promains
75-89 Link Drive,
Campbellfield VIC 3061

Dear Anthony,

Re: Superlit GRP pipe – Anglesea borefield project

Please find below a response to your survey regarding the supply of Superlit manufactured GRP pipe under Contract No. 10706.

1. Project details;

a. Length of pipeline

9km

b. Nominal Sizes of pipe

DN375, DN450 and DN600

c. Pressure ratings of pipe

PN25 and PN32

d. Stiffness rating

SN10000

2. Location of project

Anglesea, Victoria.

3. Length of each pipe

5.8m and 11.8m

4. What was the construction commencement date?

September 2008

5. What was the condition of product at delivery?

The product was delivered to site in good condition.

Barwon Region Water Corporation
ABN 86 348 316 514

61-67 Ryrie Street, Geelong Victoria 3220
PO Box 659 Geelong Victoria 3220 TEL 1300 656 007 FAX +61 3 5221 8236

www.barwonwater.vic.gov.au

6. How was the product delivered to site, in loose pipes, or strapped packs?

The pipes and fittings were delivered in strapped packs.

7. Were the product marking details visible and easy to read?

Each pipeline had a unique identification label. The label was very easy to read.

8. Did the product markings identify the;

a. Nominal Diameter?

Yes

b. Pressure rating?

Yes

c. Stiffness Rating?

Yes

9. What was the jointing system rubber ring joint?

Yes the jointing system was rubber ring joint. Fittings were flanged.

10. Could the rubber ring be removed from the coupling?

No

11. What were the ground conditions where the GRP was used?

Sandy clay. No rock was encountered.

12. What was the temperature of the bore water extracted that would flow through the GRP?

Between 30 to 40 degrees Celsius.

13. What were the range of depths where GRP was being used?

a. Deepest

Depth to invert of around 3 metres.

b. Shallowest

Depth to invert of around 1.6 metres.

c. Average

Depth to invert of around 2 metres.

14. What was the bedding and embedment materials used?

Class A bedding sand.

15. What was the hydrostatic pressure applied to the pipeline?

The pressure applied varied across pipeline depending on invert RL but ranged between 1000kPa and 2000kPa.

16. Did the contractor find the GRP easy to handle?

Yes, the contractor found the GRP easy to handle and did not have any major issues with unpacking and transporting the pipe along the alignment.

17. Did the contractor find the GRP easy to cut GRP to be used as short lengths or spigot pipe?

Following training by Promains, the contractor did not have any major issues cutting the pipe where required.

18. Was installation of the GRP easy or difficult?

The contractor found the installation to be relatively easy.

19. Was it easy for the contractor to identify Adjustment (cutting) pipe on site?

Yes, adjustment pipe was clearly labelled.

20. How long has the pipeline been in commission?

The pipeline was commissioned in November 2009.

21. Have there been any issues with the GRP since commissioning?

No, the product has performed well to date.

22. What was learned about the product that could make it better or worse than other brands?

The only negative aspect of the Superlit GRP product is that for this project it supplied in ISO dimensions. Adaptor ISO to AU rubber rings were used to connect AS ductile iron fittings to the ISO dimensioned GRP pipeline. I have been informed by Promains that they are now supplying Superlit GRP pipe and fittings in Australian sizes in accordance with AS/NZS2280.

If you require further information please do not hesitate to contact Adam Cunningham, Project Manager, on (03) 5226 2460.

Yours sincerely,



Adam Cunningham
Project Manager
Capital Projects

APPENDIX H - NATA LABORATORY TEST RESULTS

Test Reports have been made available for the purposes of preparing this product appraisal report. The information is considered to be commercial in confidence and has not therefore been made public. Should you require such information, please contact the manufacturer (Appendix F).

The type testing and ongoing production testing (batch testing) confirm the GRP filament wound pipe and fittings meets the requirements of ISO 10647:2004. This is verified by the Bureau Veritas Inspections Certificate and TUV SUD Confirmation Certificates. SUPERLIT have provided testing results which have been primarily conducted at the SUPERLIT Test Laboratory Certification (TURKAK accredited) and copies of test reports are available upon request from the WSAA Product Appraisal Manager. Batch release testing is done in-house on appropriate specialist testing equipment.

ISO 10467:2004 calls up a range of performance tests which include the following:

TABLE H1: SUMMARY OF TYPE TESTS AND BATCH TEST RESULTS

Characteristics	Clause	Requirement	Frequency	Test Result	CONFORMS	Pipe Size	Doc ID
PIPES							
Pipe Type Tests							
Material Properties	4.2.3	Resin Temperature of deflection	At any new material formulation or design or every 10 years - whichever occurs first	> 70°C	PASS	NOT APPLICABLE	Annex C PCP PCP 25.02.2011
	4.8	Effect on potable water		AS/NZS 4020 - Exposed to areas to volume ratio's up to 15,000 mm ² /L	PASS	DN600 PN25 SN10,000	Annex C Test 11
Performance	5.2.7	Long term circumferential tensile stress/strain regression characteristics		33.1 Bar 0.66%	PASS PASS	DN600 PN16 SN10,000 DN700 PN10 SN5,000	Annex C Test 6A Annex C Test 6B
	5.2.4	Long term circumferential flexural strain creep and/or relaxation factor		12.82%	PASS	DN600 PN16 SN10,000	Annex C Test 3
	5.2.2	Long term stiffness		0.72	PASS	DN1200 PN16 SN10,000	Annex C Test 2
	5.3	Resistance to cyclic pressures		No signs of failure for 10 ⁶ cycles	PASS	DN500 PN16 SN10,000	Annex C Test 7
	5.4	Resistance to Strain Corrosion		Deflection 0.83%	PASS	DN600 PN6 SN5000	Annex C Test 8
Pipe Batch Release Tests							
Mechanical Properties	5.2.1	Initial ring stiffness	One pipe per batch	18632 N/m ²	PASS	DN600 PN16 SN16,000	Annex C Test 1
	5.2.3	Ring deflection	One pipe per batch				
	5.2.6	Apparent initial circumferential tensile strength	One pipe per batch	Avg 2354.78 N/mm	PASS	DN600 PN16 SN16,000	Annex C Test 5
	5.2.5	Longitudinal tensile strength	One pipe per batch	Avg 319.67 N/mm	PASS	DN600 PN16 SN16,000	Annex C Test 4

Characteristics	Clause	Requirement	Frequency	Test Result	CONFORMS	Pipe Size	Doc ID
PIPES							
Pipe Type Tests							
	Informative	Leakage resistance at a hydrostatic test pressure of 2.0 x PN for 2 minutes	Each Pipe	OK	PASS	DN500 PN10 SN10,000	Pipe Test Certificate (15.02.2011)
Dimensions	5.1.1.3.1 and 3	Diameter and wall thickness, Length and witness mark location, Spigot end and tolerance,	Each Pipe	To Manufacturer Specifications	PASS	DN700 PN16 SN5,000	FW Pipe Inspection Form Date 28.02.2011
	Informative	Squareness of ends	Each Pipe	OK	PASS	DN500 PN10 SN10,000	Annex C PCP PCP 25.02.2011 Pipe Test Certificate
Appearance	4.4	Visual Assessment	Each Pipe	OK	PASS	DN500 PN10 SN10,000	Annex C PCP PCP 25.02.2011 Pipe Test Certificate (15.02.2011)
Markings	5.5	Identification	Each Pipe	All markings present	PASS	DN600 PN16 SN16,000	Appendix 1 PCP 25.02.2011
COUPLINGS							
Coupling Type Tests							
Material Properties	4.2.3	Resin Temperature of deflection	At any new material formulation or design or every 10 years - whichever occurs first	> 70°C	PASS	NOT APPLICABLE	Annex C PCP PCP 25.02.2011
	4.8	Effect on potable water		AS/NZS 4020 - Exposed to areas to volume ratio's up to 15,000 mm ² /L	PASS	DN600 PN25 SN10,000	Annex C Test 11
	4.7.3	Elastomeric seal characteristics		No damage, leakage or weeping	PASS	DN800 PN10	Report No. RJ1007

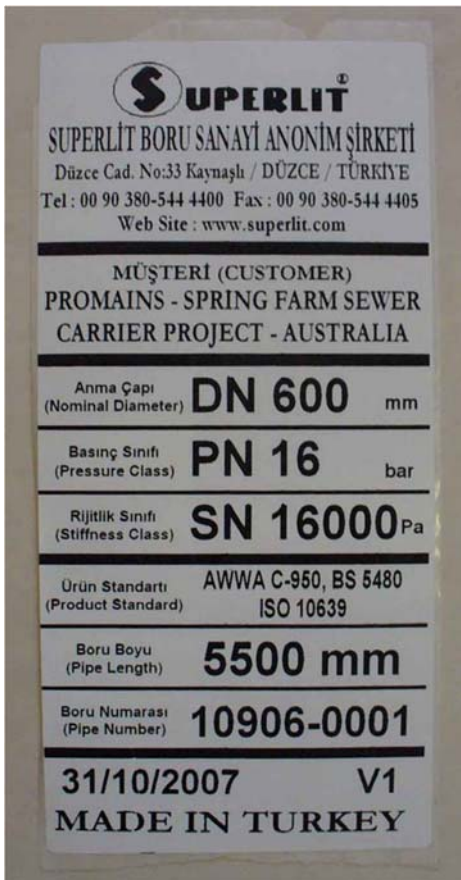
Characteristics	Clause	Requirement	Frequency	Test Result	CONFORMS	Pipe Size	Doc ID
PIPES							
Pipe Type Tests							
Performance of Flexible Pipe Joint	4.7 and 7.2	Resistance to leakage, vacuum in standard joint test configurations including draw and angular deflection		No damage, leakage or weeping	PASS	DN800 PN10	Report No. RJ1007
Coupling Batch Release Tests							
Performance	Informative	Leakage resistance at a hydrostatic test pressure of 2.0 x PN for 2 minutes	Each Coupling	OK	PASS	DN500 PN10 SN10,000	Pipe Test Certificate (15.02.2011)
Dimensions	5.1.1.3.1 and 3	Diameter and wall thickness	Each Coupling	OK	PASS	DN500 PN10 SN10,000	Pipe Test Certificate (15.02.2011)
	Informative	Gasket profile and hardness	One gasket per batch	OK	PASS	All Sizes	F144 Quality Control Report No. 11-051
Appearance	4.4	Visual Inspection	Each Coupling	To Manufacturer Specifications	PASS	DN700 PN16 SN5,000	Production Control Plan PCP 25.02.2011 FW Pipe Inspection Form Date 28.02.2011
Markings	5.4	Identification of conformance	Each Coupling	All markings present	PASS	APPENDIX I	Coupling Label

APPENDIX I – EXAMPLE OF PIPE MARKING

The pipe marking label (see below) is computer generated for each section of pipe length. The label is fixed to the pipe or coupling prior to the application of the external surface coating effectively encasing the label within the structure. Label details conform to Clause 2.9 of AS 3571 (similar to ISO 10467 / 10639, AWWA C-950 and BS5480)

The Label 1 is for the pipe order placed in 2007 by Sydney Water for a critical sewer project (this is the reason they selected water grade pressure pipe). Label 2 is of a coupling, When adjustment pipe is manufactured it is stencilled onto the pipe as shown in Label 3.

Label 1.



Label 2.



Label 3.



APPENDIX J – CONNECTIONS USING FLANGED OFF-TAKE CLAMPS

Subject to Water Agency approval flanged off-takes on host pipes > DN 450 are permitted, Refer to The “SUPERLIT Glass Reinforced Polyester (GRP) Pipe and Fittings” INSTALLATION MANUAL for more information.

The under pressure cut-in performed according to the method described in WSA 03:2011 Appendix C – Under Pressure Cut-In-Connections to Pressure Pipe \geq DN 80 can be carried out successfully on GRP pipe using a diamond impregnated shell cutter of the appropriate diameter.

Mechanical flanged off-take clamps complying with AS 4181-2013 *Repair and off-take clamps for water industry purposes* are recommended. For more information refer to The “SUPERLIT Glass Reinforced Polyester (GRP) Pipe and Fittings INSTALLATION MANUAL.

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