Clover Pipelines Pty Ltd

PRODUCT APPRAISAL REPORT No PA 1422 Issue 2

SUPERLİT Centrifugal Casting (CC) GRP Pressure Pipe and Non-Pressure Pipe for Sewerage DN 400 – DN 1400

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 representing the urban water industry. Our members provide water and sewerage services to over 20 million customers in Australia and New Zealand and many of Australia's largest industrial and commercial enterprises.

Based around our vision of 'customer driven, enriching life', WSAA facilitates collaboration, knowledge sharing, networking and cooperation within the urban water industry. We are proud of the collegiate attitude of our 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 influencers, to monitor emerging issues of importance to the urban water industry.

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

The urban water industry is committed to anchoring its services to customers' values, and to enrich communities where water services have broad economic, environmental and social values. In line with this our 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 SUPERLİT GRP Centrifugal Cast (CC) pipes and fittings, for water supply, recycled water and sewerage applications for the Oceania region.

This issue 2 is to address the Future Work Item for a field trial report relating to an installation of SUPERLİT CC-GRP non-pressure pipe in an open trench situation. Clover advise that since publication of this report they have not supplied SUPERLİT CC-GRP for an open trench installation. This future work requirement has therefore been retained on the basis that a field trial report will be submitted after the next installation opportunity.

SUPERLİT GRP centrifugal cast 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 Centrifugal cast 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.

SUPERLİT GRP centrifugal cast pressure and non-pressure pipes are manufactured with nominal pressure range of PN 1 to 32 in nominal pipe diameters ranging from DN 400 to DN 1400. It should be noted that ISO 10467 scope of pressure ranges for GRP pipes and fittings is limited to PN 32. However SUPERLİT GRP centrifugal cast 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: SUPERLİT 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.

SUPERLİT GRP centrifugal cast pressure and non-pressure pipes are manufactured with nominal pipe stiffness ranging from SN1250 N/m^2 to SN10000 N/m^2 in nominal pipe diameters ranging from DN 400 to DN 1400 with any combination of the above pressure class of pipe. SUPERLİT GRP centrifugal cast pressure and non-pressure pipes can also be manufactured with nominal stiffness up to SN20000 N/m^2 for deep trench application.

SUPERLİT 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 SUPERLİT coupling.

While SUPERLİT 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 SUPERLİT pipe to be imported into Australia will meet the following criteria:

DN 400 to DN 500 ISO 10467 Series “B2” (Table 6)

DN 600 to DN 1400 ISO 10467 Series “B1” (Table 5)

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 three parts and this report focuses on Part 1 only:

Part 1 (**This part**) SUPERLIT® GRP centrifugal cast 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.

Part 2 SUPERLIT® GRP centrifugal cast 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 3 SUPERLIT® GRP centrifugal cast pipes and fittings manufactured in accordance with ISO 25780:2011 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 above ISO standards for GRP centrifugal cast pipes and fittings are essentially the same except that SUPERLİT pipes designated for sewerage applications must comply with strain corrosion and abrasion resistance type test and SUPERLİT 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 centrifugal cast 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 SUPERLİT GRP centrifugal cast 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 as the Agent and Distributor for the range of SUPERLİT GRP centrifugal cast 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.

SUPERLİT is a major manufacturer and exporter of pressure and non-pressure pipes and their associated accessories. SUPERLİT 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 SUPERLİT 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

SUPERLİT GRP centrifugal cast pipe is a flexible, structural, centrifugal cast 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 "SUPERLİT GRP Centrifugal Cast (CC) Product Guide" provides a more complete description of the range of fittings (Refer to Appendix A).

3.2 Manufacture of Centrifugal Cast (CC) GRP

SUPERLİT GRP centrifugal cast composite pipes are produced by feeding the raw materials are fed into the rotating mould by a completely automated and electronically controlled process, starting from the external surface of the pipes until the determined wall thickness is obtain.

This pre-programmed repetitive process precisely measures the amount of the raw materials, the speed of rotation of the mould, the build-up of the pipe wall layer by layer and the internal heating of the mould. A feeder arm deposits the raw materials at pre-determined quantities into the mould. The resin is specially formulated not to polymerise during the filling process and the glass fibre is chopped into its design length at the end of the feeder arm. The organisation of the fibre is controlled to give the requisite circumferential and longitudinal design strength. The mould initially rotates at relatively low speed until all the raw materials are in position. The spinning speed is then increased to increase the compaction forces. The increase in speed ensures the complete compaction, creating a void-free pipe wall construction. The GRP Pipe wall is built up with each pass of the arm feeding the raw materials into the mould in layers with progressive transitions from layer to layer. The reinforcing fibres are positioned on both sides of the neutral axis of the pipe wall and the intermediate space is filled with progressive mixture of sand and resin with glass as reinforcement.

The mechanical properties of GRP centrifugal cast pipes can be varied by adjusting the quantity, proportions and orientation of the various laminates in the pipe wall. The flexibility of this system enables pipes to be designed to meet a wide range of pressure and gravity applications. The types of resin may also be varied in order to meet the many duties and environments to which the pipes may be subjected to.

3.2.1 Reinforcement

Ref: Clause 4.2.2 of ISO 10467:2004

Fiberglass materials are available with a variety of compositions. This allows for additional design flexibility to meet performance criteria. (All fibreglass reinforcement begins as individual filaments of glass drawn from a furnace of molten glass. Many filaments are formed simultaneously and gathered into a "strand." A surface treatment (sizing) is added to maintain fibre integrity, establish compatibility with resin, and ease further processing by improving consolidation and wet strength. Sizing can also affect resin chemistry and laminate properties.)

Superlit use any combination of glass material (Full ECR, full E or mixture of E & ECR glass) in production in accordance with the customer request and application area. Clover Pipelines provides the necessary information to Superlit so that they are able to determine if their standard glass mix is satisfactory or if it needs to be modified to meet the application. Superlit are able to meet any request for pipes to be manufactured with either ECR, E or mixed.

Approximately 50% of the fibre glass requirements are supplied from manufacturers in Turkey and the remainder is supplied by eight producers in Europe and/or Far East Asia. All fibre glass materials orders are required to meet detailed specific quality requirements specified by SUPERLİT 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 glass fibers most commonly used in pipe are referred to as Types E, ECR, and C. Glass types ECR and C provide improved acid and chemical resistance. Type C glass fibres are generally only used to reinforce chemical-resistant liners. E-glass have good insulation properties, tensile and compressive strength and stiffness, good electrical properties. ECR glass offers enhanced resistance to certain types of corrosive environment. ECR glass fibres offer enhanced long-term acid resistance and short-term alkali resistance.

All resin used in the manufacture of SUPERLİT GRP plants is supplied by 3 specialist suppliers in Turkey. All resin orders are required to meet detailed specific quality requirements specified by SUPERLİT and samples of all orders are checked in the QC laboratory on delivery and prior to use.

3.2.3 Aggregate and Fillers

Ref: Clause 4.2.4 of ISO 10467:2004

Silica sand is used as the filler in SUPERLİT centrifugal cast 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

SUPERLİT GRP centrifugal cast composite pipes are manufactured to the Australian market to ISO 10467, in nominal sizes ranging from DN 400 to DN 1400.

The spigot dimension of SUPERLİT GRP centrifugal cast pipe to be imported into Australia will generally fit the following criteria:

DN 400 to DN 600	ISO 10467 Series “B2” (Table 6)
DN 600 to DN 1400	ISO 10467 Series “B1” (Table 5)

3.4 Nominal Stiffness

SUPERLİT GRP centrifugal cast pipes are supplied in the following stiffness classes.

TABLE 1: NOMINAL STIFFNESS (SN)

Stiffness Class (SN)	Stiffness (N/m²)
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. SUPERLİT GRP centrifugal cast pressure and non-pressure pipes can also be manufactured with nominal stiffness up to SN 20000 N/m^2 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 SUPERLİT GRP centrifugal cast pipes for non-pressure (branch and trunk/main gravity sewer mains) sewerage applications are supplied with a standard nominal pressure of (PN) 1.

The SUPERLİT GRP centrifugal cast pipe for pressure sewer (rising mains) applications are supplied with a standard nominal pressure range between (PN) 1 to 32.

SUPERLİT GRP centrifugal cast 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.

3.6 Nominal Pipe lengths

Ref: Clause 5.1.3.1 of ISO 10467:2004

The SUPERLİT GRP centrifugal cast pipe machines are capable of producing pipe lengths up to 6 m.

The SUPERLİT pipe for gravity sewer applications are supplied in either 2.8 or 5.8 m lengths. Other pipe lengths are available for special orders.

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

3.7 SUPERLİT Pipe Coupling

Ref: Clause 4.2.6 of ISO 10467:2004

The standard pipe jointing system is the SUPERLİT 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 SUPERLİT 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 SUPERLİT 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			

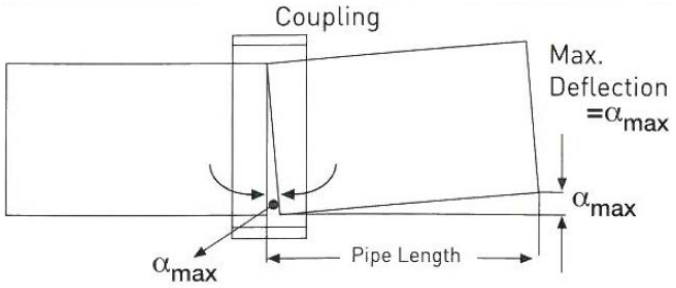

FIGURE 2 ANGULAR JOINT DEFLECTIONS

For proper sealing of the SUPERLİT coupling, a smooth, dimensionally accurate outside spigot surface is needed on each end of the pipe. SUPERLİT 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.

3.9 Pipe Fittings and Accessories

SUPERLİT 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 SUPERLİT 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, with and without rock.

Rocker Pipes with puddle flange.

Manhole couplings are used in sewer pipelines and are available in various lengths, with and without rock and a puddle flange. The puddle flange position can be fabricated in accordance with the pipeline design requirements.

Rocker pipes have spigot/spigot connections and a puddle flange fabricated onto the pipe. The puddle flange position can be fabricated in accordance with the pipeline design requirements.

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 "SUPERLİT GRP Centrifugal Casting (CC) 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 SUPERLİT GRP centrifugal cast 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.

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 JASANZ accredited Certification Assessment Body (CAB) or by a CAB accredited by international accreditation system recognised by JAS-ANZ.

5.3 Performance Requirements

SUPERLİT 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 Specifications are also relevant to this application:

- WSA PS - 237S Centrifugally Cast Glass Reinforced Plastics (CC-GRP) Pipes and Fittings (ISO Sized) 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 (Glass fibre 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-fibre Reinforced Plastic) pipes, joints and fittings (DN 250 to 3500, PN 1 to PN 40 SN500 to SN10000 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

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

Details are available in the "SUPERLİT GRP Centrifugal Castings (CC) 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 SUPERLİT 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. SUPERLİT 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 500, PN6, SN 5000 pipe (1 sample), which was tested in 2011, confirms the testing system used and shows the pipe met the ISO standards requirement as specified in ISO 10639 and ISO 7685.

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

Ref: Clause 5.2.2 of ISO 10467:2004 - Specifies ISO 10468 test procedure

The long-term specific ring stiffness of SUPERLİT GRP CC pipe was checked using the long-term creep stiffness method in accordance with ISO 10467:2004.

The tests are conducted in the SUPERLİT Laboratory, a type test report, for a section of DN 900, PN 1, SN5000 pipe (2 samples) dated 1 October 2009 to 22 November 2009, 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 SUPERLİT pipe is part of routine quality control system. The test procedure used is based on ISO 10466 as nominated in ISO 10467 and the SUPERLİT 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	Maximum No of failures
5000	12.2	18.9
10000	9	15

Testing of pipes on a regular basis has shown that pipes produced in the SUPERLİT 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 SUPERLİT 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 800, PN 16, SN5000 pipe which started on 8 June 2010 and finished 20 December 2010 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 1.34%, which, when compared with the 11.3% minimum requirement for SN5000 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 SUPERLİT Manufacturing Quality Control Laboratory (TURKAK accredited) and the SUPERLİT test procedure used is TL 6.01-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 gives a strength of >278.5 N/mm, which, when compared with the ISO standards PN6 pipe requirements of 150 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 SUPERLİT routine quality control system testing. The test procedure used is TL 6.01-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.

The results in the report show that the circumferential tensile strength according to the requirements of ISO 10467 gives a strength of >1310.8 N/mm, which, when compared with the ISO standards PN 6 pipe requirements of 547 N/mm, shows a high level of compliance.

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

Ref: Clause 5.2.7 of ISO 10467:2004- Specifies ASTM D 2992 and EN 1447 test procedure

The SUPERLİT 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.

The Hydrostatic Design Base (HDB) Test was performed in SUPERLİT Long term test laboratory, to determine the failure pressure after 50 years of 18 samples of DN 400 PN 10 SN10000 SUPERLİT GRP CC pipes, following the guidelines ASTM D 2992 and EN 1447.

The long term failure pressure of DN 400 PN 10 SN10000 SUPERLİT GRP CC pipe at 50 years was calculated as 20.4 bar from HDB regression line (statistical extrapolation model to the test data plotted in a log-log scaled pressure-time diagram results in a projected safety factor after 50 years operational life time).

The results in the SUPERLİT 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 20.4 bar, which relates to a safety factor at 50 years of >2, which, when compared with the PN 10 pipe requirements for a minimum safety factor of 1.9, 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 SUPERLİT pipes to cyclic internal pressure up to 1 million pressure cycles has been verified through ongoing testing.

An example SUPERLİT Laboratory test report dated 9 February 2010 for DN 500, PN16, SN 10000 pipe shows details of the testing apparatus and the test procedures used. The test was conducted in SUPERLİT (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

The results show the strain corrosion resistance of SUPERLİT pipes has been measured at 1.125%. The long term relative ring deflection in a corrosive environment after 50 years for the Type Test using sample DN 800 PN 6 SN5000 SUPERLIT GRP CC pipes was calculated as 15.22% by the extrapolation of the regression line obtained from the test data. The test results show SUPERLİT pipe complies with the minimum requirement shown in ISO 10467 Table 17:

TABLE 4: INITIAL RESISTENCE TO FAILURE

Stiffness	SN5000
Calculated deflection %	15.22 %
Allowable Minimum Deflection,% (11.3 of Table 17)	11.3 %

6.2.13 Elastomers - Type test

Ref: Clause 4.2.6 of ISO 10467:2004

The SUPERLİT 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 SUPERLİT 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 are 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

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

The pipes that have 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 SUPERLİT 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 SUPERLİT 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 SUPERLİT 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 SUPERLİT's Long Term Test Laboratory, conducted an abrasion resistance test on a piece of DN 600, PN 1, SN10000 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 SUPERLİT pipe was found to be 0.3 mm at 100,000 cycles.

These test results on Test Report RA0110 dated 30 July 2010 show indicate the sealing layer was not exposed after 100,000 cycles.

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 SUPERLİT 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 SUPERLİT for a recommendation on resins and re-rating.

6.2.17 Resistance to ultraviolet degradation

SUPERLİT 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 SUPERLİT 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 SUPERLİT Centrifugal cast 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, SUPERLİT 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 SUPERLİT 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 SUPERLİT GRP Installation Manual.

8 UNDER PRESSURE TAPPING AND REPAIR

SUPERLİT 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 ≥ 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 PN16 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. 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

SUPERLİT 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;
- Date of manufacture in text or code YYMMDD;

The SUPERLİT 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.

10 PACKAGING AND TRANSPORTATION

Because of the large number of international projects they support, SUPERLİT 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 SUPERLİT 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

Internationally, SUPERLİT 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 SUPERLİT 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 SUPERLİT 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: Constructors need only chamfer the cut end(s) of the pipe before jointing. Sealing of the cut ends of the pipe is not required for SUPERLİT 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 (≤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: CC-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/SUPERLİT.

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 SUPERLİT 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 advise transportation arrangements for GRP pipes and fittings.

Answer: SUPERLİT 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 8. Please advise what appearance acceptance criteria will be used for inspection and batch release of pipes and fittings?

Answer: SUPERLİT 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 3571.2

Q 9. What are the intentions with respect to the manufacture of fittings?

Answer: Fittings will be manufactured in the SUPERLİT 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 10. 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: SUPERLİT is unaware of any incidences of osmotic blistering with SUPERLİT 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 SUPERLİT pipes and fittings uses no binders since the SUPERLİT process achieves complete wetting of the glass reinforcement by physical means.

Q 11. Can GRP pipes and fittings be colour coded?

Answer: The SUPERLİT 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 12. 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 SUPERLİT 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. SUPERLİT can manufacture axial loading pipe if required. GRP pipe produced in the SUPERLİT 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 SUPERLİT 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 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 shows that while SUPERLİT 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.

15 FUTURE WORKS

It is required that Clover Pipelines Pty Ltd provide an agency endorsed field trial report for SUPERLİT CC-GRP non-pressure pipe used in an open trench situation. The report is required after the next installation opportunity.

A field trial report is included in Appendix F detailing a jacking pipe installation for Yarra Valley Water. The purpose of this report is to demonstrate adequate precautions are taken during the shipping, storage and transportation of the CC GRP pipes, from the place of manufacture to project site.

16 REPORT RECOMMENDATION

It is recommended that WSAA members and associates, subject to any specific requirements of the member or associate, accept or authorise the SUPERLİT GRP centrifugal cast 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 Sewerage Code or WSAA Members or Associated Members integrated WSAA Code editions.

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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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APPENDIX A – TECHNICAL MANUALS BROCHURES

AVAILABLE FROM CLOVER PIPELINES OR THE SUPERLIT WEBSITE

Technical Manuals Brochures Manuals Documents Referenced

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

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

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

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

Or at www.cloverpipe.com.au

APPENDIX B - QUALITY CERTIFICATIONS

Copies of the following Quality Certification Certificates are available for downloading from the WSAA members only website.

TABLE B1: CLOVER PIPELINES PTY LTD – MANAGEMENT SYSTEMS

Applicants Business Site Address: 141 National Boulevard, Campbellfield, Victoria 3061	
Quality Systems Standard	AS 9001:2008
Certification licence no.	102368
Certifying agency	Global Mark
First date of certification	12 May 2014
Current date of certification	27 March 2017
Expiry date of certification	1 September 2019

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

Manufacturing Plant Address: Cele Mah. Duzce Cad. No:33 81900 Kaynasli DUZCE / TURKEY	
Quality Systems Standard	TS EN9001:2008
Certification licence no.	1200 15302
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 2012

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

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

TABLE B5: SÜPERLIT BORU VE LEVHA SANAYI 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 Sanyi ve Ticaret A.S. – Supplier of Gaskets

Applicants Business	
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 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 HARBİYE-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**

Munich, 2012-12-17

Page 1 of 2

IAF

QMS-TGA-ZM-07-92

Industry & Facilities Division

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 Manifacturing 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
3rd 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:

18 BUREAU VERITAS 1828 IND TURKEY

Checked by:
Name: Mustafa EYÜBOĞLU
Signature:

Date of issue: 01.10.2009
Inspection centre: BV Turkey/ Istanbul

Distribution: ☒ CLIENT ☐ MANUFACTURER ☐ ☐

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Member of TÜV CERT

TÜV SÜD Industrie Service

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

TÜV SÜD Industrie Service GmbH 00 36

Notified Body No.: 0036
Mitglied der
CONFÉDÉRATION EUROPÉENNE
CEOC
D'ORGANISMES DE CONTROLE

TÜV SÜD / Türkiye
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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

Annex of the Certificate (Page 1/1)

Accreditation Scope

TÜRKAK Test TS EN ISO/IEC 17025 AB-0024-T	**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 Pipe Series/External Diameter (mm) / Permissible deviation upper/lower limits	Length (m)	Remarks
	Pressure (PN)[1]	Stiffness (SN)			
DN 400	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B2 ” Series / 427	Up to 6.0m	RRJ Coupling fitted one end
DN 500	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B2 ” Series # / 530	Up to 6.0m	RRJ Coupling fitted one end
DN 600	From PN 1 to PN 32	From SN 1250 to SN 20000	IS0“B1 ” Series # / 616 (+1.0,-1.8)	Up to 6.0m	RRJ Coupling fitted one end
DN 700	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 718 (+1.0,-2.2)	Up to 6.0m	RRJ Coupling fitted one end
DN 800	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 820 (+1.0,-2.4)	Up to 6.0m	RRJ Coupling fitted one end
DN 900	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 924 (+1.0,-2.6)	Up to 6.0m	RRJ Coupling fitted one end
DN 1000	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 1026 (+2.0,-2.6)	Up to 6.0m	RRJ Coupling fitted one end
DN 1200	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 1229 (+2.0,-2.6)	Up to 6.0m	RRJ Coupling fitted one end
DN 1400	From PN 1 to PN 32	From SN 1250 to SN 20000	ISO “B1” Series / 1434 (+2.0,-2.8)	Up to 6.0m	RRJ Coupling fitted one end

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 - It should be noted that ISO 10467 scope of pressure ranges for GRP pipes and fittings is limited to PN32. However SUPERLİT GRP centrifugal cast pressure and non-pressure pipes can be manufactured up to PN40 and meet the requirements of ISO 10467 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 - 237S CENTRIFUGALLY CAST GLASS REINFORCED PLASTICS (CC-GRP) PIPES AND FITTINGS (ISO SIZED) FOR PRESSURE AND NON-PRESSURE APPLICATIONS - SEWERAGE

237S.1 SCOPE

This specification[1] covers CC[2]-GRP pipes[3] and fittings[4] for non pressure[5] and pressure applications[6] sewerage.

237S.2 REQUIREMENTS

(a) CC-GRP pipes and fittings shall comply with ISO 10467:2004/Amdt 1:2012[7].

(b) CC-GRP pipes and fittings shall be manufactured using either of the following glass reinforcement types:

(i) Type "C" glass;

(ii) Type "E" glass;

(iii) Type "ECR" glass 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) CC-GRP pipes shall be manufactured with an opaque inner resin liner layer.

237S.3 QUALITY ASSURANCE

(a) CC-GRP pipes and fittings shall have product certification (ISO Type 5) to ISO 10467:2004/Amdt 1:2012.

(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.

237S.4 AGENCY OR PROJECT SPECIFIC REQUIREMENTS

Pressure Class[4], PN	
Stiffness Class[3], SN	
Joints and couplings	
Alternative glass type	
Alternative elastomeric material for joint seals	

NOTES:

1 The use of this specification requires approval by the Water Agency.

2 Manufactured using centrifugally casting process for CC- GRP pipe.

3 Includes the GRP couplings that are supplied with CC-GRP pipe.

4 Pipes manufactured to this specification are not directly compatible with fittings manufactured to AS/NZS 2280:2012. In some cases special adapter elastomeric seals many be used but their suitability would need to be tested to verify performance.

5 Pipes for gravity sewerage are classified by nominal stiffness, SN.

6 Pipes for pressure sewerage are classified by nominal stiffness, SN and nominal pressure, PN.

7 ISO 10467:2004/Amdt 1:2012 – Plastics piping systems for pressure and non-pressure drainage and sewerage -- Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin.

APPENDIX E - SUPPLIER CONTACTS

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

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

Western Australia
Locked Bag 2022,
Somerton Victoria 3062
Telephone: +61 8 6166 6800
Fax: +61 8 6166 6899

Northern Territory
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Somerton Victoria 3062
Telephone: +61 8 7999 8400
Fax: +61 8 7999 8499

South Australia
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Somerton Victoria 3062
Telephone: +61 8 8120 4600
Fax: +61 8 8120 4699

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

Tasmania
Locked Bag 2022,
Somerton Victoria 3062
Telephone: +61 3 6111 9500
Fax: +61 3 6111 9599

APPENDIX F – FIELD TRIAL REPORT

Yarra Valley Water Chirnside Park Jacking Pipe

Client:	Yarra Valley Water
Location:	Chirnside Park, Victoria
Project:	Chirnside Park Sewerage System Upgrade, Stage 2
Contractor:	MFJ Constructions
Promains's Role:	Supply, delivery and unloading of 64m of GRP CC Jacking Pipe and Fittings
Works Undertaken:	Supply of 64m x 2m lengths, DN800, PN1 100T (SN20,174) Jacking Pipe with stainless steel couplings 2 Manhole Connectors. Logistics of delivery of pipe and fittings to site. Regular on-site attendance to ensure smooth unloading and installation of pipeline.
Date of Installation	February 2012
Comments:	All pipe was delivered in strapped packs and in good condition. Pipe was delivered as planned and to schedule. The labeling was very easy to read and provided all necessary details which included the DN, PN Jacking tonnage and serial number The GRP pipe supplied was CC (centrifugal cast) and had stainless steel couplings with a rubber ring joint system. The rubber ring was fixed, non removable. The contractor had a trouble free installation that was tunneled under a road crossing section. The project is still subject to completion of commissioning. Not anticipated issues are expected with the installed GRP pipe Promains representatives worked together with the contractor and Yarra Valley water to ensure a successful installation

Photo 1 Storage of GRP CC- jacking Pipes

Photo 2 Couplings

Photo 3 Timber and Scallop supports and strappings

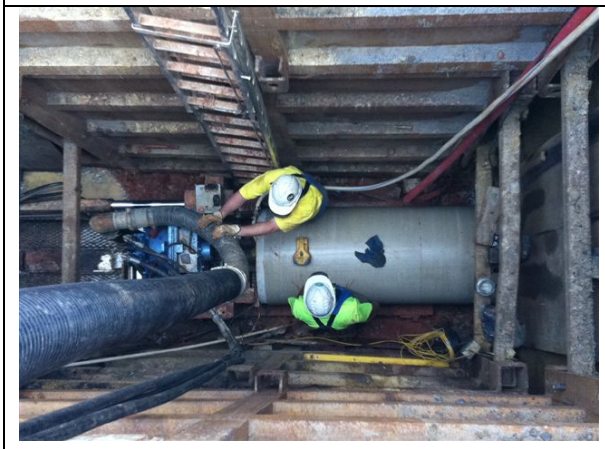

Photo 5 Installation

Photo 4 Labelling on Pipes

Contact Details

Kevin Dawson
Delivery Services Manager
Lucknow St, Mitcham, Victoria 3132
T: +61398721474
M: +61419535918
E: Kevin.Dawson@yvw.com.au

APPENDIX G - 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 E).

The type testing and ongoing production testing (batch testing) confirm the GRP centrifugal cast 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 SUPERLİT 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		20.4 Bar	PASS PASS	DN400 PN10 SN10,000	Annex C Test 6
	5.2.4	Long term circumferential flexural strain creep and/or relaxation factor		20.42 %	PASS	DN800 PN16 SN5,000	Annex C Test 3
	5.2.2	Long term stiffness		0.66	PASS	DN900 PN1 SN5,000	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 1.125%	PASS	DN600 PN6 SN5000	Annex C Test 8
		Abrasion Resistance		0.30mm after 100,000 Cycles	PASS	DN600, PN1 SN10,000	Annex C Test 9
Pipe Batch Release Tests							
Mechanical Properties	5.2.1	Initial ring stiffness	One pipe per batch	5707 N/m^2	PASS	DN900 PN1 SN5,000	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 1372.90 N/mm	PASS	DN500 PN6 SN5,000	Annex C Test 5
	5.2.5	Longitudinal tensile strength	One pipe per batch	Avg 307.64 N/mm	PASS	DN500 PN6 SN5,000	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	DN350 PN1 SN10,000	CC 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	DN450 PN16 SN2,500	CC Pipe Inspection Form Date 06.07.2011
	Informative	Squareness of ends	Each Pipe	OK	PASS	DN350 PN1 SN10,000	Quality Plan 25.02.2011 CC Pipe Certificate 15.02.2011
Appearance	4.4	Visual Assessment	Each Pipe	OK	PASS	DN350 PN1 SN10,000	Quality Plan 25.02.2011 CC Pipe Certificate (15.02.2011)
Markings	5.5	Identification	Each Pipe	All markings present	PASS	DN350 PN1 SN10,000	Quality Plan 25.02.2011 Label
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 mm2/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 ISO 10467 (similar to AS 3571 / 10639, AWWA C-950 and BS5480)

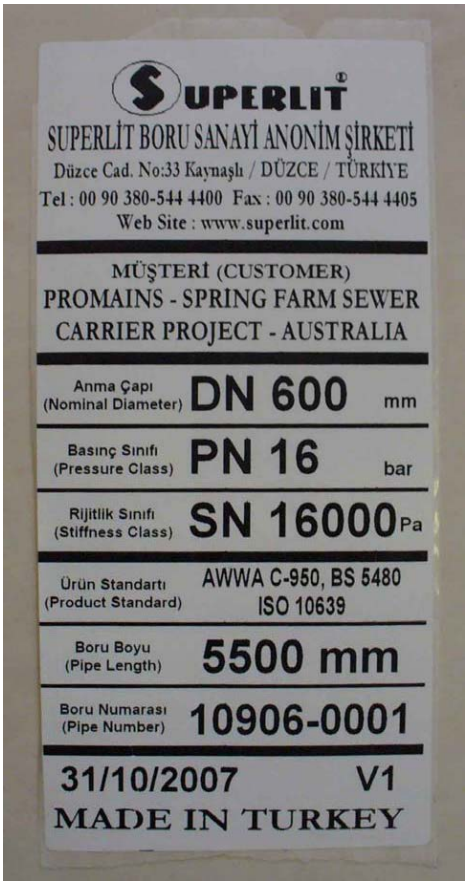

Figure 1 - Label on CC-GRP pipe

Figure 2 - Label on FW-GRP Coupling

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 “SUPERLİT 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 ≥ 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 “SUPERLİT Glass Reinforced Polyester (GRP) Pipe and Fittings INSTALLATION MANUAL.

Melbourne Office

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Docklands VIC 3008

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Sydney Office

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