Clover Pipelines Pty Ltd

PRODUCT APPRAISAL REPORT No PA 1423

SUPERLİT Centrifugal Cast (CC) Glass Fibre Reinforced Plastic (GRP) Jacking Pipes for Non Pressure Sewerage Applications DN 400 – DN 1400

ISO 25780 – Plastic piping systems for pressure and non-pressure water supply, irrigation, drainage or sewer - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin – Pipe with flexible joints intended to be installed using jacking techniques

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Name/Title	Signature	Date
Carl Radford, Product Appraisal Manager	Carl Radford	22/5/2015

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.

CONTENTS

1 EXECUTIVE SUMMARY

This appraisal applies to SUPERLİT® Centrifugal Cast (CC) Glass Fibre Reinforced Plastic (GRP) jacking pipes, for non-pressure applications, joined using flexible non-end-load-bearing joints with elastomeric seals, intended to be installed using various trenchless installation methods e.g. slip Lining, micro-tunnelling and pipe jacking.

Clover Pipelines Pty Ltd has been appointed the Agent and Distributor for the range of SUPERLİT® CC-GRP jacking pipes for the Oceania region.

SUPERLİT® CC-GRP jacking pipes 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 CC-GRP and Filament Wound (FW) GRP pipeline systems 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.

Clover Pipelines imports SUPERLIT® CC-GRP jacking pipes with nominal pipe diameters ranging from DN 400 to DN 1400. SUPERLİT® CC-GRP jacking pipes are manufactured with nominal jacking loads ranging from 50 tonnes to a maximum of 500 tonnes.

SUPERLİT® CC-GRP jacking pipes are manufactured with a nominal pressure class ranging from PN 1 to 2.5 and stiffness rating ranging from SN12,500 to 1,500,000.

NOTE SUPERLİT CC-GRP pipes marked PN 1 are designated for non-pressure sewerage applications. For the purposes of this appraisal CC-GRP pipes are manufactured with nominal pressure rating of PN 1 to PN 2.5 are typically used in non-pressure sewer applications. It should be noted that although SUPERLİT can manufacture a jacking pipe as low as SN12,500 the ISO 25780 standard requires a minimum of SN 20,000.

GRP fittings used with SUPERLİT® CC-GRP jacking pipe are fabricated from sections of straight pipe, cut to length, joint wrapped externally and internally with additional fibre reinforcement in accordance with ISO 10467 for sewerage system. GRP fittings are supplied with spigot ends suitable for connection to the SUPERLİT CC-GRP jacking pipe stainless steel couplings.

The SUPERLİT® CC-GRP jacking pipe system is manufactured to comply with ISO 25780 – Plastic piping systems for pressure and non-pressure, water supply, irrigation, drainage or sewer - Glass-reinforced thermosetting plastics (GRP) systems based on unsaturated polyester (UP) resin – Pipe with flexible joints intended to be installed using jacking techniques.

The TÜV SÜD Confirmation Certificate confirms the manufacturing capability of Sperlit Boru ve Levha Sanayi A.Ş to produce SUPERLİT® CC-GRP jacking pipes with flexible joints intended to be installed using jacking techniques according to ISO 25780.

The declared external and internal diameters of the SUPERLIT® CC-GRP jacking pipe are provided in Clover Pipelines' SUPERLIT GRP Jacking Pipe Product Guide.

This appraisal submission is in three parts and this report focuses on Part 3 only:

Part 1 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 2 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 3 **(This part)** SUPERLIT® CC-GRP jacking 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.

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® CC-GRP jacking pipe and fittings as detailed in this report for use in non-pressure drainage or 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 SUPERLİT® CC-GRP jacking pipes, for non-pressure 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.

SUPERLİT is a major pipe producer in Eastern Europe.

3 THE PRODUCT

3.1 General

Clover Pipelines’ SUPERLİT® GRP Jacking Pipe Product Guide provides a complete description of the products covered by this appraisal. Refer to Appendix A.

3.2 Manufacture of the SUPERLİT® CC-GRP Jacking Pipes

SUPERLİT® can design CC-GRP jacking pipes to meet the different needs of many non-pressure applications (pressure applications omitted from appraisal scope), by varying resin and glass proportions, orientation and configuration.

3.2.1 Manufacturing process

CC-GRP jacking pipes are produced by feeding the raw materials 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 SUPERLİT® CC-GRP jacking 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 SUPERLİT® CC-GRP jacking 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.

3.2.2 Joints

Ref: Clause 7.5 of ISO 25780:2011

Superlit have three types of joints available for SUPERLİT® CC-GRP jacking pipes, each with a coupling mounted onto one end of the pipe and an elastomeric which seals the pipe.

SUPERLIT provide instructions for the selection of the available types of flexible stainless steel or filament wound joint coupling for jacking pipe.

Refer to Section 3.7, 3.8 and 6.2.5 for joint properties, allowable angular deflection and joint type tests.

The scope of this appraisal only covers Superlit couplings that have stainless steel sleeves.

3.2.2.1 GRP coupling (Non-jacking application)

(Included for information only, not considered to be part of this appraisal)

Ref: Clause 4.2.6 of ISO 10467:2004

The standard pipe jointing system (non-jacking application) is the SUPERLİT double socketed coupling. The couplings comprise a full face EPDM rubber membrane encased in a GRP collar. Refer to Figure 1A.

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 in WSAA Product Appraisal Report No 14/22.

The GRP coupling may be used in non-jacking applications; for example providing a flexible joint when connecting GRP-CC jacking pipe, to a rigid structure, like a maintenance hole.

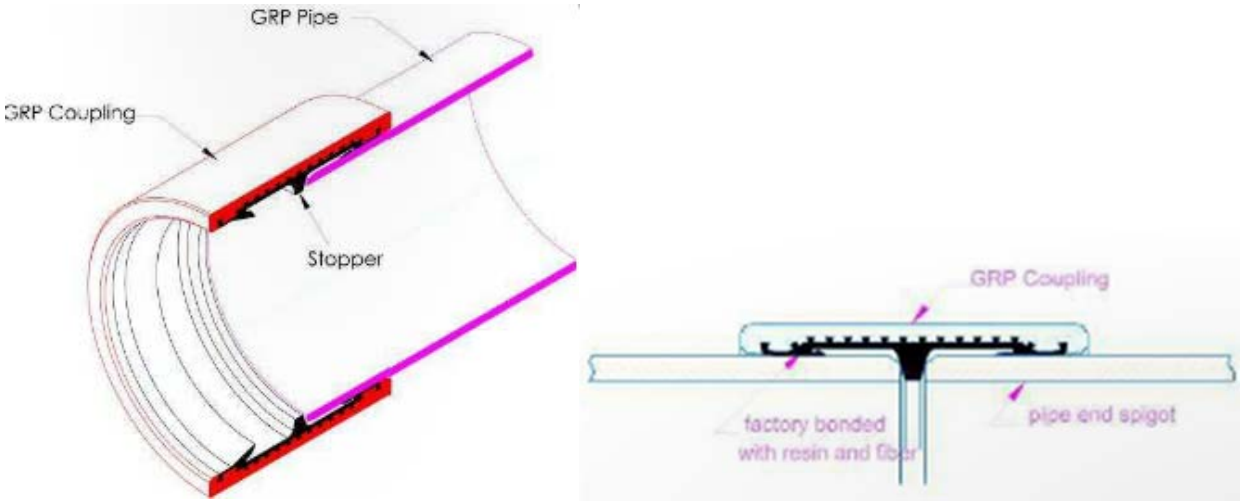

FIGURE 1A: GRP COUPLING

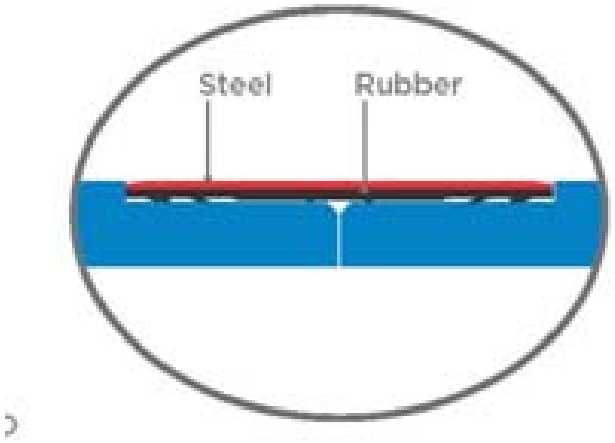

FIGURE 1B: STANLESS STEEL COUPLING

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.

3.2.2.2 Stainless Steel Coupling for Jacking Pipes

These Superlit couplings have a stainless steel sleeve with an EPDM seal firmly attached and are used for trenchless installations only. Refer to Figure 1B for a diagram of the Stainless Steel Coupling.

3.2.2.3 Filament Wound Couplings for Jacking Pipes

(Included for information only, not considered to be part of this appraisal)

Superlit offer couplings with a glass fibre reinforced plastic sleeve that is flush fitted and used for trenchless installations where the pipeline is under pressure.

3.2.3 Jacking pipe constituents

SUPERLIT can select jacking pipe constituents including ECR, E or ECR/E mixture glass fibre reinforcement, resin and fillers, to meet user or specified needs confirmed by Clover Pipelines.

Resin, glass fibre reinforcement and aggregate fillers, sourced by SUPERLIT from Turkey, Europe and Eastern Asia are checked for compliance with specific quality parameters in the SUPERLIT QC Laboratory prior to use in pipe manufacturer.

3.2.3.1 Reinforcement

Ref: Clause 4.3.2 of ISO 25780:2011

Fibreglass 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 SUPERLİT 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. SUPERLİT 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 8 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.

3.2.3.2 Resin

Ref: Clause 4.3.3 of ISO 25780:2011

The glass fibres 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 has 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.

3.2.3.3 Aggregate and Fillers

Ref: Clause 4.3.4 of ISO 25780:2011

Silica sand is used as the filler in SUPERLİT® CC-GRP jacking 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.

3.2.4 Elastomers

Ref: Clause 4.3.5 of ISO 25780:2011

The SUPERLİT pipe coupling for jacking application comprises a full-face EPDM rubber membrane (hardness 60 ±5) encased in a 316 Stainless Steel collar.

SUPERLİT require elastomeric joint compliance with EN 681-1:1996 which is equivalent to AS 681.1:2008.

3.3 Nominal Sizes

Ref: Clause 4.2.1 of ISO 25780:2011

SUPERLİT® CC-GRP jacking pipe is manufactured for the Australian market to ISO 25780, in nominal sizes ranging from DN 400 to DN 1400.

The manufacturers declared external and internal pipe diameters are specified in the Clover Pipelines' SUPERLIT GRP jacking Pipe Product Guide. Refer to Appendix A & C.

The declared external diameters are closely aligned with ISO 10467 / 10639 Table 6 Series B2 for DN 400 and 500 and with Table 5 Series B1 for DN 600 to 1400 jacking pipe. For application in Australia these align closely with the external diameters required by AS 3571 Appendix ZZ Table 5 (Series B1, B2, B3 and B4) for DN 400 and 900 to 1400 jacking pipe. DN 500 to 800 SUPERLIT jacking pipe connections with AS 3571 Appendix ZZ Table 5 GRP and other DN 500 to 800 pipe may require the use of non-standard tapered or stepped adaptor fittings.

3.4 Jacking Load and Nominal Stiffness

Ref: Clause 4.2.2 and 4.2.3 of ISO 25780:2011

SUPERLİT® CC-GRP jacking pipes can be supplied in the following jacking loads and stiffness classes.

TABLE 1: JACKING LOAD (TONNES) AND NOMINAL STIFFNESS (SN)

Jacking Load (Tonnes)	Nominal Stiffness (N/m²)
From 50 to 500	≥ 20,000

The nominal stiffness in Table 1, correspond to the minimum nominal stiffness value specified in Clause 4.2.3 of ISO 25780.

SUPERLİT® CC-GRP jacking pipe can be supplied with a nominal stiffness as low as SN 12,500 although ISO 25780 requires a minimum stiffness of SN 20,000 for jacking applications.

3.5 Nominal Pressure

Ref: Clause 4.2.4 of ISO 25780:2011

The SUPERLİT® CC-GRP jacking pipe intended for use in non-pressure applications can be supplied with a nominal pressure rating ranging from (PN) 1 to 2.5, which relates to components pressure rating in bars.

3.6 Nominal Pipe Lengths

Ref: Clause 5.1.3 of ISO 25780: 2011

SUPERLİT tubular moulds are capable of producing SUPERLİT® CC-GRP jacking pipe lengths up to 6 m.

The SUPERLİT® CC-GRP jacking pipe can be supplied in 1.0, 2.0, 3.0, 4.0 or 6 metre lengths. Intermediate 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® Joint Properties (couplings)

Ref: Clause 4.7.2 of ISO 25780: 2011

The standard jacking pipe jointing system is the SUPERLİT double socketed coupling. The couplings comprise a full face EPDM rubber membrane encased in a stainless steel collar. Rebated spigots are used to accommodate flush couplings as seen in Detail A in Appendix C.

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 in Section 3.8.

3.8 Allowable Angular Deflection

Ref: Clause 4.7.3.1 of ISO 25780: 2011

In accordance with ISO 25780 SUPERLİT has declared that:

(a) The maximum allowable deflection between adjacent pipes in the installed condition.

(b) The maximum allowable deflection at which each joint is designed to operate when subjected to either internal or external pressure and the.

(c) The maximum angular deflection permitted during pipe jacking operations.

(d) For parts (a) and (b) the values shall not be less than the values required by ISO 25780 Table 2 for sizes < DN 1000 and as calculated for sizes > DN 1000.

(e) Table 2 below specifies the maximum allowable angular deflection, at which each joint is designed to operate when subjected to either internal or external pressure, including the maximum allowable angular deflection permitted during pipe jacking operations.

TABLE 2: MAXIMUM ALLOWABLE INSTALLED DEFLECTION FOR PIPE JOINTS

External Diameter dOD mm	ISO 25780 Requirements		Superlit Specifications	
	Maximum allowable installed deflection a mm/m	Maximum allowable installed deflection δ degrees	Maximum allowable installed deflection a mm/m	Maximum allowable installed deflection δ degrees
$200<d_{OD}\leq500$	15	0.8594	15	0.8594
$200<d_{OD}\leq500$	10	0.5729	10	0.5729
$1000=d_{OD}$	$a=10 \times 1000/d_{OD}$	Derive from value a	9	0.5156
$1200=d_{OD}$	$a=10 \times 1000/d_{OD}$	Derive from value a	8	0.4583
$1400=d_{OD}$	$a=10 \times 1000/d_{OD}$	Derive from value a	7	0.4010

3.9 Straightness

Ref: Clause 5.1.5 of ISO 25780: 2011

The maximum permissible deviation from straightness of a surface line shall not exceed the values given in Table 3 in ISO 25780, based on a 6 m length. Superlit conforms to the requirements of Table 3 in ISO 25780.

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.

3.10 Pipe Fittings and Accessories

The Clover Pipelines' SUPERLİT GRP Jacking Pipe Product Guide (Appendix A) provides a more complete description of the range of products covered by this appraisal.

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.

3.11 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.

GRP flanges are also available in either full face or as a stub arrangement. The drilling pattern of flanges is determined by the request of the customer. When connecting to metallic flanges the drilling pattern is as per the applicable tables as set out within the AS 4087.Other types of flanges may be supplied with the agreement of the purchaser. It is recommended that flat faced metallic flanges are used when connecting to GRP flanges. It is also recommended that backing rings are used on GRP flanges when connecting to metallic flanges for pressure applications.

4 SCOPE OF THE APPRAISAL

The scope of this product appraisal applies to the SUPERLİT® CC-GRP jacking pipe and specified in Section 3, for non-pressure applications using various trenchless installation methods such as slip lining, micro-tunnelling and pipe jacking. Refer to Clover Pipelines' Schedule of imported certified products attached to Appendix 'C'.

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.

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 ISO 9001 and having ISO Type 5 product certification in accordance with ISO 25780 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

SUPERLİT GRP jacking pipe and fittings have been appraised for compliance with the requirements of ISO 25780 – Plastic piping systems for pressure and non-pressure drainage and 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 following Product Specifications are also relevant to this application:

WSA PS – 205J Centrifugally Cast Glass Reinforced Plastics (CC-GRP) Pipes for Pressure and Non-Pressure Applications – Water Supply and Sewerage – Installed Using Trenchless Installation Methods.

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 fiber 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 (No TR-RE-12-R-00140) 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, SN12,500 to SN1,500,000 for jacking application pursuant to standards (listed on Certificate in Appendix B), including ISO 25780.

6.2 Compliance with Performance Requirements

The SUPERLİT® range of CC-GRP Jacking pipes has been appraised for compliance to ISO 25780. The TÜV SÜD Conformation Certificate affirms the manufacturing capability of Sperlit Boru ve Levha Sanayi A.Ş to produce SUPERLİT® CC-GRP Jacking Pipes with flexible joints intended to be installed using jacking techniques according to ISO 25780.

The Conformation Certificate issued by TÜV SÜD (No TR-RE-12-R-00140), September 2012 is accepted as sufficient conformance requirements for the SUPERLİT® CC-GRP Jacking pipes. This certificate is valid for 2 years with yearly periodic assessments. This system corresponds to ISO System 5 product certification as described in ISO/IEC Guide 67, for ISO 25780.

Copies of the Certificates can be found in Appendix B.

6.2.1 Production and type test requirements to ISO 25780:2011

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:

6.2.2.1 Initial specific ring stiffness - Batch release test

Ref: Clause 5.2.1 of ISO 25780: 2011

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 25780:2011.

SUPERLİT provided batch release test results (Report No 12-R-00044/2) for a typical initial ring stiffness test performed on test specimens cut from a section of DN 400, PN 1 SN70,000 pipe. For the SN70000 N/m^2, the initial specific ring stiffness, 3 samples were tested and the average of the test results was 70886 N/m^2. The value is higher than the SN value, so the results were satisfactory. The batch release test results (Report No 12-R-00044/2, dated 14/3/20012) confirms the testing system used and shows the pipe met the ISO standards requirement, as specified in ISO 25780.

6.2.2.2 Long-term specific Creep Stiffness - Type test

Ref: Clause 5.2.2 of ISO 25780:2011

The long-term specific ring stiffness of SUPERLİT® CC-GRP pipe was performed using the long-term creep stiffness method in accordance with ISO 25780:2011.

To determine the creep ratio after 50 years of DN 900, PN 1, SN 5000 SUPERLIT CC-GRP pipe, a long-term specific ring stiffness test was performed at the SUPERLIT Plant Long term Test Laboratory. The test was conducted using two samples from the above specimen between 1/10/2009 to 22/11/2009.

During this period the measured deflections and corresponding time intervals between 1h and 10000h were recorded and the specific ring stiffness under wet conditions were then calculated for each test piece. The stiffness data with respect to time was plotted for each sample and the long term specific ring stiffness value was calculated by extrapolating the line to 50 years. The wet creep factor after 50 year was equal to the average of the wet creep results of the two samples.

According to type test results, (Report No 10-B-00342 dated 23/11/2010) the wet creep factor of the SUPERLIT CC-GRP DN 900, PN 1, SN5000 pipe was 0.66 at 50 years.

The test specimen was considered having a wall structure that is the same as the pipe intended to be used in jacking installations.

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

Ref: Clause 5.2.3 of ISO 25780:2011

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, delamination, buckling or failure.

TABLE 3: INITIAL RESISTANCE TO FAILURE

Stiffness Class (SN)	No surface cracks
70,000	0

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. Where a pipe fails to comply with this requirement, it is rejected, the cause of failure is identified and production processes reviewed to prevent recurrence.

6.2.3 Resistance of pressure pipes internal pressure - Type test

Ref: Clause 5.7 of ISO 25780:2011 - (Specifies ISO 15306 test procedure within ISO 10467 and ISO 10639)

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, PN 16, SN10000 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.

6.2.4 Resistance to strain corrosion - Type test

Ref: Clause 5.3 of ISO 25780:2011 - Specifies ISO 10467 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® CC-GRP 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 RESISTANCE TO FAILURE

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

6.2.5 Joint performance - Type test

Ref: Clause 7.5 of ISO 25780:2011

SUPERLİT CC-GRP Jacking pipes are joined using flexible non-end-load bearing joints with elastomeric seals.

Clause 7.5 covers the performance requirements end-load-bearing joints with elastomeric sealing rings. Test reports supplied “Joint Performance Test for DN 400 Stainless Steel Couplings” approved by TUV covers clauses 7.5.2, 7.5.3, 7.5.4 and 7.5.6 requiring leak tightness when subjected to an external pressure differential, internal positive pressure, angular deflection, misalignment and draw under static and positive cyclic pressures. All tests performed pass and met the requirements of ISO 25780. Refer to Table H1 for results.

TABLE 5: INITIAL RESISTANCE TO FAILURE

Summary of test requirements for flexible joints					
Clause and Description	**Test**	**Test Conditions**	**Duration**	**Result**	**Conforms**
Initial leak-tightness test (ISO 8639:2000, 7.2)	Initial positive pressure	1,5 × PN	15 min	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
External pressure differential (ISO 8639:2000, 7.3)	Negative pressure a	– 0,8 bar (– 0,08 MPa)	1 hr	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
Misalignment and draw under static pressure (ISO 8639:2000, 7.5)	Positive static pressure	2,0 × PN	24 hrs	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
Misalignment and draw under cyclic pressure (ISO 8639:2000, 7.6)	Positive cyclic pressure	Atmospheric to 1,5 × PN and back to atmospheric	10 cycles of 1,5 min to 3 min each	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
Angular deflection and draw (ISO 8639:2000, 7.4)	Initial pressure	1,5 × PN	15 min	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
	Positive static pressure	2,0 × PN	24 hrs	No damage, leaking or weepage	Yes, Report No. JP Test 1 (12-R-0044)
Relative to atmospheric pressure, i.e. approximately 0,2 bar (0,02 MPa) absolute.					Yes, Report No. JP Test 1 (12-R-0044)

6.2.6 Longitudinal compressive strength

Ref: Clause 5.4 of ISO 25780:2011

Longitudinal compressive test was performed to determine the longitudinal compressive stress at break for sample DN400 CC-GRP jacking pipe. For DN400 jacking CC-GRP pipe sample the minimum compressive stress at break is 90 N/mm^2. Results obtained were 91.7 N/mm^2 which is higher than the minimum proving the sample fulfils the requirements of ISO 25780.

6.2.7 Permissible jacking forces

Ref: Clause 5.5 ISO 25780:2011

6.2.7.1 General

Permissible jacking forces are calculated to determine the force that can be applied to a pipe during the jacking operation. Therefore the declared jacking load, ultimate longitudinal load, the theoretical jacking load (concentric) and the eccentric jacking loads are to be determined.

Superlit used a DN 400, 37 Tonne Jacking Pipe for these results.

Therefore the theoretical jacking load (Fj) for the jacking pipe sample used was 370kN (37 Tonne). Material safety factors (γ) of 1.75 and 3.00 have been used for assessment.

6.2.7.2 Ultimate Longitudinal Load

The ultimate longitudinal load is the calculated value of the concentric longitudinal load that the pipe withstands just before it breaks. This calculated value is used to determine the permissible jacking forces of a jacking pipe.

Superlit tested a DN 400, 37 Tonne jacking pipe and calculated its ultimate longitudinal load to be Fult =1388kN.

Therefore the jacking pipe sample tested can withstand a concentric longitudinal load of 1388kN just before the pipe will break.

6.2.7.3 Designed jacking load and permissible eccentric jacking forces

Superlit has calculated that the theoretical design jacking load as:

- $F_{j,calc}$ = 793 kN, using a Material Safety Factor of 1.75
- $F_{j,calc}$ = 462 kN, using a Material Safety Factor of 3.00

The theoretical jacking load for the sample was 370kN which is less than both 793kN (γ =1.75) and 462kN (γ =3.00) and therefore complying with the requirements of ISO 25780.

The estimated angular deflection for the case of concentric jacking must use the factor S_a which is the dependence of the stress ratio.

Superlit have calculated the permissible eccentric jacking force on the pipe using the estimated angular deflection to be:

- $F_{perm,p}$ = 397 kN, using γ = 1.75 (minimum set by ISO 25780)
- $F_{perm,p}$ = 231 kN, using γ = 3.00 (Superlit jacking pipe design)

Therefore the permissible eccentric longitudinal load that the pipe can withstand during a jacking operation, taking into account the material safety coefficient of γ 1.75 and γ 3.00 respectively and the estimated angular deflection to be 397kN and 231kN.

Superlit have declared that the permissible eccentric longitudinal force that the system can withstand during a jacking operation is 330kN, taking into account the material safety coefficient (γ 1.75) and the estimated angular deflection.

6.2.8 Specific initial longitudinal compressive modulus

Clause 5.6 ISO 25780:2011

Superlit used a DN 400, 37 Tonne Jacking Pipe for these results.

The specific initial longitudinal compressive modulus expressed as $E_{c,m}$ is the ratio of the applied stress to the resulting strain below the elastic limit, both measured concurrently during a short term compression test.

The specific initial longitudinal compressive modulus, $E_{c,m,}$ is determined by selecting any point from the performed quality control test data and using strain gauge at the tested specimens.

A test piece taken from the pipe wall is compressed, at a uniform rate of strain in the direction parallel to the longitudinal axis of the pipe, until failure occurs.

The ratio of the applied stress to the resulting strain below the elastic limit was calculated to be 12058 MPa and declared as 12000-15000 MPa.

6.2.9 Abrasion resistance

This appraisal assesses the SUPERIT CC-GRP pipe system suitability for sewerage applications in accordance with ISO 10467. In order to determine the abrasion resistance of the SUPERIT CC-GRP pipe systems, several Darmstadt rocker tests were performed. The Darmstadt Rocker test is based on DIN 19565. For an assessment of the abrasion resistance of Superlit's range of CC-GRP pipes refer to PA Report 1422.

6.2.10 Temperature and pressure re-rating

This appraisal assesses the temperature and pressure de-rating of SUPERIT CC-GRP pipe systems in accordance with ISO 10467. Temperature and pressure re-rating requirements vary according to the pipeline application and SUPERLIT can provide special resins and re-rating for abnormal applications. For further information refer to PA Report 1422.

6.2.11 Resistance to ultraviolet degradation

This appraisal assesses the requirement for resistance to ultraviolet degradation of SUPERIT CC-GRP pipe systems, in accordance with ISO 10467. For further information refer to PA Report 1422.

6.2.12 Other Technical Data

For additional information refer to Clover Pipelines' SUPERLİT CC-GRP Jacking Pipe Product Guide in Appendix A.

7 FITTING INSTRUCTIONS, TRAINING AND INSTALLATION

The Australasian Society Trenchless Technology has developed Trenchless Guidelines, Standards and Specifications to assist industry users in Australia and New Zealand in utilising these technologies. These documents are not intended not replace any existing relevant manuals or standards. It remains the user's responsibility to ensure that all relevant laws, standards and specifications are adhered to during the course of a Works with use of these trenchless technologies.

These Guidelines, Standards and Technical specifications are available from the Australasian Society Trenchless Technology (ASTT) website. (http://astt.com.au).

8 REPAIR FOR NON-PRESSURE CC-GRPJACKING PIPE FOR SEWERAGE APPLICATIONS

The SUPERLIT installation manual provides information on GRP repair procedures and methods.

9 PRODUCT MARKING

Ref: Clause 6 in ISO 25780:2011

SUPERLİT pipes are labelled in accordance with Clause 6 of ISO 25780: 2011, (similar to ISO 10467 /10639, AWWA C-950 and BS5480):

- Number of the applicable standard(s);
- Manufacturers declared pipe external diameter;
- Stiffness rating, (SN);
- Pressure rating, (PN);
- Permissible jacking load;
- The code letter “C” for the conveyance of surface water or sewage;
- Manufacturers name or identification; and
- Date of manufacture in text or code YYMMDD.

The SUPERLİT label also includes:

- The individual pipe number;
- Project name (if known); and
- Pipe length.

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

SUPERLİT GRP “Installation Manual” has sections covering Receiving, Unloading, Storing, Handling and Transporting the pipe.

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 should be as per the instructions detailed in the SUPERLİT GRP “Installation Manual”.

11 PRODUCT WARRANTY

This product is covered by the normal commercial and legal requirements of the Competition and Consumer Act 2010, which covers manufacture to relevant standards. Additional warranties may be negotiated on a project specific basis.

12 WATER AGENCY EXPERIENCE WITH THE PRODUCT OR FIELD TESTING REPORT

At the time this report was being prepared Clover Pipelines Pty Ltd had submitted details of a field trial installation that has been completed and commissioned for Yarra Valley Water. The Yarra Valley Water project involves 64m x 2m lengths, DN 800, PN1 100T (SN20, 174) SUPERLİT® CC-GRP jacking pipe with stainless steel couplings, including two GRP manhole couplings. The purpose of notification and inclusion of this field trial report, demonstrates adequate precautions are being taken during the shipping and storage and transportation of the SUPERLİT® CC-GRP jacking pipes, from the place of manufacture to project site. For details regarding this field trial report Refer to Appendix E.

Details of many international GRP Pipe projects have been supplied by SUPERLIT. Details of these projects can be provided upon request.

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® CC-GRP jacking pipes.

13 DISCUSSION

All fittings can be supplied with either the Stainless Steel couplings or GRP filament wound couplings. It is common to have transition fittings which are used to connect to the start and end of the pipe to be jacked. Transition fittings may have a filament wound coupling and a stainless steel coupling where one end joins to the jacking pipe and the other to an open trench pipe.

SUPERLİT export its CC-GRP jacking pipes. 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. A major proportion of all pipes installed in Turkey bear the SUPERLİT trademark and their products have been exported.

WSAA members responding to the peer review process requested Clover Pipelines provide a definition of the glass fibres referred to in Section 3. The following definitions for E Glass, C Glass and ECR Glass have been provided by Clover Pipelines:

E Glass - comprising primarily either oxides of silicon, aluminium and calcium (alumino-calcosilicate glass) or silicon, aluminium and boron (alumino-borosilicate glass).

C Glass - comprising primarily oxides of silicon, sodium, potassium, calcium and boron (alkali-metal calcium glass with an increased boron trioxide content) which is intended for applications requiring enhanced chemical resistance.

ECR Glass - A corrosion-grade glass exhibiting corrosion resistant properties superior to "E" glass. Superior resistance to acids and alkalis is obtained through the application of special treatments and sizings to "E" fibres.

14 LIFE EXPECTANCY

The ISO 7509 tested regression characteristics of GRP (as used by SUPERLIT to manufacture CC-GRP jacking pipe) together with the long term safety factors applied to the probability of failure at 50 years at a lower confidence level of 97.5% suggest that the pipe is likely to perform successfully beyond a 100 year operating life.

15 FUTURE WORKS

There are no outstanding future work items.

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® CC-GRP jacking pipes and couplings as detailed in this report for use in non-pressure sewerage applications subject to the design, installation and commissioning 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.

17 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: 8605 7601 email carl.radford@wsaa.asn.au.

17.1 Issue of Report

This Report has been published and/or prepared by the Water Services Association of Australia Limited and nominated Project Manager and peer group of technical specialists (the Publishers).

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).

By accepting this Report, the Recipient acknowledges and represents to the Publisher(s) and each person involved in the preparation of the Report that the Recipient has understood and accepted the terms of this Disclaimer.

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Neither the Publisher(s) nor any person involved in the preparation of the Report accept(s) any liability for any loss or damage suffered by any person however caused (including negligence or the omission by any person to do anything) relating in any way to the Report or the product appraisal criteria underlying it. This includes (without limitation) any liability for any recommendation or information in the Report or any errors or omissions.

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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' IPAM Portal 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*	12 May 2015
Expiry date of certification**	14 April 2017

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 Address: Cele Mah. Duzce Cad. No:33 81900 Kaynasli DUZCE / TURKEY	
Product Standard/Spec.	ISO 25780:2011
Confirmation No.	TR-RE-12-R-00140
Issuing certification body	TUV SUD
Issued date	September 2012
Valid Until	September 2014

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)

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

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:

Date of issue: 01.10.2009

Inspection centre: BV Turkey/ Istanbul

Checked by:
Name: Mustafa EYÜBOĞLU
Signature:

Distribution: ☒ CLIENT ☐ MANUFACTURER ☐ ☐

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

TÜV SÜD
Industrie Service

CONFORMATION

The Certification Body of TÜV SÜD/Turkey

confirms that

SUPERLİT BORU SANAYİ AŞ.
Çele Mah. Düzce Cad. No:33 81900 Kaynaşlı – Düzce / Turkey

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

Therefore, the company is qualified for manufacturing of GRP
(Glass-fiber Reinforced Plastic) pipes, joints and fittings
According to:

ISO 25780:2011 – PLASTIC PIPING SYSTEMS FOR PRESSURE AND NON PRESSURE WATER SUPPLY, IRRIGATION, DRAINAGE OR SEWERAGE- GALSS-REINFORCED THERMOSETTING PLASTIC (GRP) SYSTEMS BASED ON UNSATURATED POLYSTER (UP) RESIN- PIPES WITH FLEXIBLE JOINTS INTENDED TO BE INSTALLED USING JACKING TECHNIQUES.

Confirm No.: TR-RE-12-R-00140
valid until September, 2014

İstanbul, September, 2012

Head of Department

Mitglied der
CONFÉDERATION EUROPÉEN
CEOC
D'ORGANISMES DE CONTROLE

TÜV SÜD / Türkiye
Yıldız Posta Cad. No.17 Kat:5
TR-34394 Esentepe / İstanbul / TÜRKİYE
Tel.: (+90) 212 347 98 10
Fax: (+90) 212 347 98 11
e-mail: info@tuv-sud.com.tr TÜV®

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
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D'ORGANISMES DE CONTROLE

TÜV SÜD / Türkiye
Yıldız Posta Cad. No.17 Kat:5
TR-34394 Esentepe / İstanbul / TÜRKİYE
Tel.: (+90) 212 347 98 10
Fax: (+90) 212 347 98 11
e-mail: info@tuv-sud.com.tr

TÜV®

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

+90 312 410 82 00 - www.turkak.org.tr

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

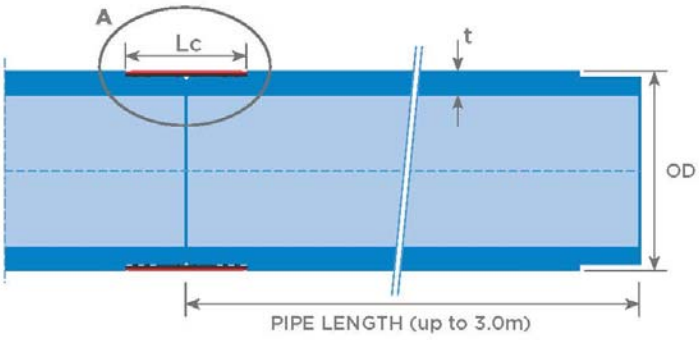
APPENDIX C – PRODUCT SCHEDULE

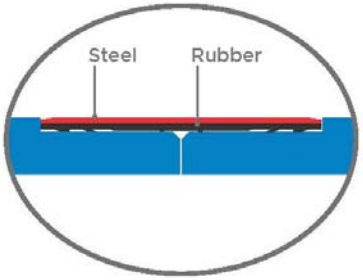
The following pipes are the standards range to be handled by Clover PIpelines. Other pipe classes are available on request. Refer to SUPERLIT catalogue for details of other available classes.

JACKING PIPE DIMENSIONS

Nominal Diameter DN	Jacking Load Tonnes	Pipe Outside Diameter OD (mm)	Pipe Thickness t /(mm)	Pipe Stiffness SN /(Nm²)
400	50	427	23.3	142278
500	50	530	20.5	49614
600	50	617	18.6	21455
700	50	719	17.3	10867
400	100	427	37.2	579028
500	100	530	31.7	183450
600	100	617	27.9	72379
700	100	719	25.3	33987
800	100	821	24.3	20174
900	100	923	24.9	15245
400	150	427	51.2	1509666
500	150	530	42.8	451515
600	150	617	37.2	171564
700	150	719	33.2	76802
800	150	821	31.3	43114
900	150	923	31.1	29703
1000	150	1025	34.3	29043
1200	150	1229	31.5	13021
500	200	530	54.0	906822
600	200	617	46.5	335086
700	200	719	41.2	146774
800	200	821	38.2	78374
900	200	923	37.3	51245
1000	200	1025	39.9	45727
1200	200	1229	36.1	19599
1400	200	1433	35.5	11737

Nominal Diameter DN	Jacking Load Tonnes	Pipe Outside Diameter OD (mm)	Pipe Thickness t /(mm)	Pipe Stiffness SN /(Nm²)
500	250	530	54.0	1588853
600	250	617	46.5	579028
700	250	719	41.2	249949
800	250	821	38.2	129836
900	250	923	37.3	81281
1000	250	1025	39.9	67363
1200	250	1229	36.1	28294
1400	250	1433	35.5	16168
600	300	617	65.1	919475
700	300	719	57.1	390719
800	300	821	52.2	199983
900	300	923	49.7	121225
1000	300	1025	51.0	95491
1200	300	1229	45.4	38983
1400	300	1433	43.4	21445
700	400	719	73.1	819802
800	400	821	66.1	406055
900	400	923	62.2	236482
1000	400	1025	62.2	173230
1200	400	1229	54.7	68182
1400	400	1433	51.4	35625
900	500	923	74.5	408312
1000	500	1025	73.3	283506
1200	500	1229	64.0	109206
1400	500	1433	59.4	54983





Detail A - COUPLING

Steel: Stainless Steel Gr316Ti
Rubber: EPDM 60 ± 5 Shore

Lc = 120mm (DN 400-800)
140mm (DN 900-1400)

GRP Jacking Pipe Page 7

APPENDIX D – WSAA PRODUCT SPECIFICATIONS

WATER SERVICES ASSOCIATION of Australia

PRODUCT SPECIFICATION

WSA PS – 205J CENTRIFUGALLY CAST GLASS REINFORCED PLASTICS (CC-GRP) PIPES FOR PRESSURE AND NON-PRESSURE APPLICATIONS – WATER SUPPLY AND SEWERAGE - INSTALLED USING TRENCHLESS INSTALLATION METHODS

205J.1 SCOPE

This specification covers CC[2]-GRP pipe[1] for:

(a) Gravity stormwater/sewerage[3].

(b) Pressure sewerage[4]/water[5].

205J.2 REQUIREMENTS

(a) CC-GRP pipes shall comply with ISO 25780:2011[6].

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

(i) Type "C"

(ii) Type "E" glass

(iii) The "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.

205J.3 QUALITY ASSURANCE

(a) CC-GRP pipes shall have product certification (ISO Type 5) to ISO 25780:2011.

(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.

205J.4 AGENCY OR PROJECT SPECIFIC REQUIREMENTS

Nominal size, DN	
Pressure Class[4,5], PN	
Stiffness Class[3,4,5], SN	
Design Jacking Load (kN)	
Joints SS Sleeve / FW GRP couplings	
Alternative elastomeric material for joint seals[7]	

Pipe lengths	
Alternative glass type	

NOTES:

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

2 Manufactured using centrifugally casting process for GRP pipe useful in managing the compressive loads during jacking.

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 Pipes for source water, drinking water and recycled water supply are classified nominal stiffness, SN and nominal pressure, PN.

6 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.

7 Flange gaskets and O-rings should be supplied to WSA PS-312.

APPENDIX E - SUPPLIER CONTACTS

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

New South Wales
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
Locked Bag 2022,
Somerton Victoria 3062
Telephone: +61 8 7999 8400
Fax: +61 8 7999 8499

South Australia
Locked Bag 2022,
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
Supplier:	Promains (were the Australian agent for the supply of SÜPERLIT BORU VE LEVHA SANAYI A.Ş)
Contractor:	MFJ Constructions

Supplier'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.

The suppliers 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

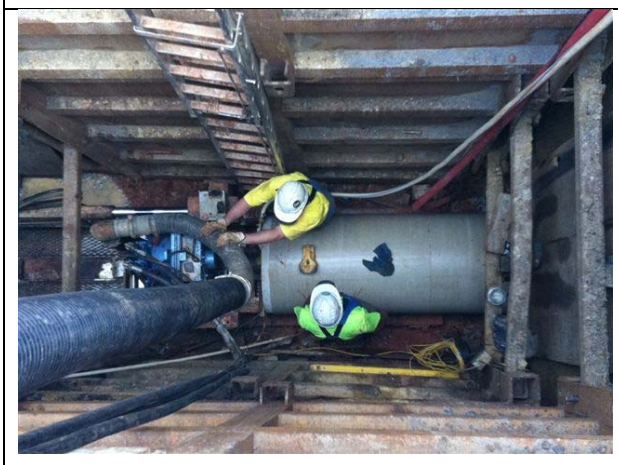


Photo 5 Installation

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 jacking pipe meets the requirements of ISO 25780:2011. This is verified by the Bureau Veritas Inspections Certificate and TUV SUD Confirmation Certificates. SUPERLIT have provided testing results which have been conducted at the SUPERLİT Test Laboratory Certification (TURKAK accredited) and from TUV SUD TURKIYE 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 25780: 2011 calls up a range of performance tests which include the following:

TABLE G1: SUMMARY OF TYPE TESTS AND BATCH TEST RESULTS

Characteristic	Standard	Clause	Requirement	Frequency	Test Result	Standard Result	Pipe Size	Doc ID
PIPES								
Pipe Type Tests								
Longitudinal Compressive Strength	ISO 25780	5.4.2	Determine the specific initial longitudinal compressive stress at break	UNSPECIFIED	PASS - $\alpha_{b,s}$ 91.7 N/mm^2 where $\alpha_{b,s,min}$ = 90 N/mm^2 for DN400 CC JP	PASS	DN400	JP Test 3
	ISO 25780	5.4.4	Determine the specific initial longitudinal compressive stress at break on both rebated and unrebated test pieces		PASS Unrebated (Barrel): $\alpha_{b,s}$ 92.8 N/mm^2 where $\alpha_{b,s,min}$ = 90 N/mm^2 for DN400 CC JP Rebated (Barrel): αb,s 92.4 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP Unrebated (Spigot): αb,s 92.8 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP	PASS	DN400	JP Test 3
	ISO 25780	5.4.6.1	The specific initial longitudinal compressive stress at break shall be **higher** than the declared **minimum** specific initial longitudinal compressive stress at break		PASS - $\alpha_{b,s}$ 91.7 N/mm^2 where $\alpha_{b,s,min}$ = 90 N/mm^2 for DN400 CC JP	PASS	DN400	JP Test 3

Characteristic	Standard	Clause	Requirement	Frequency	Test Result	Standard Result	Pipe Size	Doc ID
Specific initial longitudinal compressive modulus	ISO 25780	5.6	Determine the specific initial longitudinal compressive modulus		$E_{c,m,Avg}$ = 7812 Mpa	PASS	DN400	JP Test 2
Pipe Batch Release Tests								
Longitudinal Compressive Strength	ISO 25780	5.4.4	Determine the specific initial longitudinal compressive stress at break on both rebated and unrebated test pieces	AS PER QUALITY PLAN	PASS Unrebated (Barrel): $\alpha_{b,s}$ 92.8 N/mm^2 where $\alpha_{b,s,min}$ = 90 N/mm^2 for DN400 CC JP Rebated (Barrel): αb,s 92.4 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP Unrebated (Spigot): αb,s 92.8 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP	PASS	DN400	JP Test 3
	ISO 25780	5.4.5.2	Calculate derated compressive stress of the spigot		Unrebated (Spigot): αb,s 92.8 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP	PASS	DN400	JP Test 3
	ISO 25780	5.4.5.3	Calculate derated compressive stress of the barrel		Unrebated (Barrel): αb,s 92.8 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP	PASS	DN400	JP Test 3
	ISO 25780	5.4.6.2	Both derated initial longitudinal compressive stresses at break for spigot and barrel of all quality control tests shall be higher than the minimum initial longitudinal		PASS Unrebated (Barrel): $\alpha_{b,s}$ 92.8 N/mm^2 where $\alpha_{b,s,min}$ = 90 N/mm^2 for DN400 CC JP Rebated (Barrel): αb,s 92.4 N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP Unrebated (Spigot): αb,s 92.8	PASS	DN400	JP Test 3

Characteristic	Standard	Clause	Requirement	Frequency	Test Result	Standard Result	Pipe Size	Doc ID
			compressive stresses at break		N/mm2 where αb,s,min = 90 N/mm2 for DN400 CC JP			
Specific initial longitudinal compressive modulus	ISO 25780	5.6	Determine the specific initial longitudinal compressive modulus		$E_{c,m,Avg}$ = 7812 Mpa	PASS	DN400	JP Test 2
COUPLINGS								
Coupling Type Tests								
Performance	ISO 25780	7.5.2	Leak Tightness when subjected to an extenal pressure differential	AS PER QUALITY PLAN	No damage, leakage or weeping	No signs of damage to components or change in pressure greater than 0.08bar/h	DN400 PN1	JP Test 1
	ISO 25780	7.5.3	Leak Tightness when subjected to internal positive pressure following assembly		No damage, leakage or weeping	Withstand without leakage an internal pressure of 1.5 x PN for 15mins	DN400 PN1	JP Test 1
	ISO 25780	7.5.4	Leak Tightness when simultaneously subjected to angular deflection and draw		No damage, leakage or weeping	No signs of damage to components nor leak	DN400 PN1	JP Test 1

Characteristic	Standard	Clause	Requirement	Frequency	Test Result	Standard Result	Pipe Size	Doc ID
	ISO 25780	7.5.5	Leak Tightness when simultaneously subjected to misalignment and draw under static pressure		No damage, leakage or weeping	No signs of damage to components nor leak	DN400 PN1	JP Test 1
	ISO 25780	7.5.6	Leak Tightness when simultaneously subjected to misalignment and draw under a positive cyclic pressure		No damage, leakage or weeping	No signs of damage to components nor leak	DN400 PN1	JP Test 1
Material / Joint Properties	ISO 10467 AND ISO 25780	4.8 / 4.7.5	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	Australian Water Quality Centre Test Report / NSF International Test Report
	ISO 25780	4.7	Joint Properties		No damage, leakage or weeping	PASS	DN400 PN1	JP Test 1
Coupling Batch Release Tests								
Performance	ISO 25780	Informative	Leakage resistance at a hydrostatic test pressure of 1.5 x PN for 2 minutes	AS PER QUALITY PLAN	OK	PASS	DN500 PN10 SN10,000	Pipe Test Certificate (15.02.2011)
Dimensions	ISO 10467 AND ISO 25780	Informative	Gasket profile and hardness	One gasket per batch	OK	PASS	All Sizes	F144 Quality Control Report No. 11-051

Characteristic	Standard	Clause	Requirement	Frequency	Test Result	Standard Result	Pipe Size	Doc ID
Markings	ISO 25780	6	Identification of conformance	AS PER QUALITY PLAN	All markings present	PASS	CC WSAA APPRAISAL APPENDIX 1	Coupling Label

APPENDIX H – 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 conforms to Clause 6 of ISO 25780.

The label shown in Figure H1 is for the pipe order placed in 2012 by Yarra Valley Water for a jacking pipe sewer project. This project was used as the trial project for this appraisal.

FIGURE H1: SUPERLIT GRP JACKING PIPE

Melbourne Office

Level 8, Suite 8.02

401 Docklands Drive
Melbourne VIC 3008

Phone: (03) 8605 7601

Fax: (03) 8605 7612

Sydney Office

Level 11, 39 Martin Place
Sydney NSW 2000

GPO Box 915
Sydney NSW 2001

Phone: (02) 9221 5966
Fax: (02) 9221 5977

www.wsaa.asn.au