



MARINE DIVISION

Certificate number: 07795/D1 BV

File number: ACM 135/0106/001

Product code: 2090H

This certificate is not valid when presented without the full attached schedule composed of 7 sections

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TYPE APPROVAL CERTIFICATE

This certificate is issued to

NOV FGS Singapore (Pte) Ltd
SINGAPORE - SINGAPORE

for the type of product

THERMOSETTING MATERIAL PIPES AND FITTINGS

Bondstrand Series 7000M Conductive Glassfiber Reinforced Epoxy (GRE) Pipes and Fittings

Requirements:

- BUREAU VERITAS Rules for the Classification of Steel Ships
- BUREAU VERITAS Rules for the Classification of Offshore Units
- FTP Code, Resolution MSC.61(67), IMO Resolution A.753(18)

This certificate is issued to attest that BUREAU VERITAS did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 02 Oct 2018

For BUREAU VERITAS,

At BV SINGAPORE, on 20 Dec 2013,

Shivananda Upadhyia



This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with BUREAU VERITAS. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. This certificate is issued within the scope of the General Conditions of BUREAU VERITAS Marine Division available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against BUREAU VERITAS for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

Bondstrand Series 7000M Conductive Glassfiber Reinforced Epoxy (GRE) pipes and fittings

1.1 Product description

- Pipe: Filament-wound fiberglass-reinforced epoxy pipe with conductive filaments in pipe wall
- Fittings: Filament-wound fiberglass-reinforced epoxy fittings with conductive veils, mitered fittings
- Type of joints: Taper-taper joint, quick-lock joint, flange joint, lamination (butt and wrap) joint and double O-ring expansion coupling joint

1.2 Product range and rating

| | | | | | | | | | |
|--|--------|--------|--------|---------|---------|---------|----------|----------|----------|
| Nominal Pipe Size inch (mm) | 1 (25) | 2 (50) | 3 (80) | 4 (100) | 6 (150) | 8 (200) | 10 (250) | 12 (300) | 14 (350) |
| Minimum Structural Wall Thickness (mm) | 3.5 | 3.6 | 3.6 | 4.6 | 4.6 | 5.5 | 7.0 | 8.3 | 9.0 |

| | | | | | | | | | |
|--|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Nominal Pipe Size inch (mm) | 16 (400) | 18 (450) | 20 (500) | 24 (600) | 28 (700) | 30 (750) | 32 (800) | 36 (900) | 40 (1000) |
| Minimum Structural Wall Thickness (mm) | 10.3 | 11.5 | 12.8 | 15.4 | 18.7 | 20.0 | 21.4 | 24.0 | 26.9 |

- Maximum working pressure at 93 °C: 16 bar
- Maximum working temperature: 100 °C
- Pipe wall electrical resistance: 10 Mohm @1500 volt

1.3 Raw material as per manufacturer's specification

2. DOCUMENTS AND DRAWINGS

2.1 Bondstrand Product Data

- FP 195 C 12/03 - Bondstrand Series 7000M Fiberglass Pipe and Fittings
- FP 707A 04/01 - Bondstrand Design Manual for Marine Piping Systems
- FP 282 11/93 - Quick lock fittings
- FP 169 B 01/94 - Fittings
- FP 168 C 01/94 - Flanges
- MOS2055 (supersedes FP 212 B) March 2013 - Bondstrand Double O-Ring Expansion Couplings
- ADH4720 February 2013 - PSX 60 Adhesive kit
- ADH4730 (supersedes FP 458 F) October 2012 - Bondstrand RP-60B Conductive Epoxy Adhesive for bonding
- ADH4750 (supersedes FP 420 G) November 2012 - Bondstrand RP-34C Epoxy Adhesive for bonding

2.2 Process Description

- MP-ELBOW-T16 rev. 00 dated 10/10/2001 - Fabrication of mitered elbows with vinylester resin system
- MP-19 rev. 05 dated 15/11/2005 - Butt and wrap joint with epoxy resin systems (16 bar)

2.3 Labelling of Bondstrand Products

- LABEL-01 rev. 20

3. TEST REPORTS

3.1 Short term pressure resistance test

- Test reports N° S 84-051 dated 17/10/1984 (DNV), N° S 86-463 dated 31/12/1986 (DNV), N° S 85-006 dated 14/01/1986 (DNV), N° E076/05 dated 25/10/2005 (BV) - 8" Mitered elbow 90 per MP-Elbow-T16 Process and N° E086/05 dated 11/10/2005 (BV) - 8" Mitered elbow 90 per MP-Elbow-T16 Process

3.2 Lamination qualification test

- Hydrostatic test pressure at 2.5 times the design pressure of the test spool assembly for not less than one hour)
- Test reports dated 26/10/2005 - Spool 1 (8" lamination joint for 7000M product series) and dated 27/10/2005 - Spool 2 (8" lamination joint for 7000M product series)

3.3 Impact test

- Test report dated 23 January 1996

3.4 Fire resistance

- Test reports N° 96-CVB-R0410 dated 02/1996 (TNO) and N° 022/93/CI/X-001 dated 27 July 1993 (GERBAM)
- Fire resistance test for lamination (butt and wrap) joint and mitered fittings not carried out

3.5 Flame spread

- Test reports N° 96-CVB-R0539 dated 15/03/1996 (TNO), N° DSC/DCG/DLC/L 7 85 649 dated 02/01/1986 (BV) and N° 10176 according to ASTM D 635 - 10 July 1998 dated 15/01/2002 (BV)

3.6 Conductivity test

- Test report N° S85-018 dated 11/02/1985

4. APPLICATION / LIMITATION

4.1 Pipes and fittings are approved for use in locations according to Pt C, Ch 1, App 3 [2.3.1] of Bureau Veritas Rules for Ships (or appendix 4 of IMO Resolution A.753 (18)) and Pt C, Ch 1, App 2 [2.3.1] of Bureau Veritas Rules for Offshore Units when the abbreviations "O or NA" are specified and for the level 3 piping system without fire protective coating.

4.2 These pipes may also be used for bilge pipes inside cargo tanks if the latter are kept under inert gas and fire mains provided that pipes are kept full of running water constantly and provided the joints are protected with an approved protective coating.

4.3 Piping system is approved to Low Flame Spread, according to ASTM D635-06, accepted as alternative to IMO Resolution A.653(16).

4.4 The product (conductive) can be installed in areas that need conductive application (cargo tanks) and in fire areas (i.e. pump rooms).

4.5 Detailed drawings of each piping system are to be submitted for review of compliance with the Rules and the applicable regulations.

4.6 The pipe and fittings assembly is to be carried out in accordance with the manufacturer's instructions and the person performing these tasks is to be qualified to the satisfaction of the Society Surveyor.

4.7 After completion of the installation a test of conductivity is to be carried out. Earthing wires should be accessible for inspection.

4.8 Behaviour in case of fire (smoke generation and toxicity) is to be deemed satisfactory by the flag authorities of the ship on board which the piping system is fitted.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 The products are to be supplied by **NOV FGS Singapore (Pte) Ltd** in compliance with the type described in this certificate and in compliance with the requirements stated on the front page of this certificate. This type of product is within the category HBV of Bureau Veritas Rule Note NR 320.

5.2 **NOV FGS Singapore (Pte) Ltd** has to make the necessary arrangements to have its works recognised by Bureau Veritas in compliance with the requirements of NR 320 for HBV products.

5.3 Each pipe and fitting is to be tested by the manufacturer at a hydrostatic pressure not less than 1.5 times the nominal pressure. Other recognised national or international standard may be accepted for pipes and fittings not employing hand lay up techniques. Depending upon the intended application the Society may require the pressure testing of each pipe and/or fitting.

5.4 No Bureau Veritas certificate is required.

Place of Production

1) NOV FGS Singapore (Pte) Ltd
7A, Tuas Avenue 3
Singapore 639407
SINGAPORE

2) NOV FGS Malaysia Sdn Bhd
Plo 202 Senai Industrial Park Phase IV
81400, Senai - Johor
MALAYSIA

6. MARKING OF PRODUCT

Pipes and fittings are to be permanently marked with at least:

- Manufacturer's name or logo
- Product name

- Pressure rating
- Temperature rating

The marking shall remain legible under normal handling and installation practices.

7. OTHERS

This approval is given on the understanding that the manufacturer will accept full responsibility for informing shipbuilders or their sub-contractors of the proper methods of fitting and general maintenance of the product and of the conditions of this approval.

This certificate supersedes the Type Approval Certificate N° 07795/D0 BV issued on 02/10/2013 by the Society.

***** END OF CERTIFICATE *****