DNV·GL

Certificate No:
TAK00000F2

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Plastic Pipes, Fibre Reinforced Thermosetting

with type designation(s)
Bondstrand™ 2400 Series; 2410, 2412, 2414, 2416, 2420, 2425,
Bondstrand™ 2400C Series; 2410C, 2412C, 2414C, 2416C, 2420C, 2425C

Issued to
NOV FGS Malaysia Sdn. Bhd.
Senai Johor, Malaysia

is found to comply with
DNV GL class programme DNVGL-CP-0070 – Type approval – Fibre reinforced thermosetting plastic piping systems
DNV GL rules for classification – Ships
IMO Resolution A.753(18). Guidelines for the Application of Plastic Pipes on Ships

Application :

For installation according to DNV GL Rules and Manufacturer's Specification, non-conductive/conductive. The piping system is approved to Fire Endurance L3 according to IMO Resolution A.753(18) and Low Flame Spread, according to ASTM D635-97.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until **2021-08-31**.
Issued at **Høvik** on **2016-09-01**

DNV GL local station: **Singapore**

Approval Engineer: **Gisle Hersvik**

for **DNV GL**
Digitally Signed By: Törnqvist, Rikard
Location: DNV GL Høvik, Norway
Signing Date: 03.09.2016 , on behalf of

Martin Strande
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Job Id: **262.1-013187-3**
Certificate No: **TAK00000F2**

Product description

Bondstrand™ 2400 Series Fiberglass Pipes and Fittings, Lined/Unlined, Conductive/Non-conductive. According to Ameron's Bondstrand Product Data: FP 158A 07/02.

Pipes:

	Minimum reinforced wall thickness in mm, incl. 0.5 mm liner											
Ø (mm)	**50**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**
2410	2.3	2.3	2.3	2.5	3.1	3.5	3.9	4.1	4.5	4.9	5.4	6.3
2412	2.3	2.3	2.3	2.7	3.2	3.9	4.5	4.8	5.5	6.0	6.6	7.7
2414	2.3	2.3	2.3	3.0	3.7	4.5	5.3	5.7	6.4	7.0	7.7	9.3
2416	2.3	2.3	2.5	3.4	4.2	5.1	6.0	6.6	7.4	8.1	8.9	10.6
2420	2.3	2.3	2.7	3.8	4.8	5.8	6.8	7.4	8.4	9.2	10.1	12.1
2425	2.3	2.7	3.3	4.6	5.8	7.2	8.4	9.2	10.5	11.5	12.7	15.1

	Minimum reinforced wall thickness in mm, incl. 0.5 mm liner						
Ø (mm)	**650**	**700**	**750**	**800**	**900**	**1000**	
2410	6.9	7.4	7.9	8.4	9.3	10.3	
2412	8.5	9.1	9.7	10.3	11.5	12.8	
2414	10.1	10.8	11.6	12.3	13.7	15.3	
2416	11.7	12.6	13.5	14.3	16.0	17.8	
2420	13.4	14.3	15.3	16.3	18.2	20.3	
2425	16.6	17.9	19.1	20.4	22.8	25.3	

Fittings:
Elbows, Tees, Laterals, Crosses, Reducers, Flanges, Couplers and Adaptors.

Jointing Methods:
Taper-Taper Adhesive Joint

Manufactured by

NOV FGS Malaysia Sdn. Bhd., PLO 202 Senai Industrial Park, Phase IV, 81400 Senai, Johor, Malaysia

NOV FGS Malaysia Sdn. Bhd., PLO 79, Jalan Rumbia 2, Kompleks Perindustrian Tanjung Langsat, Johor, Malaysia

DNV GL local station: Singapore

Responsibility

The Company (stated on the front page of this Certificate) takes the responsibility that both design and production are in compliance with Rules, Standards and/or Regulations listed on page 1 of this certificate.

Application/Limitation

Approved only for installation of piping systems onboard ships which will not be exposed to vacuum inside the pipes and not exposed to external pressure outside the pipes.

For installation according to DNV GL Rules/Standards and Manufacturer's Specification.

The piping system is approved as:
- Unlined and Conductive
- Unlined and Non-conductive
- Lined and Conductive
- Lined and Non-conductive

dependent on client's needs.

The piping system is approved to Fire Endurance L3 according to IMO Resolution A.753(18).

The piping system is approved to Low Flame Spread, according to ASTM D635-97 (accepted as an alternative to IMO Resolution A.653(16)).

Maximum operating temperature +93°C.

Conductivity testing to be carried out on installed system.

Approved mounting/joining specification to be followed.

Type Approval documentation

1. Previous Type Approval Certificate Nos. K-4900 and K-4905.
2. ISO 9001-Certificate, 30187-2008-AQ-SGP-RvA.
3. Email from NOV FGS of 2016-04-23, re. MYS TACs + new facility in MYS
4. Email from NOV FGS of 2016-04-23, including Application for Type Approval of 2016-04-23, NOV FGS Burst Test Report Nos. STB14-080 of 2014-07-28, STB14-081 of 2014-07-28, STB14-086 of 2014-07-23, STB14-087 of 2014-07-23, STB14-078 of 2014-08-21, STB14-079 of 2014-08-21 ((BS 2425)).
5. Bondstrand® Product Data, Series 2400 Fiberglass Pipe and Fittings, FP 158A 07/02.
6. Ameron Test Report No. E068/11(M)(C-04) of 2011-08-22 (short term burst pressure testing of 40").
7. Email from DNV Singapore of 2012-03-15, incl. Survey Report of 2012-02-28.

Tests carried out

Type Testing carried out according to **Type Approval documentation**.

Marking of product

The pipes and fittings are to be marked. The marking shall at least include the following information:
- *manufacturer's name*
- *manufacturing plant*
- *type designation*
- *pressure rating*
- *temperature rating*
- *nominal pressure*
- *dimensions*
- *production date.*

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV GL Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical Assessment to be performed after 2 years (Certificate Retention) and at renewal after 5 years (Certificate Renewal).

The main elements of the Periodical Assessment are to:

- Ensure that **Type Approval documentation** is available.
- Review design, materials, production process, and performance with respect to possible changes, in order to ensure compliance with **Type Approval documentation** and/or referenced material specifications.
- Ensure traceability between manufacturer's product marking and the DNV GL Type Approval Certificate.

END OF CERTIFICATE