DNV·GL

Certificate No:
TAK0000041

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Plastic Pipes, Fibre Reinforced Thermosetting

with type designation(s)
FIBERBOND® 20HV Series, FIBERBOND® 20FR-E Series

Issued to
ISP Co., Ltd.
Miryang-si Gyeongsangnam-do, Republic of Korea

is found to comply with
Det Norske Veritas' Type Approval Programme 1-501.1, 2011, Fibre Reinforced Thermosetting Plastic Pipes
Det Norske Veritas' Rules for Classification of Ships
Det Norske Veritas' Offshore Standards
IMO Resolution A.753(18). Guidelines for the Application of Plastic Pipes on Ships

Application :

For installation in accordance with DNV GL Rules and Manufacturer's Specifications. The piping system is conductive or non-conductive. The piping system has been tested to Low Flame Spread in accordance with ASTM D635.
FIBERBOND® 20FR-E: The piping system has been tested to Fire Endurance L3 in accordance with IMO Resolution A.753(18).
FIBERBOND® 20HV: The piping system has not been tested to Fire Endurance characteristics.

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

This Certificate is valid until **2018-06-30**.

Issued at **Høvik** on **2015-10-27**

for **DNV GL**

DNV GL local station: **Changwon**

Approval Engineer: **Gisle Hersvik**

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.

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Job Id: **262.1-020287-1**
Certificate No: **TAK0000041**

Product description

FIBERBOND® 20HV Series & FIBERBOND® 20FR-E Series; Glass Fiber Reinforced Thermosetting (polyester and epoxy vinyl ester) Plastic Piping System

Including the variants:
- **FIBERBOND® 20HV** [plastic piping system, with non-conductive exterior]
- **FIBERBOND® 20HV-C** [same as above, but with electrically conductive exterior]
- **FIBERBOND® 20FR-E** [same as above, but with fire retardant additive]
- **FIBERBOND® 20FR-EC** [same as above, but with electrically conductive exterior]
- **FIBERBOND® 20HV(FDA)** [same as FIBERBOND® 20HV, but it uses materials suitable for food contact]
- **FIBERBOND® 20HV(FDA)-C** [same as above, but with electrically conductive exterior]

Design range:
200 psig (13.8 bar) up to 12 in.
150 psig (10.3 bar) up to 30 in.

Pipes:

Internal Pressure: 6.9 to 13.8 bar as per below table.

Nominal wall thickness in in./mm, incl. 0.2 in. (0.5 mm) liner													
Ø [in.]:	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**
Ø [mm]:	50	80	100	150	200	250	300	350	400	450	500	600	750
wt [in.]:	**0.24**	**0.24**	**0.24**	**0.30**	**0.36**	**0.42**	**0.48**	**0.42**	**0.48**	**0.53**	**0.59**	**0.71**	**0.73**
wt [mm]:	6.0	6.0	6.0	8.0	9.0	11.0	12.0	11.0	12.0	14.0	15.0	18.0	19.0
Pressure rating [psig]:	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**150**	**150**	**150**	**150**	**150**	**150**
Pressure rating [bar]:	13.8	13.8	13.8	13.8	13.8	13.8	13.8	10.3	10.3	10.3	10.3	10.3	10.3

Fittings (contact molded):
Elbows, tees, reducers, couplings, saddles, laterals and flanges.

Joining Methods:
Plain End Butt and Strap

Application/Limitation

For installation in accordance with DNV GL Rules and Manufacturer's Specification.

Piping system is approved as:
- **FIBERBOND® 20HV**, **FIBERBOND® 20FR-E** and **FIBERBOND® 20HV(FDA)**: non-conductive, not for installations in gas hazardous areas.
- **FIBERBOND® 20HV-C**, **FIBERBOND® 20FR-EC** and **FIBERBOND® 20HV(FDA)-C**: conductive, for installations in gas hazardous areas.

Fire Endurance:
FIBERBOND® 20HV and **FIBERBOND® 20HV(FDA)**:
The piping system has not been tested to Fire Endurance characteristics.

FIBERBOND® 20FR-E:
The piping system has been tested to Fire Endurance L3 in accordance with IMO Resolution A.753(18).

Low Flame Spread:
The piping system has been tested to Low Flame Spread in accordance with ASTM D635 (accepted as an alternative to IMO Resolution A.653(16)).

Maximum working temperature is +65ºC. For applications with working temperature above +30ºC, the permissible pressure is to be reduced in accordance with DNV Rules for Classification of Ships, Pt.4 Ch.6 Sec.7, Table A8.

Test of conductivity is to be carried out after installation of piping system.

Type Approval documentation
Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**.

Marking of product

The pipes and fittings are to be marked. The marking shall at least include the following information:
- *Product name*: **FIBERBOND® 20HV/20FR-E**
- *Manufacturers name*: **ISP Co., Ltd.**
- *Pressure rating*
- *Temperature rating*

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.

Assessment to be performed after two (2) years (Certificate Retention) and at renewal after four (4) years (Certificate Renewal).

The main elements of the Periodical Assessment are:
- 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