Certificate No:
TAK000026D

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Insulation Materials for Gas Carriers

with type designation(s)
High Density Reinforced Polyurethane Foam (HD R-PUF):
HRF-150LX (210mm and 290mm, 8 and 11 layers of CSM)

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

is found to comply with
Gaztransport & Technigaz Specification Nr. M3045: High Density Reinforced Polyurethane Foam 150kg/m3 (HD R-PUF 150), Rev. 01, June 2021

Application :

For the use in Gaztransport & Technigaz (GTT) Cargo Containment System (CCS) technologies of Liquefied Gas (LG) carriers.

Issued at **Høvik** on **2022-12-19**
This Certificate is valid until **2027-12-18** .
DNV local unit: **Gimhae Station**

Approval Engineer: **Gisle Hersvik**

for **DNV**

Gustav Heiberg
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

HRF-150LX; High Density Reinforced Polyurethane Foam (HD R-PUF), which contains 8 and 11 layers CSM of 450 g/m^2 each, 210 and 290 mm board thickness.
Blowing agent: HFC-245fa/ HFO-1233zd.

Place of Manufacture

L719-13, Sangnam-Ro, Sangnam-Myeon, Miryang-Si, Gyeongsangnam-Do, Republic of Korea

Application/Limitation

For use in the prefabrication of insulating panels (IP) destined for GTT Cargo Containment System (CCS) technologies.

The material is only approved for use in Cargo Containment System (CCS) technologies of Liquefied Gas (LG) carriers built under licence from GAZTRANSPORT & TECHNIGAZ SAs (GTT).

Deliveries to actual shipbuilding projects shall be in compliance with the "High Density Reinforced Polyurethane Foam 150 kg/m^3 (HD R-PUF 150)" Specification, GTT document no. M3045, rev. 01 dated June 2021, and the product shall have a valid approval from GTT.

Type Approval documentation

Tests carried out

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

Marking of product

Product/package shall be marked with the *manufacturer's name*; **Hankuk Carbon Co., Ltd., Korea**, or *manufacturer's identification letter(s)*, *Lot No., Size, Quantity,* and *type designation.*

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 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 assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.

This certificate is only valid if required periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com

END OF CERTIFICATE