

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Inside Air Foam Fire Extinguishing System

with type designation(s)
SP-HIEX

Issued to

Seaplus Co., Ltd.
Busan, Republic of Korea

is found to comply with

Det Norske Veritas' Offshore Standards
Det Norske Veritas' Rules for Classification of Ships
Det Norske Veritas' Interpretation of SOLAS 1974 Convention as Amended

Application :

Approved for use as a fixed fire extinguishing system for machinery spaces and cargo pump rooms.

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

This Certificate is valid until **2019-06-30**.

Issued at **Høvik** on **2015-08-05**

for **DNV GL**

DNV GL local station: **Pusan**

Approval Engineer: **Silje Helene Waagaard**

Petter Langnes
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.

Product description

"SP-HIEX",

consists of SPFG foam generators, foam concentrate as specified below and other system components like water and foam pump(s), foam proportioner, steel distribution piping, strainer, valves, test and blow through lines, power and control system.

The system is accepted for use in machinery spaces, cargo pumps rooms (oil products only) and similar spaces. The system can also be accepted for use in ro-ro spaces (see the DNV rules for this application).

Only the foam generators are type approved by this certificate. All other systems components are subject to case-by-case approval.

Application/Limitation

The system shall be installed according to the below specifications:

Volume of protected space	Minimum required filling rate
Up to 500 m ³	2.4 m per minute
Between 500 m ³ and 3100 m ³	$1.65 + 0.0002884 \times (3100 - V)$ m per minute
Above 3100 m ³	1.65 m per minute

The SP-HIEX system is approved for use with the below specifications for the foam generators:

SPFG-100	
Foam production (cold condition)	49.2 m ³ /min at 1.5 bar 80.1 m ³ /min at 3.0 bar 79.5 m ³ /min at 4.5 bar
k-factor ($Q = k \times p^{1/2}$)	57.74 lpm/bar ^{1/2}
Premix ¹⁾ consumption	70.7 l/min at 1.5 bar 100.0 l/min at 3.0 bar 122.5 l/min at 4.5 bar
Expansion ratio	1:696 at 1.5 bar , 1:801 at 3.0 bar , 1:649 at 4.5 bar
Drawing	SPFG-100, dated 10 August 2010

1) Premix = solution of foam concentrate and water

SPFG-50	
Foam production (cold condition)	29.2 m ³ /min at 1.5 bar 46.3 m ³ /min at 3.0 bar 27.4 m ³ /min at 4.5 bar
k-factor ($Q = k \times p^{1/2}$)	31.75 lpm/bar ^{1/2}
Premix ¹⁾ consumption	38.9 l/min at 1.5 bar 55.0 l/min at 3.0 bar 67.4 l/min at 4.5 bar
Expansion ratio	1:752 at 1.5 bar , 1:841 at 3.0 bar , 1:407 at 4.5 bar
Drawing	SPFG-50, dated 10 August 2010

1) Premix = solution of foam concentrate and water

SPFG-25	
Foam production (cold condition)	11.1 m ³ /min at 1.5 bar 19.7 m ³ /min at 3.0 bar 19.5 m ³ /min at 4.5 bar
k-factor ($Q = k \times p^{1/2}$)	16.17 lpm/bar ^{1/2}
Premix ¹⁾ consumption	19.8 l/min at 1.5 bar 28.0 l/min at 3.0 bar 34.3 l/min at 4.5 bar
Expansion ratio	1:562 at 1.5 bar , 1:703 at 3.0 bar , 1:568 at 4.5 bar
Drawing	SPFG-25, dated 10 August 2010

1) Premix = solution of foam concentrate and water

The following additional applications / limitations apply:

- A. Nominal pressure is 3.0 bar. Approved pressure range is 1.5-4.5 bar. Application of generators at a pressure above or below the approved pressure range is subject to case by case approval.
- B. A DNV approved foam proportioner shall be used. The foam concentrate to be used shall be "2% HEF" manufactured by "Jiangsu Suolong Fire Science and Technology Co., Ltd." (MED certified by KR Hellas Ltd.).
- C. The foam generators shall be equally spaced in a horizontal plan at a level above the main and auxiliary engines. Generators shall also be arranged to cover other high-risk objects at all levels in the machinery spaces. Extra foam generators may be required in locations where the normally required generators have problem to reach due to obstructions like gratings, (semi-)tight bulkhead / decks, structures, etc.
- D. The generators shall be equally spaced and shall have at least 1 m free space in front of the foam outlet without obstructions. Positions exposed to overpressure in case of boiler and crankshaft explosions shall be avoided as far as practicable (positions above and somewhat to the side of the object is in general accepted).
- E. At least two foam generators shall be fitted in all protected with fuel oil installations like engines, boilers or separators. Other spaces (workshops, etc.) may be designed using the lowest filling rate (regardless of volume).
- F. Sufficient amount of foam is to be provided to produce a volume of foam equal to five times the largest space to be protected, applying the expansion ratio above, or 30 minutes operation, whatever value is larger. The system shall be activated with as little delay as possible and it is recommended that natural ventilation openings in upper part of the space are kept in open position.
- G. With respect to cargo pump rooms, the system is approved for pump rooms which handle oil cargos only, the system cannot be applied for pump rooms which are also intended for alcohol cargos (polar solvents).
- H. A strainer with mesh openings of maximum 1.5 mm shall be fitted on the water supply line before the foam proportioner (this to avoid clogging).
- I. The water supply pumps and foam concentrate pumps with capacity exceeding 25 m³/h (measured at 10 bar) shall be delivered with DNV product certificate. Foam concentrate pumps with lower capacity shall be delivered with certificate issued by the maker (work certificate). Ambient room temperature for foam pump/foam container should be between 4°C and 45°C.
- J. The system shall in addition to the above comply with relevant parts of SOLAS Ch. II-2, the FSS Code and DNV Statutory Interpretations Appendix C.

The following items are to be submitted for approval for each project:

- i. System arrangement plans including location of generators, section valves, release stations, pumps, foam tank and foam proportioner.
- ii. Documentation of power supply and control system.
- iii. Specification of pipes, section valves, electrical motors, pumps, foam concentrate, foam tank, foam proportioner and associated components.
- iv. Foam capacity calculations and pressure drop calculations, including actual pressure characteristic (pump curve) of water supply pump.
- v. Design, installation, operation (including emergency operation) and maintenance manual.

Installation testing:

- Pipes, valves and fittings and assembled systems shall be tested to the satisfaction of the Society.
- All distribution piping shall be blown through with air to ensure that the piping is free from obstructions.
- Function testing of the foam proportioner shall be performed as per its type approval certificate (see also Pt. 4 Ch.10 App.C for details). A mixing range of 2.0-2.6 % will normally be accepted. The mixing ratio shall be measured.

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Certificate No: **TAF0000034**

- Function testing of the power and control systems, water pump(s), foam pumps(s), valves, remote and local releases stations and alarms shall be carried out.
- Other tests as required by DNV Rules and according to maker's manual.

Periodical testing:

- Every month: Function test of control panel, water and foam pumps.
- Every 6th month: Alarm system, foam generators, piping, fittings and filter condition.
- Annually (minimum): foam mixer to be function tested, with water and foam pumps running (or an equivalent test procedure)
- Annually: Distribution pipes shall be blow through with air annually and nozzles inspected for debris
- After 3 years and then annually: condition test for foam the concentrate
- Renewal survey: Distribution pipes should be flushed properly with fresh water and inspected to ensure that they are free from debris and not clogged.

Test log and condition test report for foam concentrate shall be presented to the surveyor. Other tests may be required on a case by case basis.

Type Approval documentation

Certification in accordance with Standard for Certification No. 1.2, Type Approval, January 2013.

Fire test and component test report:

REPORT NO. R1-2008-23 dated 8 February 2011 from Fire Insurers Laboratories of Korea (FILK), Gyeonggi-Do, Korea.

Foam concentrate test reports (separate approval by KR Hellas Ltd):

Report No. R1-2009-28 dated 16 April 2010 from Fire Insurers Laboratories of Korea (FILK), Gyeonggi-Do, Korea.

Drawings, foam generators:

SPFG-100, dated 10 August 2010 (Seaplug Foam Generator-100).

SPFG-50, dated 10 August 2010 (Seaplug Foam Generator-50).

SPFG-25, dated 10 August 2010 (Seaplug Foam Generator-25).

Initial Type Approval Survey Report dated 18 April 2011 from DNV Pusan.

Tests carried out

The foam generators have been tested according to IMO MSC.1/Circ.1271, including selected items of IMO MSC/Circ. 1165 and EN 13565-1.

The foam concentrate has been tested according to IMO MSC/Circ.670 (see separate approval).

Marking of product

The foam generators, foam mixer and other main components in the system are to be marked with type designation, whereas the main pump unit is to be marked with the name of manufacturer.

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Standard for certification No. 1.2 Type Approval Item 4.