



Marine Design Appraisal Document

Lloyd's Register Group Limited
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Date
10 September 2012

Quote this reference on all future communications
YDS/M-2-1/NNA/114851 & 124764

NOV FGS SINGAPORE (PTE) LTD. (EX-AMERON (PTE) LTD.) WATER TIGHT BULKHEAD PENETRATION SPOOLS FOR GRE PIPES GENERAL DESIGN APPRAISAL

Valid until 30 November 2016

1. The documents listed in paragraph 1 of the appendix have been examined for compliance with the design requirements of Part 5, Chapters 12 and 13 of the Rules and Regulations for the Classification of Ships (July 2011), and are assigned an appraisal status as indicated, in respect of the following conditions:-

2. Description & Application

Epoxy cast watertight bulkhead penetration spools for GRE pipes through steel bulkheads which are not fire divisions, separating double bottom void spaces with no fire risk and ballast tanks.

3. Specification

- GRE Pipe : Ameron S2000M & S7000M pipe series
- Epoxy Resin : Chockfast Orange
- Sealant : Phillybond Orange
- Design Conditions
 - Maximum Working Pressure : 1.72 MPa
 - Maximum External Pressure : 0.4 MPa
 - Temperature Range : -40 °C to 93 °C

Dimension Table

Diameter GRE pipe in inch	1	1.5	2	3	4	5	6	8	10	12
Diameter GRE pipe in mm	25	40	50	75	100	125	150	200	250	300
GRE outside diameter in mm	35.6	50.6	61.9	90.5	115.9	142.6	169.7	221.3	278.4	331.8
Minimum sleeve length in mm	187	187	187	187	187	191	191	191	191	211
Diameter GRE pipe in inch	14	16	18	20	24	28	30	32	36	40
Diameter GRE pipe in mm	350	400	450	500	600	700	750	800	900	1000
GRE outside diameter in mm	357.1	407.9	458.5	509.6	611.3	739.1	791.9	844.7	946.8	1053.8
Minimum sleeve length in mm	221	243	265	287	331	386	409	431	478	523

FINAL ACCEPTANCE OF ACTUAL ITEM(S) DEPEND(S) ON SATISFACTORY SURVEY AND TESTING

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4. Mandatory Requirements

- | | <u>Action</u> |
|--|---------------|
| 4.1 Materials are to be made and tested in accordance with the Rules for the Manufacture, Testing and Certification of Materials. | AQS |
| 4.2 The steel pipe piece is to be of an extra heavy gauge and of a weldable quality carbon steel, equivalent to the bulkhead material. | AQS |
| 4.3 Welding of steel pipe into the bulkhead as well as the pouring and venting fittings are to be to the Surveyor's satisfaction. | AQS |
| 4.4 The following requirements for this epoxy resin application are to be adhered to:- | AQS |
| <ul style="list-style-type: none">- Preparation of the steel and GRE pipe and mixing and pouring of the resin is to be carried out under the supervision of experienced personnel.- Concluded that the minimum radial gap occupied by the resin is not less than 6 mm at any one point with a nominal resin thickness of 12 mm.- Concluded that the metal "adhesive" surfaces are machined with an Ra value greater than 12.5 microns and prepared with Phillyclad 1000 or equivalent (no release agent to be applied).- The manufactures procedures/instructions are strictly complied with. | |
| 4.5 The forces in way of the bulkhead penetration are to a minimum and a sufficient number of expansion couplings are to be provided accordingly. Maximum shear strength as indicated in the Design Philosophy has not been verified by LR. | AQS |
| 4.6 The arrangements are to be acceptable to the National Authority concerned. | AQS |

5. General Comments

- 5.1 This General Design Appraisal is valid for a period of 5 years from the date of issue. After that time, an application for renewal would be considered.
- 5.2 It is concluded that the Watertight Bulkhead Penetration Spool will be manufactured in accordance with the approved plans under the usual conditions of survey and testing, all to the Surveyor's satisfaction.
- 5.3 Any significant changes in design, as well as modifications and revisions of the Watertight Bulkhead Penetration Spool in future cases, should be covered by suitable and amended new plans, after being submitted for re-approval.
- 5.4 Amendments and additions to the Society's Rules in future, if applicable for the subject Watertight Bulkhead Penetration Spool could result in a re-examination of the relevant plans.
- 5.5 The Society will always be entitled to request a complete set of plans for each separate order, if considered to be necessary.

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5.6 The Society reserves right to cancel a General Design Appraisal if:-

- a) Any design changes are made to the appraised Watertight Bulkhead Penetration Spool which is deemed to adversely affect the provisions under which the appraisal was granted.
- b) Safety or any other feature of the appraised Watertight Bulkhead Penetration Spool is found to be unsatisfactory in service.



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Appendix

1. The documents listed below have been examined

<u>Document No.</u>	<u>Rev.</u>	<u>Title</u>	<u>Status</u>	<u>Date</u>
RH30032010/01	2	Design Proposal for Epoxy Cast Bulkhead Penetration	SI	01/12/2011
Table 69	3	GRE Bulkhead Penetration Design & Dimension Table	AQ	01/12/2011

The date is the date on which the document is stamped.

2. The documents listed below have been referred to in this design appraisal.

<u>Drawing No.</u>	<u>Rev.</u>	<u>Title</u>
PF-32	0	Assembly Instruction for 1"– 40" GRE Bulkhead Penetration Spool
INB-009B	0	GRE Bulkhead Penetration Installation

Appraisal Status & Action Key

- AQ Approved subject to the matters raised that require resolution - and provided the arrangements are to the surveyor's satisfaction
- SI Retained as supporting documentation for information only
- AQS Details to be submitted by the client to the local surveyor's Office responsible for surveying the building and the arrangements verified in accordance with the Rule/Regulations requirements by the surveyor

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