



Marine Design Appraisal Document

Lloyd's Register EMEA
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Date
09 October 2013
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RTS/ENG/131408 / JdB

Machinery General Design Appraisal

Client : World-Valve B.V.
Manufacturer : World-Valve B.V.
Subject : Resilient Seated Butterfly Valves of the following Types:
Series 1; TB-70.1, WVTB-70.1, WVTB-70.1-M, WVFL-70.2.
Series 2; WVTB-ISO, WVTB-ISO-LT, WVM-70.4, WVFL-F16.
Series 3; Regulating Butterfly Valves, Types WWSK-70-3 and WWSK-70-3-K3.
Series 4; WVTB-NOVA, WVTB-NOVA-LT, WVTB-ISOLEX, WVTB-ISOLEX-LT, WVFL-NOVA and WVFL - ISOLEX.

G.A. Registration No.: **ROT.07.M.037 (E1)**

Valid Until 08 October 2018

This Design Appraisal Document (D.A.D.) supersedes and cancels the previous D.A.D. No. ROT/07.M.0980, Issue Nr. 1, dated 21 December 2007. The plans as listed in Appendix A remain applicable.

The valves are of the design in accordance with the plans and documentation listed in the Appendix A. The pressure / temperature rating for the various types of valves are tabled in Appendix B. Additional tests on the disc are shown in Appendix C.

1. The resilient seated butterfly valves are such as could be accepted as shown on the documentation listed in Appendix A for the following services on ships, classed or intended for classification with this Society, provided they will be constructed, tested and installed to the Surveyors' satisfaction.
 - 1.1 Salt and fresh cooling water systems.
 - 1.2 Water ballast and fresh water pumping systems. (When subject valves will be used in clean ballast lines through cargo oil tanks to forward ballast tanks, or as collision bulkhead valves, they are not to be made of grey cast iron).
 - 1.3 Cargo oil lines on tankers.

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- 1.4 Bilge suction of cargo holds in bulk carriers (only when fitted in a pipe tunnel and in association with a metal seated non-return valve).
- 1.5 As suction valves on double bottom oil fuel tanks (only when located in a closed pipe tunnel or duct keel) or, in addition, as suction valves on double bottom lubricating oil fuel oil tanks in machinery spaces, subject to the applicable conditions as set forth under the paragraph 1.7.
- 1.6 As pump suction valves from the main bilge line (only when the valve is located in the immediate vicinity of the pump). The valve is to be fitted in conjunction with a metal non-return valve which is to be on the bilge main side of the butterfly valve.
- 1.7 Low pressure lubricating of fuel oil piping systems, subject to the following requirements:-
 - 1.7.1 Valves are accepted for "in-line" use only (i.e. not as terminal valve on deep tanks or piping systems).
 - 1.7.2 The design is such that failure of the non-metallic seal would not result in external leakage.
 - 1.7.3 The location of the valve is such that failure of the seal would not prevent transfer of oil to settling or service tanks.
 - 1.7.4 The valves to be installed to the Surveyor's satisfaction.
- 1.8 Sanitary systems.
- 1.9 Non-essential air piping systems having a working pressure not greater than 7 bar (except as stop valves for air receivers).
- 1.10 This type of valves could be used as shipside valves, provided they are of an approved ductile material. For cast steel or spheroidal graphite iron they are to be made at approved works in accordance with the Rules "Manufacture, Testing and Certification of Materials".

The approval of these valves for use as shipside valves is limited to those in the machinery spaces and associated with machinery, and is not applicable to scuppers and similar fittings.

A distance piece of heavy gauge pipe and suitable length or heavy reinforcement pad is to be fitted between the valve and the shell plating, in order to prevent the possibility that the disc could project outside the shell plating when the valve is in open position. The valves are to be bolted to the shipside connection in such a way that the section of pipe immediate inboard of the valve can be removed without affecting the watertight integrity of the hull.

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- 1.11 Fire main isolating valve provided the valve is of an approved fire safe type.
 - 1.12 Domestic fresh and salt water service (non-essential).
 - 1.13 Water systems intended for heating. (For the *Series 3* and *Series 4* only).
 - 1.14 Ventilation systems for easy accessible spaces. The valves are to be fitted in a visible location and it should be easily recognised that they are in the open position. They may be closed only in case of fire or flooding. A name plate to that effect is to be fitted in a prominent position.
 - 1.15 Refrigerant systems intended for air-conditioning. The materials are to be suitable for use with the selected refrigerants. This includes liners, seats, seals and all other components in direct contact with the refrigerant.
 - 1.16 Inert gas distribution system (deck lines) on tankers.
 - 1.17 Steam systems. (For the *Series 3* and *Series 4* only).
2. The butterfly valves should be provided with indicators, to show whether the valves are open or shut and positive mechanical means are to be provided to prevent the valve from "swinging-through" from the open position, through closed position, to open position again.
 3. In general for valves where the internal surfaces are to be fitted with a non-metallic lining, the valve body is to be subjected to a hydraulic test of 7 bar, or twice the working pressure whichever is the greater, before the lining is fitted.
On completion of the assembly, the valves are to be subjected to a suitable test to verify water tightness of the disc and seat under the above test conditions.
 4. With regard to the required material test certificates for the different materials, we refer to the requirements as given in Part 5, Chapter 12, Section 1.6, 2.1, 3.1, 4.1 and 4.2 of the Rules.
 5. It is noted from the documentation that the disc and the shaft of the butterfly valve could be made from stainless steel and we would explain that stainless steel may be prone to rapid deterioration when standing in polluted seawater.
 6. It is stipulated that the butterfly valves may only be used within the temperature limits of the applicable seat material for the relevant medium.
 7. With regard to the construction and design of subject valves we have to add that if the disc is equipped with two stub spindles instead of one continuous spindle, the disc tends to distortion for valves over 4" diameter. Additional Disc tests are to be carried out as indicated in the Appendix C of this Design Appraisal Document.

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8. For butterfly valves operated by actuators provision is to be made for local manual control independent of the remote operating mechanisms. The arrangements are to be such that they are of a "fail safe design" i.e. in the event of loss of pressure in the operating medium or loss of electric power, the valves serving a compartment which may be filled or flooded will not be open and render the piping system inoperable.
9. The butterfly valves, types WVSK-70-3 and WVSK-70-3-K3, showing a regulating butterfly valve, could only be accepted as "in-line" valves for cargo oil, fuel oil and lubrication oil systems, provided:-
 1. Valves are not to be used as terminal valves.
 2. The owners should be informed that the degree of tightness obtained with these valves is sufficient for their purpose.
10. The valves are to be suitable for the maximum pressure and temperature to which the system can be subjected. For limitations of nodular cast iron reference is made to Part 5, Chapter 12, Section 4.1 of the Rules.
11. Special consideration will be given to the use of butterfly valves in the bilge systems of passenger ships for which the arrangements should also be acceptable to the Nation Authority concerned.
12. For general requirements on valves reference is made to Part 5, Chapter 12, Section 6 of the Rules.
13. Valves intended for Classes I and II, are to be tested in accordance with recognised standards, but to not less than 1,5 times the design pressure as per Part 5, Chapter 12, Section 8.1.7 of the Rules. A tightness test is to be carried out at 1.1 times the nominal pressure rating.
14. Valves intended for the installation on the ship's side below the loaded waterline, are to be tested by hydraulic pressure to not less than 5 bar as per Part 5, Chapter 13, Section 2.5.11 of the Rules.
15. Valves intended for refrigerants are to be subject to a strength test of 2,0 times the design pressure and a leak pressure test of not less than 1,0 times the design pressure.
16. Locking or securing arrangements are to be to the Surveyor's satisfaction.
17. It is noted that the material of a number of valve bodies is optional and can be manufactured upon request from K-SILUMIN. This valve body material may be used only for non essential piping systems where leakage or failure caused by fire could not result in fire spread, flooding or the loss of an essential service.

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18. Seats of N-Nitril Food or U-Vulcolan are not acceptable for valves intended for ships classed or eligible to be classed with the Society.

for

J.M. du Bois
Lead Technical Specialist
Machinery Department
Rotterdam Technical Support Office



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Appendix

1. Appendix A

1. The documents listed below have been examined

Catalogue Page No.	Rev.	Title	Status	Date
Concentric Valves with lining vulcanised to the valve body, Series 1:-				
4-5	-	TB-70.1	SI	21-12-2007
6-7	-	WVTB-70.1	SI	21-12-2007
8-9	-	WVTB-70.1-M	SI	21-12-2007
10-11	-	WVFL-70.2 (50-700)	SI	21-12-2007
12-13	-	WVFL-70.2 (750-2000)	SI	21-12-2007
Concentric Valves with lining vulcanised to the valve body, Series 2:-				
16-17	-	WVTB-ISO	SI	21-12-2007
18-19	-	WVTB-ISO-LT	SI	21-12-2007
20-21	-	WVM-70.4	SI	21-12-2007
22-23	-	WVFL-F16 (50-750)	SI	21-12-2007
24-25	-	WVFL-F16 (800-2000)	SI	21-12-2007
26-27	-	WVFL-F4 (65-1200)	SI	21-12-2007
28-29	-	WVFL-F4 (1400-2000)	SI	21-12-2007
Regulating Valves, Series 3:-				
34-35	-	WVSK-70.3 (50-500)	SI	21-12-2007
36-37	-	WVSK-70.3 (600-1000)	SI	21-12-2007
38-39	-	WVSK-70-3-K3	SI	21-12-2007
Double eccentric valves with renewable seats, Series 4:-				
42-43	-	WVTB-NOVA (65-250)	SI	21-12-2007
44-45	-	WVTB-NOVA (300-1200)	SI	21-12-2007
46-47	-	WVTB-NOVA-LT (80-250)	SI	21-12-2007
48-49	-	WVTB-NOVA-LT (300-800)	SI	21-12-2007
50-51	-	WVTB-ISOLEX	SI	21-12-2007
52-53	-	WVTB-ISOLEX-LT (65-600)	SI	21-12-2007
54-55	-	WVTB-ISOLEX-LT (700-1200)	SI	21-12-2007

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Catalogue Page No.	Rev.	Title	Status	Date
56-57	-	WVFL-NOVA	SI	21-12-2007
58-59	-	WVFL-ISOLEX	SI	21-12-2007

Appraisal Status Key

SI Retained as supporting documentation for information only

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

- The Comments and Conditions, as listed in the Design Appraisal Document, have all been assigned an Action Status Code **AQS**, unless specified otherwise.

AQS Details to be submitted by the client to the local Surveyor's office responsible for the building and the arrangements verified in accordance with the Rule/regulation requirements by the Surveyor.

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Appendix B

Maximum Working Pressure of all Types per Nominal Diameter

Table of Maximum Working Pressure of Concentric Rubber lined Valves Series 1 and 2 and, Regulating Butterfly Valves Series 3. Valves are deliverable with hollow or non-hollow disc design.

Available Types and Sizes										Maximum Working Pressure				
DN	Series 1			Series 2				Series 3			4 bar	6 bar	10 bar	16 bar
25	-	-	-	-	-	-	-	-	-	-	-	-	10	16
32	-	-	-	-	-	-	-	-	-	-	-	-	10	16
40	-	-	-	-	-	-	-	-	-	-	-	-	10	16
50	-	-	-	-	-	-	-	-	-	-	-	-	10	16
65	-	-	-	-	-	-	-	-	-	-	-	-	10	16
80	-	-	-	-	-	-	-	-	-	-	-	-	10	16
100	-	-	-	-	-	-	-	-	-	-	-	-	10	16
125	-	-	-	-	-	-	-	-	-	-	-	-	10	16
150	-	-	-	-	-	-	-	-	-	-	-	-	10	16
175	-	-	-	-	-	-	-	-	-	-	-	-	10	16
200	-	-	-	-	-	-	-	-	-	-	-	6	10	-
250	-	-	-	-	-	-	-	-	-	-	-	6	10	16*
300	-	-	-	-	-	-	-	-	-	-	-	6	10	16*
350	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
400	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
450	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
500	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
550	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
600	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
650	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
700	-	-	-	-	-	-	-	-	-	-	-	6	10*	16*
750	-	-	-	-	-	-	-	-	-	-	-	6*	10*	-
800	-	-	-	-	-	-	-	-	-	-	-	6*	10*	16*
900	-	-	-	-	-	-	-	-	-	-	-	6*	10*	16*
1000	-	-	-	-	-	-	-	-	-	-	-	6*	10*	16*
1200	-	-	-	-	-	-	-	-	-	-	-	6*	10*	16*
1300	-	-	-	-	-	-	-	-	-	-	-	6*	10*	-
1350	-	-	-	-	-	-	-	-	-	-	-	6*	10*	-
1400	-	-	-	-	-	-	-	-	-	-	-	6*	10*	-
1500	-	-	-	-	-	-	-	-	-	-	-	4*	-	-
1600	-	-	-	-	-	-	-	-	-	-	-	4*	-	-
1800	-	-	-	-	-	-	-	-	-	-	-	4*	-	-
2000	-	-	-	-	-	-	-	-	-	-	-	4*	-	-

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- Notes: ¹ Not available in DN175 ² Not available in DN550
³ Not available in DN650 ⁴ Not available in DN750
⁵ Not available in DN1300 and DN1350 ⁶ Not available in DN1500

- * Valves with a non hollow disc design having a continuous spindle.
- Valves with a hollow disc are also available with a continuous spindle.
- Regulating valves of the series 3, fitted with standard disc design, should not be continuously subjected to a differential pressure over the disc exceeding 1 bar in order to avoid possible noise and / or cavitation.
- Series 3 valves with flat plate disc design should not be subjected to a differential pressure over the disc exceeding 1 bar, for DN50 up to DN300 the differential pressure should be 1,5 bar maximum.

Table of Maximum Working Pressure of Double eccentric Valves Of all NOVA Design Types and WVFL-ISOLEX, Series 4

Available Types and Sizes				Maximum Working Pressure			
DN	Series 4			6 bar	10 bar	16 bar	25 bar
65	-	-	-	-	10	16	25
80	-	-	-	-	10	16	25
100	-	-	-	-	10	16	25
125	-	-	-	-	10	16	25
150	-	-	-	-	10	16	25
175	-	-	-	-	-	-	-
200	-	-	-	-	10	16	25
250	-	-	-	-	10	16	25
300	-	-	-	-	10	16	25
350	-	-	-	-	10	16	25
400	-	-	-	-	10	16	25
450	-	-	-	-	10	16	25
500	-	-	-	-	10	16	25
550	-	-	-	-	10	16	25
600	-	-	-	-	10	16	-
650	-	-	-	-	10	16	-
700	-	-	-	-	10	16	-
750	-	-	-	-	10	16	-
800	-	-	-	-	10	16	-
900	-	-	-	-	10	16	-
1000	-	-	-	-	10	16	-
1200	-	-	-	-	10	16	-

- Notes: ¹ Not available in DN175
² Not available in DN550
³ Not available in DN650
⁴ Not available in DN750

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Table of Maximum Working Pressure of Double Eccentric Valves of WVTB-ISOLEX and, WVTB-ISOLEX-LT Design Types, Series 4.

Available Types and Sizes		Max. Available Working Pressure				
DN	Series 4	6 bar	10 bar	16 bar	25 bar	
65	WVTB-ISOLEX ^(a)	-	10	16	25	
80		-	10	16	25	
100		-	10	16	25	
125		-	10	16	25	
150		-	10	16	25	
175		-	-	-	-	
200		-	10	16	25	
250		-	10	16	25	
300		WVTB-ISOLEX-LT ^(a-b)	-	10	16	-
350			-	10	16	-
400			-	10	16	-
450			-	10	16	-
500			-	10	16	-
550			-	-	-	-
600			-	10	16	-
650			-	-	-	-
700	-		-	10	16	-
750	-		6	10	-	-
800	-	6	10	-	-	
900	-	6	10	-	-	
1000	-	6	10	-	-	
1200	-	6	10	-	-	

- Notes: ¹ Not available in DN175
² Not available in DN550
³ Not available in DN650
⁴ Not available in DN750

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Appendix

Minimum Design Temperatures.

Valve Body Material				
Nodular Cast Iron GGG-40	Cast Steel GS-C25	Steel RST-37/2	St St AISI Grades 304 / 316	AluBronze
-10°C	-20°C	-20°C	-60°C	-30°C

Valve bodies intended for use in conventional refrigerating circuits where the pressure/saturation relationship applies are not required to be low temperature impact tested unless the design temperature is lower than minus 40°C.

Design Temperatures of Seat and Liner materials Series 1, 2 and 4

Temperature	Material				
	NBR (Buna-N)	EPDM	FPM (Viton)	HNBR	PTFE** (Teflon)
Minimum	-10°C	-30°C/-40°C	-10°C	-10°C	-60°C
Maximum	+90°C	+130°C	+200°C	+150°C	+230°C

The minimum design temperature is dependent on the configuration of valve body material and seat material. The highest temperature established is the applicable minimum design temperature.

** Only available for Series 4

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Appendix C

The tests to be carried out on the butterfly valves are to comply with the required tests of ISO 5208. In addition the valves are to be tested as follows:-

1. Disc Test

With the valve shut, pressure should be applied to the adverse side of the valve. The opposite side should be open to the atmosphere. A test pressure of 1,5 x Design Pressure should be applied and there should be no sign of damage or leakage through the disc during the test.

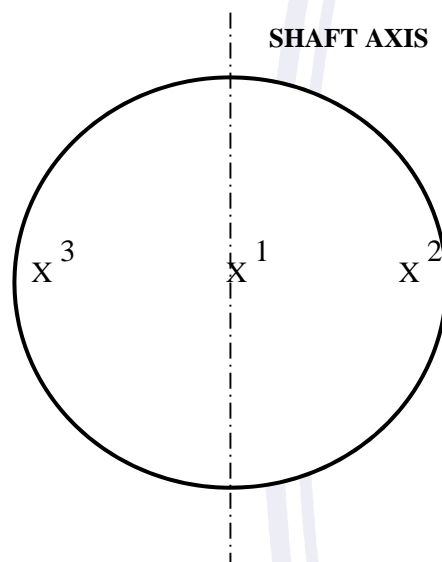
A small leakage past the disc edge is acceptable.

This test applies only to valve sizes DN350 and over. One size of each type is to be tested.

2. Disc Deflection Test

With the valve shut a test pressure of 1 x Design Pressure should be applied in the normal direction of the valve.

Dial gauge reading should be taken simultaneously in the three positions indicated below.



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The valve should be mounted with the shaft axis in a vertical position. Readings will vary according to the sizes of the valve disc and the valve disc material. As guidance, a deflection of DN/200 measured at the valve edge (points 2 and 3) could be accepted. Other values can be accepted only based upon an acceptable leaking rating during the test and satisfactory measurements indicating that the disc is not permanently distorted after the test.

This test applies only to valve sizes DN200 and over.

For each type of valve one size is required to be tested. The size to be tested is the average bore between DN 200 and the largest available bore for that type or should otherwise agreed with the attending Surveyor.

Proposal for these tests are to be discussed and agreed with the attending Surveyors.

The above mentioned tests are to be witnessed by a Lloyd's Register Surveyor.

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