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P-08 FLEXIBLE HOSE

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Foreword:

This Guide is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

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FLEXIBLE HOSE

1 Application

1.1 The Guidelines are applicable to metallic or non-metallic flexible hoses or flexible hose assemblies used for securing piping systems and permanent connection between mechanical components. The Guidelines may also apply to flexible hoses for temporary connection or flexible hoses or flexible hose assemblies used on portable equipment.

1.2 Flexible hose assemblies complying with the requirements of the Guidelines may be used in fuel oil, lubricating oil, hydraulic and thermal oil systems, freshwater and seawater cooling systems, compressed air system, bilge and ballast systems and grade III steam piping systems. Flexible hoses are not to be used for high pressure fuel oil injection system.

1.3 The Guidelines do not apply to the hoses intended to be used in fixed fire-extinguishing systems.

2 Normative references

2.1 Annex 2, Chapter 2, PART THREE of CCS Rules for Classification of Sea-going Steel Ships (hereinafter referred to as the Rules for Steel Ships);

2.2 ISO 6802-2008 Rubber and Plastic Hoses and Hose Assemblies--Hydraulic-pressure Impulse Test with Flexing;

2.3 ISO 6803-2008 Rubber or Plastic Hoses and Hose Assemblies--Hydraulic-pressure Impulse Test without Flexing;

2.4 ISO 10380-2012 Pipework-Corrugated Metal Hoses and Hose Assemblies;

2.5 ISO 15540-2001 Ships and Marine Technology--Fire Resistance of Hose Assemblies--Test Method;

2.6 ISO 15541-2001 Ships and Marine Technology--Fire Resistance of Hose Assemblies—Requirements for the Test Bench;

2.7 ISO 1402-2009 Rubber and Plastic Hoses and Hose Assemblies—Hydrostatic Testing;

2.8 MSC/Circ.1083 Unified Interpretation on the Requirement of Shielding Means for Fuel Oil Piping

3 Terms and definitions

3.1 For the definitions of terms related to product inspection, design approval, type approval, prototype test, test specimen, unit/path inspection, final inspection, etc., refer to 3.1.2, Chapter 3, PART ONE of CCS Rules for Classification of Sea-going Steel Ships;

3.2 Flexible hose assembly: metallic or non-metallic hose/fitting combinations in which the hose ends are fitted with accessories.

4 Drawings and documentation to be submitted

When approval or inspection of flexible hoses is being applied for, the following drawings and documentation to be submitted are to be submitted to CCS for approval or review:

4.1 The following drawings and documentation to be submitted are to be submitted to CCS for approval:

4.1.1 General plan;

4.1.2 Main parts diagram (hoses, end fittings);

4.1.3 Main properties and specifications sheet;

4.1.4 Summary table of mechanical and chemical properties of main parts;

4.1.5 Technical specifications for delivery acceptance, manufacturer test program, prototype test plan.

4.2 The following drawings and documentation to be submitted are to be submitted to CCS for review:

4.2.1 Product description

4.2.2 Nameplate (label plate or other permanent mark)

4.2.3 Manufacturer certificate of conformity/warranty certificate (sample)

4.3 Other information to be submitted

4.3.1 For manufacturers applying for B type approval by CCS, the relevant basic information of the manufacturer (including manufacturer history and current situation) and description of production history, such as special verification or identification of the product, are to be submitted and associated reports and certificates may be enclosed.

4.3.2 For manufacturers applying for B type approval by CCS, quality control plan is to be submitted—a quality control plan for the products within the scope of approval is to be developed and submitted to CCS for approval by the manufacturers. The quality control plan is to describe the methods of quality assurance and control during the process of product manufacturing according to the technical requirements or applicable standards for the product. This quality control plan is to include a plan of inspection after approval and in particular, to reflect the inspection and test requirements specified in relevant CCS rules.

4.3.3 For manufacturers applying for A type approval by CCS, in addition to abovementioned documents and information, a complete set of quality management system documents covering the products within the scope of approval and complying with ISO9000 standard or equivalent standards is to be provided, among which the procedures of inspections and tests required by CCS rules are to be approved by CCS.

5 Materials and components

5.1 Materials and components are to comply with relevant requirements of CCS Rules.

5.2 Materials and components of flexible hose mainly include: hose, end fittings.

6 Design objectives

6.1 Design and manufacture

6.1.1 Flexible hoses, which are made of rubber materials and intended to be used for bilge, ballast, compressed air, fuel oil, lubricating oil, hydraulic and thermal oil systems, are to contain a single layer or multiple layers of closely woven and complete wire braid, or reinforcing layers of other appropriate materials.

Flexible hoses, which are made of plastic materials such as polytetrafluoroethylene or nylon and intended to be used in the same abovementioned systems, are not to be internally reinforced by closely woven and complete wire braid layers. Reinforcing layers made of appropriate materials are to be used as far as practicable.

Where flexible hoses made of rubber or plastic materials are used in oil supply piping system of burners, these flexible hoses are also to be provided with a wire braid layer for external protection in addition to the internal reinforcing layers mentioned above. Flexible hoses used in a steam system are to be made of metallic materials.

6.1.2 Flexible hoses are to be provided with end fittings that comply with the manufacturer's product description and have been approved by CCS in accordance with the requirements of the Guidelines. Non-flanged end connections are to comply with the requirements of 2.5.3, Chapter 2, PART THREE of CCS Rules for Classification of Sea-going Steel Ships as appropriate. Each type of hose and fitting combination is to be subject to prototype test in accordance with the same standards as those for relevant pressure and impulse tests required for the hoses.

6.1.3 Hose clamps or similar end fittings are not to be used in steam, combustible medium and starting air systems or seawater piping system consisting of flexible hoses which may, in the event of damage, cause water invasion.

Hose clamps may be used in other systems of an operating pressure less than 0.5 MPa, however, two hose clamps are to be fitted on each end connection of the system.

6.1.4 Flexible hose assemblies expected to sustain impulsive pressure and/or high vibration intensity during service are to be designed to withstand the maximum expected impulsive pressure and the forces generated due to vibration. The maximum expected working pressure, vibration frequency and forces generated due to installation are to be taken into account during the test required in 7.2.3 of the Guidelines.

6.1.5 Non-metallic flexible hose assemblies are to be of fire resistant type if used in the following systems:

6.1.5.1 Combustible medium system;

6.1.5.2 Seawater piping systems susceptible to the possibility of water invasion due to failure of such hose assemblies.

6.1.6 Flexible hose assemblies are to be selected with due consideration of the specific service requirements and taking into account the conditions of service environment and their compatibility with the fluid under working pressure and working temperature conditions.

6.1.7 The following aspects are to be specifically indicated in the service and installation requirements specified in the product description provided by the manufacturer of the flexible hose assembly:

6.1.7.1 Positioning;

6.1.7.2 Supporting of the connection ends (if necessary);

6.1.7.3 Avoidance of contacts that may cause hose friction and wear;

6.1.7.4 Minimum bending radius.

6.1.7.1.5 For the flanged joint, valve bonnet and any other flanged or threaded joint of the flexible hoses used in fuel oil and lubricating oil piping systems operating at an oil pressure greater than 0.18MPa, the possibility of installing splash guard is to be considered. Such joints are to be compatible with the type of connection interface for installation of steel protective guard designed according to IMO MSC /Circ.647, or may be compatible with the protective tape or other protective devices approved by CCS.

6.1.8 Flexible hoses are to be identified with the following permanent marks:

(1) Name or trademark of the manufacturer;

(2) Date of manufacture (month/year);

(3) Hose type (note: fire resistant or not);

(4) Nominal diameter;

(5) Pressure rating;

(6) Temperature rating.

7 Type test

7.1 Selection of typical test specimens

7.1.1All flexible hoses or flexible hose assemblies are to be classified depending on their material and service requirements (conveyed medium, pressure and temperature) to determine the applicable standards.

7.1.2 For flexible hoses of the same intended service, working pressure, working temperature and structural material, products of the maximum diameter or/and minimum wall thickness may be selected, based on the nominal diameter and wall thickness and according to the FEMA results, upon the approval of CCS, as the typical specimens for the applicable tests in accordance with the requirements of 7.1.2; for hose and fitting combinations, the specimens are to be selected respectively from hose assemblies with end fittings of different materials or structures for type test.

7.2 Test items

7.2.1 All flexible hoses or flexible hose assemblies are to be prototype tested in accordance with their respective applicable standards.

7.2.2 Hoses and end fittings of different service requirements and nominal diameters are to be subject to pressure, burst, impulse resistance and fire resistance tests respectively in accordance with the applicable standards.

7.2.3 All flexible hoses or flexible hose assemblies are to be burst tested to verify that they are capable of withstanding a burst pressure not less than 4 times of the design pressure without any damage or leakage.

7.2.4 Non-metallic flexible hoses or flexible hose assemblies expected to sustain impulsive pressure and/or high vibration intensity during service are to be subject to impulse test and where they are used in any circumstance with flexing, subject to flexing test.

7.2.5 Metallic flexible hoses or flexible hose assemblies are to be subject to bend test.

7.2.6 Non-metallic flexible hoses or flexible hose assemblies, which are used for combustible medium service or used in seawater piping systems susceptible to the possibility of water invasion due to failure of such hoses/assemblies, are to be subject to fire resistance test.

7.3 Reduction or exemption of prototype test items

7.3.1 In general, all applicable test items described in 7.2 are to be carried out during the approval process. However, provided that the conditions mentioned below are satisfied, a written request for exemption from partial test items mentioned in 7.2.1 may be submitted to CCS by the manufacturer. The surveyor is to consider such request according to the manufacturer’s production status, production history, service records, etc. and fax his/her comments together with the

manufacturer's written request to the Marine Product Management Department at CCS Headquarters. Such exemption is not to be effected until the consent thereof has been obtained from the Marine Product Management Department at CCS Headquarters.

(1)The manufacturer applying for approval is able to provide the corresponding test reports recently issued by an authoritative testing organization (e.g. State Bureau of Quality and Technical Supervision, National Defense Technology Laboratory, etc.);

(2) The approval applicant is able to provide the corresponding test reports recently endorsed by an IACS (International Association of Classification Societies) Member.

7.4 Prototype test methods and requirements

7.4.1 The procedure of prototype test of all flexible hoses or flexible hose assemblies is to comply with the requirements of the applicable standards and submitted to CCS for review and approval.

7.4.2 Burst test of flexible hoses or flexible hose assemblies

7.4.2.1The non-metallic flexible hoses or flexible hose assemblies are to be burst tested in accordance with the requirements of ISO 1402 and no pressure holding time is required when 4 times of the design pressure is reached during the test.

7.4.2.2 The metallic flexible hoses or flexible hose assemblies are to be burst tested in accordance with the requirements of ISO 10380.

7.4.3 The non-metallic flexible hoses or flexible hose assemblies are to be impulse tested in accordance with the requirements of ISO 6803 and flexing tested in accordance with the requirements of ISO 6802.

7.4.4 The metallic flexible hoses or flexible hose assemblies are to be bending tested in accordance with the requirements of ISO 10380.

7.4.5 The non-metallic flexible hoses or flexible hose assemblies are to be fire tested in accordance with the requirements of ISO 15540 and the test bench is to comply with the requirements of ISO 15541.

8 Unit/path inspection

8.1 Unit/path inspection for manufacturers which have obtained type approval by CCS

(1) the test regarding the following items is to be carried out in accordance with the inspection plan (relevant part in quality control plan) approved during the approval:

1) Visual and dimensional inspection;

2) Pressure test:

① Flexible hoses and flexible hose assemblies used in hydraulic piping systems are to be pressure tested to 1.25 times maximum design pressure; however, the test pressure does not have to exceed the design pressure plus 7 MPa;

② Flexible hoses and flexible hose assemblies other than those used in hydraulic piping systems are to be pressure tested to 1.5 times maximum working pressure, however, the test pressure is to be no less than 0.4MPa;

(2) Above tests are to be carried out by the manufacturer piece by piece and complete test reports are to be issued and submitted to the surveyor for review.

(3) In addition, the surveyor is to randomly select, at a percentage of 1-3% of the products of each batch/specification, at least one piece, a proportion of the products from the batch of products for

re-test of abovementioned inspection and test items, and provide on-site witness when the tests are being carried out by the manufacturer.

(4) The raw material quality certificates of the main parts are to be submitted along with each application for unit/path inspection to CCS surveyor for review.