

Guideline No.: B-02(201705)



# B-02

# THERMAL OIL HEATERS

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## **Foreword**

CCS Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at <http://www.ccs.org.cn>. Your comments or suggestions are welcomed and may be sent to our email addressed [mp@ccs.org.cn](mailto:mp@ccs.org.cn).

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Main changes:

The“9.3.3 Non-destructive testing of welds” is amended to identify Non-destructive testing acceptance Criteria.

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## THERMAL OIL HEATERS

### 1 Application

1.1 This Guideline applies to works approval and inspection of oil-fired (light diesel oil, heavy diesel oil, etc.) or exhaust-fired marine thermal oil heaters.

### 2 Normative references

2.1 CCS Rules for Classification of Sea-going Steel Ships;

2.2 CCS Rules for Materials and Welding.

### 3 Terms and definitions

3.1 Relevant definitions specified in CCS Rules for Classification of Sea-going Steel Ships are applicable to this Guideline.

3.2 Marine thermal oil heater is a marine thermal fluid heater having a working temperature not more than 350°C, with organic heat transfer oil as working medium, and forced circulation by thermal oil pump. Generally, it consists of the body of thermal oil heater, thermal oil collecting tank and thermal oil expansion tank.

### 4 Plans and documents

4.1 The following plans and documents are to be submitted to CCS for approval when applying for approval:

(1) Main performance specifications (including rated heating capacity, design pressure, maximum working pressure, volume of circulating oil, uptake temperature, thermal efficiency, etc.);

(2) List of physical and chemical properties of materials of pressure parts material;

(3) General assembly;

(4) Body construction (including details of welded connections, attachments and supports);

(5) Drawings of main components such as coils, headers, thermal oil expansion tank, and thermal oil collecting tank;

(6) Arrangement of mountings and fittings;

(7) Strength calculations;

(8) Diameter calculations for safety valves;

(9) Electrical control system (if necessary);

(10) type test programme.

4.2 The following plans and documents are to be submitted to CCS for information when applying for approval:

(1) Standards applicable to products;

(2) Product instructions, product nameplates and manufacturer's quality certificate (specimen).

4.3 In addition to plans and documents specified in 4.1 and 4.2, the applicant is to submit other plans and documents necessary for approval according to the relevant requirements in Chapter 3, PART ONE of CCS Rules for Classification of Sea-going Steel Ships.

## **5 Materials and components**

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

## **6 Evaluation of welding procedures**

6.1 Prior to welding, the manufacturer is to formulate detailed welding procedure specifications for approval by CCS, according to the relevant requirements of CCS Rules for Materials and Welding and the characteristics (position, type and size) of material, construction and welding joints of pressure parts of thermal oil heaters.

6.2 The welding, weld examination and post-welding heat treatment of all pressure parts of thermal oil heaters are to comply with the relevant requirements of CCS Rules for Materials and Welding.

## **7 Design and technical requirements**

7.1 The design and technical requirements for the products are to comply with the relevant requirements in Section 8, Guideline 4 and in Chapter 6, PART THREE of CCS Rules for Classification of Sea-going Steel Ships.

## 8 Strength requirements

8.1 The strength calculation and tests are to comply with the relevant requirements in Chapter 6, PART THREE of CCS Rules for Classification of Sea-going Steel Ships.

## 9 Type test

### 9.1 Selection of typical samples

Samples are to be selected according to design pressure and heating area. Products representing the manufacturer's production capacity and manufacturing level are to be selected as samples, representing or covering the scope of products for which approval is sought.

9.2 Type test is to include the following items:

- (1) material inspection;
- (2) visual examination of welds;
- (3) non-destructive testing of welds;
- (4) coil inspection;
- (5) inspection of expansion tank and collecting tank;
- (6) hydraulic test.

9.3 Type test is to comply with the following requirements:

9.3.1 Material inspection is to be carried out according to methods and requirements in Chapter 1 ~ 4, PART ONE of CCS Rules for Materials and Welding.

9.3.2 Visual examination of welds: Close-up inspection of the surface of welds. The welding of pressure parts is to comply with the relevant requirements of CCS Rules for Materials and Welding. The surface of welds is to be well formed, the edges of welds are to have smooth transitions to the base metal and the width of welds is to be uniform.

9.3.3 Non-destructive testing of welds is to be carried out according to requirements as specified in Section 3, Chapter 9, PART THREE of CCS Rules for Materials and Welding. Non-destructive testing acceptance criteria are to meet the following requirements:

- (1) Radiographic testing: NB/T47013 or GB 3323;
- (2) Ultrasonic testing: NB/T47013;
- (3) Magnetic particle testing: NB/T47013;
- (4) Penetrant testing: NB/T47013.

When using other national or regional standards, to be evaluated by CCS and confirmed the determination level before use.

#### 9.3.4 Coil inspection:

(1) excessively large overlaps are not to be formed in the internal surfaces of butt joints after welding, and the internal diameter at joints is to comply with requirements of ball-passing test;

(2) the butt welds are to be subjected to radiographic testing according to 9.3 (3);

(3) finished coils are to be subjected to hydraulic test to a pressure twice the design pressure and no leakage is allowed;

(4) finished coils are to be subjected to ball-passing test. For coil tubes, of which the welded portions are to be bent to a radius less than 600 mm, the ball-passing diameter is 90% that of butt-welded straight tubes.

#### 9.3.5 Inspection of expansion tank and collecting tank:

(1) welded tube holes of tube joints are to be clear of welds so far as practicable;

(2) the longitudinal inclination and transverse inclination of tube joints are to be not more than 1.5 mm;

(3) the flange face inclination is to be not more than 2 mm;

(4) water filling test is to be carried out for finished expansion tank and collecting tank and no leakage is allowed.

#### 9.3.6 Hydraulic test:

(1) after the single-pass tubes are formed, the pressure parts are to be subjected to hydraulic test to a pressure twice the design pressure;

(2) after assembly, the tubes are to be subjected to overall hydraulic test to a pressure 1.5 times the design pressure;

(3) water filling test is to be carried out for finished thermal oil expansion tank and collecting tank;

(4) hydraulic test and water filling test are deemed satisfactory where:

- ① no leakage is found in metal walls and welds of pressure parts; and
- ② no residual deformation is visible after completion of hydraulic test.

## **10 Unit/batch inspection**

10.1 Unit/batch inspection for issuing marine products certificates is to be carried out after CCS works approval.

10.2 Unit/batch inspection is to include the following items:

(1) The inspections are to be carried out according to approved inspection plan, including at least visual examination of welds, non-destructive testing of welds, coil inspection, inspection of expansion tank/collecting tank and hydraulic test.

(2) The manufacturer is to submit to CCS the documentation as specified in 5.1 and 5.2 of this Guideline.