

JB

Professional Standard of the People's Republic of China

JB/T 4730.2—2005

Replace part of JB 4730—1994

**Nondestructive testing for
pressure equipment
Part 2: Radiographic testing**

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CONTENTS

Foreword	28
1 Scope	31
2 Normative References	31
3 General Requirements	32
4 Specific Requirements	35
5 Quality Classification of Radiographic testing for Fusion Butt Welded Joint in Pressure Equipment	44
6 Quality Classification of Radiographic testing for Circumferential Fusion Butt Welded Joint in Pipe/Tube Used for Pressure Equipment and Pressure Piping	51
7 Radiographic testing Report	55
Annex A (informative) Characteristic Indices of Industrial Radiographic Film System	56
Annex B (informative) Periodic Calibration Method of Densitometer (Optical Density Meter)	57
Annex C (informative) Sketches of Typical Radiographic Techniques	58
Annex D (informative) Determination for Number of Exposures for Circumferential Butt Welded Joint	61
Annex E (normative) Calculation Method of Focus Size	68
Annex F (normative) Type and Specification of Specific Image Quality Indicator(IQI).....	69
Annex G (normative) Placement of Lap Location Marker	70
Annex H (normative) Type and Specification of Reference Block	72

FOREWORD

The JB/T 4730.1 ~ 4730.6—2005 《Nondestructive testing for pressure equipment》 contains following six Parts:

- Part 1: General requirements;
- Part 2: Radiographic testing;
- Part 3: Ultrasonic testing;
- Part 4: Magnetic particle testing;
- Part 5: Penetrant testing;
- Part 6: Eddy current testing.

This Part is the Part 2 of JB/T 4730.1 ~ 4730.6—2005: Radiographic testing (RT). This Part is mainly based on the domestic research achievement and the application experience of late years, and is formulated with reference to the corresponding requirements of EN, European Standard, Section V, ASME 《Boiler and pressure vessel code》 and JIS Standard. Moreover, this part is revised in accordance with the professional feedback comments. The contents of this Part in comparison with the corresponding part of JB 4730—1994 are changed as follows:

1. The technical grade classification of radiography is redefined. The technical grade selection for radiography in different cases are added.
2. The requirements of Image Quality Indicator (IQI) sensitivity of radiation film for different penetrated thickness and different radiation techniques are revised. The sensitivities are relatively promoted.
3. The industrial radiation film system is classified as 4 Types: T1, T2, T3 and T4. The requirement for characteristic indices of radiographic film system is added in Annex A (informative).
4. Some Charts of determination for exposure number of circumferential butt welded joint in accordance with different K values are added in Annex D (informative).
5. The applicable optical density range of film with respect to different radiation sources specified in the original Standard is revised and appropriately promoted.
6. The contents of radiation arrangement and exposure number for the butt welded joint of small diameter pipe/tube are revised.
7. The specification of Se-75 ray application is added.
8. The exposure curve is added.
9. The illuminance requirement for radiograph reading light is modified.
10. The curves of allowable maximum tube voltage with respect to the different thicknesses of steel, copper/copper alloy, aluminium/aluminium alloy and titanium/titanium alloy are revised.
11. The content relating to densitometer (optical density meter) is added. The periodic calibration method for densitometer is specified in Annex B (informative).
12. The quality classifications of RT for the butt welded joint in nickel/nickel alloy and copper/copper

alloy pressure equipment are added.

13. The quality classifications of RT for the circumferential butt welded joint in steel, nickel, copper/copper alloy, aluminium/aluminium alloy and titanium/titanium alloy pipe/tube used for pressure equipment and pressure piping are added.

The Annex E, Annex F, Annex G and Annex H of this Part are normative Annexes, and the Annex A, Annex B, Annex C and Annex D of this Part are informative Annexes.

This Part is proposed by the China Standardization Committee on Boilers and Pressure Vessels (SAC/TC 262).

This Part is under the jurisdiction of the China Standardization Committee on Boilers and Pressure Vessels (SAC/TC 262).

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Nondestructive testing for pressure equipment

Part 2: Radiographic testing

1 SCOPE

This Part of JB/T 4730 specifies the requirements for X-ray and γ -ray radiographic testing (RT) technique and quality classification of fusion butt welded joint in the metallic components for pressure equipment.

This Part is applicable to the RT for butt welded joint in the pressure components of pressure equipment in-fabrication, in-installation and in-service. The metallic base materials of welded joint include carbon steel, low-alloy steel, stainless steel, copper/copper alloy, aluminium/aluminium alloy, titanium/titanium alloy and nickel/nickel alloy.

The RT techniques specified in this Part are classified as three grades: Grade A — low sensitivity technique, Grade AB — medium sensitivity technique, and Grade B — high sensitivity technique.

The RT for butt welded joint in the relevant support component and structure part of pressure equipment may also refer to this Part.

2 NORMATIVE REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Part of JB/T 4730. For dated references, subsequent amendments to (excluding corrigendum), or revisions of, any of these publications do not apply. However, parties to agreements based on this Part are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. For undated references, the latest edition of the document referred to applies.

GB 11533—1989	Standard logarithmic visual acuity charts
GB 16357—1996	Radiological protection standards for industrial X-ray detection
GB 18465—2001	Radiological protection requirements for industrial gamma defect detecting
GB 18871—2002	Basic standards for protection against ionizing radiation and for the safety of radiation sources
GB/T 19348.1—2003	Nondestructive testing Industrial radiographic film Part 1: Classification of film systems for industrial radiography
GB/T 19348.2—2003	Nondestructive testing Industrial radiographic film Part 2: Control of film processing by means of reference values
HB 7684—2000	Wire type image quality indicator (IQI) used for radiography
JB/T 4730.1	Nondestructive testing for pressure equipment Part 1: General requirements
JB/T 7902—1999	Wire type image quality indicator (IQI)
JB/T 7903—1999	Industrial radiographic illuminators

3 GENERAL REQUIREMENTS

The general requirements of RT shall also meet the following provisions of this Part, besides the corresponding provisions of JB/T 4730.1.

3.1 Radiographic testing Personnel

3.1.1 The RT personnel shall be qualified by the radiation safety training, and shall hold the radiation operation certificate.

3.1.2 The near vision and distance vision of specific RT personnel, whether by correction or not, shall be not less than 5.0 (decimal record 1.0) by the vision test method specified in GB 11533. The vision of testing personnel shall be tested once a year.

3.2 Radiographic Film

3.2.1 The radiographic film system is classified as 4 Types: T1, T2, T3 and T4; where T1 is the highest class and T4, the lowest class respectively. The characteristic indices of industrial radiographic film system are shown in Annex A (informative). The film Manufacturer shall be responsible to examine the performance of the film produced systematically, and shall provide the corresponding type and parameters. The film processing and the apparatus and chemicals may be examined and controlled by the examination piece of pre-exposure film provided by the film Manufacturer in accordance with the provisions of GB/T 19348.2—2003.

3.2.2 The Grade A and Grade AB radiography shall use the film of Type T3 or higher class, and the Grade B shall use the film of Type T2 or higher class. The base fog density of film shall be not greater than 0.3.

3.2.3 When the γ -ray is applied to the RT for high crack-sensitivity material, the film of Type T2 or higher class shall be used.

3.3 Radiographic Illuminator

3.3.1 The essential performance of the radiographic illuminator shall be per the corresponding provisions of JB/T 7903.

3.3.2 The maximum illuminance of the radiographic illuminator shall meet the requirement of radiograph interpretation.

3.4 Densitometer (Optical Density Meter)

3.4.1 The maximum examinable optical density of the densitometer shall be not less than 4.5. The density reading tolerance of densitometer shall be ± 0.05 .

3.4.2 The calibration period of the densitometer shall be at least once per 6 months. The calibration method may refer to the provisions of Annex B (informative).

3.5 Intensifying Screen

Generally, the RT shall either use metallic intensifying screen, or not use intensifying screen. The selection for intensifying screen shall be per the requirements as shown in Table 1.

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