JB

# Professional Standard of the People's Republic of China

JB/T 4730.1—2005
Replace part of JB 4730—1994

# Nondestructive testing for pressure equipment Part 1: General requirements

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# CONTENTS

# 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 1 of JB/T 4730.1 ~ 4730.6—2005: General requirements. This Part is mainly formulated with reference to the corresponding requirements of Section V, ASME《Boiler and pressure vessel code》 and JIS Standard, and in coordination with the domestic actual situations. The contents of this Part in comparison with the corresponding part of JB 4730—1994 are changed as follows:

1. The application scope is extended:
   (a) Five mainly used nondestructive testing (NDT) methods, i.e. radiographic testing (RT) , ultrasonic testing (UT), magnetic particle testing (MT), penetrant testing (PT) and eddy current testing (ET), and their relevant quality level evaluations are specified;
   (b) This Standard is applicable to the NDT for metallic pressure equipment;
   (c) The technical requirements of NDT for pressure equipment in-service are added;
   (d) The technical requirements of NDT for support part and structure part of pressure equipment are added.
2. The corresponding stipulations for application principles of NDT methods are added:
   (a) A proper NDT method shall be selected in accordance with the material, fabrication method, operating medium, application condition and failure mode of the pressure equipment;
   (b) The RT and UT are mainly used to examine the internal flaws in material of pressure equipment;
   (c) The MT is mainly used to examine either open to the surface or slightly subsurface flaws of pressure equipment made of ferromagnetic material; and the ET is mainly used to examine either open to the surface or slightly subsurface flaws of pressure equipment made of electric-conductive material;
   (d) The PT is used to examine the flaws open to the surface of pressure equipment made of non-porous metallic material;
   (e) Some new NDT methods such as the acoustic emission and X-ray real-time image etc. may be used under certain specific condition.
3. The specific stipulations for using new NDT method and new NDT apparatus are added:
   (a) In case of using new NDT method from abroad, the relevant method and testing scope shall be accepted by the corresponding foreign pressure equipment sector;

(b) In case of using domestic newly developed NDT method, the relevant method shall be evaluated and approved by the China Standardization Committee on Boilers and Pressure Vessels to form a special code case.

4. The NDT procedure (including the general procedure and the instruction) are added:

(a) The general procedure shall be per the requirements of present Regulation and Standard or even more strictly, and shall be corresponding to the business scope and professional ability of the Testing Agency;

(b) The NDT instruction shall be formulated in accordance with the corresponding Regulation and Standard. The NDT for pressure equipment and part/component shall be performed according to the NDT instruction.

5. The requirements of periodic inspection for NDT apparatuses are added. The periodic calibrations of the testing instrument and the apparatus performance are specified, and the calibration results shall be recorded for review.

The Annex A of this Part is Annex (informative).

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).

This Part is responsibly drafted by the Hefei General Machinery Research Institute.

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# Nondestructive testing for pressure equipment
# Part 1: General requirements

## 1 SCOPE

This Part of JB/T 4730 specifies the general requirements and application principles of five nondestructive testing (NDT) methods, i.e. radiographic testing (RT), ultrasonic testing (UT), magnetic particle testing (MT), penetrant testing (PT) and eddy current testing (ET).

This Part is applicable to the NDT for metallic pressure equipment in-fabrication and in-service.

## 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/T 12604.1 | Terminology for nondestructive testing | Ultrasonic testing |
| GB/T 12604.2 | Terminology for nondestructive testing | Radiographic testing |
| GB/T 12604.3 | Terminology for nondestructive testing | Penetrant testing |
| GB/T 12604.4 | Terminology for nondestructive testing | Acoustic emission testing |
| GB/T 12604.5 | Terminology for nondestructive testing | Magnetic particle testing |
| GB/T 12604.6 | Terminology for nondestructive testing | Eddy current testing |
| GB 17925—1999 | Standard practice for X-ray real-time examination of cylinder weld | |
| GB/T 18182—2000 | Acoustic emission examination and evaluation of metallic pressure vessels | |
| GB/T 19293—2003 | Method of X-ray radiocopy for butt-weld | |
| JB/T 4730.2—2004 | Nondestructive testing for pressure equipment | Part 2: Radiographic testing |
| JB/T 4730.3—2004 | Nondestructive testing for pressure equipment | Part 3: Ultrasonic testing |
| JB/T 4730.4—2004 | Nondestructive testing for pressure equipment | Part 4: Magnetic particle testing |
| JB/T 4730.5—2004 | Nondestructive testing for pressure equipment | Part 5: Penetrant testing |
| JB/T 4730.6—2004 | Nondestructive testing for pressure equipment | Part 6: Eddy current testing |

Document No. 248-2003, the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China《Test and supervision rules for nondestructive testing personnel of special equipment》

## 3 TERMS AND DEFINITIONS

The terms and definitions defined in GB/T 12604.1 ~ 12604.6, and that described in the followings, are applicable to this Part of JB/T 4730.

3.1

**Nominal thickness *T***

— nominal thickness of test object excluding the manufacturing tolerance and the processing loss of material.

3.2

**Penetrated thickness *W***

— nominal thickness of material along radiation direction; for multi-layer radiation, the sum of nominal thickness of each penetrated layer.

3.3

**Object-to-film distance *b***

— distance between the surface of the source side object and the plane of the recording medium (film) measured along the radiation beam centre.

3.4

**Source-to-object distance *f***

— distance between the radiation producing area of the source and the surface of test object measured along the radiation beam center.

3.5

**Focal distance *F***

— source-film distance measured along radiation beam centre.

3.6

**Source size *d***

— effective focus size of radiation source.

3.7

**Pipe/Tube diameter $D_o$**

— outside diameter of the pipe/tube

3.8

**Round flaw**

— flaws (porosity, slag inclusion and tungsten inclusion etc.) of length to width ratio not greater than 3.

3.9

**Stripy flaw**

— flaws (porosity, slag inclusion and tungsten inclusion etc.) of length to width ratio greater than 3.

3.10

**Penetrated thickness ratio *K***

— ratio of maximum to minimum thickness of base material penetrated by the radiation beam within the range of primary radiation length.

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