

ICS 13.100



**NATIONAL OCCUPATIONAL HEALTH STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GBZ 117-2022

**Standard for radiological protection in industrial radiography
(English Translation)**

Issued on: October 13, 2022

Implemented on: March 1, 2023

Issued by: National Health Commission of the People's Republic of China

Table of Contents

Foreword...	3
1 Scope...	5
2 Normative References...	5
3 Terms and Definitions...	6
4 Radiological Protection Requirements for Operating Organization...	7
5 Radiological Protection Requirements for Defect Detectors...	7
6 Radiological Protection Requirements for Stationary Defect Detection...	11
7 Radiological Protection Requirements for Mobile Defect Detection...	14
8 Radiological Protection Detection...	19

1 Scope

This Standard specifies the radiological protection requirements for X-ray and gamma-ray defect detection.

This Standard is applicable to defect detection using X-ray radiography facilities and gamma-ray radiography facilities of 600 kV and below (including stationary defect detectors and mobile defect detectors). Industrial CT defect detection and non-destructive testing within the same radiation source range for non-defect detection purposes may take this as a reference.

This Standard is not applicable to industrial defect detection performed by accelerators and neutron defect detectors.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 9445 Non-destructive Testing - Qualification and Certification of NDT Personnel

GB 11806 Regulations for the Safe Transport of Radioactive Material

GB/T 14058 Apparatus for Gamma Radiography

GB 18871 Basic Standards for Protection against Ionizing Radiation and for the Safety of

Radiation Sources

GB/T 26837 Non-destructive Testing Instruments - Stationary Type and Movable Type

Industrial X-ray Radiographic Equipment

GBZ 98 Health Requirements and Surveillance Specifications for Radiation Worker

GBZ 128 Specifications for Individual Monitoring of Occupational External Exposure

GBZ/T 250 Radiation Shielding Specifications for Room of Industrial X-ray Radiography

GA 1002 Public Security Protection Requirements for Hypertoxic Chemicals and Radioactive

Sources Storage Site usually two source holes: the old source is pushed into one source hole of the source changer, and the new source is removed from the other source hole.

3.7 pipe crawler

A mobile pipe defect detection device installed in the pipeline. The frame of the defect detection device is installed in the pipeline, and the source is driven by power to translate (forward or backward) together with the frame in the pipeline to perform radiographic defect detection on the pipeline welds. A control source is utilized to control the forward direction and position of the defect detection equipment.

3.8 control source

A sealed radioactive source used for guidance and positioning control of the pipe crawler.

3.9 operating organization

An operating organization that utilizes industrial defect detection device to perform industrial defect detection.

4 Radiological Protection Requirements for Operating

Organization

4.1

The operating organization that carries out industrial defect detection shall bear the main responsibility for radiological protection safety.

4.2

A radiological protection management organization shall be established, radiological protection management personnel and their responsibilities shall be clarified, and radiological protection management systems and measures shall be established and implemented.

4.3

The personnel engaged in defect detection shall be subject to personal dose monitoring in accordance with the requirements of GBZ 128 and occupational health monitoring in accordance with the requirements of GBZ 98.

4.4

Before starting formal work, the defect detection personnel shall obtain non-destructive testing personnel qualifications that comply with the requirements of GB/T 9445.

4.5

Radiation dose rate meters and personal dose alarms shall be equipped.

4.6

An emergency plan for radiation accidents shall be formulated.

5.1 X-ray Radiography Facilities

- i) Check whether the warning labels and source signs are clear;
- j) Measure whether the ambient dose equivalent rate at a certain distance from the surface of the source container complies with the requirements of 5.2.1.1 and confirm that the radioactive source is in a shielded state.

5.2.2 Maintenance of gamma-ray radiography facilities

5.2.2.1

Components involving radiological protection in the gamma-ray radiography facilities shall be regularly inspected and maintained, and problems shall be repaired in a timely manner. When repairing the gamma-ray radiography facilities, the manufacturer's professionals shall pour the radioactive source into the source changer. The personnel of the operating organization shall not independently repair the gamma-ray radiography facilities.

5.2.2.2 The control components of the gamma-ray radiography facilities, including the crank handle

and the source transfer conduit, shall be frequently lubricated and scrubbed. Gears shall be frequently lubricated, and the joints of the source transfer conduit shall be scrubbed to keep them away from dust and grit.

5.2.3 Storage and use of radioactive sources

5.2.3.1

The operating organization shall establish a special-purpose storage warehouse for the radioactive sources (or defect detectors with sources).

5.2.3.2 The temporary storage of source-containing containers or radioactive sources, and

control sources intermittently during mobile defect detection shall be performed in special-purpose storage facilities. On-site storage facilities include lockable rooms, special-purpose storage boxes or storage pits, etc. The storage facilities shall have the same level of protection as those used at the operating organization's main base. After temporary storage is completed, patrol inspections shall be performed to ensure storage safety.

5.2.3.3 Radioactive source storage facilities shall reach the following requirements:

- a) Rigorously control the irradiation of surrounding people, prevent radioactive sources from being stolen or damaged, and prevent unauthorized personnel from taking any actions that may harm themselves or the public. Ionizing radiation warning signs shall be set up at the entrance of the storage facilities;
- b) They shall be able to be used under conventional environmental conditions, be structurally fireproof, and be kept away from corrosive and explosive hazards;
- c) At the point closest to the external surface that is accessible to the public, the shielding shall be such that the ambient dose equivalent rate is less than 2.5 $\mu\text{Sv/h}$ or the control level approved by the regulatory authority;
- d) The doors of the storage facilities shall be kept locked, and double-locked management shall be implemented;
- e) Regularly check the item list to confirm the storage locations of defect detection sources, source containers and control sources.

5.2.3.4 The storage of radioactive sources shall comply with the relevant requirements of GA

1002.

5.2.3.5 The operating organization shall formulate a system for the collection and return of radioactive sources, establish a collection account, clarify the flow of radioactive sources, and have a dedicated person in charge of this.

5.2.3.6 When collecting and returning a source container containing radioactive sources, the

ambient dose equivalent rate at a certain distance from the outer surface of the source container shall be measured to confirm that the radioactive source is in the source container. Source containers containing radioactive sources shall be stored in specified locations, and there shall be detailed registration of the collection and return.