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**Nondestructive testing of amusement equipment -  
Part 2: Visual examination**

游乐设施无损检测 第2部分：目视检测

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## Foreword

GB/T 34370 “Nondestructive testing of amusement equipment” is divided into the following 6 parts:

- Part 1: General requirement;
- Part 2: Visual examination;
- Part 3: Magnetic particle testing;
- Part 4: Penetrant testing;
- Part 5: Ultrasonic testing;
- Part 6: Radiographic testing.

This Part is Part 2 of GB/T 34370.

This Part is drafted in accordance with the rules given in GB/T 1.1-2009.

This Part was proposed by and shall be under the jurisdiction of National Standardization Technology Committee on the Ropeway and Amusement Device (SAC/TC 250).

Drafting organizations of this Part: China Special Equipment Inspection and Research Institute, Special Equipment Safety Supervision Inspection Institute of Jiangsu Province, Shanghai Xidu Amusement Equipment Manufacturer, Beijing SBL Amusement Equipment Co., Ltd., Special Equipment Safety Inspection and Research Institute of Henan Province.

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# **Nondestructive testing of amusement equipment -Part 2: Visual examination**

## **1 Scope**

This Part of GB/T 34370 specifies the method of visual examination for amusement equipment.

This Part applies to visual examination of manufactured and in-use amusement equipment.

This Part does not apply to visual observation activities in other nondestructive testing methods such as magnetic particle and penetration.

## **2 Normative references**

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 11533 Standard for logarithmic visual acuity charts

GB/T 20306 Amusement devices terminology

GB/T 20737 Non-destructive testing - General terms and definitions

GB/T 20968 Non-destructive testing - Aids to visual inspection - Selection of low-power magnifiers

GB/T 34370.1 Nondestructive testing of amusement equipment - Part 1: General requirement

## **3 Terms and definitions**

The terms and definitions defined in GB/T 20306 and GB/T 20737 and the following are applicable to this document.

### **3.1 Visual examination**

does not rely on auxiliary tools (except for lighting sources and magnifiers) for direct observation with the naked eye. Remote visual examination can be performed by means of mirrors, telescopes, endoscopes, optical fibers, cameras, video systems, automatic systems, robots, and other suitable visual aids. Translucent visual examination allows the examination of the interior of transparent, semitransparent materials.

## 5 Safety requirements

Safety requirements during examination shall include at least:

- a) The examiner shall comply with the safety requirements of the site of the piece under test; according to the requirements of the location of examination, wear protective overalls and wear relevant protective equipment;
- b) Care shall be taken to avoid various safety hazards such as bruises, electric shock, falling, extrusion, shearing, twining, slipping, drowning, scalds, etc..

This Clause does not list all the safety requirements for examination. Users using this Part shall, before examination, establish safety criteria.

## 6 Examiner

Personnel engaged in visual examination of amusement equipment shall, in addition to complying with the relevant provisions of GB/T 34370.1, have an uncorrected or corrected visual acuity of not less than 5.0 (The decimal is recorded as 1.0). The test method shall be in accordance with GB/T 11533. The examiner shall, every 12 months, have an examination of visual acuity.

If the examination has special requirements for color discrimination, the examiner shall supplement the test of color discrimination, to ensure the necessary color discrimination.

## 7 Equipment and apparatus

**7.1** Equipment and apparatus used for visual examination include: apparatus used for direct visual examination, remote visual examination, and translucent visual examination.

**7.2** Apparatus for direct visual examination mainly includes: lighting sources and low-power magnifiers.

n) Signature and date of developers, reviewers, and approvers.

## 8.2 Verification of examination process

It shall use verification samples to verify the visual examination process specification. The verification sample may be a thin wire having a width of less than or equal to 0.8 mm or other similar artificial defects. The verification sample shall be placed on the surface of the piece under test, or on the surface with similar lighting condition, surface structure, contrast ratio, and accessibility, etc. as the piece under test; and shall be placed on the position of the area under test which is most difficult to be observed.

When the FACTORS of examination technique, observation method, surface structure of the piece under test, surface lighting requirement of the piece under test, or verification sample which have a serious influence on the examination sensitivity CHANGE, the process specification shall be re-verified.

## 8.3 Examination process card

For the visual examination of each type of equipment or workpiece, based on the actual situation, in accordance with GB/T 34370.1, this Part, and the general examination process specification, a visual examination process card shall be developed. The process card shall include at least the following:

- a) Process card number;
- b) Executive standard for examination;
- c) Information of the workpiece under test: name, model, number, material, specifications, welding type, etc.;
- d) Examination position and accessibility;
- e) Surface state of the piece under test;
- f) Examination equipment and apparatus;
- g) Lighting conditions;
- h) Examination timing;
- i) Verification of examination process;
- j) Examination procedures (steps);
- k) Signature and date of developers and reviewers.

Direct visual examination can use mirrors to improve the observation angle; and can use low-power magnifiers to distinguish small deficiencies. The selection of low-power magnifiers is carried out according to GB/T 20968.

### 9.2.3 Lighting conditions

In order to achieve the best examination results, the lighting conditions shall meet the following requirements:

- a) MAKE the direction of lighting ray reach the best angle relative to the observation point;
- b) Avoid surface glare;
- c) Optimize the color temperature of light source;
- d) USE an illumination level which is compatible with the surface reflected light;
- e) At least 500 lx of illumination shall be achieved on the surface of the piece under test. For areas which must be carefully observed or are found to be abnormal and require further observation and examination, at least 1000 lx of illumination shall be achieved.

### 9.2.4 Visual examination of welded joint

For newly-manufactured welded joints, attention shall be paid to solder skips, cracks, burn-through, incomplete penetration, porosity, collapse, severe undercuts, incompletely filled weld, slag inclusions, and other appearance deficiencies. Special attention shall be paid to the deficiencies which may arise from welding of dissimilar materials and special welding processes. See Appendix A for typical visual deficiencies in steel fusion welded joints. Appendix B gives pictures for the typical visual deficiencies.

For welded joints in service, it shall focus on important welded joints, pay attention to cracking (arc starting place, alternating load, stress concentration), corrosion, rust, paint peeling positions. Especially craters, pores, and poor molding positions which exist in the manufacturing process shall be examined.

### 9.2.5 Visual examination of parts

#### 9.2.5.1 Bolt

Observe the bolts for bending deformation, damage, wear, and rust. USE a 10 times magnifier to observe whether the bolt, especially bolt head and thread root, has cracks.

**9.3.2** Remote visual examination can be performed using mirrors, telescopes, endoscopes, optical fibers, cameras, video systems, automatic systems, robots, and other suitable visual aids.

**9.3.3** Remote visual examination shall have at least the resolution comparable to direct visual examination. If necessary, it shall verify whether the remote visual examination system can meet the requirements for examination work.

#### **9.4 Translucent visual examination**

**9.4.1** Translucent visual examination requires a directional light source of sufficient intensity to uniformly pass through the position and area under test, to meet the requirements for examination of deficiencies in transparent and semitransparent materials.

**9.4.2** The ambient ray must be recognized in advance. The reflected light or surface glare from the surface under test shall be smaller than the applied transillumination light passing through the position and area under test.

#### **9.5 Examination records**

The visual examination records shall include at least the contents specified in 8.3 and Clause 11.

### **10 Result evaluation**

#### **10.1 General principles**

**10.1.1** All examination results shall be evaluated in accordance with the relevant regulations, executive standards, and (or) contract requirements of amusement equipment.

**10.1.2** The examination process specification of this Part specifies minimum examination requirements; but does not limit the more demanding examinations which may be performed during production and use.

**10.1.3** When the abnormality is found by visual examination, and the nature and influence of the abnormality cannot be judged, other testing methods such as thickness measurement, hardness measurement, metallography, magnetic particle, or penetration may be used to detect and evaluate the abnormal position.

#### **10.2 Welded joint**

**10.2.1** All overlaps and slags, etc. of welded joints shall be removed.



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