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Replaces JB/T 10854-2008

Horizontal Continuous Cast Iron Bars

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Introduction

This standard is drafted in accordance with the provisions of GB/T 1.1—2009.

It supersedes JB/T 10854-2008, "Horizontal Continuous Cast Iron Bars," and includes the following major technical changes compared to JB/T 10854-2008:

- New grades of cast iron profiles have been added (see Table 1).
- The hardness range for grey cast iron profiles has been expanded (see Table 2).
- The specified yield strength and hardness range for ductile cast iron profiles have been introduced (see Table 3).
- Impact absorption energy indices have been added for certain grades (see Table 4).
- Defect depth limits for cast iron profiles have been added, while the surface defect depth limits have been removed (see Table 5).
- Tolerance ranges for the sectional dimensions of cast iron profiles have been revised (see Tables 8 and 9, corresponding to Table 5 in the 2008 version).

This standard is proposed by the China Machinery Industry Federation.

It is managed by the National Technical Committee on Foundry Standardization (SAC/TC54).

The lead drafting organization for this standard is Xi'an University of Technology.

Contributing organizations include Jiangsu Hualong Cast Iron Profiles Co., Ltd., Henan Guotai Mechanical Casting Co., Ltd., Ningbo Tuotie Machinery Co., Ltd., and Shaanxi Huaan Cast Iron Profiles Co., Ltd.

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Previous editions of this standard include:

- JB/T 10854—2008



Horizontal Continuous Cast Iron Bars

1. Scope

This standard defines the classification, grades, technical requirements, testing methods, inspection rules, marking, quality certification, packaging, storage, and transportation of horizontal continuous cast grey cast iron profiles and ductile cast iron profiles.

It applies to cast iron profiles (referred to as "cast iron profiles" hereafter) produced using the horizontal continuous casting method, with diameters ranging from \varnothing 25 mm to \varnothing 400 mm, as well as square, rectangular, and other specially shaped sections of similar sizes.

2. Normative References

The documents listed below are essential for the application of this standard. For references with specific dates, only the version cited applies. For references without dates, the most recent version, including any amendments, applies.

- GB/T 228.1: Metallic Materials - Tensile Testing - Part 1: Method for Room Temperature Testing
- GB/T 229: Metallic Materials - Charpy Pendulum Impact Test Method
- GB/T 231.1: Metallic Materials - Brinell Hardness Test - Part 1: Test Method
- GB/T 1348: Ductile Iron Castings
- GB/T 5612: Designation Method for Cast Iron Grades
- GB/T 7216: Metallographic Examination of Grey Cast Iron
- GB/T 9439: Grey Iron Castings
- GB/T 9441- 2009: Metallographic Examination of Ductile Iron
- JB/T 7945.1: Test Methods for Mechanical Properties of Grey Cast Iron

3. Classification and Grades

3.1 Classification

Cast iron profiles are classified as either grey cast iron profiles or ductile cast iron profiles, based on the form of graphite in their metallographic structure.

3.2 Grades

The method for designating the grades of cast iron profiles must comply with the requirements of GB/T 5612. For grey cast iron profiles, the grades are determined by the tensile strength of test bars taken from grey cast iron profiles with a diameter no greater than \varnothing 30 mm. These profiles are classified into five grades (see Table 1). For ductile cast iron profiles, the grades are based on the tensile strength and elongation after fracture of test bars taken from ductile cast iron profiles with a diameter no greater than \varnothing 60 mm. These profiles are classified into eight grades (see Table 1).

Table 1 Grades of Cast Iron Profiles

Grades of Grey Cast Iron Profiles	Grades of Ductile Cast Iron Profiles
HT/LZ200	QT/LZ400-18
HT/LZ225	QT/LZ400-18R
HT/LZ250	QT/LZ400-18L
HT/LZ275	QT/LZ450-10



Table 1 Grades of Cast Iron Profiles (Continued)

Grades of Grey Cast Iron Profiles	Grades of Ductile Cast Iron Profiles
HT/LZ300	QT/LZ500-7
	QT/LZ550-5
	QT/LZ600-3
	QT/LZ700-2

Note 1: "HT" and "QT" are abbreviations derived from the pinyin initials of "grey iron" and "ductile iron," respectively, while "LZ" represents the initials for "continuous casting" in pinyin.

Note 2: The letter "R" signifies that the grade has impact performance requirements at room temperature (23 ° C), and the letter "L" indicates that the grade has impact performance requirements at low temperatures (-20° C).

4. Technical Requirements

4.1 Chemical Composition

The chemical composition of cast iron profiles is typically determined by the manufacturer and is not required as a criterion for acceptance. However, if the customer has specific requirements, these should be mutually agreed upon by the supplier and the customer.

4.2 Mechanical Properties

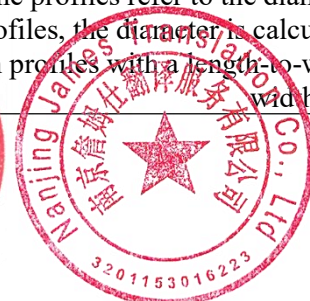
4.2.1 Mechanical Properties of Grey Cast Iron Profiles

For grey cast iron profiles, the mechanical properties should conform to the specifications in Table 2, depending on the diameter or cross-sectional size within the same grade. Generally, tensile strength is used as the primary acceptance criterion.

Table 2 Mechanical Properties of Grey Cast Iron Profiles

Grade	Dimensions of cast iron profiles ^a mm											
	D≤30		30<D≤40		40<D≤80		80<D≤160		160<D≤300		D>300	
	Tensile strength Rm MPa (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Brinell hardness HBW
HT/LZ200	200	150~ 224	190	147 219	170	45 211	150	140~ 193	140	135~ 193	130	132~ 189
HT/LZ225	225	170~ 234	200	160~ 224	190	147~ 219	170	143~ 209	155	140~ 202	145	138~ 204
HT/LZ250	250	180~ 245	225	170~ 231	210	154~ 229	190	146~ 219	170	145~ 211	160	143~ 209
HT/LZ275	275	190~ 250	240	180~ 241	230	160~ 239	195	155~ 229	185	150~ 219	175	148~ 215
HT/LZ300	300	200~ 250	270	189~ 244	250	170~ 241	220	164~ 236	210	166~ 231	190	160~ 226

^a The dimensions of the profiles refer to the diameter for round cast iron profiles. For rectangular and irregularly shaped cast iron profiles, the diameter is calculated based on an equivalent circular cross-sectional area. For rectangular cast iron profiles with a length-to-width ratio greater than 5, the dimension is defined as twice the width of the cross-section.



4.2.2 Mechanical Properties of Ductile Cast Iron Profiles

For ductile cast iron profiles of the same grade but with varying diameters or cross-sectional sizes, the mechanical properties, including tensile strength, yield strength, elongation after fracture, and Brinell hardness, must comply with the specifications in Table 3. Typically, tensile strength and elongation after fracture are used as the main criteria for acceptance.

Table 3 Mechanical Properties of Ductile Cast Iron Profiles

Grade	Dimensions of profiles ^a mm											
	D≤60				60<D≤120				120<D≤400			
	Tensile strength Rm MPa (min)	Specified plastic elongation Rp0.2 MPa (min)	Elongation after fracture A % (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Specified plastic elongation Rp0.2 MPa (min)	Elongation after fracture A % (min)	Brinell hardness HBW	Tensile strength Rm MPa (min)	Specified plastic elongation Rp0.2 MPa (min)	Elongation after fracture A % (min)	Brinell hardness HBW
QT/LZ400-18	400	250	18	130~175	400	250	16	130~175	380	240	14	130~175
QT/LZ400-18R	400	250	18	130~175	400	250	16	130~175	380	240	14	130~175
QT/LZ400-181	400	240	18	130~175	400	240	16	130~175	380	230	4	130~175
QT/LZ450-10	450	310	10	170~209	430	300	10	160~209	400	270	8	160~209
QT/LZ500-	500	320		180~229	460	310	7	170~219	430	290	6	160~219
QT/LZ550-5	550	350	5	187~241	530	340	5	180~241	510	320	4	180~231
QT/LZ600-3	600	370	3	207~255	600	360	2	195~246	560	340	2	192~241
QT/LZ700-2	700	420	2	221~275	700	400	2	210~265	660	390	2	207~255

^a The dimensions of cast iron profiles refer to the diameter for round profiles. For rectangular and irregularly shaped profiles, the diameter is calculated based on an equivalent circular cross-sectional area (known as the equivalent diameter). In the case of rectangular profiles with a length-to-width ratio greater than 5, the dimension is taken as twice the width of the cross-section.

4.2.3 Impact Test for Ductile Cast Iron Profiles

The impact absorption energy at room temperature for ductile cast iron profiles QTLZ400-18R and the impact absorption energy at low temperatures for QTLZ400-18L are provided in Table 4.

Table 4 Impact Absorption Energy for V-Notch Test Bars

Grade	Profile Diameter or Equivalent Diameter (mm)	Minimum Impact Absorption Energy K/J			
		Room Temperature (23±5)°C		Low Temperature (-20±2)°C	
		Average Value of Three Test Bars	Single Value	Average Value of Three Test Bars	Single Value
QT/LZ400-18R	D≤120	14	11		
	120<D≤400	12	9		
QT/LZ400-18L	D≤120			12	9
	120<D≤400			10	7



4.3 Metallographic Structure

4.3.1 The metallographic structure of grey cast iron profiles is generally not used as a criterion for acceptance. However, if the customer has specific requirements, it should be evaluated in accordance with GB/T 7216. The sampling location, inspection items, and criteria should be mutually agreed upon by both the supplier and the customer.

4.3.2 For ductile cast iron profiles, the graphite should primarily be in spherical form, with a spheroidization grade no less than grade 4, as defined in GB/T 9441—2009. Any special requirements should be agreed upon by both parties.

4.3.3 The spheroidization grade, matrix structure, and other evaluation items should be assessed according to GB/T 9441—2009.

4.3.4 Cast iron profiles may contain up to 5% (by mass) of carbides.

4.3.5 The sampling location, inspection items, and criteria for metallographic test blocks should be agreed upon by the supplier and the customer.

4.4 Surface Quality

4.4.1 Surface Casting Marks

Surface casting marks on cast iron profiles refer to raised streaks caused by damage to the graphite sleeve. The permissible height of these raised marks is as follows: for cast iron profiles with a diameter or equivalent diameter of 100 mm or less, the height must not exceed 1 mm; for profiles with a diameter or equivalent diameter greater than 100 mm, the height must not exceed 1.5 mm. Profiles that exceed these limits may be corrected by finishing processes used by the manufacturer.

4.4.2 Defect Depth

The defect depth refers to the machining depth required to remove surface defects such as cracks or knots. The allowable machining depth for defect removal is specified in Table 5.

Table 5 Allowable Machining Depth for Defect Removal of Cast Iron Profiles (in millimeters)

Diameter D or Side Length B	Minimum Machining Depth on One Side	
	Round Cast Iron Profiles	Rectangular Cast Iron Profiles
D (or B) ≤ 50	2.0	2.5
50 < D (or B) ≤ 100	3.0	3.5
100 < D (or B) ≤ 200	4.0	4.5
200 < D (or B) ≤ 300	6.0	6.5
300 < D (or B) ≤ 400	7.0	7.5

4.5 Dimensional Tolerances

4.5.1 Permissible Bending Deformation

The allowable bending deformation of cast iron profiles must meet the requirements outlined in Table 6. If the customer has specific needs, these should be agreed upon by both the supplier and the customer, with the manufacturer allowed to use corrective methods to achieve compliance. For lengths not covered in Table 6, the bending deformation may be estimated through interpolation or extrapolation.

Table 6 Maximum Allowable Bending Deformation for Cast Iron Profiles (in millimeters)

Cast Iron Profiles Length	1000	2000	3000
Maximum Bending Deformation	2.0	4.0	6.0

4.5.2 Standard Length and Tolerances for Supply

The standard lengths and corresponding tolerances for cast iron profiles are provided in Table 7.



Table 7 Standard Length and Tolerances for Supplied Cast Iron Profiles (in millimeters)

cast iron profiles 长度	1000	2000	3000
公差	+20 0	+30 0	+30 0

4.5.3 Dimensional Tolerances for the Cross-Section of Round Cast Iron Profiles

The cross-sections of round cast iron profiles may have slight dimensional variations. The maximum permissible dimensional tolerances for the cross-sections of the cast blanks are specified in Table 8.

Table 8 Maximum Dimensional Tolerances for the Cross-Section of Round Cast Iron Profiles (in millimeters)

Nominal Diameter D	Dimensional Tolerance
$D \leq 50$	1.5
$50 < D \leq 100$	2.0
$100 < D \leq 150$	3.0
$150 < D \leq 200$	4.5
$200 < D \leq 250$	6.0
$250 < D \leq 300$	7.0
$300 < D \leq 400$	8.0

4.5.4 Dimensional Tolerances for the Cross-Section of Square and Rectangular Cast Iron Profiles

The dimensional tolerances for the cross-sections of square and rectangular cast iron profiles are specified in Table 9.

Table 9 Permissible Dimensional Tolerances for the Cross-Section of Square and Rectangular Cast Iron Profiles (in millimeters)

Side Length	≤ 100	$>100 \sim 150$	$>150 \sim 300$	$>300 \sim 400$
Tolerance	+1.5 0	+2.0 0	+2.5 0	+4.0 0

5 Test Methods

5.1 Preparation of Test Samples

5.1.1 Tensile Test Samples and Sampling Locations

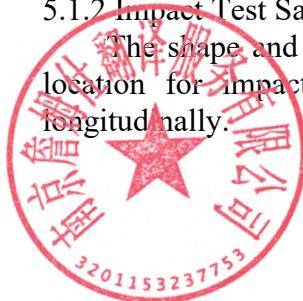
The shape and dimensions of tensile test samples for grey cast iron profiles must follow the standards set by GB/T 9439, while those for ductile cast iron profiles must adhere to the requirements of GB/T 1348.

For round profiles with a diameter of 45 mm or less, or for rectangular and irregular profiles with an equivalent diameter of 45 mm or less, samples should be taken longitudinally from the center of the profile. For round profiles with a diameter greater than 45 mm, samples should be taken at a quarter of the diameter ($D/4$). For rectangular profiles with an equivalent diameter greater than 45 mm, samples should be taken at a quarter of the diagonal length ($L/4$). The sampling locations for irregular profiles should be agreed upon by the supplier and the customer.

Note: D represents the diameter of round profiles, and L represents the diagonal length of rectangular profiles.

5.1.2 Impact Test Samples and Sampling Locations

The shape and dimensions of impact test samples must comply with GB/T 1348. The sampling location for impact test samples is the same as for tensile test samples, with samples taken longitudinally.



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5.1.3 Hardness Test Samples and Sampling Locations

5.1.3.1 If hardness is required as an acceptance criterion, the testing frequency and locations should be agreed upon by the supplier and the customer. The hardness ranges for grey cast iron profiles are specified in Table 2, and for ductile cast iron profiles in Table 3.

5.1.3.2 Preparation of hardness test samples: Samples should be cut from the profile perpendicular to the axis. The thickness of the samples and the testing method must comply with GB/T 231.1.

5.2 Tensile Testing

Tensile testing for grey cast iron profiles must follow JB/T 7945.1, while ductile cast iron profiles should be tested according to GB/T 228.1.

5.3 Hardness Testing

Brinell hardness tests should be performed according to GB/T 231.1.

5.4 Impact Testing

Impact tests should be conducted according to GB/T 229.

5.5 Metallographic Examination

Metallographic testing for grey cast iron profiles should follow GB/T 7216, and for ductile cast iron profiles, it should follow GB/T 9441.

5.6 Surface Quality and Dimensional Tolerances

The height of surface casting marks and the cross-sectional dimensions of cast iron profiles should be measured using calipers, while length dimensions should be measured with a steel tape. For defect depth, samples should be taken from typical defect areas, and the depth should be determined by comparing the dimensions before and after machining to remove the defects.

6. Inspection Rules

6.1 Batch Definition

When production is stable, cast iron profiles of the same specifications (size and grade) produced continuously during one shift are considered one inspection batch, identified by a furnace number. If less than one shift's worth is produced, it is still treated as a single batch. At least one set of three tensile test samples must be taken from each furnace batch. One sample will be tested, and the remaining two will be kept for possible retesting. Hardness and metallographic samples should also be prepared along with the tensile test samples.

6.2 Evaluation and Retesting of Results

For mechanical properties testing, evaluation, and retesting, grey cast iron profiles must follow the standards in GB/T 9439, and ductile cast iron profiles must follow GB/T 1348.

7. Marking and Quality Certificate

7.1 Marking

Cast iron profiles must be marked with the manufacturer's identification. The location, size, and method of marking should be agreed upon by both the supplier and the customer.

7.2 Quality Certificate



When cast iron profiles are dispatched from the factory, they must be accompanied by a quality certificate, signed and stamped by the manufacturer's quality inspection department. The certificate should include the following information:

- a) Manufacturer's name or trademark;
- b) Type and specifications of the cast iron profiles;
- c) Material grade;
- d) Relevant inspection results;
- e) Manufacturing date (or identification number) or batch number.

8. Packaging, Storage, and Transportation

8.1 Packaging and Storage

After inspection and approval, cast iron profiles should be clearly marked with the material grade, specifications, and furnace number, and stored appropriately. For long-distance transportation, the profiles should be packaged or bundled as agreed between the supplier and the customer.

8.2 Transportation

The method of transporting cast iron profiles should be mutually agreed upon by the supplier and the customer.



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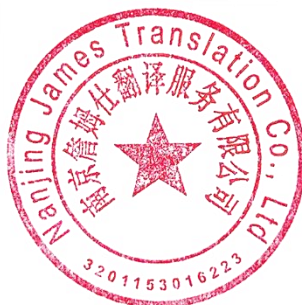
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