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Couplers for Rebar Mechanical Splicing

钢筋机械连接用套筒

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Couplers for Rebar Mechanical Splicing

1 Scope

This Standard stipulates the terms, definitions, classification, types and marking, requirements, test methods, inspection rules, mark, packaging, transportation and storage of couplers for rebar mechanical splicing.

This Standard is applicable to parallel threaded coupler, taper threaded coupler and coupler for squeezing sleeve splicing of rebars for rebar mechanical splicing in concrete structure. The couplers described in this Standard are applicable to the splicing of all types of rebars with the diameter of 12 mm ~ 50 mm, which comply with the stipulations in GB 1499.2 and GB 13014. Couplers for the splicing of plain round rebars, stainless steel rebars and foreign rebars may take this Standard as a reference.

2 Normative References

The following documents are indispensable to the application of this document. 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 197 *General Purpose Metric Screw Threads - Tolerances*

GB/T 228.1 *Metallic Materials - Tensile Testing - Part 1: Method of Test at Room Temperature*

GB/T 230.1 *Metallic Materials - Rockwell Hardness Test - Part 1: Test Method (scales A, B, C, D, E, F, G, H, K, N, T)*

GB/T 699 *Quality Carbon Structural Steels*

GB/T 700 *Carbon Structural Steels*

GB/T 702 *Hot-rolled Steel Bars - Dimensions, Shape, Weight and Tolerances*

GB 1499.2 *Steel for the Reinforcement of Concrete - Part 2: Hot Rolled Ribbed Bars*

GB/T 2975 *Steel and Steel Products - Location and Preparation of Samples and Test Pieces for Mechanical Testing*

GB/T 3639 *Seamless Cold-drawn or Cold-rolled Steel Tubes for Precision Applications*

GB/T 8162 *Seamless Steel Tubes for Structural Purposes*

GB/T 9174 *General Specification for Transport Packages of General Cargo*

GB 13014 *Quenching and Self-tempering Ribbed Bars for the Reinforcement of Concrete*

GB/T 17395 *Dimensions, Shapes, Masses and Tolerances of Seamless Steel Tubes*

JGJ 107 *Technical Specification for Mechanical Splicing of Steel Reinforcing Bars*

YB/T 5222 *Quality Hot Rolled and Forged Carbon Structural Steel Round Tube Blank*

3 Terms and Definitions

The following term and definition are applicable to this Standard.

3.1 Rebar Mechanical Splicing

Rebar mechanical splicing refers to a splicing method which transmits force in one steel reinforcing bar to another steel rebar through the mechanical occlusion effect between the rebar and the coupler, or the load-bearing effect on the end face of the steel rebar.

3.2 Coupler

Coupler refers to steel sleeve for mechanical splicing of steel rebars; it may transmit axial tensile force or pressure of steel rebars.

3.3 Threaded Coupler

Threaded coupler refers to a coupler which may be put in threaded connection with steel rebars and has threaded inner hole.

3.4 Parallel Threaded Coupler

Parallel threaded coupler refers to threaded coupler which has parallel threaded inner hole.

3.5 Parallel Threaded Coupler for Splicing Rebars with Upsetting End

Parallel threaded coupler for splicing rebars with upsetting end refers to parallel threaded coupler which may be spliced with the upsetting end of steel rebars.

3.6 Parallel Threaded Coupler for Splicing Rebars with Rib Stripped before Rolling of Threads

Parallel threaded coupler for splicing rebars with rib stripped before rolling of threads refers to parallel threaded coupler which may be spliced with rib stripped before rolling of threads on the end of steel rebars.

3.7 Parallel Threaded Coupler for Splicing Rebars with Threads Roll on to Rebar End

Parallel threaded coupler for splicing rebars with threads roll on to rebar end refers to parallel threaded coupler which may be spliced with threads roll on to rebar end.

3.8 Taper Threaded Coupler

Taper threaded coupler refers to a threaded coupler which may be spliced with taper threads of steel rebars and has taper threaded inner hole.

3.9 Coupler for Squeezing Sleeve Splicing of Rebars

Coupler for squeezing sleeve splicing of rebars refers to a coupler which has unthreaded inner hole and is applied to the squeezed splicing of ribbed rebars.

3.10 Standard Coupler for Parallel Threaded Splicing of Rebars

Standard coupler for parallel threaded splicing of rebars refers to a coupler which manifests the same dextral parallel thread in the full length.

3.11 Standard Coupler for Taper Threaded Splicing of Rebar

Standard coupler for taper threaded splicing of rebar refers to a coupler whose both ends manifest the same dextral taper thread.

3.12 Standard Coupler for Squeezing Sleeve Splicing of Rebars

Standard coupler for squeezing sleeve splicing of rebars refers to a coupler which manifests the same inner diameter and wall thickness for the squeezing of standard splices in the full length.

3.13 Coupler with Different Inner Diameter

Coupler with different inner diameter refers to a coupler whose inner diameters on both ends are different and are applied to the splicing of steel rebars with different diameters.

3.14 Threaded Coupler with Left and Right Hand Thread

Threaded coupler with left and right hand thread refers to a threaded coupler which has the same thread specifications but the opposite rotation directions on both ends.

3.15 Threaded Coupler with One Slope at Thread End

Threaded coupler with one slope at thread end refers to a parallel threaded coupler which has an internal chamfer for the centering of steel rebars on one end and extended length than the standard coupler.

3.16 Thread Plug Gauge

with different inner diameter, used for the splicing with Grade-500 rebars with the diameter of 20 mm / 25 mm shall be expressed in: GY 5 20 / 25.

5 Requirements

5.1 Raw Materials

5.1.1 Threaded coupler

The raw materials of threaded coupler shall comply with the following requirements:

a) The raw materials of coupler should adopt (designation: No. 45) round steel, seamless steel tubes for structure, whose shape and mechanical properties shall comply with the stipulations n GB/T 699, GB/T 8162 and GB/T 17395.

b) When the raw materials of coupler must adopt (designation: No. 45) cold-drawn or cold-rolled precision seamless steel tubes, annealing treatment shall be conducted and comply with the relevant stipulations in GB/T 3639; the tensile strength shall not be more than 800 MPa; the elongation after break δ_5 should not be less than 14%. The raw materials of cold-drawn or cold-rolled precision seamless steel tubes of No. 45 steel shall adopt tube blank steel with the designation of No. 45 and comply with the stipulations in YB/T 5222.

c) In terms of coupler which is molded through various cold-machining processes, annealing treatment should be conducted. In addition, in the design of the coupler, the increased strength through cold machining shall not be utilized to reduce the cross-sectional area of the coupler.

d) The raw materials of coupler may select other steel products which are proved to be compliant with the stipulations of splice performance in JGJ 107 through splice type inspection.

e) In terms of coupler that needs to be welded with steel products like sectional steel, its raw materials shall comply with the requirements of weldability.

5.1.2 Coupler for squeezing

The raw materials of coupler for squeezing shall select appropriate calendering steel products in accordance with the designation of steel rebars to be spliced. Quality carbon structural steels with the designation of No. 10 and No. 20, or, carbon structural steels with the designation of Q235 and Q275 should be selected. The shapes and mechanical properties shall comply with the stipulations in GB/T 700, GB/T 702 and GB/T 8162; the actually tested mechanical properties shall comply with the stipulations in Table 1.

When coupler is applied to steel rebar splice which has requirements for fatigue performance, its fatigue resistance performance shall comply with the stipulations in JGJ 107.

5.5 Manufacture of Coupler

5.5.1 Quality control

The quality control of coupler manufacture shall comply with the following requirements:

a) Manufacturing enterprise of coupler shall issue an enterprise standard which includes the content of product specifications, types, dimensions and tolerances, quality control methods, inspection items and systems, and disqualified product processing rules; submit it to quality and technology supervision department for reference.

b) Manufacturing enterprise of coupler should obtain valid GB/T 19001 / ISO 9001 quality management system certificate and construction engineering product certificate.

5.5.2 Inspection of products being manufactured

Inspection items of couplers being manufactured shall at least include: external diameter, internal diameter, length and thread dimensions.

5.5.3 Traceability

The traceability of coupler manufacture shall comply with the following requirements:

a) Coupler shall have imprinted mark on its external surface in accordance with the stipulations in 8.1;

b) The batch No. of couplers shall be consistent with records, such as: raw material inspection report, delivery or outbound voucher, product inspection record, product certificate and product quality certificate, etc.;

c) The storage of relevant records of coupler batch No. shall not be less than 3 years.

5.6 Anti-rust

Before exiting factory, couplers shall have anti-rust measures.

6 Test Methods

6.1 Raw Materials

6.1.1 Sampling

The inspection of the mechanical properties of raw materials of coupler shall comply with the following requirements:

a) Sampling shall be conducted on materials which have passed the inspection of shapes.

b) In the inspection of the mechanical properties of raw materials of coupler, raw materials of the same designation, the same specification and the same furnace (batch) No. shall be considered as one batch for acceptance inspection. From each batch, at least 2 samples shall be taken, and each sample shall be taken from different roots of raw materials. When the mechanical properties of each sample comply with the requirements in 5.1.1 and 5.1.2, then, this batch of materials shall be determined as qualified; if the mechanical properties of one and more than one samples fail to comply with the requirements, then, this batch of materials shall be determined as disqualified.

c) In the hardness test of the raw materials of coupler for squeezing, raw materials of the same designation, the same specification and the same furnace (batch) No. shall be considered as one batch for acceptance inspection. In accordance with 10% count of materials, conduct spot check from each batch; take 1 sample from each count. Inspect 3 points on each sample. When the tested average hardness value of each sample satisfies the hardness requirements in product design and the stipulations in Table 2, then, this batch of materials shall be determined as qualified in hardness; if the average hardness of one and more than one samples fails to comply with the requirements, then, this batch of materials shall be determined as disqualified in hardness.

7.2 Coupler

7.2.1 Classification

There are two types of coupler inspection: exit-factory inspection and type inspection.

7.2.2 Exit-factory inspection

The exit-factory inspection of coupler shall comply with the following requirements:

a) Inspection items: exit-factory inspection items of coupler shall include two types: the inspection of shapes, marks and dimensions; the inspection of tensile strength.

1) Inspection items of shapes, marks and dimensions shall comply with the stipulations in Table 8.

inspection of shapes, marks and dimensions in 1) of b) may be reduced from 10% to 5%.

7.2.3 Type inspection

The type inspection of coupler shall comply with the following requirements:

a) Under the following circumstances, type inspection of coupler shall be conducted:

1) When type approval of coupler products is required.

2) When there are changes in the materials, processes and specifications of coupler.

3) When type inspection report was issued over 4 years ago.

b) Inspection items include:

1) Marks, shapes and dimensions of coupler.

2) Tension of steel rebar test pieces.

3) Unidirectional tension of test piece of splice.

4) Repeated tension and compression of test piece of splice through high stress.

5) Repeated tension and compression of test piece of splice through large deformation.

c) Steel rebars used for type inspection shall comply with the stipulations of relevant standards on steel rebar.

d) Inspection rules include:

1) In terms of each type, grade, specification, material and process of rebar mechanical splice, standard splice shall be selected for type inspection; the number of test pieces of splice shall not be less than 9. Among them, the number of unidirectional tension test pieces shall not be less than 3; the number of repeated tension and compression test pieces through high stress shall not be less than 3; the number of repeated tension and compression test pieces through large deformation shall not be less than 3. Meanwhile, take another 3 rebar test pieces to conduct the tensile strength test. All the test pieces should be taken from the same steel rebar.

2) Test pieces of threaded splice used for type inspection shall be delivered to the inspection organization in bulk items. The type inspection

value of 3 test pieces shall comply with the stipulations in Table 7.

f) Type inspection shall be conducted by an inspection institution approved by national or provincial competent department. In accordance with the format in Appendix C, an inspection report and evaluation conclusion shall be issued.

8 Marking, Packaging, Transportation and Storage

8.1 Marking

8.1.1 Composition

On the surface of coupler, distinct and durable marking shall be imprinted. The marking shall include marks, code of manufacturer and manufacture batch No. that allows traceability to the performance of raw materials that comply with the stipulations in 4.3. The code of manufacturer may be characters or patterns. Manufacture batch No. may be figures, or a combination of figures and symbols.

8.1.2 Arrangement

Marking on the surface of coupler may be arranged in a single row or in two rows. When it is arranged in two rows, name code, character code and main parameter code shall be arranged in one row.

8.1.3 Examples of marking

Example 1:

Parallel threaded coupler for splicing rebars with rib stripped before rolling of threads, with left and right hand thread, used for the splicing with HRB500 steel rebar coupler with the diameter of 25 mm, code of manufacturer: ××××, manufacture batch No.: 11211, shall be expressed in: BZ 5 25 ×××× 11211.

Example 2:

Taper threaded, standard type, used for the splicing with HRB400 steel rebar coupler with the diameter of 14 mm, code of manufacturer: ××××, manufacture batch No.: 11211, shall be expressed in: ZB 4 25 ×××× 11211.

Example 3:

Parallel threaded coupler for splicing rebars with threads roll on to rebar end, with different inner diameter, used for the splicing with HRB400 steel rebar coupler with the diameter of 20 mm / 25 mm, code of manufacturer: ××××, manufacture batch No.: 11211, shall be expressed in: GY 4 22/25 ×××× 11211.

8.2 Packaging

8.2.1 Packaging materials and surface marks

Couplers exiting factory shall adopt cardboard boxes, woven bags or other reliable bags. On the surface of the packaging materials, indicate the name of product, type of coupler, quantity, applicable rebar specifications, date of manufacture, manufacture batch No., and name, address and contact information of manufacturer, etc.

8.2.2 Requirements

The packaging of coupler shall comply with the stipulations in GB/T 9174.

8.2.3 Product certificate and quality certificate

When couplers exit factory, a product certificate shall be attached inside the packaging. Meanwhile, a product quality certificate shall be submitted to the users.

a) Product certificate shall include the following content:

-- Name of manufacturer;

-- Name and type of product;

-- Applicable steel rebar designations, splice performance grades;

-- Manufacture batch No., date of manufacture;

-- Signature of quality inspector.

b) Product quality certificate shall include the following content:

-- Type;

-- Type and specification;

-- Applicable rebar strength grades;

-- Manufacture batch No.;

-- Implemented standard;

-- Dimensional inspection items and parameters, inspection conclusion;

-- Quality inspection seal;

-- Name, address and contact information of manufacturer.

Please refer to Appendix D and Appendix E for the formats of product certificate and product quality certificate.

8.3 Transportation and Storage

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