

DISCLAIMER: This translation may be used for reference purposes only. This English version is not an official translation of the original Japanese document. In cases where any differences occur between the English version and the original Japanese version, the Japanese version shall prevail. This translation is subject to change without notice. TEPCO Power Grid, Inc. shall accept no responsibility or liability for damage or loss caused by any error, inaccuracy, misunderstanding, or changes with regard to this translation. Any use for other purposes is strictly prohibited. TEPCO Power Grid, Inc.

## 6E-004 STEP BOLT (C RANK)



Dec. 1962	Established
June 15, 2012	(Revision 05)
July 17, 2012	Enforcement

Distribution Department  
TEPCO Power Grid, Incorporated

## 1. Scope

This product shall be used for the scaffolding for reinforced concrete poles, steel-pipe columns for coupled poles, and steel-pipe low poles.

## 2. Related standards

### 2.1 Japanese Industrial Standards

- (1) JIS G 3101 (2010) Rolled steels for general structure
- (2) JIS G 3507-1 (2010) Carbon steels for cold heading-Part-1: Wire rods
- (3) JIS G 3507-2 (2005) Carbon steels for cold heading-Part-2: Wires
- (4) JIS H 0401 (2007) Test methods for hot dip galvanized coatings
- (5) JIS H 8641 (2007) Hot dip galvanized coatings

### 2.2 TEPCO related standards

- (1) 6D-008 Reinforced concrete poles
- (2) 6D-009 Concrete low poles
- (3) 6D-010 Small-diameter reinforced concrete poles
- (4) 6D-021 Steel-pipe columns for coupled poles
- (5) 6D-022 Steel-pipe low poles
- (6) 6D-024 Steel-pipe columns for coupled low poles

### 2.3 Safety equipment standard

- (1) A60-DT Safety rope

## 3. Structure and materials

### 3.1 General matters

- (1) This product shall be able to easily fit to the scaffolding equipment for those specified in TEPCO specifications “6D-8 Reinforced concrete poles”, “6D-21 Steel-pipe columns for coupled poles” and “6D-22 Steel-pipe low poles”.
- (2) The product shall be shaped so that the clip fastener of “A60-DT Safety rope” does not come off easily.
- (3) The shaft shall be treated with anti-slip finishing and shall have no scratches, rust, cracks or other flaws.

### 3.2 Shape and dimensions

The shape and dimensions shall be in accordance with the attached drawing as a standard. For areas where no particular values are specified in the attached drawing, the shape and dimensions shall be within the range causing no practical harm.

### 3.3 Provisions on principal structural part

- (1) Material

For the material, use a steel material specified in JIS that satisfies the functional characteristics of the product.

[Explanation]

The “steel material specified in JIS that satisfies the functional characteristics of the product” includes, based on the

conventional knowledge, SWCH10R specified in JIS G 3507.

(2) Surface treatment

For the main body of step bolt, apply hot dip galvanized coating specified in JIS H 8641 (Hot dip galvanized coatings) over the entire surface, except when using a steel material having an anticorrosion property equal to or higher than hot dip galvanized coating.

## 4. Performance

The performance of the product shall be in accordance with Table 1 when the tests described in Chapter 6 are conducted.

Table 1 Performance

Item		Required performance	Test item
Appearance		There shall be no practically harmful scratches, cracks or other practical problems.	6.1
Shape/dimensions		Shall be in accordance with the shape and dimensions specified in the attached drawing.	6.2
Combination		Shall be able to robustly and securely fit to the scaffolding equipment, and shall be designed so that the clip fastener of TEPCO safety equipment “A60-DT Safety rope” does not come off easily.	6.3
Strength performance	Bend test	When a standard load of 1,960N is applied for 1 minute, the displacement of the end of step bolt shall be 5 mm or less.	6.4
	Tensile test	The breaking load shall be 29,400N or more.	
Impact drop performance		Sandbags shall not drop due to deformation or breakage of step bolt.	6.5
Zinc hot dip galvanizing		Shall be 350 g/m <sup>2</sup> or more, except the thread portion.	6.6

## 5. Indication

Indicate the abbreviated name of the manufacturer at the head of the bolt in such a manner that the indication is not easily removable.

## 6. Test method

### 6.1 Appearance inspection

Conduct appearance-related checks by visual observation or touch.

### 6.2 Shape/dimensional inspection

Conduct inspections on the structure, shape, dimensions and finish, by visual observation or using appropriate measuring apparatuses.

### 6.3 Combination test

Check that the completed product fits to the scaffolding equipment specified by TEPCO.

## 6.4 Strength test

### (1) Bend test

Attach the step bolt to scaffolding equipment or a jig, as shown in Figure 1. Then apply a vertical load of 1,960N, for 1 minute, to a point 90 mm away from the surface of the scaffolding equipment or jig. After 1 minute, remove the load, and then check the appearance and measure the residual displacement.

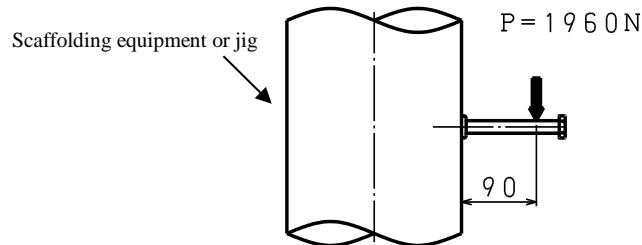


Figure 1 Bend test

### (2) Tensile test

As shown in Figure 2, apply a tensile force in the axial direction to pull the head of the step bolt against the thread portion.

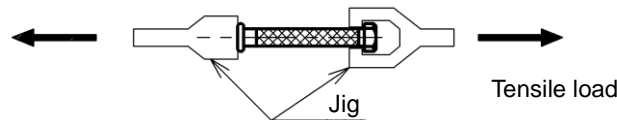
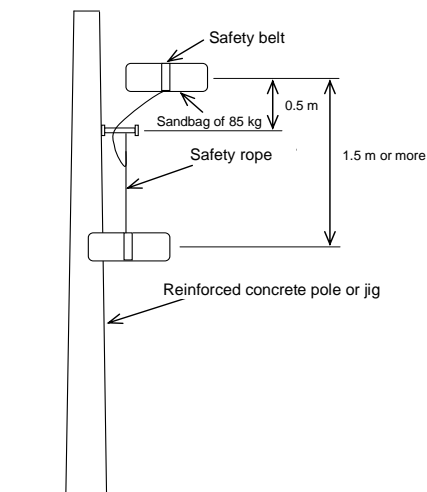


Figure 2 Tensile test

## 6.5 Impact drop test

Attach a sandbag of 85 kg in mass to a given place of step bolt mounting equipment, as shown in Figure 3. Then apply an impact load with a fall length of 1.5 m or more.



- Attach a sandbag to a safety belt, and let the sandbag free-fall from the position 0.5 m above the step bolt.
- A60-DT (safety rope) specified by us shall be attached to a point 9 cm away from the pole surface of the step bolt.
- The step bolt shall be attached with a tightening torque of 40 N·m.

Figure 3 Impact drop test

## 6.6 Hot dip galvanized coating test

Measure the coating mass according to “5.2 Indirect method” or “5.3 Electromagnetic thickness test” specified in “5. Method for coating mass test” of JIS H 0401 (Test Methods for Hot Dip Galvanized Coatings).

For the specimen of the coating mass test, an appropriate test piece may be created in advance. The test piece shall be coated in the same procedure of the same manufacturing process as the product.

## 7. Test

### 7.1 General matters

The product shall undergo “7.2 Type test”, “7.3 Manufacturing process inspection” and “7.4 Acceptance inspection” according to the test methods described in Chapter 6, and satisfy all the requirements described in Chapters 4 through 6.

### 7.2 Type test

The type test shall be conducted for products or test pieces created under the same conditions as the product. The test quantity shall be as specified in Table 2.

Table 2 Test items and test quantity

Test item	Test qty
Appearance test	3
Shape/dimension test	3
Combination test	3
Strength test	3
Impact drop test	3
Hot dip galvanized coating test	3

### 7.3 Manufacturing process inspection

For the type test, in principle, conduct a series of inspections on the design, material quality control, manufacturing process, and product management. The test results shall confirm that the production process produces completely the same items as the test pieces of the type test.

### 7.4 Acceptance inspection

An acceptance inspection shall be conducted, when requested by TEPCO, according to the procedure specified in “7.2 Type test” in the presence of TEPCO. Specific test items and the sampling rate shall be determined by consultation with TEPCO. When the witnessed acceptance inspection is not conducted, the manufacturer shall conduct an in-house test determined by consultation with TEPCO in advance and submit test result reports to TEPCO.

## 8. Other

### 8.1 General matters

- (1) Issues that are necessary to satisfy the performance and functions of the product but are not specified in this specification shall be determined by consultation with TEPCO.
- (2) When a substantial advantage for use or manufacturing is available by changing a part of this specification, it may be changed after approval by TEPCO.

- (3) TEPCO shall be entitled to conduct a witnessed process inspection, material inspection, etc. when TEPCO find it necessary.

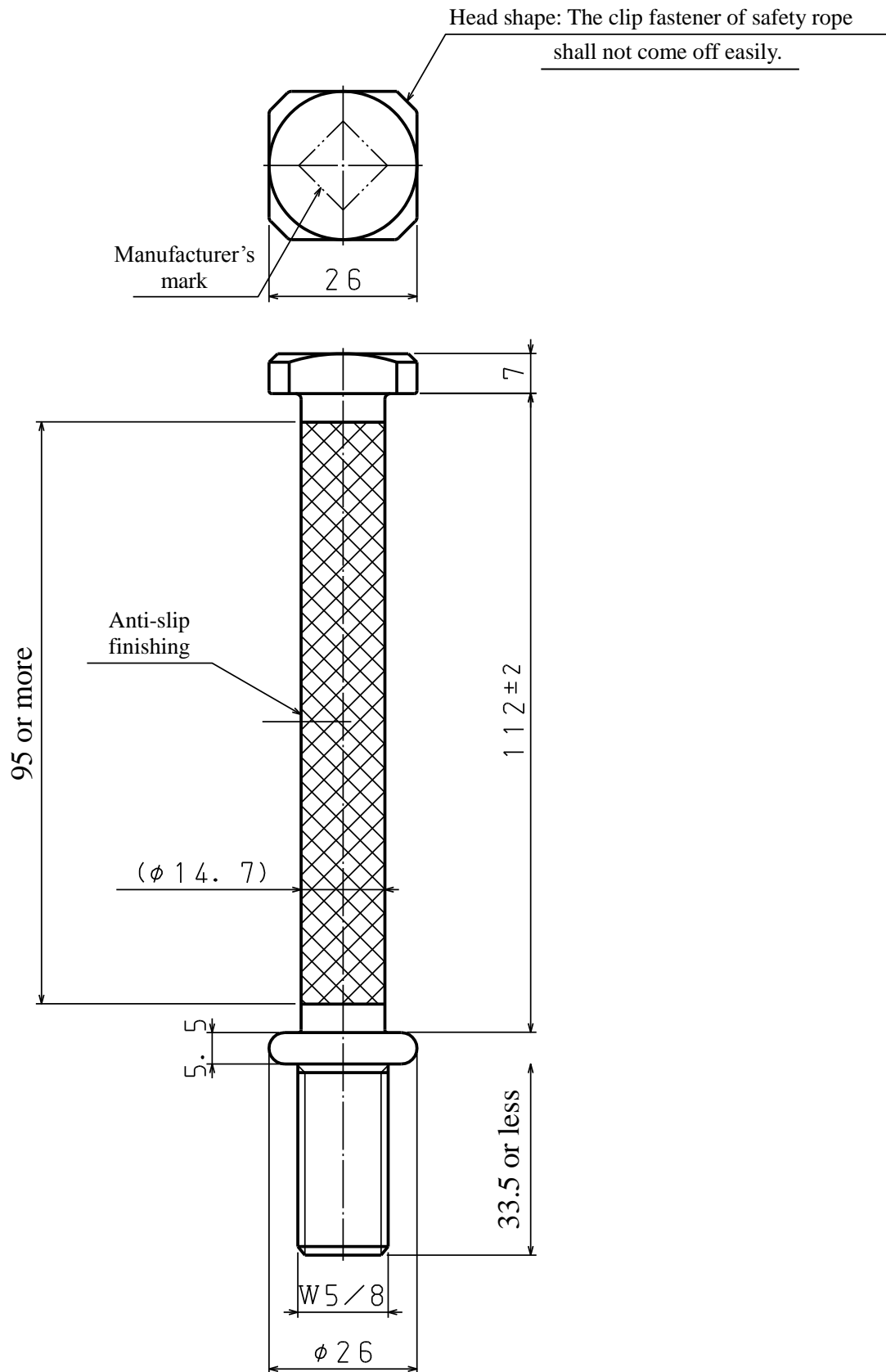
## 8.2 Cost of test piece

The products and test pieces used for the tests as well as costs required to perform the tests shall be borne by the supplier.

## 8.3 Documents to be submitted

The manufacturer shall submit the following documents when applying for the type test:

- (1) Manufacturing specifications (including dimensional outline drawing and tolerances)
- (2) Quality control report
- (3) Test result report
- (4) Technical documents (grounds for the selection of materials, materials used, material characteristics, etc.)



Attached drawing 1 Step bolt