

TOYOTA ENGINEERING STANDARD

NO. : TSH6524G

TITLE : ELECTROPLATED ZINC COATING (HEXAVALENT CHROME FREE)

CLASS : C2

Established/Revised : Rev.2{Oct.2004}

This standard has been revised in consequence of the following changes:
(1) the applicable standard for corrosion resistance evaluation test method has been corrected.
(2) brown rust and white corrosion product have been clearly defined.

Engineering Information
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TOYOTA MOTOR CORPORATION



ELECTROPLATED ZINC COATING (HEXAVALENT CHROME FREE)

1. Scope

This standard covers requirements for electroplated zinc coating⁽¹⁾ (hereinafter referred to as "coatings") applied to iron parts for automobiles for the purpose of corrosion prevention.

The parts made of materials provided by this standard shall conform to prohibitions and restrictions for substances of environmental concern in TSZ0001G. Exempt uses specified by EU ELV Directive shall conform to the latest version of the Directive.

Note: (1)

The coatings also include chromate treatment after zinc coating, which does not contain hexavalent chrome (hereinafter referred to as "chromate").

2. Treatment Method

After pretreatment (e.g. degreasing, acid pickling, etc.) suitable for the type of the substance and the surface condition, the substance is electroplated in the bath containing zinc metal salt to create coating. Dehydrogenation and chromate treatment, which inhibits formation of white corrosion products, using chromate containing no hexavalent chrome, shall also be applied if specified in drawings or the like.

3. Classification

The coatings shall be classified as listed in Table 1 according to the coating thickness (Grade) and the method of post-treatment.

Table 1 Classifications

Grade	Code			Use conditions
	As plated	Clear chromating after plating	Black chromating after plating	
U	TSH6524G-U	TSH6524G-UC	TSH6524G-UE	Extremely severe
S	TSH6524G-S	TSH6524G-SC	TSH6524G-SE	
A	TSH6524G-A	TSH6524G-AC	TSH6524G-AE	Severe
B	TSH6524G-B	TSH6524G-BC	TSH6524G-BE	Normal

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4. Quality

4.1 Appearance

The surface of the coating shall be tested with the test method specified in Section 5.1, and be smooth and free from burning, blisters, and unplated areas that can be detrimental in actual use. Table 2 shows general color tint of coatings for reference. Specific gloss or tint shall be specified, if necessary, through an agreement between the parties concerned.

Table 2 Color Tint of Coatings (Reference)

Type	Tint
As plated	Zinc metallic color
Clear chromating after plating	Yellowish silver gray
Black chromating after plating	Black

4.2 Coating Thickness

The coating thickness shall be tested with the test method specified in Section 5.2 and satisfy the specifications of Table 3. However, this requirement shall not apply to recesses and joints that are hard for a threaded portion or 12 mm diameter spherical surface to contact and portions that have been agreed upon between the related parties. Further, the coating thickness does not include the thickness of post-treatment film.

Table 3 Coating Thickness

Grade	Coating thickness (μm)
U	25 min.
S	13 min.
A	8 min.
B	5 min.

4.3 Corrosion Resistance

The corrosion resistance shall be tested with the test method specified in Section 5.3. The corrosion resistance of the coating as plated shall satisfy the specifications of Table 4. The corrosion resistance of the coating after chromate treatment (and coating) shall satisfy the specifications of Table 5. However, Tables 4 and 5 shall not apply to recesses and joints that are hard for a threaded portion or 12 mm diameter spherical surface to contact and portions that have been agreed upon between the related parties.

Table 4 Corrosion Resistance (as Plated)

Type	Corrosion resistance
	Time to formation of iron rust (brown rust) (h) ¹⁾
TSH6524G-U	240 min.
TSH6524G-S	144 min.
TSH6524G-A	96 min.
TSH6524G-B	48 min.

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Table 5 Corrosion Resistance (with Chromate Treatment)

Type	Corrosion resistance		
	Time to formation of white corrosion products (h) ⁽¹⁾	Time to formation of iron rust (brown rust) (h) ⁽²⁾	
TSH6524G-UC	72 min.	312 min.	
TSH6524G-UE		216 min.	
TSH6524G-SC			168 min.
TSH6524G-SE			
TSH6524G-AC		120 min.	
TSH6524G-AE			
TSH6524G-BC			
TSH6524G-BE			

Note: (2)

Within the specified time, iron rust (brown rust) shall not occur at 3 or more points per 100 cm² of the area applied with electroplated zinc coating. The zinc-coated area shall be free from any rust with a diameter of 2 mm or more.

Note: (3)

Within the specified time, white powdery corrosion products that are easy to visually recognize shall not appear in the area applied with electroplated zinc coating. Discoloration of chromate film and black points formed on electroplated area shall be excluded from the category of corrosion product.

5. Test Methods

5.1 Appearance Test

Appearance shall be checked visually at a distance of 500 mm from the testing surface under room light.

5.2 Coating Thickness Test

Thickness shall be tested by a microscopical method. However, a coulometric method or fluorescent X-ray method may also be used for this test.

5.3 Corrosion Resistance Test

Salt spray test shall be performed in accordance with JIS Z 2371 or ASTM B117. For the test, use a specimen that has been let stand for at least 24 h after electroplating.

6. Reference

- (1) Chromate treatment shall, as a rule, apply after zinc coating.
- (2) If the chromated surface is subjected to dehydrogenation, the chromate layer may crack then reduce the corrosion resistance. Therefore, chromate treatment shall, as a rule, apply after dehydrogenation.
- (3) Dehydrogenation shall be specified according to TSH5105G, if necessary, accompanied with the standard of zinc coating specified herein.
- (4) Ensure that a tightening part satisfies the required quality related to fastening reliability. A special attention should be paid when coating is applied after chromate treatment since it affects friction coefficient.

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Applicable Standards

TSH5105G	Dehydrogenation Treatment
TSZ0001G	Control Rules for Substances of Environmental Concern
JIS Z 2371	Methods of Salt Spray Testing
ASTM B117	Practice for Operating Salt Spray (Fog) Apparatus

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