
	<b>AMENDMENT -NOTIFICATION</b>			AA 067 36 03	Rev. No. 04
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<b>AA 067 36 03: PROCESS FOR ELECTROPLATING OF ZINC ON STEEL SURFACES FROM CYANIDE BATH</b>					
<b>1. Page 7 of 8; Cl. 11.3:</b> Last line is corrected as follows: " through a filter or perforated bucket."					
<b>2. Page 8 of 8; Cl 13.1:</b> Last line is corrected as follows: " within 96 hours on plated and passivated components."					
Please see Instructions on the reverse.					
Ref : Cl 29.29.6 of MOM of MRC-C	Amd No. 01	Approved MRC (C)	Issued CORP. R&D	Date 01.06.2001	Cum.Sr.No. A 2935

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<b>AA 067 36 03: PROCESS FOR ELECTROPLATING OF ZINC ON STEEL SURFACES FROM CYANIDE BATH</b>					
<b>PAGE 1 OF 8; Cl 3.0 COMPLIANCE WITH NATIONAL STANDARDS</b>					
<b>Year of IS reference is modified as follows:</b>					
1) IS:1340-77 (Reaffirmed 1999)					
2) IS:1573-86 (Reaffirmed 1999)					
3) IS:3203-82 (Reaffirmed 2001)					
4) IS:9844-81 (Reaffirmed 1999)					
Please see Instructions on the reverse.					
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## PROCESS FOR ELECTROPLATING OF ZINC ON STEEL SURFACES FROM CYANIDE BATH

### 1.0 GENERAL :

This standard details the process for high speed bright zinc plating on steel surfaces from cyanide zinc solution bath by tank or barrel to provide protection against corrosion and to give a bright attractive finish to the surface.

### 2.0 APPLICATION :

Used for components like fasteners, nuts, bolts, electronic panels etc.

This process is not suitable for plating on cast iron surfaces.

### 3.0 COMPLIANCE WITH NATIONAL STANDARDS :

This Standard has reference to the following Indian Standards regarding surface condition and quality of deposit.

IS : 1340 - 1977 : Code of Practice for chromate conversion coating on Zinc and Cadmium coated articles and zinc base alloys.  
(Reaffirmed 1991)

IS : 1573 - 1986 : Electroplated coatings of Zinc on Iron and Steel.  
(Reaffirmed 1991)

IS : 3203 - 1982 : Methods of Testing Local Thickness of Electroplated Coatings.  
(Reaffirmed 1992)

IS : 9844 - 1981 : Method of testing of corrosion resistance of Electroplated and Anodized Aluminium coatings by neutral salt spray test.  
(Reaffirmed 1991)

Revisions :  
Ref. Cl.28.16.6 of MOM of 28<sup>th</sup> MRC (C)

APPROVED :  
INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE-MRC (C)

Rev. No. 04	Amd.No.	Reaffirmed	Prepared BHOPAL	Issued Corp. R&D	Dt. Of 1 st Issue Jan '85
Dt.: 15.10.00	Dt :	Year :			



#### 4.0 MATERIALS :

Material	CPS No./IS No./Available From
4.1 Sodium cyanide for electroplating	: AA 556 10
4.2 Caustic Soda (Tech.)	: AA 542 01
4.3 Nitric Acid (Tech.)	: AA 541 02
4.4 Zinc Anodes (99.98% Purity, Min.) (Grade 1)	: IS : 2605
4.5 Bright Zinc Salts	M/s. Ronuk Industries Ltd.
4.6 Zinc Brightener Zn-21	Mumbai
4.7 Zinc Brightener Zn-22	
4.8 Zinc Purifier	
4.9 Zinc Brite 16 Salt	
4.10 Zinc Brite 20 Brightener	M/s. Grauer & Weil (I) Ltd.,
4.11 Monicol Purifier	Mumbai
4.12 Zinek Salt - 501	
4.13 Super Zinc Brightener - 505	M/s. Platewel Processes &
4.14 Supra Zinc Brightener 555	Chemicals Ltd., Vadodara
4.15 Zincad Purifier - 503	
4.16 Teknobrite CZ 920 Salt	M/s. Artek Surfin Chemicals
4.17 Teknobrite CZ 920 Brightener	(P) Ltd., Mumbai
4.18 Purisol	

#### 5.0 EQUIPMENT :

##### 5.1 Plating Tank / Vat :

The Tank/vat shall be made of plain welded steel sheets with rubber lining. The vat shall be provided with an insulated frame on top fitted with insulators for holding the anode and cathode rods. The tank shall also be provided with exhaust system.

##### 5.2 Barrel :

The plating barrel shall be constructed out of polypropylene perspex and shall be so driven as to rotate at 5 to 12 rpm.



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## 5.3 Rinsing Tanks :

Mild steel tank lined with rubber / FRP / PVC.

## 5.4 Hot Water Rinsing Tank (Optional) :

Mild steel tank with rubber / FRP lining and heating arrangements.

## 6.0 COMPOSITION OF ELECTROLYTE AND OPERATING INSTRUCTIONS :

### 6.1 Composition of Electrolyte (Bath Solution) And Operating Conditions :

The electrolyte shall be prepared according to any one of the following compositions and operated at the conditions specified below :

Parameter	Composition				
	I	II	III	IV	
Name of salt	RONUK	G&W	PLATEWEL	ARTEK SURFIN	
Sl. No.	Name of salt	Bright Zinc	Zinc Brite 16	Zinek 501	Tekno Brite CZ 920
	Salt Content				
	For vat	180-200	200	200	200
	For barrel	200-220	200	200	200
1.	Zinc Brightener Zn-21, ml/l	1.5	---	---	---
2.	Zinc Brightener Zn-22, ml/l	2.5	---	---	---
3.	Super zinc	---	---	6-8	---
	Brightner-505, ml/l	---	---	3-5	---
4.	Supra Zinc				
	Brightener 555, ml/l	---	3-5	---	---
5.	Zinc Brite 20				
	Brightener, ml/l	---	3-5	---	---
6.	Tekno Brite CZ 920				
	Brightener	---	---	---	2-4
7.	Monicol Purifier, ml/l	---	5	---	---
8.	Zincad Purifier-503, ml/l	---	---	5	---
9.	Purisol, ml/l	---	---	---	4
10.	Temperature	Room-55	20-45	25-55	20-45
11.	Anode to Cathode Ratio	1:1	1:1	1:1	1:1
12.	Current density, A/dm <sup>2</sup> :				
	a) For vat	1.5-4.5	2-5	2-5	2-5
	b) For barrel	1.5-4.5	0.5-2	0.5-2	0.5-2
13.	Voltage, (Volts)				
	a) For vat	6-8	2-6	3-6	2-5
	b) For barrel	12-15	10-15	12-16	10-15



## 6.2 Preparation of Electrolyte :

- 6.2.1** The vat/barrel shall be filled with water, preferably with demineralised water, to about two-thirds of its capacity.
- 6.2.2** The required amount of salt shall be added to the bath in small quantities with stirring.
- 6.2.3** The temperature of the solution should not raise beyond 70°C.
- 6.2.4** Stirring shall be continued until all the salts get dissolved.
- 6.2.5** The solution shall then be brought upto the working level by adding cold demineralised water. At this stage the temperature of the bath shall be at the working range.
- 6.2.6** The requisite amount of purifier shall now be added to the solution and stirred throughly. If necessary, filtration at this stage shall be carried out. Then requisite amount of brightener shall be added.

## 6.3 Analysis of the Electrolyte :

The solution shall be analysed initially after make up and subsequently at suitable intervals.

## 6.4 Maintenance of The Electrolyte :

- 6.4.1** The concentration of the electrolyte shall be maintained as below :

Parameter	Composition			
	I RONUK	II G&W	III Platewel	IV ARTEK
Zinc as metal, g/l	33-40	30-40	30-34	30-40
Total Sodium Cyanide, g/l	90-105	75-140	80-90	75-140
Total Sodium Hydroxide, g/l	75-93	65-85	70-80	65-85
Sodium Cyanide to Zinc ratio	2.5-3.0:1	2.5-3.5:1	2.7-3.2:1	2.5-3.5:1



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### 6.3.2 Addition of Brighteners :

Brightness of the deposit shall be maintained by adding brighteners for every 1000 ampere-hours as shown below :

Brightener	Composition			
	I RONUK	II G&W	III PLATEWEL	IV ARTEK
Brightener Zn-21, ml	60	---	---	---
Brightener Zn-22, ml	100	---	---	---
Zinc Brite 20 Brightener :				
i) For vat, ml	---	100-150	---	---
ii) for barrel, ml	---	150-200	---	---
Super Zinc Brightner-505 :				
i) For vat, m,	---	---	150	---
ii) For barrel, ml	---	---	200	---
Supra Zinc Brightener - 555	---	---	100	---
Teknobrite CZ 920 Brightener	---	---	---	100-250

Brighteners may be added directly into the bath and stirred well. Excess of brightner must be avoided.

**6.3.3** Bath shall be analyzed periodically and if the values do not lie in the limits as given in 6.3.1, required chemicals shall be added to the bath to bring the composition to the required level.

### 6.3.4 Purification of Electrolyte :

The electrolyte shall be filtered at least once in a week or as required addition of 0.25 ml of zinc purifier per litre of solution for Composition-I, 0.1 to 0.2 ml of Monicol per litre for Composition-II and 0.1 to 0.2 ml of Zincad-503 purifier for Composition-III shall be made daily and stirred well to eliminate impurities in the solution and also to settle before resuming the work.

## 7.0 PROCESS :

### 7.1 Cleaning :

All articles shall be properly cleaned as described in BHEL Standard AA 067 36 01 : Process for cleaning and preparation of metal surfaces prior to electroplating or BP 0673693 : Electroplating of zinc on steel surface from Acid bath.

**7.2 Rinsing :**

All articles shall be rinsed thoroughly after cleaning to avoid contamination of the plating solution.

**7.3 Plating :**

It shall be ensured that the current is on before the articles are put into barrel or tank.

All articles shall be plated at the specified current density for a duration which will depend on the thickness of the deposit required

**7.4 Cold Rinsing :**

After removal from the plating bath, all articles shall be rinsed thoroughly in cold running water till all the traces of solution are removed.

**7.5 Drying :**

The rinsed articles shall be dried using a centrifugal drier or hot air blower /hot air oven.

**8.0 HEAT TREATMENT : (Whenever required)**

**Note :** Steels of tensile strength of 100 kgf/mm<sup>2</sup> or corresponding hardness should be heat treated.

**8.1 Stress Relieving Before Plating : (IS : 1573)**

In accordance with IS : 1573.

**8.2 Stress Relieving After Plating : (IS : 1573)**

In accordance with IS : 1573.

**9.0 PASSIVATION :**

Electroplated heat treated articles shall be passivated as per AA 067 36 04 : Process for Passivation of Zinc And Cadmium Plated Articles.

**10.0 CARE OF ANODES :**

Anodes shall be removed from the bath when the bath is idle.

Ensure that the anodes are bright in luster while plating is on.

**11.0 PRECAUTIONS :**

**11.1** While preparing the solution the operator shall use rubber hand gloves, apron and respirator mask to avoid irritation of skin and suffocation due to fumes. The safety precautions for electroplating shop and handling of chemicals given in AA 046 28 01 shall be followed.



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- 11.2** Solution shall be kept covered when not in use.
- 11.3** Any chemical that may be necessary to be added shall be dissolved in a part of the original solution (except brighteners) before adding it to the vat/barrel. It shall be poured through a filter of perforated bucket.
- 11.4** Any metal that may be deposited on any part of the vat/barrel shall be removed immediately.
- 11.5** Any article that becomes lodged in any part of the vat / barrel shall be removed immediately.
- 11.6** Remove Zinc Anode at the end of shift so as to avoid dissolution of zinc metal during idle period.

### **12.0 INSPECTION AND QUALITY OF DEPOSIT :**

When tested in accordance with the test methods shown against each, the deposit shall conform to the norms specified below :

#### **12.1 SAMPLING :**

Minimum of 1% of each batch of tank/barrel load of part there of shall be taken at random for testing with a minimum of 5 samples. When plated components are big and can not be subjected to any of the specified test, a test panel of suitable size of the same basis metal shall be plated along with component under identical conditions for the purpose of testing. For corrosion resistance tests, test piece of minimum 150 m.m. length, and 100 m.m width and approximately 1 m.m thick shall be used.

#### **12.2 Condition of Surface :**

The plated surface shall appear as a smooth and continuous film over the basis metal and shall be free from defects such as pits, stains, cracks, blisters, nodules, pin holes, unplated areas and other superficial blemishes visible to the unaided eye. The plated surface shall be bright with required passivation.

#### **12.3 Thickness of Deposit (IS : 3203) :**

The minimum thickness shall be as specified on relevant drawing on BHEL order.

#### **12.4 Adhesion (IS:1573) :**

Flaking and blistering of the coating is not acceptable and the coating shall continue to adhere to the base metal after this test.

#### **12.5 Humidity test (IS : 1573) :**

Breakdown of the film or appearance of white corrosion products after two cycles of the test shall be taken as failure.



**13.0 ADDITIONAL TESTS :**

Whenever required, the following test shall be conducted as per the test methods shown against each and the norms of acceptance shall be as specified below :

**13.1 SALT SPRAY TEST (IS : 9844) :**

When tested in accordance with IS 9844 white corrosion products shall not be visible within 96 hours on plated and passivated components.

**14.0 REJECTION :**

If the samples taken do not comply with clauses 12.2 to 12.5 and 13, a further quantity not less than twice the number originally taken, shall be subjected to these tests. If any one of these samples also fails, the whole batch shall be rejected.

**15.0 REFERRED STANDARDS (Latest Publications Including Amendments) :**

- |              |              |                 |                 |
|--------------|--------------|-----------------|-----------------|
| 1) IS : 1573 | 2) IS : 2605 | 3) IS : 9844    | 4) AA 541 02    |
| 5) AA 542 01 | 6) AA 556 10 | 7) AA 067 36 01 | 8) AA 067 36 04 |