


		<b>PRODUCT STANDARD</b> SWITCHGEAR ENGINEERING DIVISION		SG 15605 REV.00		
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		<b><u>ELECTROPLATING OF TIN ON ALUMINIUM AND ITS ALLOYS</u></b>						
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		2. APPLICATION: Used for Bus Bars, Bus Duct Conductors, Bus Duct Flexible, Link plates, packers, Top and Bottom flanges of Switchgear equipments etc.						
		3. COMPLIANCE: This specification has reference to following WITH Indian standards regarding surface prepration NATIONAL and quality of deposits. STANDARDS						
		IS 2450 : 1963 - Recommended practice for plating on Reaffirmed 1998 Alluminium and its alloys.						
		IS 3203 : 1982 - Method of testing local thickness of Reaffirmed 1998 electroplated coatings.						
		IS 1359 : 1992 - Electroplated coatings of tin in respect of surface conditions and quality of deposit.						
		4. <u>MATERIALS:</u>						
		4.1 Trichloroethylene -(Technical) : AA 56706/IS: 245 Type 2						
		4.2 Chromium Trioxide(Electroplating : AA 54205/ Grade) IS: 330						
		4.3 Sulphuric Acid -(Technical) : AA 54101/ IS: 266						
4.4 Sulphuric acid (c.p. grade) : IS : 266								
4.5 Nitric Acid - (Technical) : AA 54102/ IS: 264								
		REV.		PRINTS TO :-		APPROVED –		
		ALTD.		SWM(P)		RKJ		
		APPD.		QCX		PREPARED	ISSUED	DATE
		DATE.		PDG		DB	APS	7.2.00
				CEG				
				TSD.				


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		4.6 Caustic Soda -(Technical) : AA 54201/IS: 252		
		4.7 ZInc oxide -(Technical) : IS: 1880		
		4.8 Rochelle salt(Technical) : IS: 4846 (sodium -potassium Tartarate)		
		4.9 Ferric chloride -(Technical) : IS: 711 (FeCl3.12H2O)		
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		4.9.1 Acitek 707 : M/s Artek Surfin Chemicals Bombay		
		4.10 Coppele 160 (Rochelle : M/s platewel processes & Copper salt) chemicals Ltd, Vadodara		
		4.11 Rochelle Copper salt : M/s Grauer & weil (I) Ltd, Bombay		
		4.12 Sodium Cyanide : IS: 6358/ AA 55610		
		4.13 Copper Anode : IS: 2603 Oval shape preferred.		
		4.14 Tin anode : IS 2384		
		4.15 Aludegreaser : M/s Srinivasa Industrial Chemicals, Bangalore		
		4.15.1 Cleaner S-21 : M/s Platewel Processes & Chemical Ltd, Vadodara		
		4.16 Deoxidiser : M/s Srinivasa Industrial Chemicals Ltd Bangalore		
		4.17 Alzincate : -do-		
		4.18 Stannous Sulphate :(1) M/s Grauer & weil (I) Ltd. Mumbai. (2) M/s Artek surfin Chemicals (P) Ltd. Mumbai.		
		4.19 Tin Brite Make up Brightner : M/S Grauer & Weil (I) Ltd, Mumbai		
		4.19.1 Tin Brite carrier additive: M/s Artek Surfin Chemicals(P) LTD Mumbai		
		4.20 Tin brite Maintenance Brightner :M/S Grauer and Weil (I) Ltd Mumbai		
		4.20.1 Teknolume Brightner : M/S Artek surfin chemical(P) Ltd Mumbai		


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		4.21 Sediwell-Sn purifier : M/s Grauer & weil (I) Ltd Mumbai		
		4.22 Alzincate D - DO -		
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		OR		
		M/s C.M.P. Ltd., Mumbai		
		OR		
		M/s Sargbhai M Chemical Vadodarg		
		4.24 Lacquer (Resistance to Acid Alkali, Cyanede and Heat)		
		4.24.1 Stopping off lacquer : M/s IEL Ltd, Calcutta		
		OR		
		M/s Shalimar paints, Mumbai		
		4.24.2 Grey Marsing compound : M/s Phiroz Sethna, Mumbai		
		4.25 Ammonium Biflourede : IS : 13119		
		4.26 Alluminium wire : SG 10708		
		5. EQUIPMENT		
		5.1 Vapour Degreasing plant : Any standard plant for the purpose.		


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		5.3 Acid cleaning Tank		
		5.3.1 Chromic-sulphuric Acid	: Lead & PVC / FRP lined mild steel Tank fitted with heating arrangements.	
		5.3.2 Nitric-Hydrofluoric Acid Solution	: PVC/PVC lined mild steel tank.	
		5.3.3 Nitric Acid solution	: PVC / FRP/ Rubber lined mild steel Tank	
		5.3.4 Sulphuric acid dip solution	: PVC/FRP/Lead,lined/mildsteel tank or PVC/poly propylene tank	
		5.3.5 For Deoxidiser solutions	: PVC/FRP/rubber lined Mild Steel tank	
		5.4 Zincate Treatment Solution	: Mild steel tank	
		5.5 Rinsing Tanks		
		5.5.1 For Rinsing After Alkali Degreasing/Electroplating	: Mild steel tank	
		5.5.2 For Rinsing After Acid cleaning	: PVC/PVC lined mild steel tank	
		5.6 Copper plating Tank	: PVC or Rubber lined mild steel tank or plain mild steel tank	
		5.7 Tin plating tank	: Mild steel tank lined with rubber/ PVC/FRP, fitted with insulators for holding the anode and cathode rods and cathode rod movement system.	
		5.8 Swilling tanks	: PVC/Rubber/FRP/lined mild steel tanks	
		5.9 Hot water Rinsing tank	: PVC/FRP lined mild steel Tank fitted with Heating arrangement	


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		5.10 Portable filter pump : Standard filtration unit suitable for filtration plating solution		
		<u>6. COMPOSITION/PREPARATION OF SOLUTIONS &amp; OPERATING CONDITIONS</u>		
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		Cleaner S-21 (clause 4.15.1) : 35 to 50 grams/litre		
		Water : To make up the volume		
		Temperature C : 90 to 100		
		Immersion time in minutes : 5 to 10 OR as required		
		OR		
		Alu-degreaser : 200 to 250 (Clause. 4.15) ml/litre		
		Water : To make up the volume		
		Temperature deg C : 50-60 deg. C		
		Immersion time : 1 to 3 minutes OR as required		
		6.1.1 The tank shall be filled with clean cold water to about 2/3rd of its capacity and then the necessary quantities of S-21 clearer OR Aludegreaser shall be added to the bath with stirring. When the chemicals are dissolved and properly mixed, the solution shall be brought to the operating level by adding more water, and heated to the operating temperature.		
		6.2 Chromic-Sulphuric Acid pickling solution		
		Chromic Acid (Clause.4.2) gm/litre - 20 to 30		
		Sulphuric Acid (Clause.4.3) gm/litre - 140 to 150		
		Water To make up the volume		
		Temperature deg. C 60 to 70		
		Immersion time in minute 2 to 3 OR as required		
		6.2.1 The tank shall be filled with clean cold water to about 2/3rd of its capacity and then the necessary quantity of sulphuric acid shall be poured into the bath with constant stirring. When the acid is mixed then the chromic acid shall be added to the bath and properly mix, the the solution shall be brought to the operating level by adding more water, and then shall be heated to the operating temperature.		


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		Nitric Acid (Clause. 4.5)		750 ml		
		Hydroflouric Acid (Clause. 4.9)		250 ml		
		Temperature		Shop temperature		
		Immersion time in minutes		2 to 5 OR as required		
		OR				
		Nitric acid (clause 4.5) ml/litre		700		
		Acitek 707 (clause 4.9.1) gram/litre		60 to 120		
		Temperature deg C		Shop temperature		
		Time in minutes		2 to 3 OR as required		
		OR				
		Nitric acid (clause 4.5)ml/litre		700 to 750		
		Ammonium Biflouride grams/litre (clause 4.25)		100 to 120		
		Temperature deg C		Shop temperature		
		Time in seconds		10 to 20 OR as required		
		6.3.1 The tank, shall be first filled with the required quantity of concentrated nitric acid and then the necessary quantity of hydrofluoric acid OR Acitek 707 (clause. 4.9.1) OR Ammonium Biflouride (clause. 4.25) shall be mixed in it with constant stirring.				
		6.4 De-oxidizing Solution (Solution A OR B may be used)				
		Solution – A				
		Nitric Acid (Clause. 4.5) ml/litre		500 to 750		
		Water		To make up the volume		
		Temperature deg C		Shop temperature		
		Immersion Time in seconds		15 to 30 OR as required		


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<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.</div>		<u>Solution - B</u>			
		Deoxidiser (Clause. 4.16) 2 parts			
		Water 1 part			
		Temperature deg C Shop temperature.			
		Time of immersion in seconds 30 to 60 OR as required			
		6.4.1 The tank shall be filled with clean cold water to about 1/3rd of its capacity. Then the necessary quantity of nitric acid or Deoxidiser as required shall be added to the tank with stirring and the solution shall be brought to the operating level by adding more water.			
		Note: Two Nos. of solution - A Bath or B Bath shall be prepared.			
		6.5 Zincate solution			
		6.5.1 composition and operating conditions any one of three composition and operating condition as detailed below shall be used			
		<u>Composition I   Composition II   Composition III</u>			
	Caustic soda 300 to 500 (Clause.4.6) grams/litre	-	-		
	Zinc oxide 100 grams/litre (Clause.4.7)	-	-		
	Rochelle salt 10 grams/litre (Clause.4.8)	-	-		
	Ferric chloride 1 gram/litre (Clause.4.9)	-	-		
	-	Alzincate (M/s Srinivasa) as supplied	Alzincate D (M/s Grauer & weil) as supplied		
	Water To make up the volume	-	-		
	Temperature Shop temperature.	Shop temperature	Shop temperature		
	Immersion time 1 to 3 . 15 to 60 seconds minutes OR as required	15 to 60 seconds OR as required	15 to 60 seconds OR as required		


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<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to interest of Co.</div>		<u>6.5.2 For Composition I</u>																											
		<p>The tank shall be filled with about 1/4th of its work- ing capacity with clean water and then required quantity of Zinc oxide added with stirring so as to make a slurry of it.</p> <p>Now tank again filled with clean water to 1/4th of its working capacity and required quantity of Sodium Hydroxide gradully added with stirring. Stir till Sodium Hydroxide is dissolved completely.</p> <p>For quick dissolution of Chemicals Rochelle salt (Sodium-potassium tartarate) and Ferric Chloride in the required quantity shall be separately dissolved in water and then added in main bath.</p> <p>The contents shall be thoroughly mixed and brought to operating level by adding more water.</p> <p><u>For Composition II &amp; III</u></p> <p>The bath shall be brought to the operating level by Alzincate itself. No dilution is required.</p> <p>6.5.3. In case, any air pockets/ blister is observed after plat- ing then the zincate solution should be sent to the labo- ratory for chemical analysis and necessary replenishment shall be made on the basis of the test result.</p> <p><u>6.6 Copper plating solution</u></p> <p><u>6.6.1 Composition &amp; Operating conditions</u></p> <p>The electrolyte shall be made according to any one of the following composition</p> <table><tr><td></td><td>Composition-I (M/s G &amp; W)</td><td>Composition-II (M/s Platewel)</td></tr><tr><td>Coppele 160 salt (gram/litre (Clause 4.10)</td><td>-</td><td>150</td></tr><tr><td>Rochelle Copper salt(gram/litre (clause. 4.11)</td><td>150</td><td>-</td></tr><tr><td>Water</td><td colspan="2">To make up the volume</td></tr><tr><td>Temperature</td><td>Shop Temperature.</td><td>Shop Temperature.</td></tr><tr><td>Current density A/sq.ft. A/sq.dm.</td><td>1.0 to 20 0.1 to 2</td><td>1.0 to 20 0.1 to 2</td></tr><tr><td>Voltage V</td><td>3 to 4.5</td><td>3 to 4</td></tr><tr><td>Time</td><td colspan="2">as per thickness requirement</td></tr></table>					Composition-I (M/s G & W)	Composition-II (M/s Platewel)	Coppele 160 salt (gram/litre (Clause 4.10)	-	150	Rochelle Copper salt(gram/litre (clause. 4.11)	150	-	Water	To make up the volume		Temperature	Shop Temperature.	Shop Temperature.	Current density A/sq.ft. A/sq.dm.	1.0 to 20 0.1 to 2	1.0 to 20 0.1 to 2	Voltage V	3 to 4.5	3 to 4	Time	as per thickness requirement	
			Composition-I (M/s G & W)	Composition-II (M/s Platewel)																									
		Coppele 160 salt (gram/litre (Clause 4.10)	-	150																									
		Rochelle Copper salt(gram/litre (clause. 4.11)	150	-																									
		Water	To make up the volume																										
		Temperature	Shop Temperature.	Shop Temperature.																									
		Current density A/sq.ft. A/sq.dm.	1.0 to 20 0.1 to 2	1.0 to 20 0.1 to 2																									
		Voltage V	3 to 4.5	3 to 4																									
		Time	as per thickness requirement																										



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		6.6.2 Preparation of Electrolyte				
		6.2.1 The tank shall be half filled with demineralised water and heated to make it warm.				
		6.6.2.2 The calculated amount of copper salt as per the composition in clause 6.6 shall then be gradually added to the water with stirring.				
		6.6.2.3 The electrolyte shall be brought upto the desired level by adding more water and subsequently stirred thoroughly.				
		6.7 Sulphuric acid Dip Solution				
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		Sulphuric acid (Clause.4.4) : 40 to 50 ml/litre				
		Water (demineralised) : To make up the volume				
		Operating Temperature deg C : Shop temperature				
		Time in minutes : 1 to 2 minutes OR as required				
		6.8 Acid tin plating solution				
		6.8.1 Composition of Electrolyte and Operating Conditions				
			For Vat	For Barrel		
		Stannous Sulphate grams/litre (Grauer and weil) (Cl.4.18)	40-60	25-35		
		Stannous Sulphate grams/litre (Artek Surfin) (Cl.4.18)	24-35	24-35		
		Sulphuric Acid, ml/litre (Cl.4.4)	80-100	95-110		
		Tinbrite make-up brightner, ml/litre (Cl.4.19)	30-40	30-40		
		Teknolume Carrier Additive ml/litre (Cl.4.19.1)	20-40	20-40		
		Tinbrite maintenance (Cl.4.20) brightner, ml/l	3-4	4-6		
		Teknolume Brightner, ml/l (Cl.4.20.1)	2-6	2-6		
		Operating Temperature, deg C	20-35	20-35		
		Current Density, A/dm sq	1-25	1-1.5		
		Voltage, V	1-3	4-6		
		Agitation (Optional)	Cathode Rod movement			
		filtration	Occasional	Occasional		
		Anode to Cathode ratio	2:1	-		


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		<p>The vat/barrel shall be filled with with demineralised water) to about two-thirds of its working level.</p> <p>The required quantity of sulphuric acid shall be added slowly to the bath with stirring.</p> <p>The requisite amount of stannous sulphate shall then be added to this solution with stirring.</p> <p>After complete dissolution, the electrolyte shall be brought upto the working level by adding demineralised water) and subsequently stirred thoroughly.</p> <p>The required quantity of Make up Brightner and Maintenance brightner shall be added with thorough stirring.</p>											
		<u>7.0 Maintenances of bath solution / brightner</u>											
		<p>7.1 The solutions shall be analysed after initial makeup and subsequently at suitable intervals. The concentration of bath solution shall be maintained as given below.</p> <p>7.2 Alkaline degreasing solution (clause. 6.1) <u>Cleaner S-21</u> Pointage 40 to 60 <u>Aluo-degreaser</u> Pointage 30 to 50</p> <p>7.3 <u>Chromic sulphuric Acid pickling (clause. 6.2)</u> Chromic acid 20 to 30 gms/litre. Sulphuric Acid 135 to 150 ml/litre.</p> <p>7.4 Deoxidizing solution (clause. 6.4)</p> <p><u>Solution A</u> Strength (Nitric acid content) / grams/litre. 260 to 390 copper content – nil</p> <p><u>Solution B</u> Pointage 20 to 30, Copper content - Nil</p>											
		<u>7.5 Zincate solution (clause. 6.5)</u> Caustic content 300 to 500 grams/litre											
		<p>7.6 <u>Copper plating solution</u> Composition-I Composition-II (clause. 6.6)</p> <table><tr><td>Copper metal grams/litre</td><td>15 to 17</td><td>18 to 20</td></tr><tr><td>Free sodium cyanide grams/ litre</td><td>5 to 7</td><td>6 to 8</td></tr><tr><td>Rochelle salt grams/litre</td><td>30 to 50</td><td>40 to 50</td></tr></table>			Copper metal grams/litre	15 to 17	18 to 20	Free sodium cyanide grams/ litre	5 to 7	6 to 8	Rochelle salt grams/litre	30 to 50	40 to 50
Copper metal grams/litre	15 to 17	18 to 20											
Free sodium cyanide grams/ litre	5 to 7	6 to 8											
Rochelle salt grams/litre	30 to 50	40 to 50											
		<p>7.7 Tin plating solution cl.6.8 <u>For Vat</u> <u>For Berrel</u></p> <table><tr><td>Tin Metal content grams/litre</td><td>15-25</td><td>12-18</td></tr><tr><td>Supphuric acid content ml/litre</td><td>70-100</td><td>80-120</td></tr></table>			Tin Metal content grams/litre	15-25	12-18	Supphuric acid content ml/litre	70-100	80-120			
Tin Metal content grams/litre	15-25	12-18											
Supphuric acid content ml/litre	70-100	80-120											


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		<u>7.7.1 Replenishment :-</u>		
		7.7.2 If the working concentration do not lie in the limits as mentioned in 7.7, addition of stannous sulphate and sulphuric acid shall be made to raise the concentration of metal and acid respectively as per the deficiency of the bath.		
		7.7.3 In normal cases the addition of brightners shall be as follows for both vat and barrel. ml / KAH		
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		or		
		Tinbright Make-up Brightner, ml/KAH		: 100 to 200
		Tinbright Maintenance Brightner, ml/KAH		: 200 to 400
		or		
		Teknolume Brightner		: 200 to 300
		<u>8.0 Purification :-</u>		
		<u>8.1 Removal of Metallic Impurities</u>		
		When objectionable amounts of metallic impurities are to be removed, electrolytic purification by using corrugated dummy cathode shall be employed at a low current density (0.3 Amp / dm sq)		
		<u>8.2 Removal of Organic Impurities</u>		
		When the electrolyte is not severely contaminated with the organic impurities, the solution shall be filtered by introducing a small amount of activated carbon powder packed within the filter. For severely contaminated organic impurities, the electrolyte shall be treated with activated carbon powder at the rate of 2-3 g/l and Sediwell-Sn purifier at the rate of 1-2 ml/l. After vigorous agitation, the mixture shall be allowed to settle for a few hours, preferably overnight, in a separate tank. Finally, the electrolyte shall be filtered into the plating tank. Sediwell-Sn purifier treatment, will also remove the stannic oxide produced during the process and also in idle hours of the electrolyte.		
		8.3 During carbon treatment brightners are partially removed. therefore, brightners shall be added after carbon treatment as under :-		
		Teknolume Carrier Additive ml/l		
		or		10 - 15
		Tinbright Make-up Brightner, ml/l		
		Tinbright Maintenance Brightner, ml/l		
		or		1 - 2
		Teknolume Brightner ml/l		


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		9.PROCESS:		
		<u>9.1 Solvent Degreasing</u>  Excess of oil / grease / cutting Lubricants shall be removed by means of suitable solvent such as trichlor-oethylene and dried in air subsequently. Preferably vapour degreasing process shall be followed.		
		<u>9.2 Alkaline Degreasing</u>  Parts shall be immersed in the degreasing solution as mentioned in clause 6.1.		
		<u>9.3Rinsing</u>  After Alkaline degreasing, the parts shall be rinsed in clean cold running water. The surface of the article at this stage shall provide a continuous water film over it. A break in water film indicates that the surface is not clean, in which case the Alkaline degreasing (clause. 6.1) shall be repeated.		
		<u>9.4 Acid Cleaning /Pickling</u>  <u>9.4.1 Chromic-sulphuric acid Pickling</u>  After rinsing the parts shall be dip in the chromic-sulphuric acid pickling solution (clause 6.2) to remove the oxide film and micro-constituents present on the metal surface.		
		<u>9.4.2 Rinsing</u>		
		<u>9.4.3 Nitric-Hydrofluoric acid Pickling (optional)</u>  In case of high silicon content, the article shall be pickled in the nitric-hydrofluoric acid pickling solution. as maintained in clause 6.3 under proper hood.		
		<u>9.4.4 Rinsing</u>		
		<u>9.4.5 De-oxidizing</u>  After pickling as mentioned either in clause 6.2 or 6.3 depending on the requirement, the parts shall be first rinsed in clean cold running water and then immersed indeoxidizing solution No.1, A or B as mentioned in clause 6.4, to remove any residual smut left on the surface.		
		<u>9.5 Rinsing</u>  After de-oxidizing the parts shall be rinsed in clean cold running water. Double rinsing is preferred.		

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COPYRIGHT AND CONFIDENTIAL  The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to interest of Co.		<u>9.6 First Zincate Treatment</u> After rinsing the parts shall be immersed in zincate solution (clause.6.5). The articles shall be gently stirred during the treatment.  NOTE :- For high silicon content cast alloys, the treatment time shall be reduced to 5 to 10 seconds only.			
		<u>9.6.1 Rinsing</u>  After the first Zincate treatment. The parts shall be rinsed in clean running water, double rinse is required.			
		<u>9.6.2 Deoxidizing Solution No 2 (Zincate removal)</u>  After rinsing the parts shall be dipped in Deoxidising solution No 2 as mentioned in Clause. 6.4 to remove loose zincate layer.			
		<u>9.6.3 Rinsing</u>  After deoxidising solution dip the parts shall be rinsed in clean cold running water. Double water rinse is required.			
		<u>9.6.4 Second Zincate treatment</u>  After rinsing, the parts shall be immediately dipped in the zincate solution as mentioned in clause 6.5.			
		<u>9.6.5 Rinsing</u>  After second zincate treatment, the article shall be rinsed in clean running water. Two successive rinses shall be given to remove the last traces of viscous zincate solution. A dip in running water followed by a spray is more effective.			
		<u>10.0 Copper plating / strike</u>  After water rinsing, a copper strike shall be given on the articles from copper plating bath (clause 6.6.1)			
		<u>11.0 Rinsing</u>  After copper plating all articles shall be thoroughly cleaned in running water.			
		<u>12.0 Acid dipping</u>  Before dipping in the plating bath all articles shall be dipped in 4 to 5% sulphuric acid (CL.6.7) solution followed by a dip in deionlised water.			

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		<u>13.0 Plating</u>  All articles shall be tin plated (as mentioned in cl.6.8) at specified current density for a duration which will depend on the thickness of the deposit required.		
		<u>14.0 Cold rinsing</u>  After removal from the tin plating bath all articles shall be rinsed thoroughly in cold running water till all traces of plating solution are removed.		
<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.		<u>15.0 Hot Rinsing</u>  After cold ringsing, all articles shall be rinsed in hot water at 60-70 deg C.		
		<u>16.0 Drying</u>  Finally, all articles shall be dried in centrifugaal drier or by hot air.		
		<u>17.0 Precautions</u>  17.1 The electrolyte shall be kept covered when not in use to keep the bath free from dust and foreign matter.  17.2 The tin anode shall be kept immersed in the electrolyte during idle hours to minimise oxidation of in to stannic oxide, which is objectionable.  17.3 Any article that becomes lodged in any part of barrel/vat shall be removed immediately.  17.4 Ensure that the bath is 'alive' before loading the job into the plating vat.  17.5 Any metal that may be deposited on any part of the vat/barrel shall be removed.  17.6 Proper pre-trreatments are essential for getting a plat-ing. Therefore, process parameters, whatever specified should be strictly followed.  17.7 In the plating of aluminium, racks OR wire should be made from pure aluminium of from the alloy similar to that being plated. The contact should be strong and sound.  17.8 Electrical contacts should invariably be established before putting the work in the electrolytes, so that immersion deposits formed by substitution process may not affect the adhesion of the subsequent electro-deposits.  17.9 A separate dilute nitric acid solution (Deoxidizing solu-tion) should be used for cleaning treatment as followed in clause 9.6.2 after first zincate treatment.		

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		17.10 If blisters are observed after Tin plating, then pretreat- ment cycles are to be checked and at the same time copper plating / strike bath is to be tested.		
		17.11 Any chemical which may be necessary for addition, shall then be added in the bath through a filter / Perforated Bucket.		
		17.12 Any metal that may be deposited on any part of the bath, shall be removed immediately.		
COPYRIGHT AND CONFIDENTIAL  The information on this document is the property of Bharat Heavy Electricals Limited It must not be used directly or indirectly in any way detrimental to interest of Co.	<u>18.0 Inspection and Quality of deposit</u>  When tested in accordance with the test methods shown against each, the deposit shall conform to the norms specified. below :-			
	<u>18.1 Sampling</u>  A minimum of 1% of each batch of vat / Barrel, load OR part thereof shall be taken at random for testing with a minimum of 2 samples when the plated articles 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 condition for the purpose of testing.			
	<u>18.2 Condition of surface</u> The coating shall be uniformly bright free from black patches stains, pinholes, sponginess, blisters, uncovered areas and other Superficial blisters visible to unaided eyes.			
	<u>18.3 Thickness of deposit (I.S. 3203)</u> The minimum thickness shall be as specified in purchase order OR drawing.			
	<u>18.4 Adhesion (I.S. 1359)</u> Flaking and blesterring of the coating is not acceptable.			
	<u>18.5 Solderability (IS:1359)</u> The actual soldering on the component may be done on shop flooe and observations be made.The sample shall be consid- ered solderable if they show a uniform coating free from discontinuities or breaks visible to the unaided eye.			
		<u>18.16 Rejection</u> If the samples taken do not comply with clauses 18.2 to 18.4 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.		
		19.0 Safety measures are to be followed as detailed in AA0462801 (Safety precautions for Electroplating shops and Handling of Chemicals).		