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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE 560 012



DEPT : QUALITY

PURCHASE SPECIFICATION

DEPT : QUALITY
SEC : 372/PSH/GAL
REV : 01
DATE : 29.08.2006
PAGE : 1 OF 5

**TECHNICAL REQUIREMENT PERTAINING TO HOT DIP GALVANISING OF
FERROUS COMPONENTS**

- 1 The components are to be hot dip galvanised in accordance with IS:2629/1985 (Refer Table-3 : General Galvanising procedure in line with IS:2629/1985 for ferrous components)
- 2 The Zinc used for hot dip galvanising should be of grade Zn 99.95 as per IS:209/1979
- 3 Adequate facilities should be available to ensure process control as per IS:2629/1985 and product testing as detailed at Clause '6'
IS-2629
- 4 The records of the following parameters checked as per the periodicity indicated against each of them to be maintained by sub-contractor and submitted for scrutiny to BHEL when asked for :

	Parameter		Periodicty
4.1	Acid concentration	Of the pickling bath	At an interval of 4 hours
4.2	Specific gravity		
4.3	Iron content		
4.4	Specific gravity of the flux solution		
4.5	Temperature of galvanising bath		At an interval of half an hour
4.6	Purity of zinc ingot		Every consignment purchased by vendor (One sample)

- 5 Galvanised components shall be inspected for freedom from surface defects (100% Visual Inspection) such as those mentioned in IS:2629/1985. Dimensions of component are altered by galvanising, Hence, dimensional inspection is necessary after galvanising (for critical dimensions only). Inspection of profiles / contours may call for suitable gauges (100% Gauge check) and the same gauges shall be provided by BHEL.

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PAGE : 2 OF 5

6. Further, coating characteristics described below shall be tested for, on the galvanised products.

	Coating characteristic	Acceptance norms	No. of samples to be tested per lot of 1000 or part thereof
6a)	Uniformity of Zinc coating (Copper sulphate dip test as per IS:2633/1986)	As indicated in Table 1	As indicated in table 2 below
6b)	Mass of Zinc coating as per IS:6745/1972	As indicated in Table 1 below	As indicated in table 2 below
6c)	Adhesion of coating (knife test as per IS:2629/1985)	The coating shall not peel off	2

TABLE 1: ACCEPTANCE NORM FOR UNIFORMITY OF ZINC COATING & MASS OF ZINC COATING TESTS

Acceptance Norm	Under Category				
Characteristic	A	B	C	D	E
Uniformity of zinc coating (no. of one minute dips to be withstood)	6	8	6	6	6
Mass of zinc coating (gm/m ²)	610	650	650	800	1150

TABLE 2: SAMPLING PLAN FOR UNIFORMITY OF ZINC COATING & MASS OF ZINC COATING TESTS

Acceptance Norm	Under Category				
Characteristic	A	B	C	D	E
Uniformity of zinc coating	3	9	6	6	6
Mass of zinc coating	3	3*	3	6	6

* Test coupons also may be processed for determining mass of zinc coating whenever provided.

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DEPT : QUALITY

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REV : 01

DATE : 29.08.2005

PAGE : 3 OF 5

7. Items of a particular type with a total quantity in number of continuous production not exceeding 1,000 shall constitute a lot. Number of samples indicated refers only to normal conditions of galvanising process. It is liable to be enhanced from time to time at the instance of performance proving not satisfactory.

8. In case of socket caps bituminous paint must be applied inside the bell portion uniformly. The bituminous paint used should have following properties as per IS:158/1981

Sl. No.	Test Description	Acceptance Norms
1.	Visual Inspection	Glossy & Smooth Coating
2.	Specific gravity	0.84
3.	Viscosity (For B4 Fort Cup)	> 60 sec.
4.	Drying Time	8 Hours Maximum

(In case bituminous paint application, asked at particular portion of Metal parts other than socket caps the same will be applicable.)

9. The sub-contractor shall satisfy himself first as to the quality of the lot for carrying out the inspection / tests detailed above. Lots shall be offered for inspection to BHEL, along with reports of inspection / tests carried out by the sub-contractor. Lot offered without prior inspection / testing by the sub-contractor shall not be entertained.

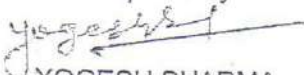
10. Prior intimation in advance of atleast one day in case of local parties or one week in case of outstation parties should be given for arranging inspection. All necessary documents like, purchase order and records maintained should be furnished for raising necessary inspection documents.

11. At the time of lot offering for BHEL inspection, internal test reports comprising details like date of galvanising, results of various tests on products and also process parameters mentioned earlier shall be produced to BHEL personnel for verification.

12. Surveillance checks to be carried out at least once in 6 months irrespective of whether supplies have been effected or not, as long as the vendor is on the PMD listing.

13. Rejection :
Components not conforming to the above stipulations shall be rejected. However, re-galvanising of the components may be taken up with due approval of BHEL in case of rejection.

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PAGE : 4 OF 5

Table 3 : GENERAL GALVANISING PROCEDURE IN LINE WITH IS:2629/1985 FOR FERROUS COMPONENTS

STEPS	OPERATION DESCRIPTION
Step - 1	If oil, Grease or paint is/are present on the component surface, cleaning of the components using NaOH solution (Concentration approximately 10 to 15 kg per 100 Liter) or suitable solution may be used. Note: In general Components for galvanising are shot blasted and are free from oil, Grease or paint.
Step - 2	Pickling - To clean the scale (due to aging after shot blasting) on the metal surface dilute Sulphuric acid to be used followed by water rinse. Then any of the following solution may be used for pickling • Dilute Technical Grade Hydrochloric acid (Concentration 100 to 150 gm/Liter) should be used with suitable inhibitor. • Dilute Technical Grade Sulphuric acid (Concentration approximately 100 to 150 gm/Liter) should be used with suitable inhibitor. This Sulphuric acid solution at elevated temperature (60° C to 80° C) gives better results. Brushing / Scrubbing may be resorted if necessary.
Step - 3	Rinsing - After pickling, the component should be rinsed using fresh water (preferably running water)
*Step - 4	Fluxing - Any one of the following process may be adopted Dry process- Strong solution of Zinc Ammonium Chloride (in general concentration is 200 to 400 gm Zinc Ammonium Chloride per liter) is prepared and some wetting agent also must be added in the flux solution. The components are dipped in the solution. The temperature may be around 80° C. Wet process- A deep flux cover is used on the zinc bath. The component immerses through the flux layer with or without prior fluxing.
*Step - 5	Pre-heating Dry process- Component should be dried on hot mesh or an air oven. Pre-heating of component shall be undertaken by taking care of non-decomposition of flux. Wet process- Component drying is not considered essential.

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PAGE : 5 OF 5

Step - 6 Galvanising

Quality of Zinc - Purity of zinc used for Galvanising should be greater than 99.95 %

Immersion in molten Zinc bath - Bath temperature may vary from 440° C to 460° C and the working temperature is 450° C. Dross should be allowed to settle at the bottom of the zinc bath and should not disturb more than necessary during dipping operation. The component should be immersed as rapidly as possible.

Component will be left in the bath until it reaches the temperature of the bath, which is usually indicated by the stopping of the boiling action.

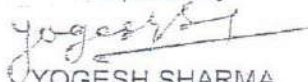
Withdrawal - The rate of withdrawal determines the thickness of the unalloyed zinc layer left on the component. The rate of withdrawal should be controlled so that zinc drains freely from the surface. While component withdrawal access zinc removal should be taken care by shaking / vibrating the component.

Water quenching - After withdrawal, the galvanised component should be immediately dipped into water to allow the coating to set and prevent the components from sticking to each other. Water used in quenching should be clean (preferably running water)

Step - 7 **Post treatment** - To avoid the "white rust" and "wet storage stain" post treatment like Chromating should be done. Chromating solution contains 1% Sodium dichromate and 0.5% sulphuric acid solution. The solution is kept at room temperature and its temperature should never be more than 65° C while usage. The galvanised components are dipped into the chromating solution after the galvanising and water quenching operations.

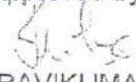
* In place of Fluxing and Preheating processes hot flux solution to be used particularly for socket caps and similar design casting and forging. In this process component after rinsing must be dipped in hot flux solution (Concentration 200 to 400 gm Zinc Ammonium Chloride per liter at Temperature around 80° C) for some time and taken out and kept for drying. Dried component to be taken for galvanising.

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