



CORPORATE STANDARD

AA 067 36 01

Rev. No. 08

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PROCESS FOR CLEANING AND PREPARATION OF METAL SURFACES PRIOR TO ELECTROPLATING

1.0 GENERAL :

This standard details the processes for the preparation of metal parts prior to electroplating, with particular reference to ferrous, copper and copper alloy parts.

Note :

Parts fabricated by riveting, spot welding, etc. where difficulty will be experienced in removing the entrapped electrolytes, should not be electroplated.

2.0 COMPLIANCE WITH NATIONAL STANDARDS :

There is no National Standard covering this process.

3.0 MATERIALS :

| <u>Material</u> | <u>CPS No./IS No./Available From</u> |
|--|---|
| 3.1 Sulphuric Acid (Technical) | : AA 541 01 |
| 3.2 Nitric Acid | : AA 541 02 |
| 3.3 Hydrochloric Acid (Technical) | : AA 541 03 |
| 3.4 Chromic Acid-Electroplating Grade : | AA 541 04 |
| 3.5 Caustic Soda (Technical) | : AA 542 01 |
| 3.6 Potassium Cyanide For Electroplating | : AA 556 09 |
| 3.7 Sodium Cyanide for Electroplating | : AA 556 10 |
| 3.8 Trichloroethylene (Technical) | : AA 567 06 |
| 3.9 Cleaner S-20 | } M/S. Platewel Processes Chemicals Ltd., Vadodara |
| 3.10 Cleaner SE-11 | |
| 3.11 Cleaner ADA-1D | : M/s. ACCI, Rishra Kolkata |
| 3.12 Metaclean ZX | : M/s CMP Pvt.Ltd, Mumbai |
| Steelex K-20 | : |
| 3.13 Inhibitor - 11 | } M/s.Grauer & Weil (I) Limited, Mumbai |
| 3.14 Pickle Aid Accelerator | |
| 3.14.1 Acitex Accelerator | : Artek sufir chemicals (P) Ltd. Mumbai |

Revisions :

Cl 34.11.4 of MOM of MRC (CPO)

APPROVED :

INTERPLANT MATERIAL RATIONALISATION
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Prepared
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| | | |
|----------------------------|---|---|
| 3.15 Pickle Aid Additive | : | |
| 3.16 Rodine - 50 | : | M/s. Agromore Limited |
| 3.17 Rodine - 119 | : | Bangalore |
| 3.18 Pickelwel-S | : | |
| 3.19 Remogal HDS | : | M/s Mascot Chemical |
| 3.20 Pickelwel - H | : | Works, Bangalore. |
| 3.21 Uniclean HD | : | M/s. Srinivasa Industrial Chemicals, Bangalore |
| 3.22 Surclean EC-504 | : | M/s. Grauer & Weil (I) Ltd., Mumbai |
| 3.23 Ginbond 808 | : | |
| 3.24 Surfolin EC-54 | : | M/s. Artek Surfin |
| 3.25 Surfolin EL-80 | : | Chemicals (P) Ltd., Mumbai |
| 3.26 Stainless Steel Anode | : | IS : 6911, Grade 07 Cr 18; Ni 19 |
| 3.27 Common salt | : | IS : 253 (Nacl 96% minimum) |

4.0 EQUIPMENT :

4.1 Vapour degreasing plant :

Any standard plant for the purpose

4.2 Alkaline degreasing vat :

Mild steel tank provided with suitable steam coils or electrical heating for heating the vat solution with thermostatic control.

4.3 Electrolytic (Anodic) Degreasing Tank :

Mild steel tank provided with suitable steam coils or electrical heating for heating the vat solution with thermostatic control and provided with anode and cathode bus bar.

4.4 Acid pickling vats :

Rubber / PVC / FRP / Lead lined M.S. Tank or PVC tank.

4.5 Bright dip pickling vat :

Stainless steel tank.

4.6 Rinsing Vats :

Rubber / PVC / FRP lined M.S. Tank.

4.7 Cyanide dip vat :

M.S.tank / Rubber lined / plastic lined / Enamel lined / Stone ware.



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5.0 COMPOSITION OF SOLUTIONS AND OPERATING CONDITIONS :

5.1 Alkaline Degreasing Solution :

| Sl. No. | Material | Quantity g/litre | Temperature °C | Duration Time minutes (Recommended) | Current Density A/DM ² | Voltage V |
|---------|---|---------------------------|----------------|-------------------------------------|-----------------------------------|------------------------------------|
| 1. | Cleaner S-20 | 30-50 | 90±5 | 10-12 | -- | -- |
| 2. | Cleaner SE-11 | 50-90 | 60-90 | 2-8 | -- | -- |
| 3. | Steelex K-20/ Metaclaen ZX | 45-75 | 90±5 | 1-5 | -- | -- |
| 4. | Cleaner ADA-1D | 30-50 | 90-95 | 1-2 | -- | -- |
| 5. | Uniclean HD | 50-100 | 80-90 | 10-15 | -- | -- |
| 6. | Remogal HDS | 20-30 | 60-65 | 3-5 | -- | -- |
| 7. | Surclean EC-504 and Sodiumhydroxide | 50-100 (ml/1) 20-60 | 65-70 -- | 2-5 -- | -- -- | -- -- |
| 8. | Surfolin EC-54 and Sodiumhydroxide | 50-100 (ml/1) 20-60 | 65-70 -- | 2-5 -- | -- -- | -- -- |
| 9. | Gin Bond 808 | 80-100 | 60-65 | 2-4 | 5-10 | 5-9 (Rack) 10-14 (Barrel) |
| 10. | Surfolin EL-80 | 80-100 | 60-65 | 2-4 | 5-10 | 5-9 (Rack) 10-14 (Barrel) |

NOTE :

- The time duration (recommended) can vary with the condition of the job.
- In case jobs do not get cleaned then the solution shall be checked for pointage and rectified.

5.1.1 The tank shall be filled with water to about two-thirds of its capacity and then the necessary quantity of material shall be added to the bath with stirring as per clause 5.1. After proper mixing, the solution shall be brought to the working level by adding more water with stirring and heated to the operating temperature.



5.1.2 Analysis and replenishment of alkaline degreasing solution :

The solution shall be analyzed at suitable intervals and deficiency if any, shall be replenished with required chemicals.

The concentration of bath solution shall be maintained as given below :

| Material | Pointage |
|--------------------------------|----------------------------|
| Cleaner S.20 | 30-50 |
| Cleaner SE-11 | 50-100 |
| Steelex K-20 | 45-75 |
| Cleaner ADA 10 | 30-50 |
| Uniclean HD | 50-55 |
| Remogal HDS | 20 minimum for 5 ml sample |
| Surclean EC 504 OR | 50-155 |
| Surfolin EC 54 | |
| Gin Bond 808 OR surfolin EL 80 | 100 - 130 |

5.2 Acid Pickling Solutions :

5.2.1 HCL Pickling Solution :

| | | |
|-------------------|---|---|
| Hydrochloric Acid | : | 400 - 500 ml/litre |
| Inhibitor - 11 | : | 2 to 6 ml/litre of the volume of the acid mixture |
| or | | |
| Rodine-50 | : | 0.1 to 0.5% of the acid used |
| or | | |
| Pickelwel-H | : | 0.25 to 0.5% of the acid used |
| Temperature | : | Shop temperature |
| Time | : | 2 to 10 minutes or as required |

The tank shall be filled with water to about two-thirds of its capacity and then the necessary quantity of hydrochloric acid shall be added to the water slowly with stirring. The required quantity of Inhibitor-II or Rodine-50 (mixed with some concentrated hydrochloric acid) or Pickelwel-H shall then be added to the acid mixture.

After all additions, the bath solution shall be brought to the working level by adding more water with stirring. The bath shall be operated at shop temperature.



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5.2.2 HCl Pickling Solution-For Heat Treated Ferrous Component/Annealed Oxide Pickling (Optional) :

| | | |
|------------------------|---|--------------------------------|
| Hydrochloric Acid | : | 400 to 500 ml / litre |
| Pickle Aid Additive | : | 20 ml / litre |
| Pickle Aid Accelerator | : | 100 gm/litre |
| Temperature | : | Shop temperature |
| Time | : | 2 to 10 minutes or as required |

5.2.3 Sulphuric Acid Pickling Solution :

| | | |
|----------------|---|----------------------------------|
| Sulphuric acid | : | 100 - 125 ml/litre |
| Rodine - 119 | : | 0.125 to 0.375% of the acid used |
| or | | |
| Pickelwel - S | : | 0.25 to 0.5% of the acid used |
| or | | |
| Inhibitor 11 | : | 2 - 6 ml/litre |
| Temperature | : | 60 - 70° C |

The tank shall be filled with water to about two-thirds of its capacity and then the necessary quantity of sulphuric acid shall be added to the water slowly with stirring. The required quantity of Rodine - 119 (mixed with some concentrated sulphuric acid) or Pickelwel - S or inhibitor 11 shall be added to the acid mixture.


After all additions, the bath solution shall be brought to the working level by adding more water with constant stirring and heated to the operating temperature.

5.2.4 Chromic-Sulphuric Acid Pickling Solution (For Heat treated / annealed Non-ferrous component)

| | | |
|----------------|---|----------------------------|
| Chromic acid | : | 30 to 40 g / litre |
| Sulphuric acid | : | 50 to 70 ml / litre |
| Temperature | : | Shop temperature |
| Time | : | 1-2 minutes or as required |

The tank shall be filled with water to about two-thirds of its capacity and then the necessary quantity of sulphuric acid shall be added to the water slowly with stirring. The required quantity of chromic acid shall then be added to the acid mixture. After complete dissolution, the bath solution shall be brought to the working level by adding more water with constant stirring.

The bath shall be operated at shop temperature.

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5.3 Bright Dip Pickling Solution (Optional) :

5.3.1 Composition I : (Composition by Volume) :
(For Ferrous Components)

| | | |
|----------------|---|------------------------------------|
| Sulphuric acid | : | 1 part |
| Nitric acid | : | 1 part |
| Water | : | 1 part |
| Temperature | : | Shop temperature |
| Time | : | 10 secs to 1 minute or as required |

5.3.2 Composition II : (Composition by Volume) :
(For Non-Ferrous Components)

| | | |
|---------------------------|---|------------------------------------|
| Sulphuric acid | : | 2 parts |
| Nitric acid | : | 1 part |
| Water | : | 1 part |
| Sodium Chloride (cl.3.27) | : | 1 to 1.5 g/litre |
| Temperature | : | Shop temperature |
| Time | : | 10 secs to 1 minute or as required |

5.4 Cyanide Dip Solution for Ferrous Components :

| | | |
|----------------|---|----------------------------|
| Sodium Cyanide | : | 80 to 100 g/litre |
| Water | : | To make up the volume |
| Temperature | : | Shop temperature |
| Time | : | 1-2 minutes or as required |

5.5 Cyanide Dip Solution - for Non-ferrous components:

| | | |
|-------------------|---|----------------------------|
| Potassium Cyanide | : | 25 to 35 g / litre |
| Water | : | To make up the volume |
| Temperature | : | Shop temperature |
| Time | : | 1-2 minutes or as required |

Whenever required, the ferrous pickled components be given passivation dip in a solution with

| | | |
|----------------|---|---------------------|
| Chromic Acid | : | 5 to 10 g / litre |
| Sulphuric Acid | : | 0.4 to 1 ml / litre |

6.0 ANALYSIS AND REPLENISHMENT:
(of acid pickling and cyanide dip solution)

The solution in clauses 5.2 to 5.5 (except 5.3) shall be analyzed regularly at suitable intervals and deficiency, if any, shall be replenished with the required chemicals. The concentration of bath solution shall be maintained as given in Cl 6.1.



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6.1 Maintenance of Acid Pickling and cyanide dip solution :

The concentration of acid pickling and cyanide dip solutions shall be maintained as given below :

6.1.1 HCL Pickling Solution (Cl. 5.2.1 and 5.2.2)

Strength (Hydrochloric acid content) grams / litre 120 to 150

6.1.2 Sulphuric Acid Pickling Solution (Cl. 5.2.3)

Strength (Sulphuric acid content) grams / litre 180 to 220

6.1.3 Chromic Sulphuric Acid Pickling Solution (Cl.5.2.4)

Chromic acid grams / litre 30 to 40

strength (sulphuric Acid content) ml / litre 50 to 60

6.1.4 Cyanide dip Solution (Ferrous) (Cl. 5.4)

Sodium Cyanide content grams / litre 80 to 100

6.1.5 Cyanide dip solution (Copper and Copper Alloy) (Cl. 5.5)

Potassium Cyanide content grams / litre 25 to 35

7.0 PROCESS FOR FERROUS PARTS :

7.1 Mechanical Cleaning :

Where parts are heavily scaled, mechanical cleaning such as scratch brushing polishing or shot-blasting shall be resorted to. Care must be taken to avoid distortion of light gauge articles.

7.2 Solvent Degreasing :

Excess grease, oil or cutting lubricants shall be removed by means of a suitable organic solvent such a trichloroethylene.

7.3 Degreasing :


Parts shall be degreased by immersion in any one of the alkaline degreasing solutions mentioned at clause 5.1.

7.4 Rinsing :

After degreasing, the parts shall be rinsed in clean cold running water. The surface of the parts at this stage shall provide a continuous water film over it. A break in the water film indicates that the surface is not clean, in which case, the alkaline degreasing process shall be repeated.

7.5 Pickling :

If required, acid pickling may be done as per clauses 5.2.1, 5.2.3 and 5.2.4 till clean metallic surface is produced. Over pickling shall be avoided.

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7.6 Rinsing :
After pickling, the parts shall be rinsed in clean cold running water.

7.7 Electrolytic (Anodic) Cleaning :
After rinsing the parts shall be degreased electrolytically in solution as mentioned in Clause 5.1 Sl.No. 9 or 10.

7.8 Hot Water Rinse :
After electrolytic (Anodic) cleaning parts shall be rinsed in Hot Water (50 - 60°C)

7.9 Cold Water Rinse :
After hot water rinse parts shall be rinsed in cold running water.
The surface of the parts at this stage shall provide 9 continuous water film over it. A break in water film indicate that surface is not clean, in which case, the process shall be repeated.

7.10 Bright Dip Pickling:
The parts shall be dipped in bright dip solution at room temperature for few seconds till a uniform bright surface free from scale is obtained.

7.11 Rinsing :
After the bright dip, the parts shall be rinsed in clean cold running water.

7.12 Cyanide Dip:
Parts shall be dipped in sodium cyanide solution till stains are removed from the articles. Parts shall be rinsed in clean cold water if subsequent plating is not a cyanide one.

7.13 Electroplating :
Electroplating shall be done in line with the appropriate BHEL Standard.

8.0 PROCESS FOR NON-FERROUS COMPONENTS:

8.1 Mechanical Cleaning :
Where necessary, the parts shall be cleaned by scratch brushing polishing. Care must be taken to avoid distortion of light gauge articles.

8.2 Solvent Degreasing :
Excess grease, oil or cutting lubricants shall be removed by means of a suitable organic solvent such a trichloroethylene.

8.3 Alkaline Degreasing :
Parts shall be degreased by immersing in cleaner SE11 or Steelex K20 alkaline degreasing solutions mentioned at clause 5.1 till the parts are free from any oil or grease.

8.4 Rinsing :
After degreasing, the parts shall be rinsed in clean cold running water. The surface of the parts at this stage shall provide a continuous water film over it.



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8.5 Acid Pickling :

8.5.1 Hydrochloric Or Sulphuric Acid Pickling :

If required, pickling may be done as per clauses 5.2.1, and 5.2.3 till clean metallic surface is produced. Over pickling shall be avoided.

8.5.2 Chromic Sulphuric Acid pickling (optional) for Non - Ferrous:

All surface residues formed during annealing, the parts shall be pickled by dipping in chromic sulphuric acid solution of following strength for a few minutes at shop temperature. Prolonged pickling shall be avoided, otherwise the surface will become etched and pitted.

Same composition as mentioned in clause No. 5.2.4.

8.5.3 Rinsing :

After pickling, the parts shall be rinsed in clean cold running water.

8.6 Bright Dip Pickling:

Parts shall be dipped in any one of the bright dip solutions mentioned at clause 5.3 at room temperature for a short duration till a uniform bright surface free from scale marks is obtained.

8.7 After the bright dip, the parts shall be rinsed in clean cold running water.

8.8 Cyanide Dip:

Parts shall be dipped in potassium cyanide solution till stains are removed from the articles.

8.9 Rinsing :

Parts shall be rinsed in clean cold running water if subsequent plating is not a cyanide one.

8.10 Electroplating :

Parts shall be electroplated in line with the appropriate BHEL Standard.

8.11 Optional Test:

Passivation.

9.0 INSPECTION :

The surface shall be examined visually for bright and clean finish free from grease and rust.

10.0 REFERRED STANDARDS (Latest Publications Including Amendments):

- | | | | |
|--------------|--------------|---------------|--------------|
| 1) AA 541 01 | 2) AA 541 02 | 3) AA 541 03 | |
| 4) AA 541 04 | 5) AA 54201 | 6) AA 556 09 | 7) AA 556 10 |
| 8) AA 567 06 | 9) IS : 253 | 10) IS : 6911 | |