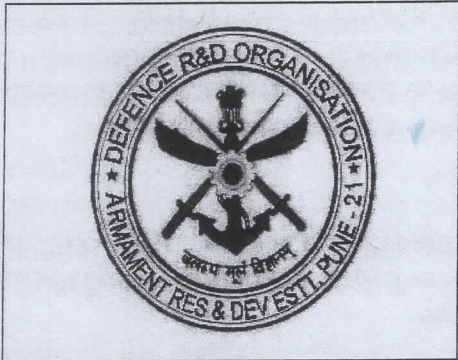


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Specification for Electroless Nickel Boron Nitride Coating

September 2016

Issued by:

Handwritten: HOS/AMM  
आरखण की सही प्रमाणित प्रतिलिपि दिनांक.....  
Certified as correct copy of drg. on 13/01/23  
Signature: Anurag  
क. कार्यशाळा प्रबन्धक  
Jr. Works Manager  
डा.सी.ओ.

ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT  
Dr. HOMI BHABHA ROAD, PASHAN, PUNE – 411 021.

## Specification for Electroless Nickel Boron Nitride Coating

(Specn No : ARDE/SA/2016/Coating-02)

### 1. FOREWORD

This specification has been prepared by ARDE Pune, for coating on 5.56x30mm Joint Venture Protective Carbine components and its accessories.

Coatings are generally applied on the Small Arms weapon components to improve their aesthetics, wear resistance, corrosion resistance & dry lubrication properties. The dry lubrication prevents sticking of sand and dust to the weapon components especially in the desert area, due to which the performance of the weapon improves, i.e. number of stoppages reduces to minimum because of non sticking of sand and dust particles in the weapon's functional area i.e. Trigger mechanism, Bolt, etc. Subsequently the routine maintenance of weapon is also reduced to a great extent; hence reduction in maintenance cost & time is possible.

### 2. SCOPE:

This specification governs the specific requirement of coating, quality assurance and acceptance of finalised coating on JVPC components & its accessories.

2.1 Quality Assurance Authority for the item covered in the specification is ARDE, Pune. Any query relating to this specification shall be referred to The Director, ARDE or the agency duly authorized to act on his behalf.

### 3. RELATED SPECIFICATIONS

This specification is to be read in conjunction with the drawings quoted in the contract / tender.

3.1 Whenever a reference is made to any document in this specification it should be taken as a general guide to workmanship and finish and not as a guide for dimensioning. The references of document/ specification should conform to the latest edition of the documents unless otherwise stated.

### 4. MANUFACTURE

The dimension and the form of the store and its components are to be in conformity with the drawings used. The coating developer/ manufacturer should prepare process schedule which is to be followed for the manufacture of Store. Any subsequent change in process schedule should be notified to the Tendering agency/ ARDE Pune in advance in writing. In process Quality control methodology shall be submitted to ARDE in advance. Developer/ Manufacturer/ Plater will also submit all aspects of process to Tendering agency/ ARDE and will obtain concurrence.

- 4.1 Neither the completed store nor any component part shall be altered or rectified in any way not provided for in the drawing or specification without prior sanction of ARDE Pune.
- 4.2 No mechanical work, heat treatment or other operation which may modify the physical properties of the material will be carried out after it has been submitted to the tests unless authorized by ARDE Pune.
- 4.3 Coating Material: Nipoderm 400 (combination of Nipoderm 300 and NiSlip 25 Surface Technology Inc make) or Nickel Boron Nitride (NiBN)

## 5. TESTS RELATED TO PROCESS

The tests to be carried out are given below.

### 5.1 HARDNESS OF COATING

Hardness of coating will be checked on test piece of 1.0mm, C45 steel sheet (and components if required) in a production batch. The batch size will be of qty 10 JVPC components and/or 150 magazines. The size of test piece will be 25 mm x 50mm.

Hardness value of the test pieces shall be as per Table -1. The hardness of the coating will be measured by micro hardness testing machine. If the hardness of test piece found not within specified value, the manufacturer has to verify his process and take corrective actions to achieve the specified hardness before undertaking the batch production.

### 5.2 THICKNESS OF COATING.

The thickness of the coating shall be as per Table -1. The thickness of coating will be checked by manufacturer / plater on test piece (and components if required). It will be ensured that Ni-BN coating thickness shall not be deviated from the specified value.

### 5.3 SURFACE ROUGHNESS

The surface roughness value (Ra) of finished components shall be as per table 1. The surface roughness value shall be checked on test piece (and components if required). The instrument *perthometer* or any other suitable instrument will be used for such test.

### 5.4 WEAR RESISTANCE TEST

The test will be carried out on test piece used for hardness test. The test will be carried out as per table -1.

**6. VISUAL INSPECTION**

All coated finished components (JVPC and accessories) will be visually inspected. The surface of coated components will be free from flaking, blisters, and uncoated areas. The colour and lustrous surface of coating will also be visually inspected. The defects are stated at Table -2.

**6.1** Areas not required to be coated shall not show generally any sign of chemical attack and shall be free from coating.

**7. RECOATING**

The recoating of JVPC components and accessories for one time is allowed for defects stated at Table -1. Recoated JVPC components and accessories should be labelled suitably for traceability. The recoated components will be subjected to all tests specified in this specification.

**8. DIMENSIONAL INSPECTION**

Coated finished components will be examined for dimensions as per the QAPs of the respective components

**9. QUALITY ASSURANCE**

ARDE officer or officer of the nominated Production partner will have access at all times to all department of processing plant which are concerned with the production and storage of the materials, components under the order at works either of the manufacturer or sub manufacturer and shall arrange for quality assurance to be carried out by his representatives as he considers necessary.

**9.1** Before proceeding with the process of coating, all materials shall be inspected and accepted by ARDE officers or the officer deputed by him in batches. Each batch shall contain a quantity of material prepared under uniform conditions in respect of composition and manufacturing process. The manufacturer shall not use any material or component until it has been accepted for its purpose by ARDE officer or officer deputed by ARDE or Production agency.

**10. SUBMISSION AND QUALITY ASSURANCE**

The manufacturer is expected to submit for QA, only satisfactory JVPC components and accessories and shall be required to assume full responsibility for unsatisfactorily coated JVPC components and accessories submitted for QA.

**10.1** If a batch of coated JVPC components submitted to ARDE officer or to the officer deputed by ARDE found deviated from the drawings / specification, the whole batch may be rejected.

**11. RESUBMISSION OF REJECTED BATCHES.**

Rejected batches shall be resubmitted with approval of ARDE officer/ Nominated production agency, where resubmission is permitted. The manufacturer will repair or remove the defects for which the JVPC components and accessories were rejected and then the same will be submitted.

**12. METHOD OF QUALITY ASSURANCE**

The manufacturer shall maintain and provide an effective Quality Assurance system acceptable to ARDE/ Nominated Production agency. The written description of the system will be considered acceptable when it provides the quality assurance required by this specification. The results of all examination and test performed under this QA system will be made available to ARDE officer or to the officer of the Nominated Production agency. The manufacturer shall notify and obtain approval from ARDE/ Nominated Production agency for any changes to the degree of assurance required by this specification on other documents referred to therein.

**12.1** In case of disputes about the quality assurance characteristics of the item the verdict of ARDE officer will be final and binding.

**13. ACCEPTANCE / SENTENCING**

- i) ARDE reserve the right to reject any coatings on JVPC components and accessories during quality assurance which does not satisfy the requirement of drawing / specification.
- ii) JVPC components and its accessories supplied by ARDE/ JVPC manufacturer will be coated and accepted by ARDE to be delivered in proper packing by vendor.

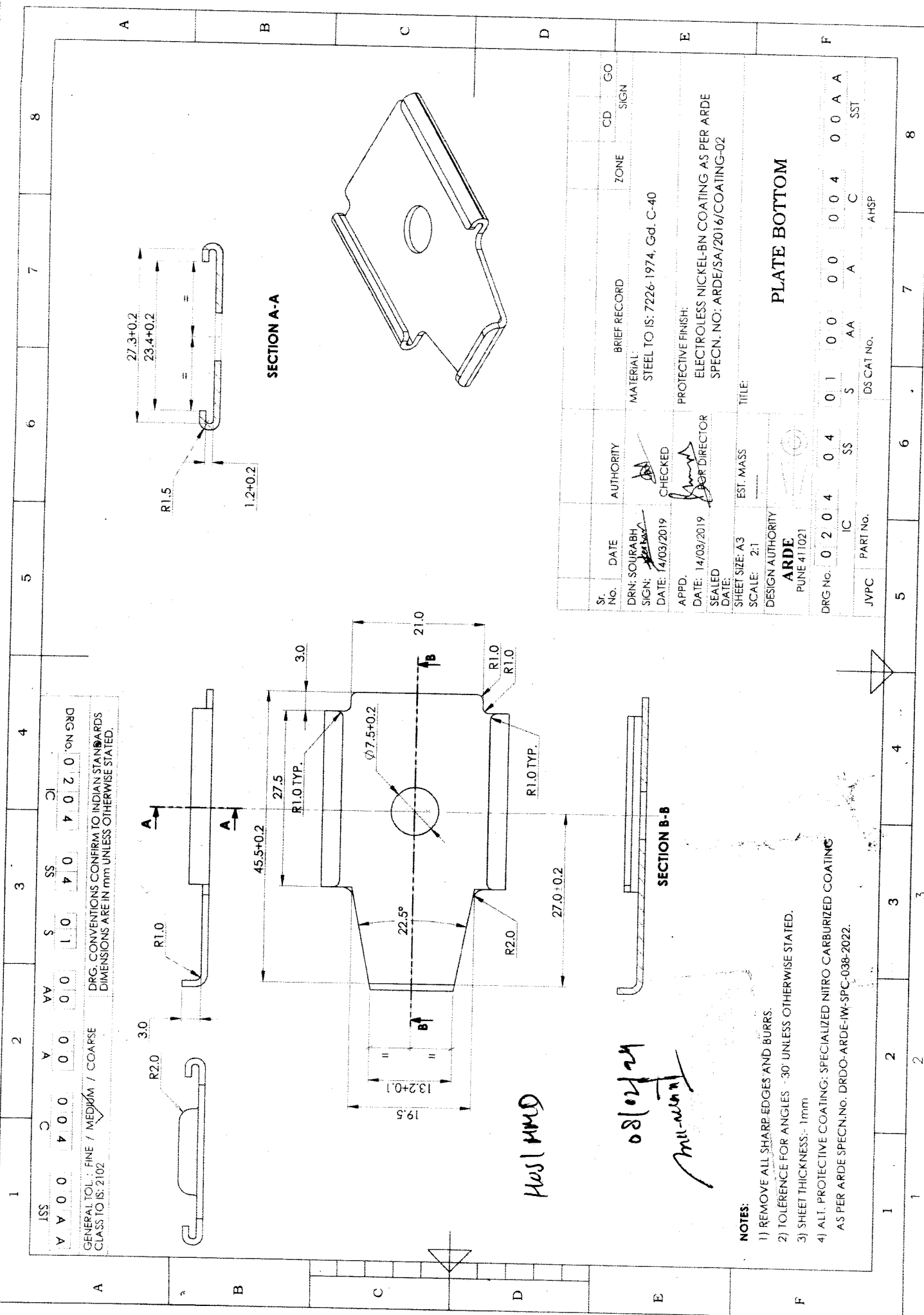
Table -1

## Tests

| SI No | Feature / Requirement  | Location   | Sentencing   |
|-------|--|--|--|
| 1.    | <b>Hardness test</b> by Micro hardness testing method.<br><i>Requirement:</i> Average micro hardness of two test pieces should be 550 HV minimum, with no single test piece below 500 HV<br>Hardness should be within 500 to 1200 HV | To be tested on test pieces (and components if required) | If failed to meet requirement Recoat the batch.<br>Components viz. Breech block, Piston extension, Slider, Slide cocking handle to be de-coated before re-coating. |
| 2.    | <b>Coating thickness</b> to be measured by XRF*/ suitable method.<br><i>Requirement:</i> 0.010 $\pm$ 0.002 mm to 0.020 $\pm$ 0.002 mm<br>*(X-Ray Fluorescence)   | To be tested on test pieces (and components if required) | If failed to meet requirement Recoat the batch.  |
| 3.    | <b>Surface roughness</b><br><i>Requirement:</i> The surface roughness value should be similar to substrate/base material or better after coating.  | To be tested on test pieces                              | If failed to meet requirement Recoat the batch.  |
| 4.    | Wear resistance as per ASTM G65<br>Normal load: 1 kg,<br><i>Requirement:</i> Number of disc rotations 1000 minimum.  | To be tested on test pieces                              | If failed to meet requirement: Check the process and the coating thickness on sample piece to be checked on opposite sides.  |

TABLE -2  
VISUAL INSPECTION

| SI No  | Defects  | Location on coated component | Sentencing            |
|--|--|------------------------------|-----------------------|
| 1.   | Fine cut marks, ring marks, tool mark, scratch or minor spots.<br>Total three defects are allowed. | Entire surface               | Accept.               |
| 2.   | Uneven colour and dullness.  | Entire surface               | Accept.               |
| 3.   | Blisters   | Entire surface               | Reject                |
| 4.   | Peeling/flaking of coating   | Entire surface               | Reject                |
| 5.   | Insufficient coating/ surface left uncoated.   | Entire surface               | Recoat the component. |
| Note: No coating permitted inside Barrel Bore and Gas Block. |  |                              |                       |



DRG. CONVENTIONS CONFIRM TO INDIAN STANDARDS  
DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.

- NOTES:**
- 1) REMOVE ALL SHARP EDGES AND BURRS.
  - 2) TOLERANCE FOR ANGLES - 30 UNLESS OTHERWISE STATED.
  - 3) SHEET THICKNESS:- 1mm
  - 4) ALT. PROTECTIVE COATING: SPECIALIZED NITRO CARBURIZED COATING AS PER ARDE SPECN.NO. DRDO-ARDE-IV-SPC-038-2022.

*Hasl RMD*

*08/02/24*  
*Mil-vent*

**PLATE BOTTOM**

| Sr. No.                                     | DATE | AUTHORITY | BRIEF RECORD | ZONE | CD | GO |
|---|------|-----------|--------------|------|----|----|
| DRN: SOURABH                                |      |           |              |      |    |    |
| SIGN: <i>[Signature]</i>                    |      |           |              |      |    |    |
| DATE: 14/03/2019                            |      |           |              |      |    |    |
| APPD.                                       |      |           |              |      |    |    |
| DATE: 14/03/2019                            |      |           |              |      |    |    |
| SEALED                                      |      |           |              |      |    |    |
| DATE:                                       |      |           |              |      |    |    |
| SHEET SIZE: A3                              |      |           |              |      |    |    |
| SCALE: 2:1                                  |      |           |              |      |    |    |
| DESIGN AUTHORITY                            |      |           |              |      |    |    |
| <b>ARDE</b>                                 |      |           |              |      |    |    |
| PUNE 411021                                 |      |           |              |      |    |    |
| DRG No. 0 2 0 4 0 4 0 1 0 0 0 0 0 0 0 0 A A |      |           |              |      |    |    |
| JVPC IC SS S AA A C                         |      |           |              |      |    |    |
| PARTING. DS CAT No. AHSP                    |      |           |              |      |    |    |

PROTECTIVE FINISH:  
ELECTROLESS NICKEL-BN COATING AS PER ARDE  
SPECN. NO: ARDE/SA/2016/COATING-02

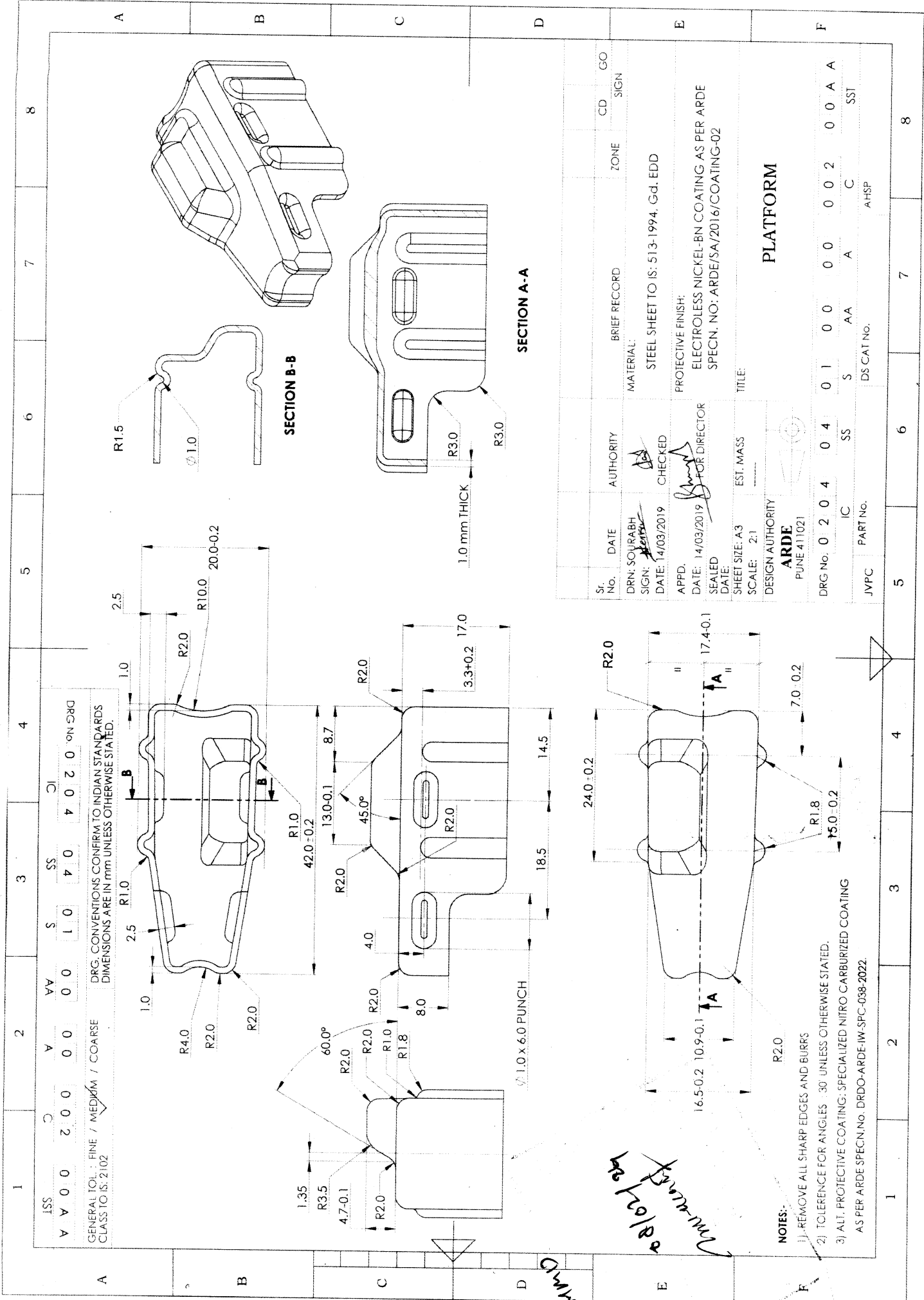
5 6 7 8

1 2 3 4 5 6









|                          |            |                    |  |      |      |         |
|--------------------------|------------|--------------------|--|------|------|---------|
| Sl. No.                  | DATE       | AUTHORITY          | BRIEF RECORD   | ZONE | CD   | GO SIGN |
| DRN: SOURABH             | 14/03/2019 | <i>[Signature]</i> | MATERIAL: STEEL SHEET TO IS: 513-1994, Gd. EDD               |      |      |         |
| SIGN: <i>[Signature]</i> | CHECKED    |                    | PROTECTIVE FINISH: ELECTROLESS NICKEL-BN COATING AS PER ARDE |      |      |         |
| DATE: 14/03/2019         |            |                    | SPECN. NO: ARDE/SA/2016/COATING-02                           |      |      |         |
| APPD. <i>[Signature]</i> |            |                    | TITLE: PLATFORM  |      |      |         |
| DATE: 14/03/2019         |            |                    | EST. MASS  |      |      |         |
| SEALED                   |            |                    |  |      |      |         |
| DATE: 14/03/2019         |            |                    |  |      |      |         |
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| SCALE: 2:1               |            |                    |  |      |      |         |
| DESIGN AUTHORITY         |            |                    |  |      |      |         |
| <b>ARDE</b>              |            |                    |  |      |      |         |
| PUNE 411021              |            |                    |  |      |      |         |
| DRG No: 0 2 0 4 0 4      | SS         | S                  | AA   | A    | C    | A       |
| JVPC                     | IC         | SS                 | S  | AA   | A    | SST     |
| PART No.                 |            |                    | DS CAT No.   |      | AHSP |         |

1 2 3 4 5 6 7 8

A B C D E F