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NOTICE

Sub: “Vendor Meet” for Indigenous procurement of CNC Folding Machine for Indian Railway

Central Organisation for Modernisation of Workshop (COFMOW) under ministry of Railway has to procure CNC Folding Machine.

In this regard, efforts for procurement of CNC Folding Machine for Indian Railway are being explored to identify the probable Indian Manufacturers.

For this a Vendor Meet is being organised at COFMOW. Details of meeting along with relevant documents, next 5 year procurement plan & specifications has also been uploaded on COFMOW website and it's link is given as under:

Date of meeting – 05.10.2021

Place -- Conference Hall, COFMOW

Time -- 11.00 AM – 13.30 PM

Website - <https://cofmow.indianrailways.gov.in>

Dy. CHIEF MECH. ENGINEER-IV

Email ID – dycme4-rly@cofmow.railnet.gov.in

Dated 15.09.2021

Sub: Requirement of 01 number of CNC Folding Machine in next 5 years i.e from 2022 - 2026 manufactured by indigenous firms.

“Central Organisation for Modernisation of Workshop (COFMOW), on behalf of Ministry of Railways is required to procure 01 number of CNC Folding Machine in next 5 years from indigenous manufacturers to be used for bending/folding profiles on corten steel/stainless steel sheets for coach components. Technical specifications and drawings are enclosed.

***Response/queries may please be submitted on the following Email ID:**

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INDIAN RAILWAYS
CENTRAL ORGANISATION FOR MODERNISATION OF WORKSHOPS
SPECIFICATION FOR CNC FOLDING MACHINE
SPECIFICATION NO. COFMOW/IR/CNCFM/6x4000/2019

IMPORTANT FEATURES OF THE TENDER	
1	INSTRUCTIONS TO BIDDERS FOR FILLING TECHNICAL BID
1.1	Unless otherwise stated, latest alterations/ revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards and environmental standards relevant to the machine, the machine manufacturers shall ensure compliance with International (CE/ISO/DIN/JIS)/National standards (IS) (wherever applicable).
1.2	Tenderers should offer and quote for all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. Even if bidder does not recommend the purchase of any of these accessories, the price must be quoted for comparison purposes and their recommendation/suggestion to be indicated in the offer. Tenderers should also quote for optional accessories, spares and consumable spares as asked in the specifications.
1.3	In case, any item is required in sets, please specify nos./pieces per set. This is essential for proper technical evaluation of the offer. Offers received without this may be considered as incomplete and liable to be rejected
1.4	The bidder should quote only for the specified make of sub-assemblies and equipment wherever specified. Makes of sub-systems other than the specified ones will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes must be brought out in the offer
1.5	In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement under Annexure A of Section VI, the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly.
1.6	Bidder or his authorized agent, in their own interest, should visit the consignees listed in clause 3 Section-IV with prior appointment with Controlling Officer of the consignee and acquaint themselves with existing process of manufacturing/remanufacturing, site conditions, availability of material Handling facilities etc.
1.7	The Purchaser may accept internationally accepted alternative specifications which ensure equal or higher quality than the specifications mentioned in the Technical Specification. However, the decision of the Purchaser in this regard shall be final. A copy of the alternative specifications offered should be sent along with the offer. The Tenderer should also furnish "Statement of Deviations" from tender specifications (as per Annexure A, Section-VI) along with the offer.
2.0	DESCRIPTION:
2.1	One number Hydraulically operated CNC Folding Machine, as per major parameters of specification no. COFMOW/IR/CNCFM/6x4000/2019 is required for the consignees as per details given at Clause 3.0 of Section-IV.
2.1.1	The CNC Folding Machine should be capable of folding Corten Steel sheets up to 6 mm thickness and Stainless Steel sheets up to 5 mm thickness of 4000 mm length of material composition as mentioned at Annexure-F (B) of Section-VI. The Folding Machines should be capable of bending/folding profiles of all the components listed at Annexure-F (A) of Section-VI.
2.1.2	The CNC Folding Machine should meet the performance and testing criterion as per CE/other relevant International Standards.
2.1.3	CNC Folding Machine should be capable of working in severe workshop conditions at full capacity continuously in double shift working with 85% availability of machine. The machine shall work in an ambient temperature of 0°C to 50°C and relative humidity up to 98% dusty environment. The machine shall be utilized for two shifts daily six days a week of working regularly. The firm should indicate the features provided in the mechanical, hydraulic, electrical, and electronic systems for tropicalisation of the offered machine.
2.2	LEADING PARAMETERS: The machine should conform to the following major & other parameters. The bidder should furnish the values of these parameters at S.N. 1 of Para 11 of the enclosed Annexure- A of Section-VI

	<ul style="list-style-type: none"> Total time per component <p>NOTE: The information asked in the above clause is essential. The offer without above details may not be considered.</p>										
2.5	<p>Prove Out at Manufacturer's Premises: The firm is required to demonstrate the following at the time of Inspection to the Inspecting authority, in addition to their normal checks carried out during assembly testing as part of quality control measures.</p>										
2.5.1	Geometric and performance tests as per clause 2.1.2 of Section-IV on the CNC Folding Machine. (The tenderer in the offer shall furnish actual test schemes along with sample charts for these tests.)										
2.5.2	Full load test – The capability test shall be carried out for low alloy high tensile strength steel sheets of size indicated in Clause 2.2.1.1 & 2.2.1.2 of Section-IV (The tenderer in the offer shall furnish actual test schemes along with sample charts for these tests.)										
2.5.3	Component Prove out at Firm's premises - In addition to above, any of the combination of components from the list in Annexure F (A) of Section-VI will also be proved out at firm's premises during inspection. The capability test and prove out of these components including cycle time would be carried out on 4 blanks of each component. The combination of the components to be chosen for the said prove out trials should be as per the requirement of ICF. The firm as per material specification given in drawings would arrange the blanks required for this purpose. Alternatively, the components can be collected from the consignee by the tenderer against Bank Guarantee. The cost of transportation, packing etc, shall be borne by the tenderer. Those components shall be returned after prove out & Inspection along with the machine. Cost of components mentioned in Annexure-F of Section-VI is indicative subject to variation at the time of actual requirement/issue.										
2.6	Prove out at Consignee's Works:										
2.6.1	The firm shall require to demonstrate & prove-out the claimed cycle time on Ten blanks of every component listed in Annexure F (A) of Section-VI shall be done at the consignee works at the time of commissioning of machine. The consignee shall provide the required components for prove-out at their end within Two weeks of the dry run of the machine, failing which the component will be deemed to have been proved out on the machine and the entire prove out activity to be completed within 60 days thereafter.										
3.0	Quantity & Consignee										
	<table border="1"> <thead> <tr> <th>S. No.</th> <th>Consignee</th> <th>Key No. (COFMOW ID)</th> <th>Quantity Required</th> <th>Specification No.</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>DY.CMM/SD/ICF/ Chennai-38</td> <td>219529</td> <td>01 No.</td> <td>COFMOW IR/CNCFM/6x4000/2019</td> </tr> </tbody> </table>	S. No.	Consignee	Key No. (COFMOW ID)	Quantity Required	Specification No.	1.	DY.CMM/SD/ICF/ Chennai-38	219529	01 No.	COFMOW IR/CNCFM/6x4000/2019
S. No.	Consignee	Key No. (COFMOW ID)	Quantity Required	Specification No.							
1.	DY.CMM/SD/ICF/ Chennai-38	219529	01 No.	COFMOW IR/CNCFM/6x4000/2019							

4.	SCOPE OF SUPPLY:	
4.1	The specification covers design, manufacture, supply, installation, commissioning and proving of one number hydraulically operated CNC Folding Machine on turnkey basis as per parameters given in Clause no. 2.2 Section-IV and as per technical details given in Section-IV & Section-V including proving out of the components as per Clause 2.5 & 2.6 of Section-IV. It includes all the concomitant accessories/ equipments as detailed in the specification and other concomitant accessories/ equipment, which the manufacturer considers essential to make the machine fully operational, when installed and commissioned. It shall also include installation and commissioning of related equipment, training of personnel in operation and maintenance of machine and supply of technical documentation.	
4.2	Concomitant Accessories: The CNC Folding Machine shall be accompanied by the following concomitant accessories whose cost shall be quoted individually :	
4.2.1	Heavy Duty Motorized Back Gauge range 10 -1600 mm	1 no.
4.2.2	First fill of Lubrication oil, hydraulic oil and grease etc. for initial commissioning of the machine (quantity and brand name) to be given in the offer. NOTE: The oils/grease should also be available from indigenous sources in India, like IOC, BPCL, HPCL, CASTROL, and ESSO	first fill
4.2.3	One set of tooling required for bending of Components, listed in Annexure –F (A) of Section-VI, of the specifications mentioned in Annexure-F (B) of Section-VI - One set should consist all toolings required for one upper beam, one lower beam & one folding beam each. Note: 1. Prices for individual tools required for each component should be	One set

	<p>furnished separately. Material composition, surface finish, tolerance and hardness value of each tool should also be furnished.</p> <p>2. Rationalization of tooling shall be done by the bidder to reduce the inventory i.e. tooling shall be designed in such a manner so that minimum number of tooling is required.</p> <p>3. Tooling shall be of segmented type for ease of handling.</p>	
4.2.4	Servo controlled Voltage Stabilizer of suitable capacity for the entire electrical load of machine as per clause 2.13.2 of Section-V	1no.
4.2.5	Ultra-Isolation Transformer of suitable capacity for the entire electrical load of machine as per clause 2.13.3 of Section-V	1 no.
	Note: Servo controlled Voltage Stabilizer and ultra isolation transformer should be from indigenous make such as Neel/Unity /Servomax/Consul/Aplab/ Neelkanth	
4.2.6	Pressure gauges to be provided in hydraulic system where pressure to be set or inspected	2 nos.
4.2.7	Electrical cables with copper conductor for connecting the incoming electrical supply from consignee's feeding point	one length of 10 m
4.2.8	Air cooled type oil cooler for Hydraulic system	1 no.
4.2.9	Operation and maintenance tools (Description, quantity and make of the tools shall be furnished along with the bid) including tools for electrical & electronic maintenance purpose shall be supplied along with storage rack with lock facility. The maintenance tools shall include multimeter of Fluke/Motwani or any reputed make, portable soldering iron of Weller/Hakko or any reputed make, one set of insulated screw drivers of various types and sizes, cutting plier, nose plier, 1 sq.mm to 6 sq.mm wire/cable crimping tool and one set of Allen keys from 1mm to 6 mm. Two nos. of tool box exclusively for electrical maintenance wing shall be supplied and the same shall be of Shutter make or similar.	One set
4.2.10	Foundation anchors, bolts leveling wedges etc. for installing the machine	One set
4.2.11	Any other accessory/ equipment, which the manufacturer considers essential to make the machine fully operational, when installed and commissioned, connected to power source and give the specified output/productivity	
4.3	OPTIONAL ACCESSORIES: The following optional accessories should be quoted separately and prices of these should not be included in the basic price of machine. The detailed technical features for each system should also be given.	
4.3.1	Programmable crowning system through CNC control as per Clause 1.2.5.2 of Section-V	
4.3.2	Electronic data storage and retrieval system (Laptop) of DELL/HP/Compaq/ Apple/IBM make for storage of backup data, critical software and monitoring/troubleshooting as per clause 1.2.9 & 1.2.12 of Section-V – 1 no	
4.3.3	Printer for generating reports as per above clause 4.3.2 - HP or equivalent make –1 no	
4.3.4	Recommended spare parts required for 2 years for the machine (List with cost break up to be given by bidder)	
4.3.5	Any other item which can result in improved productivity or additional capability may be quoted as optional accessory with full description and advantages it offers.	

5.	EVALUATION CRITERIA
	<p>Total value of the offer will be calculated based on</p> <ol style="list-style-type: none"> The cost of the basic machine. Cost of the concomitant accessories according to tender specifications. Cost of any other accessory which in the opinion of supplier is essentially required for making the machine fully functional. Cost of Turnkey Charges viz. foundation, installation & commissioning etc. Cost of Preventive Maintenance inclusive of spares, material and labour cost during 1st & 2nd year of Warranty Period Cost of comprehensive AMC for five years after the warranty as per clause 17 of Section-V Duties and taxes as quoted by the bidder, insurance and freight etc.
6.	OTHER ITEMS TO BE QUOTED:
	The following items will need to be quoted additionally though will not be part of commercial evaluation:

	i) Consumables as per clause 6 of Section-V with break up of individual items as applicable. ii) Any other item which can result in improved productivity or additional capability may be quoted as Optional accessory with full description and advantages it offers.
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7.	DELIVERY SCHEDULE CHART:
	In the event of acceptance of the offer, the machine shall be supplied as per the following Milestone Chart: Name of the Machine: CNC Folding Machine Specification No. COFMOW/IR/CNCFM/6x4000/2019

S.No.	Activity	Activity Code	Outer Limit of Time Schedule expected by COFMOW
1.	Issue of LOA	D1	-
2.	Submission of PBG By Successful Bidder	D2	D1+30 days
3.	Issue of AT / Contract By COFMOW (after verification of PBG)	D3	D2+30 days
4.	Opening of LC by COFMOW (for foreign suppliers)	D4	D3+30 days
5	Submission of GA drawings and requisition for the trial component (s) (if applicable) to consignee by Successful Bidder/Supplier along with information on power and other utilities required for machine.	D5	D3 + 45 days
6.	Approval of GA drawings by consignee (to be governed by clause 11.2 of section-V) and confirmation of availability of components to be proved out at manufacturer premises and value of BG required for providing prove out components.	D6	D5+ 45 days
7.	Confirmation of availability of clear site by consignee	D7	By D6 (i.e. at the time of approval of GA drg.)
8	Completion of foundation	D8	D7+150 days or latest by D 10
9	Submission of BG and collection of components from consignee by the supplier for prove out of machine at manufacturer's works.	D9	<u>D6 + 60 days</u>
10	Supply/ Delivery of machine (for foreign suppliers on FOB basis)	D10	<u>For First machine:</u> D4 + 180 days Or D6 + 180 Days (whichever is later) <u>Thereafter subsequent machines:</u> @ ____ machines per month <u>Indigenous portion of supply (if any)</u> <u>For first machine</u> D6 + 180 days <u>Or receipt of machine at site whichever is later</u> <u>Thereafter subsequent machines:</u>

			@_____ machines per month
	Supply/ Delivery of machine (for indigenous suppliers)	D10	<u>For First machine:</u> D6 + 180 days <u>Thereafter subsequent machines:</u> @_____ machines per month
11	Power connection for the machine and other on site requirements to be provided by railways	D11	<u>D10 + 7 days</u>
12	Railway to give call to supplier for the commissioning of machine	D12	<u>D10 + 7 days</u>
13	Installation, commissioning and proving out of machine by supplier	D13	D11 + 120 days or D12 + 120 days (whichever is later)
14.	Issue of PTC by consignee	D14	D13 + 30 days
15	Warranty by supplier	D15	D13 + 2 years

Notwithstanding the delivery period indicated elsewhere in the tender document, the delivery indicated in this schedule shall be taken as overriding and final.

TECHNICAL SPECIFICATION**ABBREVIATIONS**

A-1,A-2, A-3, A-4	Standard paper sizes
AC	Alternating Current
AMC	Annual Maintenance Contract
AT	Acceptance of Tender
BG	Bank Guarantee
CME	Chief Mechanical Engineer
CME/PCM	Chief Mechanical Engineer/Post Contract Management
CNC	Computer Numeric Control
COFMOW	Central Organization for Modernization of Workshops
COS	Controller of Stores
Db	Decibel
DC	Direct Current
FA&CAO	Financial Advisor & Chief Accounts Officer
GA (Drawing)	General Arrangement (Drawing)
HRC	Hardness Rockwell 'C' Scale (value)
Hz	Hertz
IEC-Pub	International Electro technical Commission - Publication
JCN	Joint Commissioning Note
JRI	Joint Receipt Inspection
kW	Kilo Watt
LC	Letter of Credit
LD	Liquidated Damages
LOA	Letter of Acceptance
NC	Numeric Control
NIT	Notice Inviting Tenders
PBG	Performance Bank Guarantee
PDF	Portable Document Format
PLC	Programmable Logic Controller
PTC	Proving Test Certificate
PU	Production Unit (Any of the six Railway Production Units e.g. RCF, ICF, CLW etc.)
RDSO	Research Design & Standards Organization
SS	Stainless Steel
WBG	Warranty Bank Guarantee

1.	BASIC DESIGN FEATURES:
1.1	General Characteristics The general electrical characteristics of the machine shall be as per Clause 2 and general mechanical characteristics shall be as per Clause 3
1.2	Specific Characteristics
1.2.1	Rigidity- Control-Safety
1.2.1.1	It should be possible to modify the force application through hand wheel or foot pedal manually if the bending and radius need minor alteration. Also while setting the machine it should be possible to do inching operation manually
1.2.1.2	Emergency switches should be provided at convenient locations on either side of the machine.
1.2.1.3	Over load protection should be provided on the machine.
1.2.1.4	In case of any hydraulic, mechanical or lubrication failure, machine should give suitable indication to the operator.
1.2.1.5	Protective shrouding should be provided for all hydraulic hoses and control cables.
1.2.1.6	Attention of the bidder is invited to clause 2 of Section-V of General specification (electrical) in which power supply conditions are mentioned.
1.2.1.7	The machine shall be designed for operation from centralized panel. A foot pedal switch should also be provided to enable the operator to initiate bending/folding cycle which has two stages operations, one for cycle start or machine operation and the other to stop machine operation in emergency. The foot pedal switch should be shrouded to prevent accidental operation of the Folding Machine.
1.2.1.8	The machine offered should be free from vibrations and abnormal operational noises which should normally not exceed 85 dB even when working at full rated capacity. There shall be no resonant vibrations throughout the working range of the machine at all load levels and working speeds. The actual noise level that can be obtained shall be furnished in the offer.
1.2.1.9	A temperature sensor should be provided in Folding Machine to detect rise in hydraulic oil temperature beyond safe limits. In case of abnormal rise in temperature machine should stop working and error signal/message should be displayed on the screen.
1.2.1.10	In case of power failure, the clamping beam shall not move automatically, when the power supply is resumed but shall be operated only on pressing of cycle start (ON) switch.
1.2.1.11	The doors provided on the electrical panels shall have interlocking so that the doors cannot be opened till the electric supply is disconnected by the main isolation switch. The folding machine shall not start till such time the panel doors are closed and main isolation switch is placed in 'ON' position.
1.2.1.12	All machine cables should be routed in cable trench.

1.2.2	Fabrication of Machine Frame and associated steel structure
1.2.2.1	The folding machine frame and other associated structure should be fabricated out of quality steel plates confirming to IS: 2062 or equivalent international standards. The supplier should have sound infrastructure facilities good working system and practices for fabrication and machining of various structural components of the folding machine.
1.2.2.2	Machine fabrication work shall be carried out under the overall supervision of a welding engineer qualified from any recognized institute. The welding engineer shall prepare the welding procedure in accordance with IS: 9595-1980 "Recommendations for metal Arc welding of carbon and carbon manganese steels / equivalent international Standards". In addition, the exact welding sequence to be followed for typical locations shall have qualified welding engineer's prior approval for the same. The welding engineer shall also be responsible for actual implementation of the above-mentioned approved welding procedure.
1.2.2.3	Welding supervisors shall have received formal training from Institutions with recognized courses for Supervisors.
1.2.2.4	Details of the edge preparation for welding shall be in accordance with IS-9595-1980 "Recommendations or Metal-Arc welding of Carbon steel and Carbon Manganese Steels/ equivalent International Standards". Actual standard followed should be indicated in the bid.
1.2.2.5	Automatic /Semi-automatic submerged arc/gas shielded welding shall be carried out according to corresponding IS or other International Specifications.
1.2.2.6	Welders engaged in fabrication shall be subjected to approval tests in accordance with

	IS Specification to 7318 (Part -1) "Approval tests for welders when welding Procedure Approval is not required. Part I Fusion Welding of Steel/ equivalent International Standards" Actual standard followed should be indicated in the bid
1.2.2.7	All welding equipments and accessories should meet the requirements of the corresponding Indian Standard specifications (or International Specifications here IS specifications do not exist). The Contractor shall be responsible for satisfying the Inspecting officer that all welding equipment and accessories being used meet these requirements.
1.2.2.8	Electrodes and wire flux combination used or fabrication should be from reputed make such as ESAB, Advani Orlikon, and Philips & Modi
1.2.2.9	Welding, gas or electric, where called for, shall be performed in an approved and workmanlike manner. All welds shall be homogenous and show physical properties similar to those of parent metal. Finished welds shall be perfectly free from all defects such as porosity, burnt metal inclusions etc and shall present a smooth appearance. All critical welded joints should be tested for crack detection by die penetrate test/ ultrasonic test as per requirement of the various welded Joints. NOTE: The records of above should also be presented to the inspecting officials at the time of inspection.
1.2.2.10	When the welded joints are inspected, no defect especially due to the use of equipment and/or filler material shall be accepted. After welding, the welded parts or assemblies should correspond to the dimensions required as per those mentioned in drawings.
1.2.2.11	Stress relieving of welded structure should be carried out in thermoelectric or gas fired furnace having proper facilities for temperature controlling and recording. Alternatively, structure can also be stress relieved by vibration techniques.
1.2.2.12	All the surfaces to be painted should be cleaned by grit/shot blasting to Ra 2.5. The shot blasted surface should provide a degree of roughness where total range of unevenness is less than 40 microns so that anti-corrosion protection coat covers the profile of clean surface continuously. After shot blasting, the surface must be brushed and dusted, then a coat of anti-corrosive primer should be applied the thickness of which must be at least 40 microns.
1.2.2.13	The structural surfaces to be painted should be prepared as per method given in IS 14 77 Pt 1 / equivalent International Standards and then final painting should be carried out. The thickness of painted surface should be least 80 microns when measured in dry condition with an Alcometer.
1.2.2.14	The machining of fabricated components should be carried out in a single set up preferably on horizontal boring and milling machine to get proper accuracy. The firm should furnish the details of facilities available and accuracies achieved.
1.2.3	UPPER CLAMPING BEAM
1.2.3.1	Upper beam should be designed to hold tooling and in combination with lower beam and firmly grip the work piece during the bending / folding sequence. Tooling should be hydraulically clamped for quick replacement of the toolings. While clamping, the clamping beam should exert constant pressure all along the length of bed for perfect parallelism. Details of drives offered shall be explained in the offer. The upper beam should be programmable for speed, height and pressure. It should be possible to select the clamping beam pressure for closing and stamping operation. Means and range of selection should be indicated in offer.
1.2.4	FOLDING BEAM
1.2.4.1	The drive to the folding beam should enable it to attain the desired speed and positioning accuracy of 0.1 degree.
1.2.4.2	The folding beam movement should be motorized/electro hydraulic. The movement of folding beam should be absolutely free from backlash. Proper guidance shall be given to ensure the side positioning of the desired beam angle irrespective of sheet thickness and work piece length. Bending centre correction for exact bending of work piece should be provided. Method of correction should be explained in offer.
1.2.5	LOWER BEAM
1.2.5.1	The lower beam should hold the lower tooling and should grip the work piece efficiently. No manual adjustments should be required for bending different thickness of sheets. The folding system should automatically take care of adjustment for consistent tight inner/open radius bend.

1.2.5.2	The basic crowning system should be offered as optional for folding beam lower beam for compensating any deflection developed due to different material thickness, material type or blank loading position. The crowning system should be motorized and programmable through CNC control. Details may be furnished for the actual arrangement provided in the machine for crowning purpose.
1.2.6	Sheet Support and Back Gauge
1.2.6.1	The machine should be provided with integrated sheet support and motorized finger type back gauge having range up to 1600 mm. The sheet support should be provided with ball castors for easy manipulation of work piece. Sheet support and back gauge system should hold and manipulate the worksheet accurately during clamping and bending System offered should be explained in the offer. Pop up fingers to support and push the sheet to be bending position. The fingers should go down during the rotation of the blank.
1.2.6.2	The back gauge drive should be by means of AC servomotor and ball screw. The back gauge should be provided with suitable mechanism to prevent backlash, which should be explained along with the complete back gauge mechanism. The AC drives should be of Siemens/Fanuc/Allen Bradley/ Indramat/Baldor/Mitsubishi make.
1.2.6.3	Positional accuracy and repeatability of back gauge should be ± 0.1 mm. Time taken for back gauge travel of 1500 mm should be 3 seconds approximately.
1.2.7	TOOLINGS
1.2.7.1	The toolings shall be quoted by the bidder as per Clause 4.2.3 of Section-IV
1.2.7.2	The material used for tooling should be suitable for bending/folding of all the components mentioned Annexure-F(A) of Section-VI. The firm should give the value of surface hardness, UTS, accuracy and surface finish value of each type of tool being offered individually. The names of the tool manufacturer from whom tooling shall be sourced should also be clearly indicated. The tool change should be simple and easy.
1.2.7.3	All the tooling (Goose neck & straight) shall be of segmented type, the length of each segment should be within 500 \pm 50 mm along with slide arrangement and hydraulic clamping. The tooling shall be designed for all the components. The manufacturer's name, its code, year of manufacturing and its stamping mark for proper identification of tooling should be provided by the firm during inspection of the machine.
1.2.8	HYDRAULIC SYSTEM
1.2.8.1	The operation of beam carrying bending tool shall be done with the help of two hydraulic cylinders.
1.2.8.2	Overload protection of hydraulic system shall be available. The hydraulic system shall be fitted with a suitable indicator to show the pressure being developed in the hydraulic cylinders and corresponding bending force exerted by the beam. Least count of indicators, both for pressure and force, should be given in offer.
1.2.8.3	An internal gear type pump of Rexroth Bosch/Voith/ATOS/VICKERS/PARKER make should be provided. The maximum pressure that can be developed by the pump under safe operating conditions should be indicated in the bid.
1.2.8.4	The hydraulic system shall be such that parallelism of top beam with respect to the bottom beam is maintained even in case of center loading. The method of by which this is achieved should be explained in the offer. Also maximum permissible limit of beam tilt in the offered design shall be indicated.
1.2.8.5	The hydraulic cylinders shall be machined out of closed gained forging made out of high grade alloy steel such as C-50 or equivalent EN grade of steel. The hydraulic cylinder should be finished by honing and the RA value of honed surface should be in the range of 0.1 – 0.2 microns. The maximum pressure that is developed inside the cylinder during normal working and area of cylinder should be indicated. The ovality and cylindricity of hydraulic cylinder should be within 50 microns. A dimensional assembly drawing of cylinder assembly showing its tolerance, ovality, straightness of bore over the length of cylinder etc. should be furnished.
1.2.8.6	The piston shall be made of hardened and ground alloy steel such as C-50 or equivalent EN grade and be suitably heat treated to provide surface hardness of $58 \pm$ RC. The piston surface should be super-finished and coated with brass/PTFE or hard chrome

	plated to avoid direct contact of piston with cylinder. The surface finish value of piston should be in the range of 0.1 – 0.2 Ra microns. The ovality and cylindricity of piston should be within 50 microns.
1.2.8.7	Hydraulic oil filters preferably of 10 -25 microns should be provided on discharge side of the pump or return line to the sump. Suction strainer of about 150 microns capacity should be provided on suction line of the pump. The capacity of filter in terms of size of impurity that it can filter should be explained in the bid. Life of filter and source of filter in India should be given.
1.2.8.8	The maximum hydraulic oil temperature should be kept up to 60°C even under the highest ambient temperature conditions of 50°C. The means available on the machine to keep the hydraulic oil temperature within this limit, while the machine is continuously working in double shift at maximum ambient temperature should be explained.
1.2.8.9	Oil level sight gauge showing the minimum and maximum oil level in the tank should be provided. The indicator shall have marking to show the lowest and highest permissible oil levels for the convenience of the operator. In addition an oil dipstick with graduated marking clearly indicating minimum and maximum permissible oil to be provided.
1.2.8.10	A drain plug at the lowest point of the hydraulic tank should be provided so that oil can be drained out without disconnecting any pipe or connection.
1.2.8.11	All pipes used in hydraulic system should confirm to DIN 2391/C. The pipes should be given anti-corrosion treatment. Size and thickness of pipe along with the UTS of the material should be indicated in the offer. Stackable valves and manifold should be preferably be used for ease of assembly, reduced piping and leakage through fittings. The hydraulic oil tank inner surface should be provided with anti-corrosion treatment such as phosphating or hydraulic oil resistant anti-corrosive paint. The details of anti-corrosive treatment used should be indicated in the offer. Location of flexible pipe if any, in the hydraulic circuit should also be clearly indicated. Minimes connections should be provided for pressure checking wherever required Pressure gauge provided for hydraulic system should be glycerin filled.
1.2.8.12	Line diagram of hydraulic circuit indicating different element must be furnished with the offer Operation of CNC folding machine must be explained sequentially through circuit diagram.
1.2.8.13	The construction of piston seals should be explained. Sectional drawing indicating material used in seal should be provided. The seal should be preferably from reputed make such as SIMRIT, MERKLE, HUNGER, WALKERSOLO, SOLOSEA, POLYPAC ETC.
1.2.8.14	All elements in the hydraulic system such as pump, valves filters etc., provided in the machine shall be from same manufacturer such as REXROTH BOSCH/VICKERS/VOITH/ATOS/PARKER Only
1.2.9	PLC
1.2.9.1	The PLC system to be provided shall be latest and of Siemens/Fanuc /Heidenhain/Beckhoff/Mitsubishi/ Allen Bradley/Omron/Fuji/Fagor make which shall be suitable for the CNC System and machine to be supplied. Pass words, PLC Program, Input/Output Listing, PLC Cross reference, Machine Parameter List and Alarms List with trouble-shooting Procedure are to be provided.
1.2.10	Drives & Motors
1.2.10.1	The Drives and Motors shall be of Siemens/Fanuc /Heidenhain/Beckhoff/Mitsubishi/ Allen Bradley/Omron/Fuji/Panasonic/Danfoss/Fagor/Yaskawa make and shall be suitable for use with the CNC System and the machine to be supplied. The motors shall be of energy efficient AC servo motors.
1.2.11	Switch Gears
1.2.11.1	All the switch gears shall be of Siemens/Telemecanique/Schneider make and shall be available in Indian Market.
1.2.12	Software
1.2.12.1	All the software that comes with the CNC System or PLC System has to be given as soft copy and to be proved by erasing the existing software and reloaded with the copy

	given to ensure the workability of the software given. Only Licensed version of software is to be provided
1.2.12.2	The system software should be with GUI compatible with latest windows operating system, Maximum profile storage (need to be specified), maximum tool storage (need to be specified), maximum materials library(need to be specified), accurately scaled virtual bending simulation, zoom function, optimization of all machine axes, infinitely variable machine speed, PC version for offline programming, remote connectivity for maintenance & training.
1.2.12.3	The machine should have Electronic counter with digital display mechanism to count the number of hours worked and number of jobs processed
1.2.13	Electrical Control Panel
1.2.13.1	<p>The Electrical Control Panel shall be of non-corrosive and drip proof construction of Rittal or any similar reputed make. It shall be sealed and ensured that there is no possibility of entry of rodent. The panel shall be kept 300 mm above the shop floor level where it is placed and the height of the panel shall not be more than is 1100 mm from the floor level. Easy and safe access to all electrical control panels shall be by way of permanently welded ladder and platform to the panels, if the panel is placed above 3 feet from ground.</p> <p>All cables are to be provided with cable glands at panel entry points in electrical control panel and any other openings leading to the electrical control panel or electrical equipment including junction boxes and instruments has to be properly sealed to avoid ingress of dust and rodent entry.</p>
1.2.14	Climate Control in Electrical Panel
1.2.14.1	<p>Refrigeration type AC unit of Rittal/Advance/Zapp Cool/Freeze Tech make with eco friendly refrigerant R410A or advanced for the electrical control cabinet and CNC System.</p> <p>Refrigeration type cooler with eco friendly refrigerant R410A or advanced for the hydraulic oil. The make and model shall be clearly mentioned in the offer.</p>
1.2.15	Machine Enclosure
1.2.15.1	If required, the tenderer also has to quote for climate controlled enclosure for the whole machine and it's accessories during the tender stage itself. The capacity of the climate control equipment and the dimension of the enclosure required have to be brought out clearly. The specification and cost of such an enclosure along with climate control equipment's has to be clearly mentioned and justified. Failure to mention about the enclosure along with climate control equipment's in tender stage itself and blaming the ICF in later stage for any failure or breakdown of the machine due to ambient atmospheric conditions will not be acceptable.
1.2.16	Enclosure Lighting
1.2.16.1	Machine enclosure has to be provided with adequate lighting facility such that there is no dark area inside the enclosure which shall create hardship while attending to faults in the machine during breakdown or while carrying out maintenance activities. There shall be provision for plug points in the switch boxes. The switch boxes shall be located such that they are easily approachable.
1.2.17	Power Supply for the machine
1.2.17.1	The existing powers supply system in ICF is of 3 phase 3 wire system, hence the Isolation Transformer and Stabilizer shall be provided with DELTA/STAR combination and the star point solidly earthed. All cables between main switch, stabilizer, and isolation transformer shall be submerged below ground level.
1.2.18	Ultra Isolation Transformer
1.2.18.1	The Ultra Isolation Transformer shall be of rated capacity and shall be of Neel/Delta/Design & Prototype/Servo Max/Techno Power Systems/Vertex Power Solutions/Geesys make. The class of Insulation shall be "B Class". The suppression of power line surges, spikes, transients and noises shall be filtered in primary itself. The

	type of cooling shall be air cooled type.
1.2.19	Stabilizer
1.2.19.1	The Stabilizer shall be of rated capacity and shall be of Neel/Delta/Design & Prototype/Servo Max/Techno Power Systems/Vertex Power Solutions/TSI make. The machine supplier has to study the power condition at ICF and provide suitable Servo Stabilizer. The rate of correction shall be best in class. The class of insulation shall be "B Class", Cooling shall be air cooled type.
1.2.20	Control supply
1.2.20.1	Control supply of the machine shall be derived from 440/ 55,0,55 control transformer of appropriate current rating to avoid shock hazard for maintenance staff. The panel shall be illuminated with low voltage LED lamp with switch control. There shall be 2 numbers of 5 amps 5 pin flush type sockets for connection of maintenance equipment operated on 230 volts AC supply with switch control and 1 no of 24 volts DC socket with switch control for connecting hand lamp. The machine shall have emergency switches at prime locations for operation in case of emergency. The machine builder should provide additional lighting for the convenience of the operator use at the time of tool setting and recording readings. A pre settable high voltage monitor, low voltage monitor, single phase preventer equipment shall be provided at the input supply of the machine itself and trip the incoming supply in case of these three faults.
1.2.21	Earthing
1.2.21.1	"Two earthing terminals shall be provided on all electric motors, control panels including all control gears which shall be connected to two different earth pits through a solid 16 Sq. mm green colour insulated copper wire and the earth stations shall be as per ICF drawing no. ICF/EL-1109 or latest ICF drawing. The linear distance between the two earth stations shall not be less than 5 metres."
1.2.22	UPS
1.2.22.1	<p>If the tenderer feels that UPS is required for the CNC System or whole machine, the same has to be brought out clearly while quoting for the tender along with the detailed specification and cost of the UPS. Failure to mention about the UPS in tender stage itself and blaming the ICF in later stage for any failure or breakdown of the machine due to power failure reasons will not be acceptable. The UPS shall be of On-line pure sine wave UPS of reputed make and shall have service support in Chennai. The tenderer also has to mention the dimensional and technical specification of UPS and its accessories and battery bank. It is also essential that the UPS shall not affect the existing power system in ICF by way of generation of unwanted harmonics. Hence, necessary precautions shall be taken.</p> <p>If the tenderer feels that either the UPS or Battery or both has to be kept in dust free and controlled climatic condition, the same has to be brought out in the tender stage itself along with the related technical and dimensional details. Once if these are not mentioned in the tender, it is presumed that the UPS and its accessories along with the battery bank can withstand the atmospheric conditions that may prevail in ICF.</p>
1.2.23	Diagnosis & Trouble Shooting
1.2.23.1	<p>Soft copy of the latest working software in CD/DVD (the machine program in the machine has to be deleted and reloaded with the software provided in CD/DVD)</p> <p>Hard copy of the latest working software in ladder/CSF/STL form or any other easily understandable format which can be understood by maintenance staff.</p> <p>The hard copy must be in English for easy understanding.</p> <p>A portable diagnosis cum programming unit of latest model for maintenance purpose as on date with all its accessories and preloaded software which is capable of interfacing with the CNC/PLC system provided in the machine has to be supplied. All the software provided in the diagnosis cum programming unit shall have lifetime license and also that; it can be updated/upgraded in future. The original Operating System and other original software installed in the unit have to be provided in CDs or DVDs. There shall</p>

	be no password lock in the unit. If it is there, the same has to be revealed to the maintenance staff only. The hardware lock shall also be supplied along with the unit. The Working procedure of programming unit shall be demonstrated on the relevant machine for on line diagnostics of faults
1.2.24	COMPUTER NUMERICAL CONTROL
	The CNC system offered shall be of current generation with intelligent interactive features. The folding machine should be provided with a suitable CNC control of Siemens/Fanuc/AllenBradley/Indramat/Baldor/Mitsubishi/Fagor/OMRON/Heidenhain/Bekhoff make. However, own makes of CNC system of reputed machine tool manufacturers can also be considered. The CNC system offered shall have the following features:
1.2.24.1	System shall be designed to generate Alarm Text Messages in steps for any interruption in the sequence of operation due to Power Failure or Faulty Sensors/Actuators. The messages shall be stored with date and time of occurrence and the maintenance staff shall be able to store the messages in an external storage device for machine history card purpose.
1.2.24.2	The CNC System must have AUTO POWER RECOVERY facility so that the machine will start to operate from the last point of operation at the time of power failure.
1.2.24.3	Methods to put the Systems back into operation after such interruptions are to be explained in detail on screen itself. The same shall be supplied in hard copy also as trouble shooting guide. Hard Copy as well as soft copy of Trouble shooting manual and guide has to be supplied.
1.2.24.4	Program Features:
1.2.24.4.1	Retraction of back gauge and back gauge setting
1.2.24.4.2	Speeds of clamping and folding beams.
1.2.24.4.3	Folding angles
1.2.24.4.4	Folding beam adjustment
1.2.24.4.5	Travel of clamping beam
1.2.24.4.6	Clamping pressure in l ones
1.2.24.4.7	Pre-selection of bending angles with possibility of correction
1.2.24.4.8	Pre-selection of bending beam positions with power up rated bending beam positioning
1.2.24.4.9	Complete flexure control
1.2.24.4.10	Pre-Programming of tooling data upto 40 tool pairs
1.2.24.4.11	Incremental/Absolute programming
1.2.24.4.12	Inch/Metric Programming
1.2.24.4.13	Interactive Graphics for graphics simulation of test program
1.2.24.4.14	Fixed cycle and sub-program facility.
1.2.24.4.15	Off-line programming facility and IBM compatible interface
1.2.24.4.16	Facilities for simultaneous programming
1.2.24.4.17	CAD/CAM function
1.2.24.4.18	Optimization of bend sequence
1.2.24.4.19	DNC link up-with RS 232 port.
1.2.24.4.20	Graphic control on screen
1.2.24.4.21	Graphic tool programming and machine shape programming with memory
1.2.24.4.22	USB 2.0/3.0 Port should be provided.
1.2.24.4.23	Software package should be able to draw product to be obtained on screen
1.2.24.4.24	Software package should be able to select tools from library
1.2.24.4.25	Easy programming
1.2.24.4.26	Ruggedised/Rubberized/Membrane Key Board
1.2.24.5	Following calculated function should be available as standard in CNC system:
1.2.24.5.1	Crowning/Anti deflection mechanism/unit.(as optional)
1.2.24.5.2	Technology table in the software for automatic adjustment in the event of changed sheet thickness, material of sheet etc
1.2.24.6	CNC control should permit programming and display for following component:
1.2.24.6.1	Sheet thickness
1.2.24.6.2	Sheet width
1.2.24.6.3	Material
1.2.24.6.4	Tensile strength in Kg/mm
1.2.24.6.5	Tool numbers and tool listing
1.2.24.6.6	Required batch size
1.2.24.7	The CNC control should have following operating modes:

1.2.24.7.1	Manual
1.2.24.7.2	Teach-in
1.2.24.7.3	Semi automatic step by step operation with correction facility
1.2.24.7.4	Automatic or continuous cycle mode
1.2.24.7.5	Diagnostic for fault diagnosis
1.2.24.8	A foot pedal electric should be provided in addition to the controls on CNC panel to enable the operator to initiate and control the cycle. The release or the foot pedal should instantaneously stop the cycle at that stage only. The foot pedal should be shrouded type to prevent accidental operation of the press.

2.	GENERAL ELECTRIC SPECIFICATION		
2.1	The provision of this General Specification shall apply, wherever relevant.		
2.2	All equipments and material shall comply with appropriate Indian Standards (latest) or National Standards of the country of origin provided the latter are equivalent to or better than the former. Items for which Indian Standards are not published, National Standards shall be acceptable. The Bidder shall indicate the Standards applicable. The following standards are applicable in particular. (Corresponding International Standards like ASA, NEMA, BSS, DIN etc. may also be quoted).		
IS :	325-1979 (latest)	-	Three phase induction motors (corresponding to IEC pub-34-1) (Latest).
IS :	1248 (Latest)	-	Direct acting indicating analogue electrical measuring instruments and their accessories (corresponding to IEC Pub-51) (Latest).
IS :	1231-1974 (Latest)	-	Dimensions of three phase induction motors (corresponding to IEC Pub-72-1) (Latest).
IS :	1271-1985 (Latest)	-	Classification of insulation material for electrical machinery & apparatus in relation to their thermal stability in service (corresponding to IEC-Pub-85) (Latest).
IS :	6875 (Latest)	-	Push Buttons and related control switches corresponding to IEC Pub/73) (Latest).
IS :	375-1963 (Latest)	-	Marking and arrangement of switch gear, bus bars, main connection & auxiliary wiring.
IS :	996-1979 (Latest)	-	Single phase small AC and universal electrical motors.
IS :	1356 (Latest)	-	Electrical equipment of machine tools.
IS :	2516 (Latest)	-	Circuit breakers (corresponding to IEC Pub-56) (Latest)
2.3	Unless specified in the main specification, the AC motors and starters shall be of the following type. Bidder is, however, free to give alternative proposal along with justification, if in his view alternative proposal is warranted by site conditions. Type of motor type of starter.		
	TYPE OF MOTOR	TYPE OF STARTER	
2.3.1	Any type of AC motor starting current of which does not exceed 75 amps.	Direct on line.	
2.3.2	AC squirrel cage, induction motors, starting current of which is above 75 amps. if started direct on line	Star delta or Auto transformer type.	
2.3.3	AC slipring type motor	Resistance type air/fan Cooled	
2.3.4	AC synchronous motor.	Suitable makers standard.	
2.3.5	DC motor	Resistance type/Thyristor type.	
2.4	The control gear for AC/DC motors shall incorporate the following protection devices as concomitant accessories.		
2.4.1	No Voltage Protection - No voltage protection shall be provided so that machine will not start up again by itself when, following an interruption the supply is restored.		
2.4.2	Short Circuit Protection - To protect against short circuits due to insulation failure of faulty connections HRC fuses shall be provided for each motor. The rating of the fuse shall be such as to take care of the over current due to motor starting.		
2.4.3	Over Load Protection - To prevent motors from overloading, overload protection shall be provided separately for each motor. Three phase motors shall be protected by overload tripping devices on each phase.		
2.4.4	Single Phase Protection – A separate current sensitive delayed action single phasing		

	preventer shall be provided for each motor separately. Overload protection shall not be treated as single phase protection.		
2.5	Control equipment shall be mounted in separate drip proof enclosures. Control enclosures and compartments are to be so designed as to give adequate protection against ingress of dust, oil, coolant or chips. All control devices like contractors etc. shall be front mounted on a rigidly fabricated metal panel for ease of operation. All other electrics shall be installed that they are readily accessible when the doors and covers are opened. Hinged covers shall be interlocked with the machine tool control to prevent operation of the machine when cover is open.		
2.5.1	<u>Easy and safe access to all electrical control panels shall be by way of permanently welded ladder and platform to the panels, if the panel is placed above 3 feet from ground.</u>		
2.5.2	<u>All cable entry points in electrical control panel and any other openings leading to the electrical control panel or electrical equipments and instruments has to be properly sealed to avoid ingress of dust and rodent entry.</u>		
2.6	The motor shall be totally enclosed with or without fan cooled frame. Screen protected drip proof type motor may be provided if it is mounted inside protective enclosures.		
2.7	The electrical equipments shall comply with the requirement of Indian Electricity Act and Rules.		
2.8	All instruments shall be of the Industrial Grade "A" (IS-1248) switch board type the range of the instrument shall be such that the maximum load expected in the circuit shall produce a deflection of 60% to 80% of the full scale.		
2.9	<i>The supplier shall furnish 3 sets of complete electrical and electronic wiring <u>drawings comprising of component level drawings for all the PCBs used in the machine and control panels, location drawing of all electrical components in the machine, detailed electrical schematic of the machine and drawing with complete detail of cable routing and layout with specification and identification number of all the cables used in the machine</u> in full details to enable the maintenance staff to locate faults in the circuits, 3 sets of part catalogues, maintenance manuals operating instructions with details of coils and windings, used in the equipment to facilitate repairs and maintenance should also be supplied. <u>Hard Copy of OEM's original manual for Stabilizer, Isolation Transformer, Servo Motors and Drives has to be supplied. List of spare parts list with OEM's part nos. and specifications has to be supplied.</u></i>		
2.10	For main motor class minimum "B" insulation shall be provided. If any other class of insulation is proposed, detailed justification for providing different class of insulation shall be given.		
2.11	Motors shall be designed to withstand frequent starts, stops and reversals as demanded in the operation of the machine.		
2.12	<u>Two earthing terminals shall be provided on all electric motors, control panels including all control gears which shall be connected to two different earth pits through a solid 16 Sq. MM green colour insulated copper wire and the earth stations shall be as per ICF drawing no. ICF/EL-1109 or latest ICF drawing. The linear distance between the two earth stations shall not be less than 5 mtrs.</u>		
2.13	POWER SUPPLY		
2.13.1	The machine shall be suitable for operation on 415 volts 3 phase 50 cycles AC 3 wire or 4 wire system with neutral solidly earthed. The supply voltage may vary up to +10 -20%. The frequency may vary up to + 3%. However, full rated power of the motor shall be available at the lower voltage. Firm should confirm satisfactory performance of the machine at incoming power supply in the range 415 V+10-20% and 50HZ+3% frequency or should provide voltage stabilizer against clause 2.13.2 of required capacity as specified below.		
2.13.2	The voltage stabilizer, if required, shall conform to :		
i)	Input Voltage	-	320 to 460 volts 3 phase 4-wire unbalanced supply.
ii)	Out put Voltage	-	415 volts
iii)	Regulation	-	+ 1% from No load to Full load.
iv)	Rate of correction	-	20 volts per second per phase.
v)	Wave from distortion	-	NIL
vi)	Efficiency	-	Not less than 97%.
vii)	Winding and class of insulation	-	Copper wire wound with "B" class of insulation or better.
2.13.3	In case of machine equipped with NC, SS, CNC, Thyristor controlled devices and other		

	sophisticated electronic gadgets including microprocessors etc. which are susceptible to power line spikes and surges, a suitable voltage stabilizer and ultra isolation transformer of adequate capacity to cover for the entire electrical load of the machine shall be offered conforming to Specification for voltage stabilizer as mentioned in clause 2.13.2 above and ultra isolation transformer to the parameters mentioned below. Indigenous make voltage stabilizer and ultra isolation transformer from the reputed manufacturers are acceptable.		
i)	Transformer ratio	-	1:1
ii)	Winding	-	Copper wire wound with "B" class insulation or better.
iii)	Protection	-	To arrest spikes and surges to the order of 3 KV for 200-400 micro seconds duration.
iv)	Common mode noise rejection	-	120 dB
v)	Isolation	-	Capacitance 005 Pf: resistance greater than 1000 Mega Ohms.
13.4	Voltage stabilizer shall be equipped with a protective relay to trip to trip the AC power supply to the machine instantaneously with audio and visual indication to the operator. Settings of the protective relay for low and high voltage shall be 320 volts and 460 volts respectively.		
2.14	OPERATING ENVIRONMENT/ATMOSPHERIC CONDITIONS		
2.14.1	The ambient temperature at the site at which the machine will be installed may vary from -4°C to +50°C over the year. The relative humidity may be as high as 98%. The atmosphere is expected to be dusty. The machines offered shall be suitably tropicalised to work under these atmospheric conditions without any adverse effect on their performance.		
2.15	The temperature rise shall not reach such a value that there is a risk of injury to any insulating material or adjacent parts.		
2.116	The drive shall be capable of operating at any one of the speed required independent of the load in accordance with the requirements of the machine.		
2.17	Information/data shall be furnished as per the format of submission of technical bid Annexure–A.		

3.	GENERAL CHARACTERISTIC		
3.1	RIGIDITY AND STABILITY		
3.1.1	The machine shall be robust, rigid and of sturdy construction. It shall be designed to meet heavy duty demands of various operations on the machine under normal Workshop environment for such machines. It shall be free for vibrations even when working at full capacity.		
3.1.2	All machine castings shall be made of close grained high grade cast iron like Mechanite or equivalent materials meeting IS-210 Standards to ensure durability and rigidity. The casting shall be thermal stress relieved to ensure stability and continued accuracy.		
3.1.3	All machine fabrications of critical load bearing assemblies like beds, columns etc. shall be adequately strengthened and stress relieved.		
3.1.4	Change in ambient temperature shall not affect the performance of the machine.		
3.1.5	There shall be no change in the performance of the machine either on switching on the machine or after continuous running.		
3.1.6	There shall be no resonant vibrations throughout the working range of the machine at all load levels.		
3.2	SAFETY CONTROLS		
3.2.1	The machine shall incorporate safety devices to provide protection to the operator and machine against all possible operational and machinery failures.		
3.2.2	Suitable interlock shall be provided to prevent machine operations in the event of:		
3.2.2.1	Faulty sequence of operation.		
3.2.2.2	Fluctuation in supply voltage.		
3.2.2.3	Resumption of power supply after power failure.		
3.2.2.4	Non-positioning of safety guards.		
3.2.2.5	Failure of hydraulic system (where applicable)		
3.2.2.6	Failure of lubricating system (In case of automatic including drop in pressure lubrication)		
3.2.3	A fault or damage in the control circuit or interruption re-establishment after an interruption of fluctuation in whatever manner in the power supply to the machinery must not lead to dangerous situations in particular.		
3.2.3.1	The machinery must not start unexpectedly.		

3.2.3.2	The machinery must not be prevented from stopping if command has already been given.
3.2.3.3	No moving part of the machinery or piece held by the machinery shall fall or be ejected.
3.2.3.4	The protection devices must remain effective.
3.2.4	The machine shall be fitted with an emergency stop device to enable actual or impending danger to be averted. This device must be:-
3.2.4.1	Conveniently located.
3.2.4.2	Clearly identifiable.
3.2.4.3	Stop the machine as quickly as possible without causing additional hazards.
3.2.4.4	The emergency stop must remain engaged. It should be possible to disengage it only by appropriate operation. Disengaging the control must not restart the machinery but only permit restarting.
3.2.5	Safety features shall also include.
3.2.5.1	Safety device against overload for all mechanical and electric items to the extent possible.
3.2.5.2	Safety stops against over-running of slides.
3.2.6	Guard and protection devices shall protect exposed persons against risks related to moving transmission parts (such as pulleys, belts, gears, rack and pinion, shafts etc.) and moving parts directly involved in the process to the extent possible. This shall meet the following requirements:-
3.2.6.1	Be of robust construction
3.2.6.2	Not give rise to any additional risk
3.2.6.3	Not be easy to by pass or render non-operational
3.2.6.4	Be located at an adequate distance from danger zone
3.2.6.5	Cause minimum obstruction to the view of the production process.
3.2.6.6	Rigidly connected and not prone to rattling
3.2.6.7	Enable essential work to be carried out without the guard or protection device having to be dismantled
3.2.7	A load meter shall be provided to indicate the load on the machine. The meter shall have a suitable mark to indicate the maximum load the machine can take. Full details of the above and other safety features indicating how each one functions must be explained in the offer
3.3	OPERATIONAL CONTROLS
3.3.1	The operation of the machine shall be by push buttons or levers. The basic rules for the direction of operation of controls and the corresponding direction of movements of the machine tools shall be as per IS:2987-1985.
3.3.2	The control devices shall be
3.3.2.1	Clearly visible and identifiable.
3.3.2.2	Ergonomically positioned for safe operation without hesitating or loss of time, and without ambiguity.
3.3.3	CNC Controls (where applicable) - The general requirements of CNC controls are given at Schedule-V.
3.4	LIGHTING
3.4.1	Integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient lighting of normal intensity shall be provided.
3.4.2	The manufacturer must ensure that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects due to lighting provided by the manufacturer.
3.4.3	Integral parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.
3.4.4	The machine lighting should be of low voltage so as to prevent any hazard to the operator.
3.5	MACHINE MAINTAINABILITY
3.5.1	The machine shall be so designed as to require minimum possible maintenance and to give trouble free service.
3.5.2	All assemblies/parts of the machine shall be easily accessible for maintenance.
3.5.3	The machine shall not require major dis-assembly for checking and replacement of a particular part, especially for parts requiring periodical check up and replacement.
3.5.4	The manufacturer must provide means of access e.g. stairs, ladders, cat walks etc. to allow access safety to all areas used for production, adjustments and maintenance operations.

3.5.5	<p>Firm shall submit assembly drawings and cross sectional drawings of various assemblies / sub-assemblies with write up duly explaining the working methods in A2 or A1 size drawings</p> <p>a) Spindle assembly b) Gear boxes c) Axis movement gear boxes d) Gears with module and No of teeth. e) Rotary axis drive f) All bellows with specifications.</p>
3.6	WEAR COMPENSATION ADJUSTMENT(IF APPLICABLE)
3.6.1	The original built in accuracy of the machine shall be capable of being maintained conveniently and economically by suitable adjustments for taking up wear on slides, bearings and load screws. The system of adjustments incorporated shall be explained in the offer
3.7	COOLANT SYSTEM (WHERE APPLICABLE)
3.7.1	Suitable coolant system with pump, motor, tank, filter etc. shall be provided. The coolant pump shall be as per IS:2161-1962. The filter shall be of reusable type and indigenously available. If reusable filter cannot be offered the filter cartridge shall be readily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare. Details of the coolant system shall be indicated in the offer.
3.7.2	The supply of coolant shall be in ample volume. Provision to re-circulate the coolant shall be available. A chip and coolant tray shall be provided. The volume of coolant flow shall be indicated. It shall be adjustable.
3.7.3	An enclosure shall be provided to prevent the coolant from splashing outside the machining zone. Details of enclosure shall be provided. Specific requirements of coolant system for grinding machines etc. shall be clearly indicated.
3.8	LUBRICATION SYSTEM (WHERE APPLICABLE)
3.8.1	The machine shall be provided with an automatic lubricating system for ensuring delivery of adequate quantity of lubricant to areas requiring continuous lubrication. Suitable arrangements must be provided for indication of failure of the lubricating system.
3.8.2	The system shall be provided with interlock to prevent machine operating/starting in the event of the failure lubrication system.
3.8.3	Reusable filters capable of filtering chips, dust particles etc. shall be provided. Indicators for showing clogged condition of filters shall be available. The filters shall be indigenously available. If reusable filter cannot be offered the filter cartridge shall be readily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
3.8.4	Lubrication and filter cleaning chart shall be displayed on a metal plate at a conspicuous location on the machine indicating :-
(a)	Specific location of points on the machine to be oiled lubricated/greased.
(b)	Periodicity of lubrication of these points.
(c)	Filter to be cleaned.
(d)	Periodicity of cleaning filters.
(e)	Periodicity of replenishing lubricating oil for the centralized system.
(f)	Any other similar relevant information.
3.8.5	Points where manual lubrication is needed shall be separately indicated. Frequency of lubrication shall be also clearly mentioned.
3.8.6	Lubricating oils used in the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils manufactured by various Indian Oil Companies.

3.8.7	First fill of lubricating oils used in the machine shall be provided with the machine. Details of lubricating system provided shall be indicated.
3.9	PNEUMATIC SYSTEM (WHERE APPLICABLE)
3.9.1	The compressed air supply will be provided by the customer at the machine within pressure range of 4.5-7.5 kg/cm ² and a moisture content or 1000 ppm. The pneumatic system of the machine should be designed accordingly. An alarm shall be provided for low air pressure.
3.9.2	Suitable filter/moisture trap shall be provided by the contractor in the system of pneumatic air intake. The filter shall be reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be easily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
3.9.3	Air pressure regulator, if necessary, shall be provided by the tenderer.
3.9.4	The make of pneumatic control equipment shall be of reputed make. The makes shall be indicated.
3.10	HYDRAULIC SYSTEM (WHERE APPLICABLE)
3.10.1	Hydraulic circuit must be equipped with the following safety and inspection equipments:
(a)	Pressure gauges at all places, where pressure has to be set up or inspected.
(b)	Safety valves for hydraulic circuit if relief valve does not fulfill this function.
(c)	Equipment for checking of temperature in the circuit or in the pump wherever necessary.
(d)	Arrangement to show if the filters (including those in the pump set) are choked and need cleaning. The filters shall be of reusable type and indigenously available. If reusable filter cannot be offered, the filter cartridge shall be readily available in India. Source of supply shall be indicated. Adequate no. of filters for 2 years working on double shift basis shall be offered as spare.
(e)	Alarm for low oil level.
3.10.2	The sump aggregate shall have the following:
(a)	Oil level sight gauges or any other equipment showing the minimum and maximum oil levels in sump.
(b)	A drain plug at the lowest portion of the tank.
(c)	It shall be possible to drain the oil from the tank without disconnecting any pipes or other fittings.
3.10.3	The temperature of oil in hydraulic circuits shall not exceed 60 degrees C in any case. Suitable arrangement shall be incorporated to ensure that the oil is not overheated under local weather conditions at continuous normal working of the machine.
3.10.4	Facilities for bleeding of air in case of air lock shall be provided.
3.10.5	The hydraulic reservoir, pump and allied equipment shall be suitably segregated from the machine in order to remove major source of heat.
3.10.6	Hydraulic oils used on the machine shall be available in India. Successful tenderer will be required to indicate brand names of approved oils supplied by various Indian Oil Companies.
3.10.7	First fill of hydraulic oils used on the machine shall be provided with the machine.
3.10.8	The hydraulic system elements shall be from reputed Indian manufacturers like M/s. REXROTH, Vickers-Sperry, <u>Parker and Denison</u> . The make of different elements shall be clearly indicated. Details of Hydraulic system shall be indicated.
3.11	Hydraulics, Pneumatics and Lubricating Circuits: All circuits shall be given in normal readable size in English language i.e. drawing shall be of A3, A2 or A1 only.

	<ul style="list-style-type: none"> b) Circuits shall have various pressure settings on the drawings and location of component on the machines. c) All components shall be labeled with Aluminum tags as per the identification number given in the drawing. d) logical sequence of operation of valves on various assemblies must be clearly explained in the manual. e) All hydraulic return line shall be routed through return line filter. f) All hydraulic filter shall have the clog indicator with alarm. g) Pressure line filter to be provided in between pump and hydraulic components.
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4.	TECHNICAL LITERATURE
4.1	One copy of the printed illustrative catalogue showing features of the machine and its elements must be enclosed with each copy of the bid.
4.2	The technical literature shall be provided for the complete machine, including imported and indigenously purchased components / sub- assemblies. The successful tenderer will have to furnish 4 (four) copies each of the following manuals directly to the consignee along with the machine. Out of these 04 sets, the bidder shall be required to submit one set of all documents in best available condition one month prior to the training for the machine. One set of technical literature should cover the following details:
i.	Operational & Maintenance manual of the machine.
ii.	Operational & Maintenance manual of the servo controlled voltage stabilizer.
iii.	Operational & Maintenance manual of the ultra isolation transformer.
iv.	Instruction & Maintenance manual for Hydraulic Oil Cooling Unit.
v.	User manual for Tool changer system.
vi.	Technical & Maintenance manual for Hydraulic System
vii.	Technical & Maintenance manual for Lubrication System.
viii.	Operator Guide for CNC Control System.
ix.	Programming Guide for CNC Control System.
x.	Diagnostic & Trouble shooting Guide for CNC Control System.
xi.	Start-up Guide for CNC Control System.
xii.	Machine Software Listing.
xiii.	Soft and hard copies of PLC Program in ladder form with cross reference listing and PLC project file.
xiv.	Drawings of tooling & fixtures, hard copies in A-2 size as well as soft copy in PDF format.
xv.	Wiring diagram, in which length of wires must be mentioned, hard copies in A-3 size as well as soft copy in PDF format.
xvi.	Mechanical drawings (spindle assembly, table assembly, column assembly), hard copies in A-1 size as well as soft copy in PDF format.
xvii.	Spare part manual including part lists no., hard copies in A-4 size as well as in PDF format.
xviii.	Lay out drawings in A-1 size, which clearly shows the position of all type of electrical components in machine.
	Note: All manual and literature should be in English/Hindi.
5.0	SPARES:
5.1	Since the machine will be under comprehensive preventive maintenance during warranty period of two (02) years and under AMC for five (05) years after the warranty period, it is the sole responsibility of bidders to stock such spares as required for smoother execution of PMC during warranty and AMC in order to achieve response time in compliance to machine availability as per stipulated requirements.

6.0	CONSUMABLES:
6.1	The list of consumables shall be furnished and quoted along with their unit rate.
6.2	Consumables shall be supplied along with the machine or as per agreed time table, if ordered.
7.0	SPECIAL FEATURES:
7.1	Special features incorporated in the machine, if any, shall be indicated separately in the bid clearly indicating the advantages.
8.0	DEVIATIONS:
8.1	The tenderer shall certify that the offered machine fully meets the specification. Various design features incorporated in the machine to fulfill different technical performance requirements shall be fully explained in the offer. However, minor deviations from these specifications which do not affect or in any way interfere with the stipulated performance standards or would result in improved safety/ reliability or would reduce recurring maintenance/operating cost of the machine, can be considered for acceptance. The tenderer in such eventuality shall clearly indicate the details of these deviations and their implications as per the following format:
8.2	All Deviations shall be clearly indicated in the deviation statement as per the format of submission of technical bid Annexure–A
9.0	INSPECTION AND TESTING AT MANUFACTURER'S WORKS:
9.1	The machine shall be inspected and tested during different stages of its manufacture starting from raw material till the completion of machine, by the purchaser or his authorized representative at the supplier's or his sub-supplier's works. The Quality Assurance Programme as per Annexure-I shall be submitted along with the bid. The bidder must submit the exhaustive QAP incorporating the tests as given in Annexure-I along with other tests /stage inspection as followed by them
9.2	A load and functional test like no load test and maximum Horse Power test must be carried out at the manufacturer's works. Rigidity of the machine shall be demonstrated to the satisfaction of appointed inspector or inspecting agency.
9.3	Manufacturers must have suitable facilities at their works for carrying out various performance tests on the sub-assembly/assembly/machine. The tenderer shall clearly confirm that all facilities exist and shall be made available to the inspecting authority.
9.4	A Sample Inspection Chart for inspecting the equipment shall be supplied along with the bid. The inspection chart should indicate all the tests that are carried out during the machine manufacture and also the tests to be offered to inspecting agency. The standard to which this inspection chart conforms should be clearly indicated. Against each test, acceptable limit/ range of values shall be indicated.
10.	TRAINING:
10.1	Free training by the firm shall be imparted in operation and maintenance of the machine. The training to be imparted shall cover operation, troubleshooting and repair of all mechanical, hydraulic, electrical & electronics equipments (CNC Control & AC Drives) and CNC/PLC part programming. This training shall be provided to 04 persons nominated by the consignee, for a period of 02 weeks free of cost at the manufacturer's premises. All charges pertaining to travel, boarding and lodging shall be borne by Indian Railways.
10.2	Subsequently, technical experts from the manufacturer will fully and adequately provide training to operators and maintenance minimum 4 staff nominated by the consignee at the time of commissioning of the machine.
10.3	The supplier will be responsible for co-coordinating with the consignee the travel plans of trainees to ensure that the training is imparted on the machine at its assembly and testing stage. The bidder shall also submit training schedule along with the offer.
Note:	All training should be imparted in English/Hindi only.
11.	FOUNDATION & RELATED DRAWINGS
11.1	SUBMISSION OF GA, FOUNDATION & RELATED DRAWINGS FOR APPROVAL:
11.1.1	For each machine, the supplier shall first submit 01 copy of foundation drawings with details of construction of foundations, complete layout of machine elements like bed, hydraulic tank, coolant tank, electrical panel, Servo Controlled Voltage Stabilizer etc. and other related diagrams (Mechanical, Hydraulic, Electrical & Electronics) along with machine weight, overall dimensions, electrical load with length of 3 phase, 415 V AC electric power cable for approval as per time schedule specified in Section-IV to each consignee for approval and to enable the consignee for making necessary arrangements for Installation & Commissioning of Machine on receipt. After getting approval from consignee, the supplier shall supply directly to each consignee 6 copies of approved GA foundation drawings and

	<p>related diagrams for each machine as per time schedule specified in Section-IV from the date of approval of GA drawing for information only. This information should be furnished on the pattern indicated in detail in the following IS Specifications (Latest) or relevant international standards</p> <ul style="list-style-type: none"> i) IS: 2974 (Pt.I Para 4.1) for reciprocating type machine. ii) IS: 2974 (Pt.III Para 3.1) for rotary type machine (medium & high frequency). iii) IS:2974 (Pt.IV para 4.1) for rotary type machines of low frequency. iv) IS: 2974 (Pt.V para 3.1) for impact type machines other than hammers
11.2	<p>APPROVAL OF GA DRAWING (Applicable for machines wherever delivery period is linked with approval of GA drawing) To be governed by Time Schedule in clause 7 of section-IV and following stipulations.</p>
11.2.1	<p>General Arrangement Drawings will be sent by the 'Contractor' to the Consignee as per Time Schedule annexed in LOA/AT. Consignee will download the copy of AT from COFMOW website and take necessary action for approval of GA drawings. The 'Contractor' should ensure that drawings sent to consignee are complete in all respects as specified in technical specification. The GA drawings shall be approved by the consignee and given back to the contractor, under advice to COFMOW, as per the Time Schedule in the LOA/AT.</p>
11.2.2	<p>Delays in submission of drawings by Contractor will be added to the delay in supply of machine in case submission of GA drawing is delayed beyond stipulated time as per time schedule and LD will be levied as per bid document part-I. Thus the number of days delay in submission of GA drawing plus the number of days delay in supply of machine together will be taken as the delay in supply of machine for the purpose of calculations of LD as per clause 1002 of section II of bid document part-I. However if the contractor supply the machine before original delivery period as per AT the number of days by which machine has been supplied earlier than original delivery period that many days will be subtracted from the delay in submission of GA drawings and LD will be levied accordingly. Delays in approval of the drawings by consignee will not be on account of Contractor, except as detailed below.</p>
11.2.3	<p>In case Consignee finds some deficiencies in the Drawings and returns the same for rectification to the 'Contractor', the contractor must return the rectified drawings within 30 days from the date of issue of letter by Consignee. This period will not be counted towards LD calculation. The consignee shall ensure that all deficiencies in the Drawings shall be pointed for clarification to the firm together at one time only instead of piecemeal multiple reference</p>
11.2.4	<p>A repeat back reference(s) by Consignee to Contractor pointing out further defects/deficiencies in the Drawings, will be considered a delay on account of the contractor, except for special circumstances like change in location, review of arrangement etc. Thus, Contractors must take utmost care in ensuring completeness as per requirements of the Consignee.</p>
11.2.5	<p>Where GA Drawing cannot be approved by consignee due to clear site not being available etc., the Consignee must inform Contractor and COFMOW, explaining the exact delay. However, initiative must be taken by Contractor to obtain such a certificate from Consignee. Contractor must bring any difficulty/dispute to the notice of COFMOW immediately.</p>
11.2.6	<p>In their own interest, contractor must maintain a log of events in this respect with clear dates and regularly inform consignee and COFMOW to avoid wrong levy of LD. Consignees must cooperate with Contractors by providing all assistance, including clear information about any expected delays in site availability, promptly and in writing.</p>
11.2.7	<p>If an order has been placed on the firm, the firm will have to advise the consignee well in advance regarding requirement of road permit and assistance required from the consignee, if any, so that delay on this account is avoided. Firm should also visit the site before dispatch of machine to assess the condition of path to be used for movement of trailer</p>
11.3	<p>DISPATCH OF THE MACHINE FROM MANUFACTURER WORKS:</p>
11.3.1	<p>The supplier should normally dispatch the machine only after the foundation is ready for installation and commissioning of the machine on arrival.</p>
11.3.2	<p>In case of delay on part of consignee in providing the clear site for construction of foundation or any other facility as specified in the contract to the supplier, the supplier will report the matter to COFMOW and consignee. In case of delay in readiness of site on part</p>

	of consignee, COFMOW shall take up the matter with concerned Railway/ PU, and advise supplier accordingly
11.3.3	In case proving of component at manufacturer works, the supplier should request for the same as soon as possible after receiving contract keeping allowance of transit time etc. and approximately 60 days for consignee to handover the parts after receipt of the request accompanied by appropriate and valid bid guarantee. In the event of consignee certifying the non-availability of prove out components, such components will be deemed to be proved out at manufacturer works. However the firm will prove out these components at consignee subject to the availability.
12.	INSTALLATION, COMMISSIONING AND PROVING TESTS: (ON TURNKEY BASIS)
12.1	Joint Check – The contractor or his agent would be required to carry out a joint check at consignee's end, along with the consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint receipt inspection be done immediately on receipt of the machine by consignee & bidder's representative to avoid commissioning delays due to shortages/transit damages. After receipt of the machine as above a Joint Receipt Inspection note (JRI) as per Annexure-C of Section-VI shall be prepared by the consignee and the firms representative indicating the tentative time schedule for various activities of installation and commissioning. For Indian manufacturers, JRI note shall accompany the bill for 80% payment.
12.2	RESPONSIBILITIES OF CONSIGNEE AND BIDDER
12.2.1	The consignee shall be responsible for-
i.	Provision of a clear covered (except where shed is in the scope of contract) site for construction of foundation as per the schedule to ensure its readiness before arrival of machine at site
ii.	In case where construction of shed is also in the scope of contractor the consignee shall ensure site is encroachment and encumbrance free
iii.	Electricity, water and compressed air for installation and commissioning of machine shall be provided free of cost within one week of arrival of machine at site
iv.	Wherever a road mobile crane has to be arranged by the supplier for material handling, a clear approach for it up to the site has to be provided
v.	Clear covered space for storage of material/equipment required for working/ construction of foundation and installation of the machine etc
vi	The consignee shall arrange the raw material for prove out at their end within 3 days of the dry run of the machine (installation, power connection, auxiliary connection like air, water connection) failing which such components will be deemed to have been proved out. The components supplied by the consignee in time will be required to be proved out within specified time schedule thereafter.
12.2.2	The bidder shall be responsible for-
i.	Design of foundation as well as flooring (if required) of sufficient thickness, suiting local soil conditions at the site.
ii.	Advise consignee in time regarding schedule for requirement of clear site for construction of foundation and other infrastructure, resources & facilities required.
iii.	Construction of foundation as well as flooring (if required) of sufficient thickness suiting local soil conditions, for machine shall be completed by the bidder at the site provided by the consignee before receipt of the machine at their premises.
iv.	Provision of all tools and equipment, technical and unskilled manpower, material handling accessories/ equipment and material for installation and commissioning.
v.	Unloading of the machine on receipt (both imported and indigenous machine) and its movement to the site of installation including provision of road mobile crane.
vi.	The bidder should ensure the proper earthing for the machine and its peripherals/accessories.
12.3	Consignee will provide only 415 V+10%-20%, 3 phase 50 Hz+3% AC supply at a single point (mains). All types of cables, connections, circuit breakers etc. required for connecting power supply point to different parts of the machine/control cabinets, shall be the responsibility of the bidder. Requirement of grounding/earthing with required material shall also be incorporated by the bidder during construction of foundation. Electrical work like laying of power/electrical cables & earthing wires from mains to machine control panel (upto 20 meters) as well as within the machine, with supply of all materials shall also be carried out by the supplier.
12.4	The supplier shall demonstrate machine performance and prove out the claimed capability

	<p>for successful commissioning at the consignee's works as per clause 2.4 of Section-IV. The M&P shall be deemed to be "commissioned" at consignee premises on the date when it is tested and meets with the specified capabilities/functions according to the technical specifications. In addition to above, in case of tooled-up M&P, the M&P shall be deemed to be "Commissioned" at consignee premises on the date when "prove out" components specified as per the relevant clause of technical specification have been successfully proved out meeting the productivity requirements of Technical specification. The consignee shall arrange the raw material for prove out at their end within 3 days of dry run of the machine (installation, power connection, auxiliary connections like air, water etc.) failing which such components will be deemed proved out. The components supplied by consignee in time will be required to be proved out machine within specified time schedule thereafter. Any delay in providing the "raw material or any other input" for proving out shall not be logged on supplier's account.</p> <p>A Joint Commissioning Note (JCN) to this effect shall be made as per the format at Annexure-D of Section-VI. After issue of JCN the performance shall be watched for a period of one month, after which the PTC shall be issued. The issue of PTC can not be delayed by more than 60 days from the issue of JCN. If some minor breakdowns are noticed after the issue of JCN, these shall be attended as per warranty obligations and suitable extension of the warranty period, under intimation to COFMOW. If no intimation is given to COFMOW and the PTC is not issued till the expiry of 60 days from the issue of JCN, then the issue will be discussed in a meeting between CME/PCM and the consignee. Based on this, decision to issue PTC will be taken by CME/PCM, the concerned technical officer and CME.</p>
12.5	If an assembly/sub-assembly requires to be taken back to the manufacturer's premises for repair/replacement either before commissioning or during warranty, the manufacturer or his agent would be required to submit BG of suitable amount. In case the entire machine has to be taken back, a Bank Guarantee for the cost of the machine would have to be submitted. The bank guarantee should be of adequate value so as to cover the cost of the assembly/sub-assembly/paid up cost of the machine.
13.0	SERVICE FACILITY IN INDIA AND TECHNICAL SUPPORT
13.1	The tenderer will clearly spell out in the offer the facilities available with him or his agent for providing adequate after-sales service in India during warranty period in the appropriate section of Annexure 'A' of Bid Document Part-II. The complete details such as organization for after sales service, availability of technically competent engineers and warehousing facilities for spares should be clearly indicated. Bidders not offering complete servicing/repair facilities in India to ensure quick response to maintenance/ servicing calls are not likely to be considered.
13.2	After the warranty period and AMC period, if any, the manufacturer or his agent shall agree to provide service supports for trouble shooting and obtaining spare parts. The manufacturer shall be obliged to provide spare parts required by the Purchasers for a period of 15 years from the date of delivery of the machine at the ultimate destination to safeguard against obsolescence.
13.3	Tenderer who are OEM, shall undertake to supply spare parts for a period of expected life of machine. Other tenderers shall submit undertaking from OEM for supply of spare parts for a period of expected life of the machine.
13.4	During warranty period, the supplier or his authorized agent shall attend for break down as soon as possible, but in no case later than 72 hours of receipt of intimation of the breakdown.
14.	BOUGHT OUTS
14.1	The bidder shall furnish along with the offer a list of all critical items/ sub-assemblies which are bought out by the bidder and proposed to be used, along with the manufacturer's name, brand model etc. The successful bidder may be required to produce invoices to ensure genuineness of such products / verification by the Inspecting agency.
14.2	The bidder should clearly indicate that in case of components/sub assemblies taken from reputed companies such as Vickers, Rexroth, RITTAL, THK, and Shenburger etc., the parent company has already entered into contract with their Indian units/affiliates for undertakings repairs/after sales service during warranty and post warranty

S.No.	SUB ASSEMBLY	MAKE
1	CNC Controller	Cadman/Delem/Cebelec/Siemens/Fanuc/Robosoft/ Heidenhain/Indramet/Omron
2	Hydraulic System	Rexroth/Vickers/Yuken/Altos/Parker
3	Feedback devices	Heidenhain/Fagor/Siemens/Fanuc/IFM
4	Ball Screws	Star/INA/THK/sheenburger/Korta
5	Air Conditioning for control cabinet	Rittal/Warner Finley/Kelvin
6	Bearings	FAG/SKF/TIMKEN/NTN/KOYO
7	Lubrication System	Cenlub/ Dropco/ Vogel/Rexroth
8	Electrical control cabinet	RITTAL/Siemens or other reputed makes with IP55protection level
9	Servo Controlled Voltage stabilizer or Solid State Stabilizer	Neel/Servmax/TSI
10	Ultra Isolation transformer	Neel/Servmax
11	Drive system	Siemens/Fanuc/Indramat/Yaskawa
12	PLC	Siemens/Fanuc/Mitsubishi/OMRON

15.0	COLOUR: The machine and its accessories shall be painted in Apple Green Colour No.281 to IS:5-1978,(if any specific colour code standardized by BIS is available, the same be given). The machine can also be painted in equivalent RAL/DIN/other International Standards. If there is a standard color scheme of the manufacturer, the same can also be considered and may be specified.
16.	WARRANTY OBLIGATION –The following conditions regarding Maintenance and reliability shall also apply:-
16.1	The machine shall be designed for a life of 15 years with regular maintenance and all the structural members of the machine and the foundation shall be guaranteed for 15 years against cracks breakages and etc. during the course of normal operations. Tenderer would submit suitable undertaking
16.2	Foreign suppliers who do not have registered office / maintenance facilities in India may authorize an Indian agent, who shall be responsible for maintenance and break down support. In such case, Indian agent should have experience of maintaining at least 5 machines after commissioning .the tenderer should submit documentary evidence towards the experience of the Indian agent in maintaining the machine in India .along with the offer. The Indian agent should have submit the detail of infrastructure and man power available with them in the Bid.
16.3	In addition to warranty obligations prescribed under clause 3400 and 3500 of the Bid Document Pt.- I, the warranty period would also cover comprehensive preventive maintenance, which will be inclusive of all spares, material and labour cost. All maintenance consumables like lubricants and grease except hydraulic oil / machine coolants shall form part of the scope of the preventive maintenance during the warranty. The cost of preventive maintenance to be carried out during warranty period should be quoted separately.
16.4	The payment of preventive maintenance schedule carried out during warranty period shall be made by COFMOW annually at the end of each year after completion of the work and issue of certificate by the consignee as per annexure-E of section-VI.
16.5	The machine shall at all times give contractual out-put and accuracy. Any deficiency or break down for a total of 02 hr. or more for a day would be treated as failure for the day, for the purpose of extending warranty period in terms of clause 3405 of Bid Documents Part-I.
16.6	The tenderer shall ensure that in case a failure is reported by a consignee qualified service engineers shall visit the site within two days from the date of complaint on calendar day's basis. The period of three days (excluding date of complaint) after the failure reported shall be treated as grace period, which will not count towards breakdown time for up to one failure per month and a maximum of 3 failures per quarter. In case the number of failure exceeds one failure per month or three during any quarter of warranty, grace period of only 1 day will be permissible for such additional failure. Complaints shall be lodged by consignee by fax phone, e-mail or per bearer at address given by the tenderer.
16.7	The details of preventive maintenance to be provided during warranty period shall be indicated by the tenderer giving details of type of preventive schedule, periodicity on items to be checked, items to be replaced and expected plant down time. Preventive maintenance schedules shall be

	conducted on weekends as far as possible or any other day through mutual agreement with consignees. Total break down hours shall be calculated after discounting grace period and preventive maintenance period.
16.8	<p>Maximum permissible down time till it is restored back to the contractual output and accuracy levels, in any quarter of the year during the warranty period, shall be 150 hrs. in case the total break down period in any one of year during warranty period, exceeds 500 hrs., the consignee shall inform the same to COFMOW To ensure this a record of breakdown (duly signed by shop incharge) in hours on quarterly basis should be maintained by the consignee and joint report with the contractor shall be made for each breakdown attention. At the end of first and second year of warranty, these details of breakdown hours during warranty period should be advised to COFMOW as per performance appraisal report given in Annexure – E of section –VI. The firm will then request COFMOW for release of WBG annexing the performance appraisal report as per Annexure-E of Section-VI and the breakdown details mentioned above.</p> <p>Penalty will be levied on the bidder for breakdown period on working days basis (excluding holidays) after discounting for the grace period. Penalty will be calculated as percentage of annual preventive maintenance charges and will be deducted from the respective annual payments as under.</p>

Breakdown period	Applicable penalty
Up to 150 hours in each quarter and not exceeding 500 hours annually	Nil
Exceeding 150 hours - up to 200 hours in any quarter and not exceeding 500 hours annually	5 % of annual preventive maintenance charges
Exceeding 500 hours - up to 750 hours annually	10% of annual preventive maintenance charges
Exceeding 750 hours - up to 1000 hours annually	25% of annual preventive maintenance charges
Exceeding 1000 hours annually	50% of annual preventive maintenance charges and Encashment of Warranty Bank Guarantee besides other action like noting adverse performance of the bidder and/or agent for future tenders and their offer in the subsequent tenders will not be considered for placement of any order.

17.	ANNUAL MAINTENANCE CONTRACT
17.1	<p>Tenderers are required to quote for a comprehensive Annual Maintenance Contract for the machine supplied against this specification for a period of five years on yearly basis giving the rates for each year i.e. first year, second year..so on., which will be inclusive of all spares, material and labour costs. The duties and taxes as applicable should be indicated separately. All consumable spares and materials shall form a part of the scope of comprehensive AMC except as follows</p> <p>a. Diesel/Fuel, lubricating oils or coolant</p> <p>b. Major machines elements/structural members which are under guarantee for a period specified in clause 16.1 as stipulated in 'warranty obligations' requirement.</p>
17.2	AMC shall be operated, managed and paid by the consignees indicated under clause 3 of Section IV. The consignee shall indicate the bill payment authority & custodian of the AMC BG. No further agreement is required for operating AMC at consignee end.
17.3	<p>AMC is a part of scope of supply, in case of concomitant requirement and included in commercial evaluation criteria vide clause 5 of Section-IV</p> <p>The detailed terms and conditions of AMC shall be as given in following clauses.</p>
17.3.1	The duration of AMC shall be 5 years from the date of expiry of warranty. Rates for AMC shall be quoted by the tenderer on yearly basis, which will remain applicable during the duration of AMC and not subject to any variation except any statutory changes in taxes and duties as compared to quoted rates.
17.3.2	The tenderer must provide AMC services at the consignee location without any precondition. The AMC should include complete responsibility for the bought out sub assemblies and components like CNC system, diesel engine, AC unit etc.
17.3.3	The details of preventive maintenance services including cleaning of machine to be provided under

AMC shall be provided by the tenderer in the following format					
S.No.	TYPE OF PREVENTIVE SCHEDULE	PERIODICITY	ITEMS TO BE CHECKED	ITEMS OF REPLACEMENT	EXPECTED PLANT DOWN TIME
17.3.4	Preventive maintenance shall preferably be conducted on weekends through mutual agreement with the consignee. Each preventive maintenance schedule normally shall not exceed one day. The total shutdown time for preventive maintenance should be kept as low as possible but not more than 60 hours/month (averaged over the quarter) including time for cleaning, weekly, fortnightly, monthly, quarterly schedules etc. The preventive maintenance regime offered must be aimed at achieving minimum 90% uptime of the plant excluding the plant down time for preventive maintenance schedules.				
17.3.5	The tenderer shall ensure that in case a failure is reported by a consignee, qualified service engineers visit the site within 3 days from the date of complaint on calendar days' basis. This period of 3 days (excluding date of complaint) after the failure report shall be treated as grace period, which will not count towards plant down time for upto one failure per quarter and a maximum of 4 failures per annum. In case, the numbers of failures exceed one during any quarter or four during any year of AMC, grace period of only 2 days will be permissible for such additional failures. Complaints shall be lodged by consignee by fax, e-mail or per bearer at address given by the tenderer. The responsibility to keep the failure reporting address details current will rest with the tenderer.				
17.3.6	In case preventive maintenance is carried out alongwith breakdown maintenance schedule; preventive maintenance time will be deducted from breakdown time of the plant .				
17.3.7	Penalty Clause: Penalty shall be levied on the tenderer for maintaining plant up time below the limit of 90% calculated on working days basis, after discounting for grace period and preventive maintenance period. Penalty shall be calculated as %age of quarterly payment and will be deducted from the respective quarterly payments. Penalty calculation will be done over quarterly payment period.				

S. No.	Availability Slab	Applicable Penalty
1.	90% to 80%	0.5% for every 1% (or part there of) reduction in availability of plant below 90%.
2.	Below 80%	1% for every 1% (or part there of) reduction in availability of plant below 80%.

17.3.8	A Bank Guarantee equal to $\frac{1}{4}$ of annual value (highest of the annual values if the rates offered for various years are different) of AMC subject to a minimum value of 1.25% of the quoted cost of machine including concomitant accessory (in case the annual AMC rate quoted is less than 5% of the cost of machine), will be submitted by the tenderer to the consignee 90 days before the expiry of warranty. AMC will have the validity of 5 years 6 months. The bidder can submit multiple BG for lesser duration to cover the period of 5 year 6 months ensuring the uninterrupted validity of the AMC BG for 5 year 6 months. The confirmation for the submission of this BG will be returned on completion of AMC period. In case, the tenderer fails to provide AMC services successfully, the AMC BG will be forfeited. This will be in addition to penalty as per clause 17.3.7 above. This provision would not be applicable where the advance payment is made.				
17.3.9	Plant up time of less than 60% for two consecutive quarters will constitute complete failure of tenderer to provide the AMC services successfully and will result in forfeiture of AMC BG, besides other action like noting adverse performance of the bidder and/or agent for future tenders and their offer in the subsequent tenders will not be considered for placement of any order. This will be in addition to penalty clause 17.3.7 above for the period of actual performance.				
17.3.10	As per clause 5.0 of bid document Part-II section V, where AMC is part of evaluation of offer, it is the sole responsibility of bidders to stock all spares and materials as required for smoother execution of AMC in order to achieve response time in compliance to machine availability as per stipulated requirements.				
17.3.10.1	In all cases of plant failure except as mentioned in clause 17.3.10.2, any other spare part or material necessary to restore the plant to proper working order will be arranged by the tenderer as				

	a part of AMC.
17.3.10.2	.In case of damage to the machine on account of any external factor, viz., floods, earthquake, fire, arson or sabotage, entire cost of spare parts and material necessary for repair of the plant shall be borne by the railways. However, the tenderer shall provide services of their engineers free of cost as a part of AMC to restore the plant to working order.
17.3.10.3	In case of damage to the plant as mentioned in para 17.3.10.2, any spare parts and material necessary to restore the plant to proper working order shall be arranged by the tenderer and charged on actual basis duly certified by authorized railway official in the next quarterly bills. The rates charged for such spare parts shall be based upon the spare part rate list provided by tenderer in compliance of clause 5.2 or any other valid document. The tenderer shall furnish documents to support the rates charged for spares used for repair under para 17.3.11(a).
17.3.11	Normally quarterly payment (@ 1/4 th of the annual quoted rates) under AMC will be made to the tenderer within 30 days from the end of that quarter subject to submission of the following documents by the tenderer to the paying authority assigned by the consignee: <ul style="list-style-type: none"> a. Consignee's certificate for work done as per Annexure-G of Section-VI with calculation of down time and penalty applicable. b. A certificate by consignee that no spare part is due with the tenderer as per clause 17.3.10 above. c. Bills submitted by the tenderer & accepted by consignee. d. Attested photocopy of the AMC BG.
17.3.12	The AMC contract can be terminated in following ways : Consignee may terminate the AMC in the event of failure of tenderer to provide AMC services of the AMC agreement in addition to encashing of AMC BG as per clause 17.3.8
17.3.13	Other general conditions shall be governed by Bid Document Part-I (Section-I, II and III) as applicable to respective COFMOW A/T .

ANNEXURE-A OF SECTION VI

FORMAT FOR SUBMISSION OF TECHNICAL BID

1. We, M/s.----- offer our ----- machine, model no. ----- as per the description given in Schedule of Requirements. We further state that, except for the following, for which clause wise brief description and justification for deviation has been indicated, our machine fully complies with all the clauses as given in technical specification Section-V and we also confirm all the schedules given in the Delivery Schedule at para 7 of **Section-IV:**

S.No.	Clause/Item	Brief description of Deviation	Justification for deviation

Note1: In case there is a contradiction in any information provided (some parametric values given in the specification and those given in the brochure or some other document enclosed by the tenderer), unless specifically mentioned in the deviation cum confirmation statement under Annexure A of Section VI, the values as given in the specification shall be taken as confirmed by the tenderer and offer evaluated accordingly

Note2: In case tenderer offers internationally accepted alternative specifications as per clause 1.7, complete details of alternative specification, apart from filling above deviation statement, may be enclosed

2. We further certify that we are meeting the reference clause as

(A) We are the regular manufacturer of this type of machine

(B) We have made the following past supplies of similar machines as per clause _____ of special conditions during last 5years:-

S N o .	Name of purchaser with postal address	P.O. No. and date (along with the copy of PO)	Name of contact person with designation	Phone/ fax /e-mail nos. of contact person	Date and place of commissioning of the machine	Folding Capacity, Working Length Main Motor Power

(C) We are submitting following performance certificate from past users as per clause _____ of Special Conditions :-

S N o .	User Name	Date Supplied	Date of issue of certificate	Application / Use	Leading parameter	Performance
					Folding Capacity Working Length Main Motor Power	

3. We are having following facilities available with us or our agent for providing adequate after-sales service in India during warranty period. Complete details of after sales service, availability of technically competent engineers and warehousing facilities for spares is indicated below:

- After sales service centers:
- Availability of technically competent engineers;
- Warehousing facilities for spares

4. We have quoted for the following optional accessories as indicated under clause 4.3 of section IV :

Sr No.	Description of the optional accessory	Quantity (in Nos.)	Rate (in Rest.)	Indigenous	Shelf Life (in Months)

--	--	--	--	--	--

5. We have quoted for following recommended perishable and non-perishable spares required for normal maintenance to cover complete range of mechanical, hydraulic and electrical equipments including controls on double shift working basis:

Perishable Spares

SNo.	Description of the spares	Part number	Quantity (In Nos.)	Rate (In Rs)	Shelf Life (in Months)

Non perishable spares

S.No.	Description of the spares	Part number	Quantity (In Nos.)	Rate (In Rs)

6.*We hereby confirm that we are the OEM and undertake to supply spare parts for a period of expected life of machine.

OR

*We hereby confirm that we are not the OEM, but are submitting undertaking from OEM for supply of spare parts for a period of expected life of the machine to provide maintenance spares (as and when ordered) after the expiry of the Warranty/AMC for 5 years (life of machine - 15yrs) including the maintenance spares required for the bought out sub-assemblies and parts.

(*Strike out which ever is not applicable)

7. We have quoted consumables required as per clause 6.1 of Section V of Bid document Pt-II, in the format give below

Sr No.	Description of the consumable spares	Qty	Unit	Rate

8 It is certified that we are having suitable facilities at our works for carrying out various performance tests on the sub-assembly/assembly/machine and these shall be made available to the inspecting authority

9. **BOUGHT OUT ITEMS:** We hereby furnish a list of all critical items/ sub-assemblies which are bought out by us and proposed to be used, along with the manufacturer's name, brand model etc.

Sr No.	Description	Item no.1	Item no. 2	Item no. 3
1.	Brief description of item			
2.	Model no.			
3.	Make			
4.	Quantity/machine			
5.	Manufacturer's name and complete address			
6.	Whether imported or indigenous			
7.	Country of origin			

10. We have quoted for Preventive Maintenance during warranty and comprehensive Annual Maintenance Contract as per clause 16.3 & clause 17 of section-V respectively. Details of preventive maintenance services

including cleaning of machine to be provided under PMC during warranty and AMC is given in the following format:

S.No.	TYPE OF PREVENTIVE SCHEDULE	PERIODICITY	ITEMS TO BE CHECKED	ITEMS OF REPLACEMENT	EXPECTED PLANT DOWN TIME

11. We further submit the following information about the offered machine as per the technical specification section VI and Important Features of the tender section IV. We understand that any omission of any of the below mentioned information will render our offer incomplete to that extent.

S.N.	Clause No.	Information required	Compliance/ Value/Write-up																																														
SECTION-IV																																																	
1.	2.2	<p>For Actual values of the following major & other parameters of the offered CNC Folding Machine should be given:</p> <table border="1"> <thead> <tr> <th>2.2.1</th> <th>MAJOR PARAMETERS:</th> </tr> </thead> <tbody> <tr> <td>2.2.1.1</td> <td>Folding Capacity</td> </tr> <tr> <td>2.2.1.2</td> <td>Working length</td> </tr> <tr> <th>2.2.2</th> <th>OTHER PARAMETERS:</th> </tr> <tr> <td>2.2.2.1</td> <td>Upper Clamping Beam</td> </tr> <tr> <td>2.2.2.1.1</td> <td>Opening Height</td> </tr> <tr> <td>2.2.2.1.2</td> <td>Speed up/down</td> </tr> <tr> <td>2.2.2.2</td> <td>Folding Beam</td> </tr> <tr> <td>2.2.2.2.1</td> <td>Adjustment range</td> </tr> <tr> <td>2.2.2.2.2</td> <td>Angle setting range</td> </tr> <tr> <td>2.2.2.2.3</td> <td>Folding speed</td> </tr> <tr> <td>2.2.2.3</td> <td>Lower Beam</td> </tr> <tr> <td>2.2.2.3.1</td> <td>Adjustment range</td> </tr> <tr> <td>2.2.2.4</td> <td>Back Gauge</td> </tr> <tr> <td>2.2.2.4.1</td> <td>Range</td> </tr> <tr> <td>2.2.2.4.2</td> <td>Adjustment time for back gauge</td> </tr> <tr> <td>2.2.2.5</td> <td>Drive Power</td> </tr> <tr> <td>2.2.2.5.1</td> <td>Main motor power</td> </tr> <tr> <td>2.2.2.6</td> <td>Accuracies</td> </tr> <tr> <td>2.2.2.6.1</td> <td>Setting accuracy of folding beam</td> </tr> <tr> <td>2.2.2.6.2</td> <td>Setting accuracy of back gauge</td> </tr> <tr> <td>2.2.2.6.3</td> <td>Positioning accuracy of back gauge</td> </tr> <tr> <td>2.2.2.6.4</td> <td>Angular accuracy of formed components</td> </tr> </tbody> </table> <p>Note: No deviation shall be permitted in Major parameters.</p>	2.2.1	MAJOR PARAMETERS:	2.2.1.1	Folding Capacity	2.2.1.2	Working length	2.2.2	OTHER PARAMETERS:	2.2.2.1	Upper Clamping Beam	2.2.2.1.1	Opening Height	2.2.2.1.2	Speed up/down	2.2.2.2	Folding Beam	2.2.2.2.1	Adjustment range	2.2.2.2.2	Angle setting range	2.2.2.2.3	Folding speed	2.2.2.3	Lower Beam	2.2.2.3.1	Adjustment range	2.2.2.4	Back Gauge	2.2.2.4.1	Range	2.2.2.4.2	Adjustment time for back gauge	2.2.2.5	Drive Power	2.2.2.5.1	Main motor power	2.2.2.6	Accuracies	2.2.2.6.1	Setting accuracy of folding beam	2.2.2.6.2	Setting accuracy of back gauge	2.2.2.6.3	Positioning accuracy of back gauge	2.2.2.6.4	Angular accuracy of formed components	Values
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2.	2.3.1	The machine should confirm to International Standard/ ISO for geometric accuracy and performance test and should be capable of doing operations as per accuracy given in the drawing. The tenderer in the offer shall furnish actual test schemes along with sample charts for these tests.	Write-up & Values
3.	2.3.2	The tenderer in the offer shall furnish actual test schemes along with sample charts for Full Load Test of machine	Write-up & Values
4.	2.4	Cycle Time/ Productivity : The bidder shall indicate the cycle time required to bend the	Write-up (tabular sheet)

		<p>components as listed in the Annexure-F (A) of Section-VI, clearly giving the breakup of different elements of operation, such as handling time, gauging time and bending/folding time of the components etc. The cycle time should be given in the following format:</p> <table border="1"> <thead> <tr> <th>S I · N o ·</th> <th>Component description</th> <th>Thickness</th> <th>Weight</th> <th>Bend No.</th> <th>Angle of bend</th> <th>Flange / side dimension</th> <th>Rotate/ flipping of sheet</th> <th>Tool change time</th> </tr> </thead> <tbody> <tr> <td colspan="9" style="text-align: center;"> <ul style="list-style-type: none"> • Total Gauging time • Approach time • Working time • Return time • Misc. time (including loading/unloading time) • Total time per component </td> </tr> </tbody> </table>	S I · N o ·	Component description	Thickness	Weight	Bend No.	Angle of bend	Flange / side dimension	Rotate/ flipping of sheet	Tool change time	<ul style="list-style-type: none"> • Total Gauging time • Approach time • Working time • Return time • Misc. time (including loading/unloading time) • Total time per component 									
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5.	4.2.2	<p>First fill of lubricating, hydraulic, cutting oil & grease</p> <ul style="list-style-type: none"> • Indigenous brand • Quantity 	Write-up & Values																		
6.	4.2.3	<p>Tooling: Quantity Make Material composition Surface finish Tolerance/accuracy Hardness UTS</p>	Write-up & Values																		
7.	4.2.9	<p>Operating & Maintenance Tools :</p> <ul style="list-style-type: none"> • Make • Description • Quantity 	Write-up & Values																		
SECTION-V																					
8.	1.2.1.8 of Section V	<p>Noise level measurement</p> <ul style="list-style-type: none"> • Maximum noise level value • Noise measurement technique • National /International Standards to which it conform 	Values/Writeup																		
9.	1.2.2.4 of Section V	Actual standard of edge preparation for welding	Values/Writeup																		
10.	1.2.2.6 of Section V	Actual standard for approval tests of welders	Values/Writeup																		
11.	1.2.2.14 Section V	Details of facilities available for machining in a single set up and accuracies achieved	Values/Write up																		
12.	1.2.3.1 of Section V	Details of drives Means and range of selection of clamping beam closing & stamping operation	Values/Write up																		
13.	1.2.4.2 of Section V	Method of bending centre correction	Values/Write up																		
14.	1.2.5.2 of Section V	Details of the actual arrangement in the machine for crowing purpose	Values/Write up																		

15.	1.2.6.1 of Section-V	Details of sheet support and back gauge system to hold and manipulate the work sheet during clamping and bending system	Values/Write up
15.	1.2.6.2 of Section-V	Details of back gauge mechanism to prevent backlash	Values/Write up
16.	1.2.8.2 of Section-V	Least count of indicators both for pressure and force	Values/Write up
17.	1.2.8.3 of Section-V	Maximum pressure develop by the pump under safe operating condition	Values/Write up
18.	1.2.8.4 of Section-V	Method of hydraulic system for maintaining parallelism of the top beam with respect to bottom beam in case of center loading	Values/Write up
19.	1.2.8.5 of Section-V	Maximum pressure inside the cylinder during normal working and area of the cylinder	Values/Write up
20.	1.2.8.7 of Section-V	Capacity of filter in terms of size of impurity that can be filtered Life of filter Indigenous source of filter	Values/Write up
21.	1.2.8.8 of Section-V	Method of maintaining hydraulic oil temperature in limit	Values/Write up
22.	1.2.8.11 of Section-V	Size and thickness of pipes, UTS of material Details of anti corrosive treatment on hydraulic oil tank Location of flexible pipe in hydraulic circuit	Values/Write up
23.	1.2.8.12 of Section-V	Line diagram of hydraulic circuit duly indicating different element. Explain Operation of CNC folding machine sequentially through circuit diagram	Values/Write up
24.	1.2.8.13 of Section-V	Details of construction of piston seals along with drawing and material used	Values/Write up
25.	1.2.14 of Section-V	Make & model of Refrigeration type AC unit	Values/Write up
26.	1.2.15 of Section-V	Capacity of the climate control equipment and dimension of the enclosure with specification	Values/Write up
27.	1.2.22.1 of Section-V	Dimension and technical specification of UPS and its accessories and battery bank Technical and dimensional details controlled climatic condition for the UPS or Battery	Values/Write up
28.	1.2.24 of Section V	CNC System •Make •Model •Type • List of technical features	Values/Write up
29.	1.10 of Section V	Hydraulic system • Size of hydraulic tank, •Make • Max. pressure developed • Nos. of safety/interlocks provided against insufficient flow of hydraulic oil • Hydraulic motor power in KW (if applicable). • Hydraulic tank capacity in liters • Size of filter (if used) •Hydraulic Circuit Diagram	Values/Write up
30.	3.7 of Section V	Pneumatic system (if applicable) Make Air pressure	Values/Write up
32.	3.8 of Section V	Lubrication system Make of lubrication motor & pump • No. of lubrication points •Tank Capacity • Motor power in KW • Filter size (if used) • Nos. & details of safety devices •Lubrication Diagram	Values/Write up

33.	Misc.	<ul style="list-style-type: none"> • Total weight of the machine. • Total weight of machine along with packing • Total connected electrical load and its break up. • Details of quoted machine like brand name, model etc. • Total working area • Maximum floor space area required for installation and commissioning of the machine • Facilities required during commissioning of the machine • Overall dimensions of the machine in packed condition. • Maximum size of packing and no. of packages • Copy of Technical Literature of quoted mode 	Values/Write up
34.	Section-IV	Clause wise comments	
35.	Section-V	Clause wise comments	
36.	2.3 Section-V	<p>Technical Details/Particulars of Motors, Control Gears, Voltage Stabilizer & Isolation Transformer</p> <p>A.C. Servo & other AC Motors and Control Gears</p> <p>AC SERVO & OTHER AC MOTORS</p> <ul style="list-style-type: none"> • Manufacturer's Name • Type of enclosure • Type of duty (Ref. IS: 325) (Latest) • Rating-Continuous/intermittent • Output (KW/BHP) • AC voltage across phases, number of phases & frequency. • Speed in RPM • Class of insulation • Normal full load current • Starting current • Maximum current at the time of change over from lower speed to higher speed • Type of motor-Squirrel cage/slipring (wound rotor) • Temperature rise of windings and other parts allowed above an ambient temperature of 50 degree C. • Frame size of motor • End use of motor <p>CONTROL GEARS</p> <ul style="list-style-type: none"> ▪ Manufacturer's Name ▪ Type of control gear (Direct on line/Star Delta/Auto-transformer etc.) ▪ Rating of starting gear in KW & amps. ▪ Short circuit protection (y/n) ▪ No volt trip (y/n) ▪ Overload trip (y/n) ▪ Delayed action current sensitive single phasing preventor (y/n) ▪ Standard specifications to which the motor control gear and its ancillary offered conform to 	Values/Wri te up
37.	2.3	<p>D.C. Motors and Control Gears</p> <p>DC MOTOR</p> <ul style="list-style-type: none"> • Manufacturer's Name • Type of enclosure • Type of duty (Ref. IS: 4722) (Latest) • Rating-Continuous/intermittent • Output (KW/BHP) • DC voltage across phases, number of phases & frequency • Method of excitation whether shunts, series, compound or separately excited, if separately excited state excitation voltage. • Speed in RPM • Class of insulation 	Values/Wri te up

		<ul style="list-style-type: none"> • Normal full load current in amps. • Starting current • Temperature rise of windings and other parts allowed above an ambient temperature of 50 degree C. • Frame size of motor • End use of motor <p>CONTROL GEARS</p> <ul style="list-style-type: none"> • Manufacturer's Name • Type of control gear (Direct on line/Resistance type/Thyristor type) • Rating of starting gear in KW & amps. • Short circuit protection (Y/N) • No volt trip (y/n) • Overload trip (y/n) • Standard specifications to which the motor control gear and its ancillary offered conform to • Standard specification to which control gear conforms to 	
38.	2.13.2/ 2.13.3	<p>Voltage Stabilizer & Ultra Isolation Transformer</p> <p>VOLTAGE STABILISER</p> <ul style="list-style-type: none"> • Manufacturer's Name • Type of voltage stabilizer : <ul style="list-style-type: none"> a) DC servo motor type b) AC servo motor type c) Solid state • Rated capacity in KVA • Nos. of phases & frequency • Type of input supply unbalanced • Input voltage • Output voltage • Rate of correction • Class of insulation & winding (only copper wound is acceptable) • Type of control circuitry • Class of duty • Type of cooling • Indicating instruments and their ranges • Safety features <p>ULTRA ISOLATION TRANSFORMER</p> <ul style="list-style-type: none"> • Manufacturer's Name • Rated capacity • Ratio of input/output voltage • Class of insulation • Arrangement for suppression of power line surges, spikes, transients and noises • Type for cooling. 	Values/Wri te up

**Signature of the authorized representative of
the bidder with company stamp**

FORMAT FOR INDEMNITY BOND

This deed of Indemnity executed by M/s. ----- hereinafter referred to as Indemnifier' which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, representative and assignees in favour of Central Organization for Modernization of Workshops, Railway offices Complex, Tilak Bridge, New Delhi – 110 002, India, hereinafter referred to as the 'Indemnified' which expression shall unless repugnant to the context or meaning thereof, include its successors and assignees witnesses as to.

Whereas the Indemnifier herein had participated in a global tender for the supply of ----- (machine name) which is opened on ----- (date) on terms and conditions set out interalia in the Tender Document.

And whereas, clause of the above mentioned tender document described that the machine shall be designed for a life of 15 years with regular maintenance and all the structural members of the machine and its foundation should be guaranteed for 15 years against cracks, breakages etc. during the course of normal operations from the date of commissioning whichever is earlier of the stores supplied by the Indemnifier to the indemnified.

The indemnifier hereby irrevocably agrees to indemnify the indemnified that in the event of the said machine not achieving the life guarantee, the indemnifier shall as may be deemed necessary repair the defective machine at site, free of cost, within a reasonable time specified by the indemnified or reimburse the pro-rata cost of the machine to the extent a life not achieved as per the guarantee, or supply a spare stores for the defective portion only free of cost at site.

Bidder's authorized signatory
With seal

Station:

Date:

Witness: 1.-----
(Signature with Name, Designation & Address)

2. -----
(Signature with Name, Designation & Address)

JOINT RECEIPT INSPECTION NOTE

Date.....

Sub: Receipt of consignment for machine.....

Ref: COFMOW Contract No.....

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Consignment of the machine received on	

It is certified that the consignment of the machine has been received complete and in good condition as per specification shown in the contract.

Tentative plan for installation and commissioning of the machine is as under:

1.	Date of clear site provided	
2.	Contract	Turnkey/Non-turnkey
3.	Status of readiness of foundation:	
3(a)	Already constructed on	
3(b)	Under construction & likely date of its completion	
3(c)	Construction yet to be started from and & likely date of its completion	
4.	Status of availability of electrical power, water and compressed air etc.	Available/Not-available
5.	Number of components to be proved out on the machine	
6.	Likely date for start of erection	
7.	Likely date for switch-on the machine	
8.	Likely date of completion of commissioning of the machine	

Representative of firm
Designation

Representative of consignee
Designation
(Minimum Gazetted level)

JOINT COMMISSIONING NOTE

Date:.....

Sub: Commissioning of (name of machine).....**Ref:** COFMOW AT No.....

1.	Name of consignee/Railway	
2.	Machine name	
3.	Quantity	
4.	Name of supplier	
5.	Machine received on	

1. All the parameters of the machine are found okay. The proving test on the machine was conducted from to and machine is working satisfactorily.
2. Machine has finally been commissioned on..... . The machine has been handed over for regular use and kept under one month observation to watch its performance.
3. Following minor deficiencies (if any) found during joint observation trials are to be attended/rectified by the firm during one month observation and before issuing the PTC for the machine:
 - a.
 - b.
 - c.

Representative of firm
Designation

Representative of consignee
Designation
(Minimum Gazetted level)

PERFORMANCE APPRAISAL FORM**APPRAISAL ON COMPLETION OF WARRANTY PERIOD**

Dated:.....

To, M/s.

1.	COFMOW AT No.	
2.	Consignee/Railway	
3.	Name of supplier	
4.	Machine Name	
5.	Machine received on	
6.	Machine commissioned on	
7.	PTC issued on	
8.	Warranty period expired on	
9.	Performance during warranty period:	
9(a)	Total number of breakdowns	
9(b)	Total downtime in number of days	
10(a)	Any warranty complaint pending on date	Yes/No
10(b)	If yes, then the date and nature of defect(s)	

In case, Warranty clause No.16 of the machine during warranty period is also given in Bid Document Pt. II, then following details of breakdown hours for preceding eight quarters may also be furnished.

Quarter	Period	Breakdown hours
	From -----To-----	
1		
to		
8		

Signature-----

Name-----

Designation: DY.CME/Sr.DME/Dy.CEE/Sr.DEE
Office Stamp

1. COS/COFMOW/Railway Offices Complex, Tilak Bridge, New Delhi-110 002
2. CME(PCM)/COFMOW/Railway Offices Complex, Tilak Bridge, New Delhi-110 002
3. FA&CAO/COFMOW

Note:

i.) This appraisal may please be sent immediately on completion of warranty period. If any extension of warranty period required, may please also be mentioned with details.

ii) Sr. Scale Officer having independent charge is also authorized to sign.

ANNEXURE – F(A) OF SECTION VI

LIST OF COMPONENTS TO BE PROVED OUT ON CNC FOLDING MACHINE

S.no	Drawing number	Description	Size	Material	Allowed Time in minutes for each folding operation	Cost per one no. in (Rs.)
1	AAB 10 024 001B	Cross Beam	3x171x3050	CK 201 X2 CrNi12	2.31 +2.31	2356
2	652 16 018 004 A	Cross Beam	2x171x1200	CK 201 X2 CrNi12	2.07 + 2.07	1063
3	AAD 11 244 001	Channel	5x120x2748	IRS M 41	2.07	1090
4	469 11 006 002 c	Channel	5x167x2750	IRS M 41	2.31	1617
5	231 14 009 004 b	Part Pillar	2x150x301	SS 409M	1.71 +1.77	1385
6	231 14 009 007 b	Part Pillar	2x150x321	SS 409M	1.71 +1.77	1073
7	310 14 007 040 f	Part Pillar	2x150x214	SS 409M	1.71 +1.71	146
8	310 14 007 041f	Part Pillar	2x150x318	SS 409M	1.77 + 1.77	247
9	AAD 10 437 001	Z section	2x40x92	SS 409M	1.71	327
10*	AAB 14 947 001	Bracket	2.5x70x87.5	CK 201 X2 CrNi12		203
11*	231 16 002 005 d	Cantrail	3.2x385x2985	IRS M 41		3449
12*	156 51 003 001	Door Sheet	1.6x765x1848	SS 409M		9620

Note 1: i) 10 numbers of each type of components are to be proved out as per quoted cycle time including set up time

ii) The radius of the bending angles up to 1.5 times thickness of the sheet shall be acceptable.

iii) Allowed Time mentioned above are existing Timings in ICF which include Loading & unloading of jobs but **excluding set up time**. The quoted cycle time should be on par or better than existing ones. It is to be noted that wherever single timing is mentioned that job requires single folding operation & wherever two timings are mentioned that job requires two folding operations.

Note 2: Drawing numbers with latest Alteration index shall be obtained from consignee after order confirmation

Note 3 : *Capability of the machine to process these components shall be proved out.

ANNEXURE – F(B) OF SECTION VI

TABLE 1: STEEL GRADES AND THEIR CHEMICAL COMPOSITION AS DETERMINED BY LADLE ANALYSIS

S.No.	Material designation/ grade number	C%	Mn%	Si%	S%	P%	Cr%	Mo%	Ni%	Others
1	C-K 201 X2CrNi12 (409 M) (IRSM 44)	≤ 0.03	0.5 to 1.5	1.0 (max)	0.030 (max)	0.040 (max)	10.5 to 12.5		0.3 to 1.0	N-0.03 (max)
2	MDTS069 (Rev. NIL) X2 Cr11- /1.4003	≤ 0.03	0.5 to 1.5				10.5 to 12.5		0.3 to 1.0	N≤0.03

TABLE 2: MECHANICAL PROPERTIES OF COLD ROLLED/PRODUCTS NOT ROLLED

Designation/ grade number	Material condition	Min. Yield stress or 0.2 % (proof stress) (N/mm ²) transverse	Tensile strength (N/mm ²) transverse	Minimum elongation at fracture (%) at 50 mm gauge length
C-K 201 X2CrNi12 (409 M)	Cold rolled 16 mm thickness max	320	450 – 650	20
X2Cr11/1.4003	Hot rolled flat	320*	450 – 650	20

- When thickness exceeds 8 mm, this value shall become 280 N/mm²

Consignee's Certificate for Quarterly Work Done Under AMC

1. Name of Plant:
2. Consignee
3. COFMOW AT No.
4. Name of Contractor
5. Quarterly charges for AMC(Standard): Rs. _____
As per COFMOW AT no. _____ dt. _____
6. Quarter for which bills are preferred: _____
From: _____ To: _____
7. No. of Breakdowns during the quarter:
8. **Calculation of Penalty and Net AMC charges payable to Contractor for the quarter:**
 - i. Total Plant Down Time (in days):
 - ii. Standard down days for preventive maintenance (in days/quarter):
 - iii. Total grace period for break down:
 - iv. Net down time for the plant [= (i)-{(ii)+(iii)}] :
 - v. 100% Availability for the quarter (in days) :
 - vi. Actual availability [= (v)-(iv)] :
 - Actual availability in %age [= {(vi) / (v)}x 100]:
 - vii. Calculation of penalty:
 - a. %age availability below 90% to 80%:
 - b. %age availability below 80%:
 - c. Penalty[={ (vii a)x(5)x0.005 +(vii b)x(5)x0.01 }]:
 - viii. Net amount payable as AMC charges to [= (5)-(vii c)]

It is certified that spares borrowed by the contractor for the previous quarter have been returned in good condition.

Signature of authorized representative of consignee

**CENTRAL ORGANISATION FOR MODERNISATION OF WORKSHOPS
(C O F M O W)**

REPORT ON FRESH TECHNICAL SUITABILITY ASSESSMENT

on ----- of

M/s ----- .

CONTENTS:	PAGE NO.
Para - 1 : GENERAL INFORMATION (MISCELLANEOUS)	
Para - 2 : GENERAL INFORMATION (TECHNICAL)	
Para - 3 : DESIGN CAPABILITY	
Para - 4 : MANUFACTURING PROCESS	
Para - 5 : QUALITY ASSURANCE	
Para - 6 : AFTER-SALES SERVICE	
Para - 7 : PAST PERFORMANCE	
Para - 8 : COMMERCIAL INFORMATION	
Para - 9 : CONCLUSIONS AND RECOMMENDATION	

LIST OF ANNEXURES :

- A : LIST OF MANAGERIAL & SUPERVISORY STAFF
- B : PLAN OF MAIN WORKS ATNOT ENCLOSED.
- C : LIST OF MACHINERY & PLANT
- D : LIST OF RAW MATERIALS IN STOCK
- E : LIST OF IMPORTANT CUSTOMERS & ORDERS
- F : DELIVERY AND COMMISSIONING PERFORMANCE
- G : SSI (and similar)REGISTRATION CERTIFICATES
- H : COPY OF LATEST ELECTRICITY BILL
- I : INCOME TAX CLEARANCE CERTIFICATE
- J : Q.A.P. OF THE FIRM.

**CENTRAL ORGANISATION FOR MODERNISATION OF WORKSHOPS
(C O F M O W)**

REPORT ON TECHNICAL SUITABILITY ASSESSMENT

ON ----- of

M/s-----

1.0 GENERAL INFORMATION--MISCELLANEOUS

1.1 Name of the firm

1.1.1 Reason for Inspection

The firm was inspected to assess technical capability to meet COFMOW specifications, on the basis of prima-facie suitable offer in T. No.

1.1.2 Background in Brief

1.1.3 Location

1.2 Postal Address

i. Head Office :

ii. Works/Factory :

iii. Agents (if any) :

1.3 Telephone No.(with STD code).

i. Head Office :

ii. Works/Factory :

iii. Residence of important officials:

iv. Agents :

1.4. Fax/Email no. :

i. Head Office :

ii. Works/Factory :

iii. Agents :

1.5 Description of Factory/Works.

i. Total land area (in Sq.metres) :

ii. Total covered area (in sq.metres) :

iii. Different sub-units (with details of covered/ uncovered area etc.)

iv. Special features, if any :

1.6. No. of personnel employed (category-wise).

i. Managerial :

ii. Supervisory (Attach stt. of managerial & supervisor staff at Ann. A)

iii. Skilled artisans :

iv. Unskilled :

1.7 Hours of working

1.8 Is this inspection for fresh technical suitability assessment? If it is a re-inspection details of earlier technical suitability assessment(s) to be furnished or attached.

2.0 GENERAL INFORMATION—TECHNICAL

- 2.1 Description of different departments in the Factory / Works and function of each department.
- 2.1.1 The break-up of different work areas given below refers to the main works at. In addition,
Administrative Block :
Fabrication and assembly :
Machine Shop :
Store :
Laboratory :
- 2.1.2 A plan of the works at _____, as described above, is attached at Annexure-B.
- 2.2 Detailed description of Machinery and Plant in each department (make and year of procurement /commissioning to be provided. For special type of equipment copy of pamphlets/write ups to be furnished so as to supplement the description).
- 2.2.1 The list of machinery & plant available is attached at Annexure-C.
- 2.2.2 It will be seen that
- 2.3 Plans for future expansion, if any.
- 2.3.1
- 2.4 Details of raw-materials held in stock (state whether imported / indigenous).
- 2.4.1 List of raw-materials held in stock is at enclosed Annexure-D.
- 2.5 Production Capacity.**
- i. Per month :
- ii. Per year :
- 2.6 Type of Stores/Items, which the firm is capable of manufacturing.
- 2.7 Details of Stores/Items/Parts/components for which fresh technical suitability assessment is sought (please indicate complete description and drawing nos.)
- 2.8 In case, the application is also for inclusion of additional items at the time of technical suitability assessment, give a list of each along with complete description.
- 3.0 DESIGN CAPABILITY**
- 3.1 Availability of Qualified Personnel.
- 3.1.1
- 3.2 Assessment of Expertise and Facilities.
- 3.2.1
- 4.0 MANUFACTURING PROCESS**
- 4.1 Level of in-house Facilities
- 4.1.1
- 4.2 Important Items of Work by Outside Vendors
- 4.2.1
- 4.3 Brief details of manufacturing process relevant to the items for which technical suitability assessment is sought.
- 4.3.1
- 4.3.2

5.0 QUALITY ASSURANCE.

5.1 Does the factory have an established Quality Assurance Programme. If yes, please enclose a copy of the write-up? If not, what plans are there if any for setting it up?

5.1.1

5.2 Details of Quality Assurance Organization. Names of key personnel, their qualifications, designations and position in overall management structure (explain with organization chart, if necessary).

5.2.1 The QC organization is headed by Shri, who is designated as, with responsibility for.....

5.3 Quality Control Testing Facilities and Laboratory equipment available.

5.3.1 In-house facilities available for inspection and QC include the following:

i

ii

iii

5.4 Availability of gauges(please give details)

5.4.1 The following important items of gauging and other related quipment are available:

5.5 Calibration of Laboratory/test equipment/gauges, indicated in Para 5.3 and 5.4 above:

i. How is the calibration done?

ii. Frequency of calibration.

iii. System to ensure that calibration of above equipments does not fall overdue.

iv. Action taken if such calibration has fallen overdue.

5.5.1

5.6 Source of procurement of raw-materials, important bought-out, and steps taken to ensure their quality.

5.6.1

5.7 Details of inspection/checks done on material during various stages of the above manufacturing process.

5.7.1

5.8 Have acceptable values for the parameters inspected during above stage checks been laid down? If yes, the action taken if value of the parameter inspected does not meet the desired laid-down value.

5.8.1

5.9 System for documentation of the results of the above stage checks.

5.9.1

6.0 AFTER-SALES SERVICE

6.1 Facilities Available at Works and Branch Offices.

6.1.1

6.2 Assessment of Quality of Service Including Response times.

6.2.1

7.0 PAST PERFORMANCE

7.1 List of important customers of the firm (as relevant to the works for which requisition is sought).....

7.1.1 This is attached at Annexure-E. It is seen that.....

7.2 Details of important orders executed in the past, and reference to the supplies made. Also included in Annexure-E.

7.3 Important orders in hand
There are presently on order, These are as follows:

Sl. No.	Consignee	Capacity
---------	-----------	----------

- 7.4 Whether another unit/factory of the firm is already approved by COFMOW for supply of stores/components.
- 7.5 Performance of machines manufactured and supplied in the past to different consignees.
- 7.5.1 Selection of Consignees
- 7.5.2 Machines at M/s
- 7.5.3 Conclusions on performance of M/s m/cs.
- 7.6 Commissioning Performance

8.0 COMMERCIAL INFORMATION

8.1 Full details of the location of the factory/Manufacturing works

- i. Address :
- ii. Tele. Nos. :
- iii. Telex/Fax :
- iv. Email no. :
- v. Website no.

8.2 Copies of following documents obtained and attached as Annexures.

- i. Proof of Ownership. : Annexure-G.
- ii. Factory License. : Annexure-G.
- iii. Latest electricity bill. : Annexure-H.

- 8.3 Whether the firm is registered under Indian Factories Act.
- 8.4 Whether the firm comes under the scope of Industries (Development & Regulations) Act, 1951.
- 8.5 Income Tax Clearance Certificate Copy attached at Annexure-I.

9.0 CONCLUSIONS AND RECOMMENDATIONS.

- 9.1 Observations and Conclusions
- 9.1.1
- 9.2 Recommendations
- 9.2.1

(SIGNATURE)
NAME:
DESIGNATION:

Place:

Date:

ANNEXURE – A OF ANNEXURE -H

**DETAILED PARTICULARS OF MANAGERIAL STAFF
AS ON-----**

S. No.	Name	Designation	Qualification	Working since

ANNEXURE -B OF ANNEXURE -H

LIST OF MACHINERY AND PLANT

S. No	Description of Items	Manufacturer	Qty.	Year of procurement

ANNEXURE - C OF ANNEXURE -H

LIST OF QC EQUIPMENT AND MEASURING EQUIPMENT

S. No.	Description	Range	Least count where applicable	Qty.	Year of procurement

ANNEXURE - D OF ANNEXURE -H

LIST OF IMPORATANT ORDERS EXECUTED W.E.F.....(DATE)

S.N.	Purchaser Order No.	Description/ value	Delivery Date	Date recd.	Date Comm.	REMARKS

ANNEXURE - E OF ANNEXURE -H

LIST OF PENDING ORDERS AS ON----- (DATE)

S.No.	Purchaser	Order No. and date	Value

ANNEXURE-I
QUALITY ASSURANCE PLAN

MACHINE DESCRIPTION

Category	S. No.	Component/ Process	Sample Size	Type Of Check	Quality record	TYPE OF CHECK	REMARKS
Bought Out Raw Material		Steel plates, rods etc	1 Sample / Size	Chemical & Mech.	TC & INV.	V	
Bought Out Components		Bearings	100%	Visual	Inv	V	
		Electric motors	100%	Review of TC	TC & INV	V	
		Hydraulic Pumps , Air cooler pump, Dies, Jaws, machine lamps, Voltage stabilizer, Isolation transformer, Panel AC, operating & maintenance tools, controllers,	100%	Review of TC	TC & INV	V	
Fabrication & sub assemblies		Weld joints	100 %	RT	IR	V	
		Table Hardness	100%	Hardness	IIR	V	
		Heat Treatment	100%	Review of Inv.	IIR	V	
		Castings	100%	Visual	IIR	V	
		surface finish of components	Random	Surface	IR	V	
Final Inspection		Inspection of machine in complete as per specification	100%	Visual & Load test	IR	CHP	
		Noise level	100 %	Sound	IR	CHP	
		Temperature rise of Hydraulic	100 %	Measurement	IR	CHP	
		Structures Geometry alignment,	100%	Relevant international ISO/DIN/IS/JIS standard	IR	CHP	

INV - Invoice
 TC – Test Certificate
 V – Verification
 CHP – Customer Hold Point
 IIR – Internal Inspection Report
 IR – Inspection Report

SV/DPC-1-4-007

08/13
ITEM-58 ADDED. CUTWAY ADDED IN ITEM-52. ITEM-22, 23, 24 & 25 DELETED. QUANTITY FOR ITEM-28 DELETED IN COL-I AND QUANTITY ALTD FROM 4 TO 2 IN COL-IV. QUANTITY FOR ITEM-7 ALTD FROM 11 TO 17 IN COL-IV. SECTION-CC DELETED.

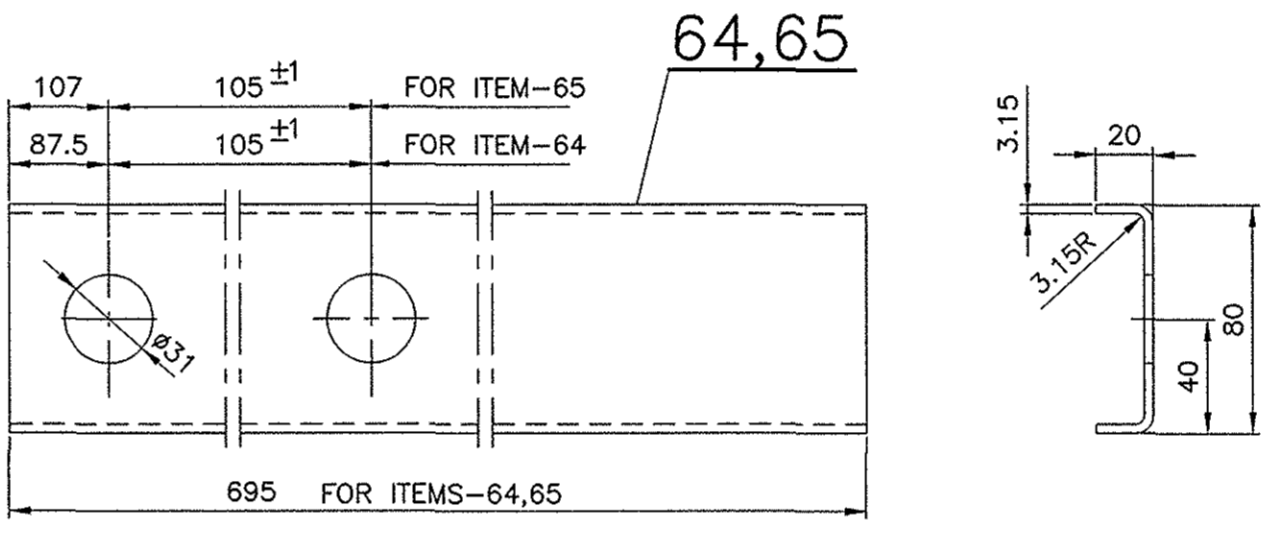
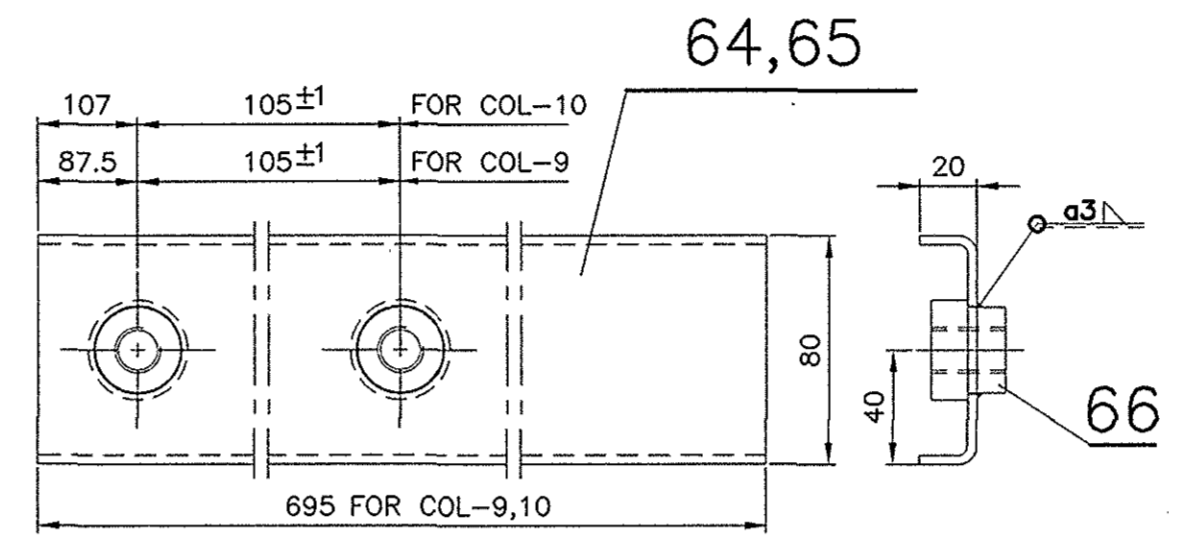
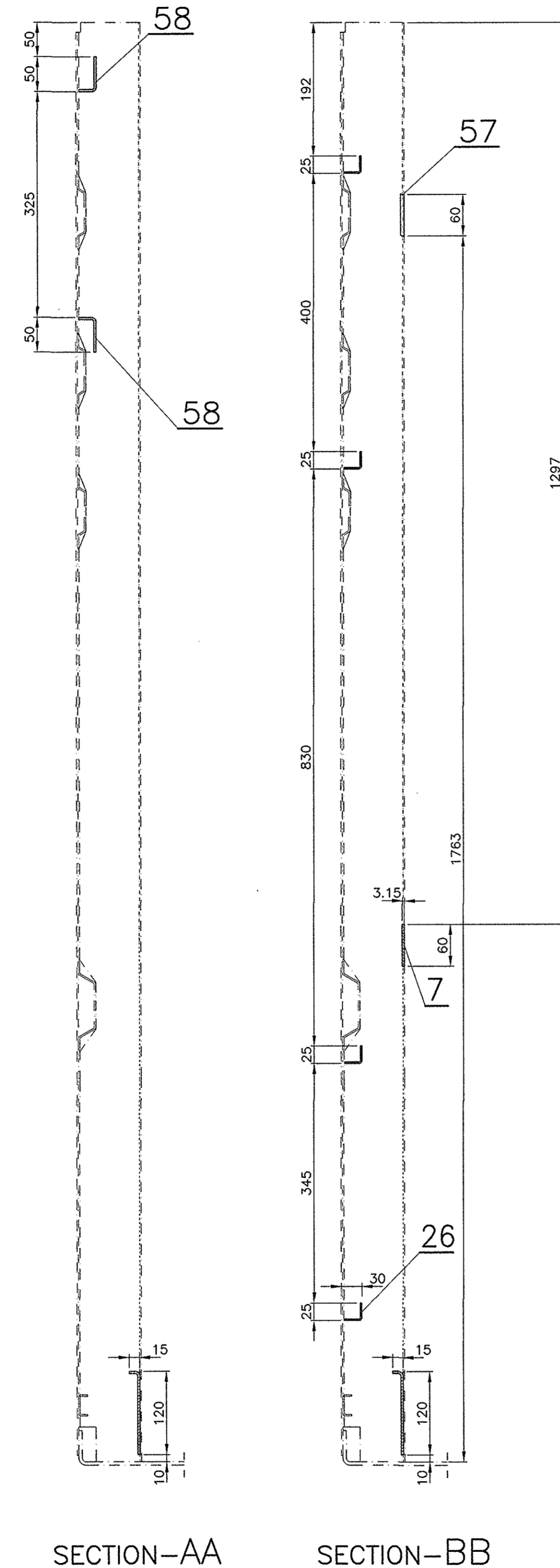
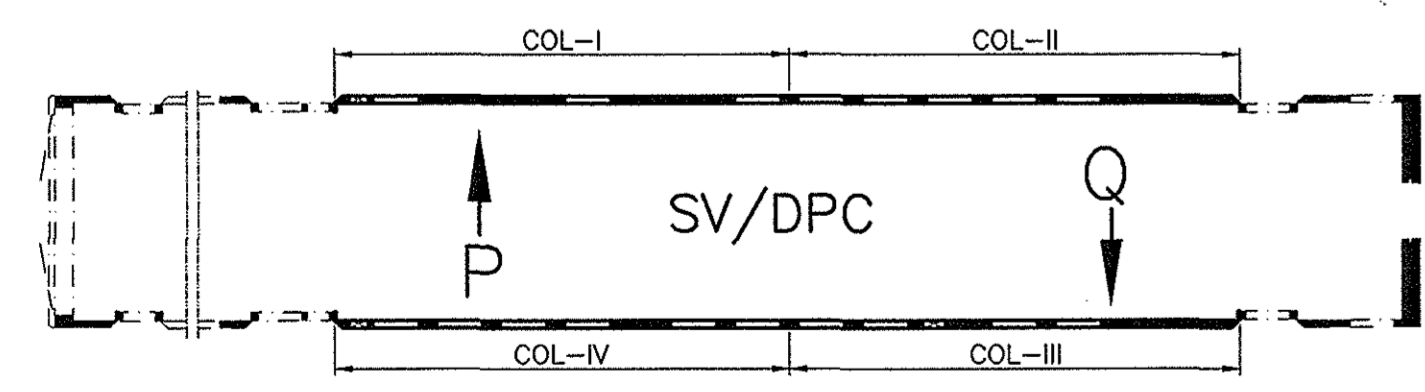
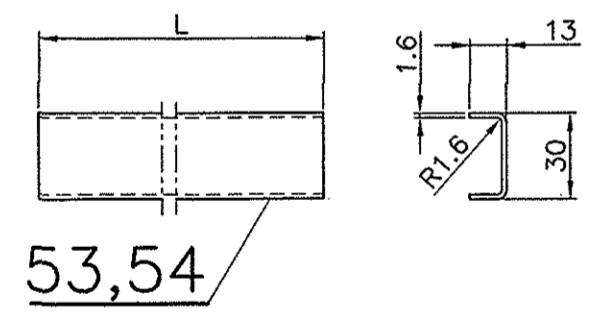
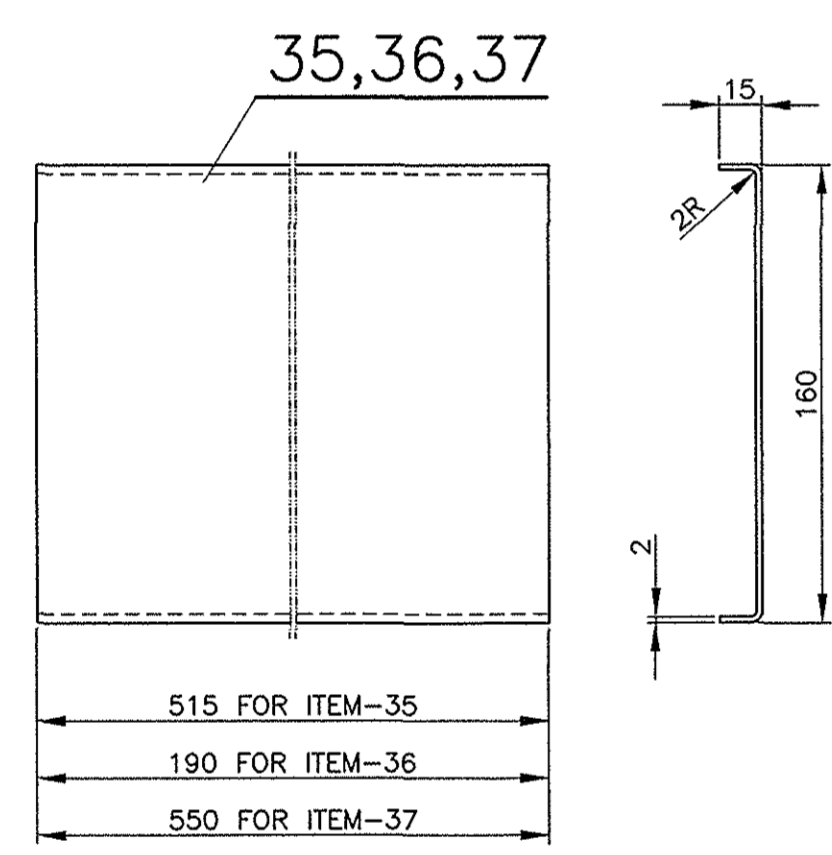
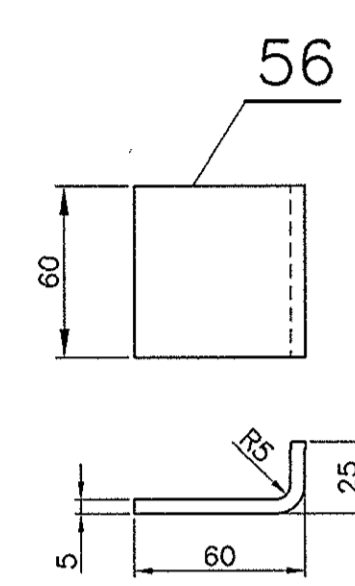
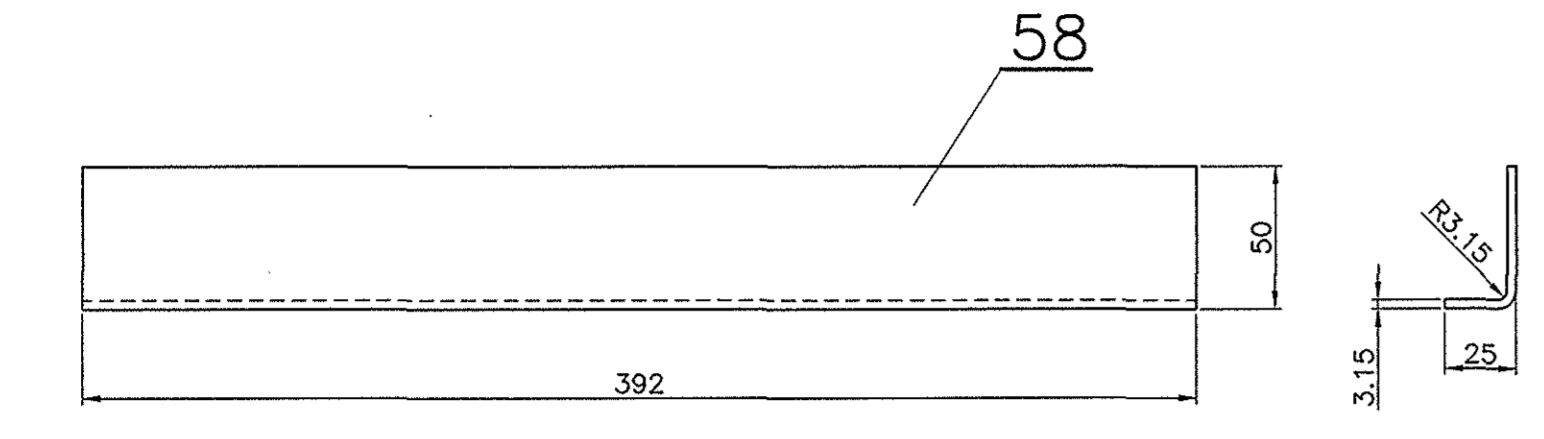
5/13 SECTION-UU REVISED. SECTION-VV ADDED. THE QTY. OF FOLLOWING ITEMS ALTD. AS FOLLOWS.

ITEM NO.	FROM	TO
8	II/1	II/2
14	IV/-	IV/2
17	IV/-	IV/2
56	III/12	III/6
	IV/12	IV/6

03/2015 LOCATING DIMENSION FOR ITEM-58 ALTD.

LOCATING DIMENSION FOR ITEM-58 ALTD.	FROM	TO
SSE/D	-sd-	SME/DSS

ALTERATIONS
06/17
ITEMS-59 TO 67, COL-9&10 ADDED. ITEMS-25, 30&56 DELETED. QTY FOR ITEM-7 ALTD FROM 11.7 TO 10.6 IN COL-1&2 RESPECTIVELY.



QTY	DESCRIPTION & DIMENSION	ITEM	REF.DRGS	MAT.SPEC	WEIGHT/UNIT	REMARKS
1	FLAT 3.15x180x225	67	IRS M-41			
2	BUSH	66	SCNB 1-4-812			ITEM-2
1	CHANNEL 3.15x110x695	65	IRS M-41			
1	CHANNEL 3.15x110x695	64	IRS M-41			
3	BRACKET COMPLETE	63	SCNB 1-4-812			COL-1
1	BRACKET COMPLETE	62	SV/DPC 1-4-007			COL-10
1	BRACKET COMPLETE	61	SV/DPC 1-4-007			COL-9
3	ANGLE 3.15x59x695	60	IRS M-41			
2	FLAT 5x35x115	59	IRS M-41			
2	ANGLE 3.15x69x392	58	IRS-M41-97			
6	FLAT 5x30x60	57	IRS-M41-97			
6	ANGLE FOR MIRROR FIXING 5x60x77	56	IRS-M41-97			
4	BACKPIECE FOR BERTH SUPPORT 6x80x80	55	IS:2062 Fe 410 WA			
3	U - STIFFENER 1.6x51x575	54	IRS-M41-97			
5	U - STIFFENER 1.6x51x650	53	IRS-M41-97			
1	PANEL 1.6x700x1970	52	IRS-M41-97			
1	PANEL 1.6x788x1970	51	IRS-M41-97			

QTY	DESCRIPTION & DIMENSION	ITEM	REF.DRGS	MAT.SPEC	WEIGHT/UNIT	REMARKS
1	PANEL 1.6x171x1970	50		IRS-M41-97		
1	PANEL 1.6x203x1620	49		IRS-M41-97		
1	PANEL COMPLETE	48	SV/DPC 1-4-007			COL-8
2	PANEL COMPLETE	47	SV/DPC 1-4-007			COL-7
1	BACK PIECE FOR PARTITION 2x85x1855	46		IRS-M41-97		
2	FLOOR SIDE MOULDING 3.15x129x535	45		IRS-M41-97		
2	BACK PIECE 8x40x583	44		IRS-M41-97		
2	SCREWING PIECE	43	SCN 1-4-207			ITEM-2
2	RIB 2x40x70	42		IRS-M41-97		
1	PART PILLAR 2x150x318	41		IRS-M41-97		
1	PART PILLAR 2x150x214	40		IRS-M41-97		
1	BACK PIECE FOR PARTITION 2x80x1855	39		IRS-M41-97		
3	BACK PIECE 8x50x695	38		IRS-M41-97		
1	BACK PIECE FOR PART PILLAR 2x182x550	37		IRS-M41-97		
2	BACK PIECE FOR PART PILLAR 2x182x190	36		IRS-M41-97		
2	BACK PIECE FOR PART PILLAR 2x182x515	35		IRS-M41-97		
1	PART PILLAR	34	SV/DPC 1-4-007			COL-5
2	PART PILLAR	33	SV/DPC 1-4-007			COL-6
2	PART PILLAR	32	WSSCWAC4 1-4-406			COL-3
2	PART PILLAR	31	WSSCWAC4 1-4-406			COL-5
2	CHAIR ANGLE 5x106x420	30	IS:2062 Fe 410 WA			
2	BACK PIECE FOR CHAIR ANGLE	29	ICF/STD 1-4-031			ITEM-2
1	ANGLE FOR CONDUIT 2x46x395	28		IRS-M41-97		
4	ANGLE FOR CONDUIT 2x46x383	27		IRS-M41-97		
12	ANGLE FOR CONDUIT 2x46x197	26		IRS-M41-97		
	ANGLE FOR CONDUIT 2x30x90	25				
	FLAT FOR CONDUIT 2x30x60	24				
	ELECT. CONDUIT L=590	23				
	ANGLE FOR MCB FIXING	22				
3	BACK PIECE FOR RACK 3.15x50x159	21		IRS-M41-97		
3	BACK PIECE FOR RACK 5x50x386	20		IRS-M41-97		
3	BACK PIECE FOR RACK 5x50x695	19		IRS-M41-97		
1	BACK PIECE FOR RACK 5x50x180	18		IRS-M41-97		
2	BACK PIECE FOR PARTITION 2x80x863	17		IRS-M41-97		
2	BACK PIECE FOR PARTITION 2x80x1305	16		IRS-M41-97		
2	BACK PIECE FOR PARTITION 2x80x510	15		IRS-M41-97		
2	BACK PIECE FOR PARTITION 2x80x950	14		IRS-M41-97		
3	BACK PIECE FOR PARTITION 2x80x1975	13		IRS-M41-97		
2	BACK PIECE FOR PANEL 3.15x60x550	12		IRS-M41-97		
1	BACK PIECE FOR PANEL 3.15x60x520	11		IRS-M41-97		
2	BACK PIECE FOR PANEL 3.15x60x384	10		IRS-M41-97		
3	BACK PIECE FOR PANEL 3.15x60x100	9		IRS-M41-97		
2	BACK PIECE FOR PANEL 3.15x60x695	8		IRS-M41-97		
17	BACK PIECE FOR PANEL 3.15x60x180	7		IRS-M41-97		
1	FLOOR SIDE MOULDING 3.15x100x129	6		IRS-M41-97		
7	FLOOR SIDE MOULDING 3.15x129x180	5		IRS-M41-97		
8	FLOOR SIDE MOULDING 3.15x129x695	4		IRS-M41-97		
7	FLOOR SIDE MOULDING 3.15x180x214	3		IRS-M41-97		
	FLOOR SIDE MOULDING 3.15x214x695	2		IRS-M41-97		
2	FLOOR SIDE MOULDING 3.15x129x387	1		IRS-M41-97		

NOTE:-
1. ITEMS MARKED *THUS TO BE SUPPLIED LOOSE AND WELDED AT SHELL ASSY. STAGE.
2. BOTH ENDS OF PIPES TO BE THREADED TO LENGTH OF 50 mm. THE PROFILE OF SCREW THREADS SHALL BE AS PER APPENDIX B OF IS:1653-72.
3. WHEREVER TOLERANCE FOR DIMENSIONS ARE NOT GIVEN OPEN TOLERANCE TO DRG. NO. ICF/STD-9-0-001 IS FOLLOWED.

SV/DPC-1-4-003
SV/DPC-1-4-002
ASSEMBLY DRAWINGS
05-04-2008
06-2017

BACK PIECES FOR SIDEWALL SUPERVISOR VAN (DPC)

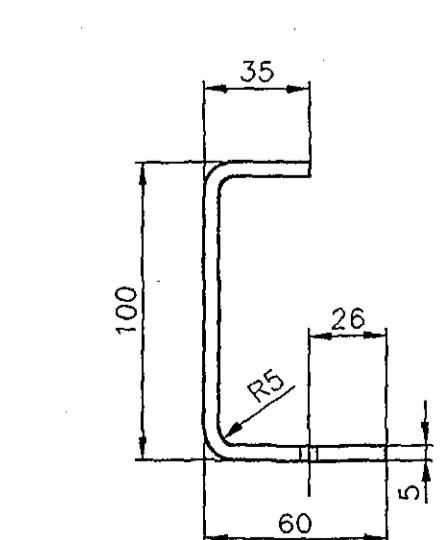
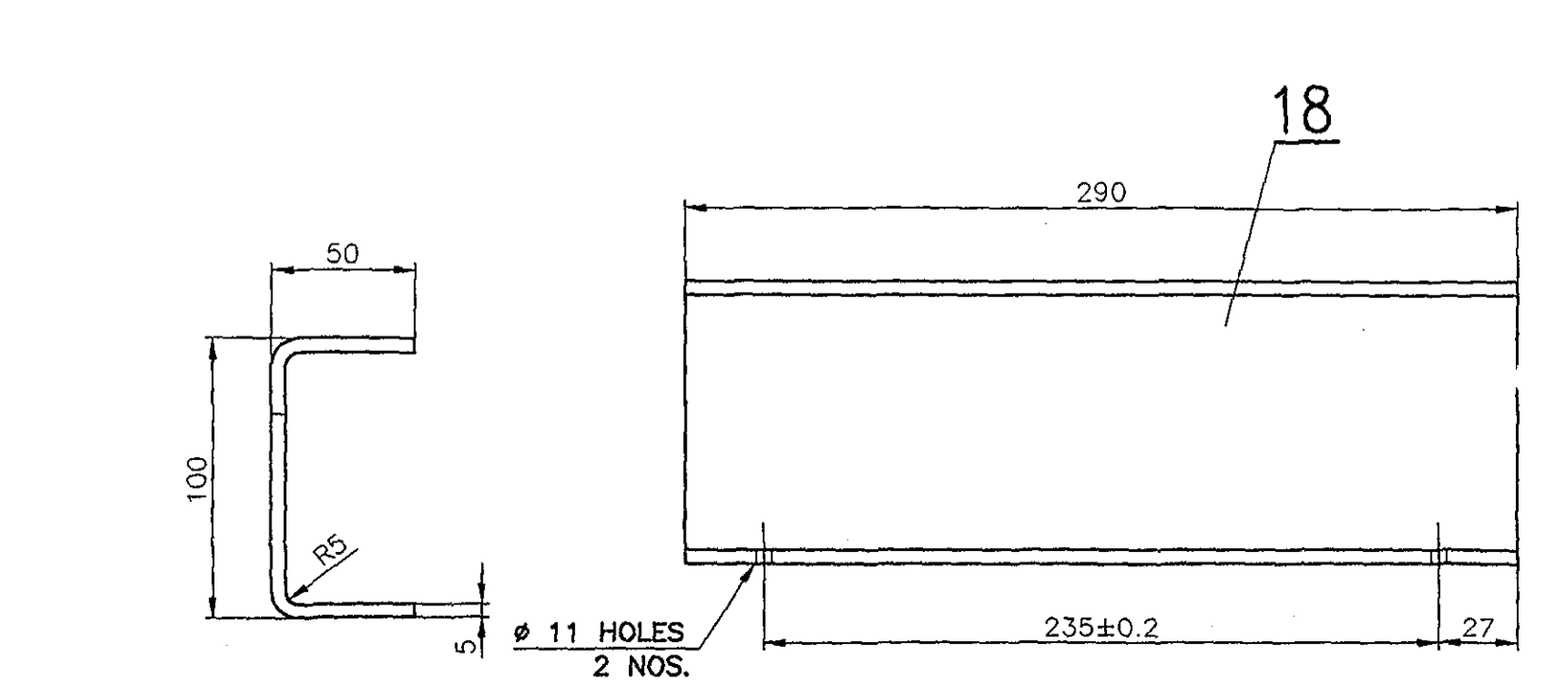
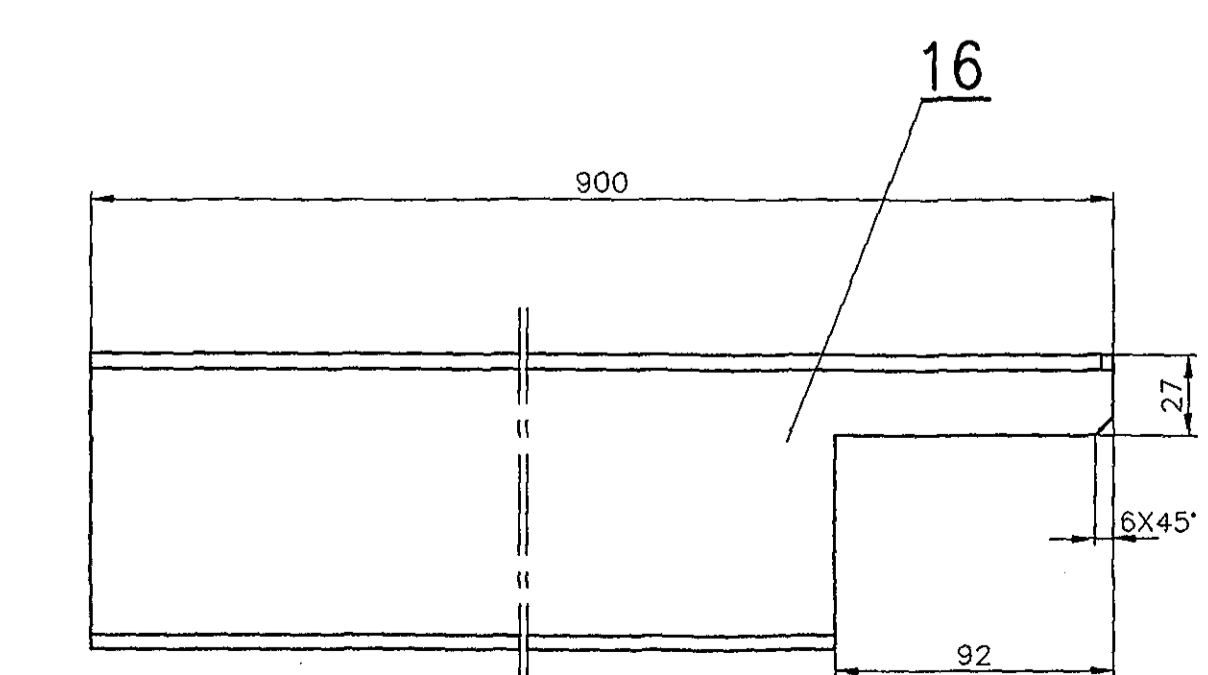
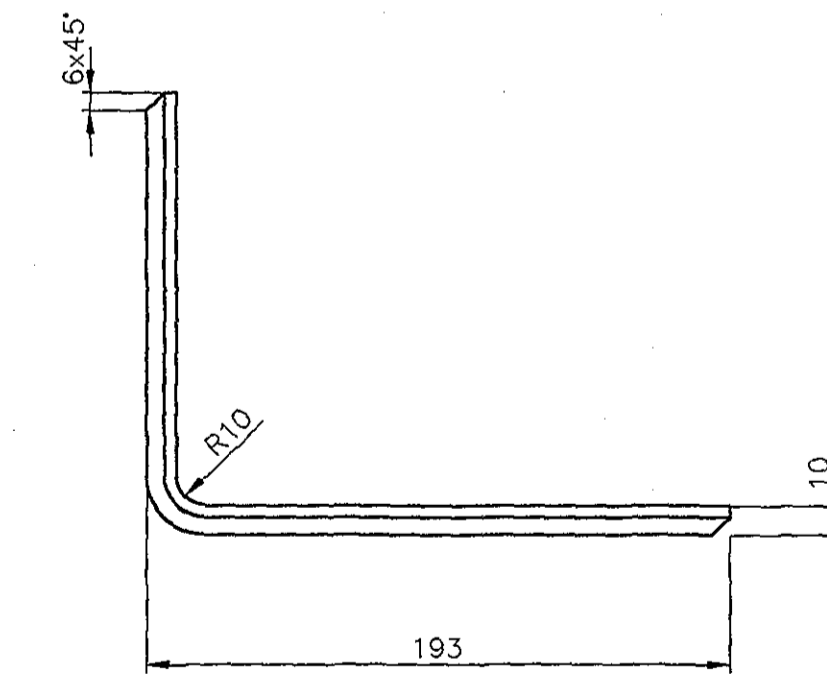
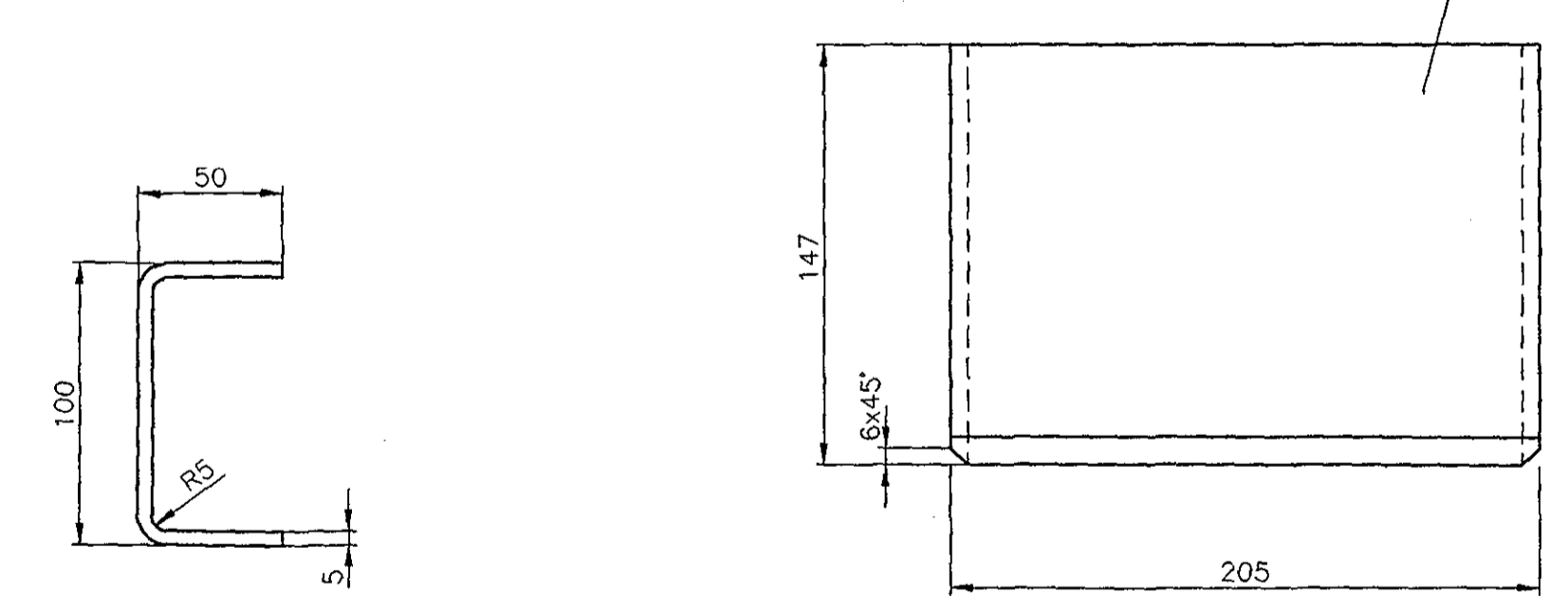
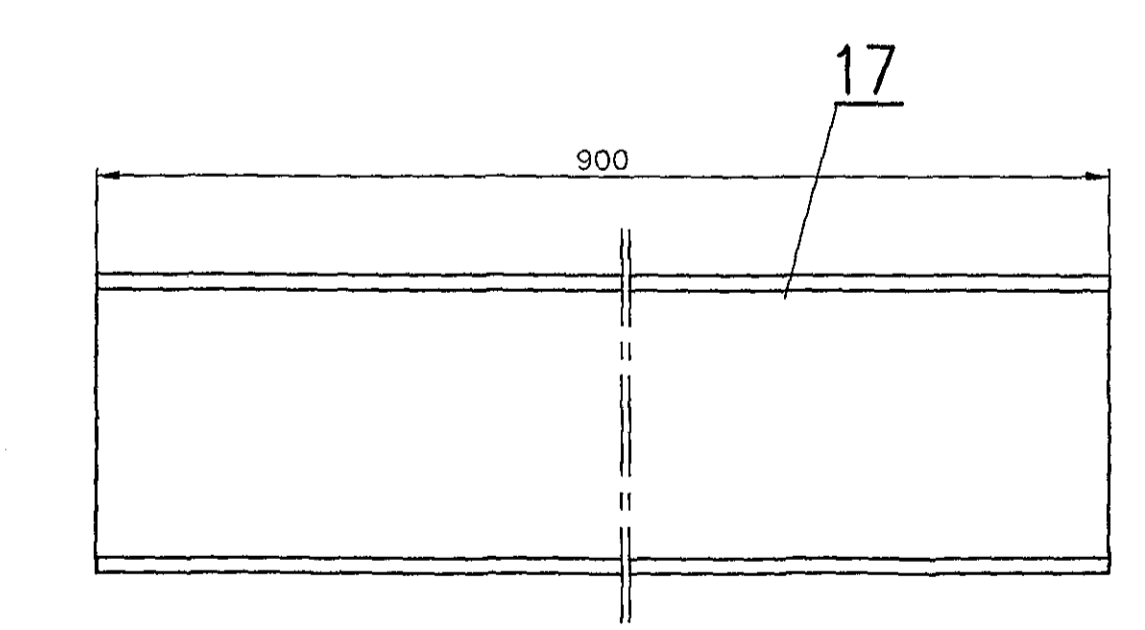
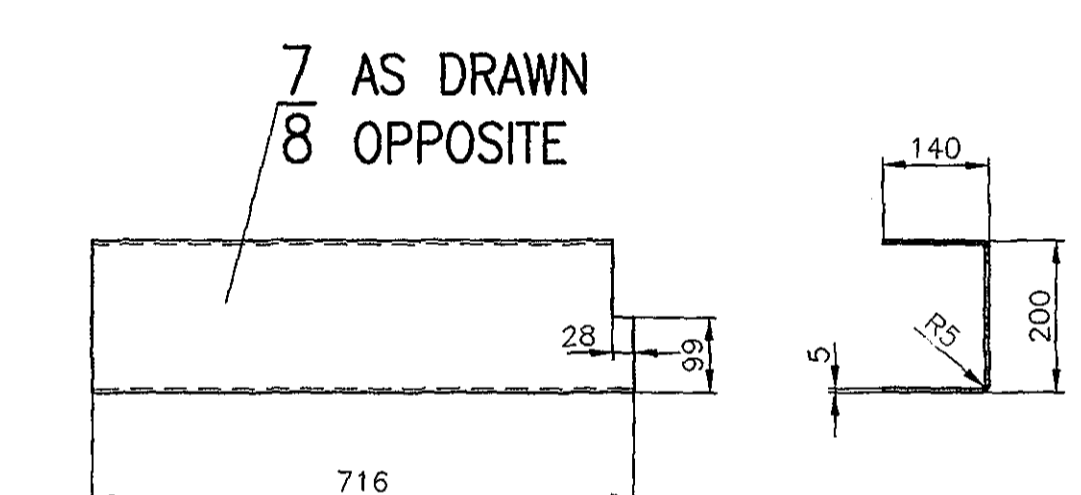
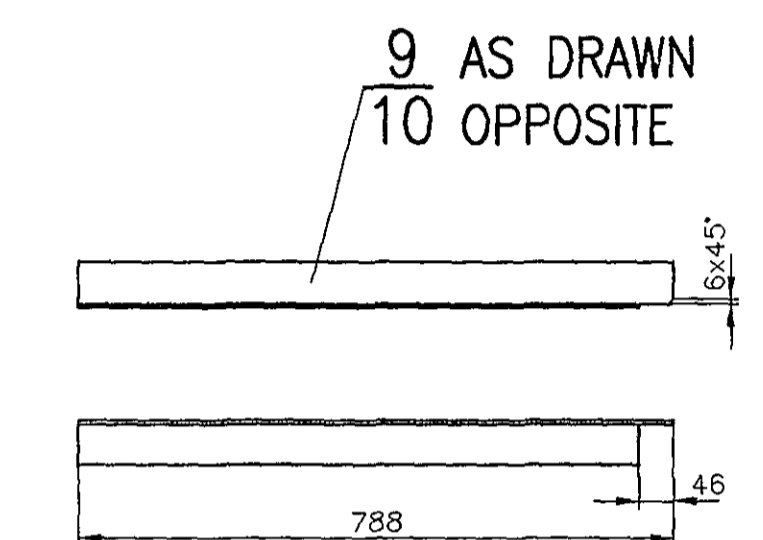
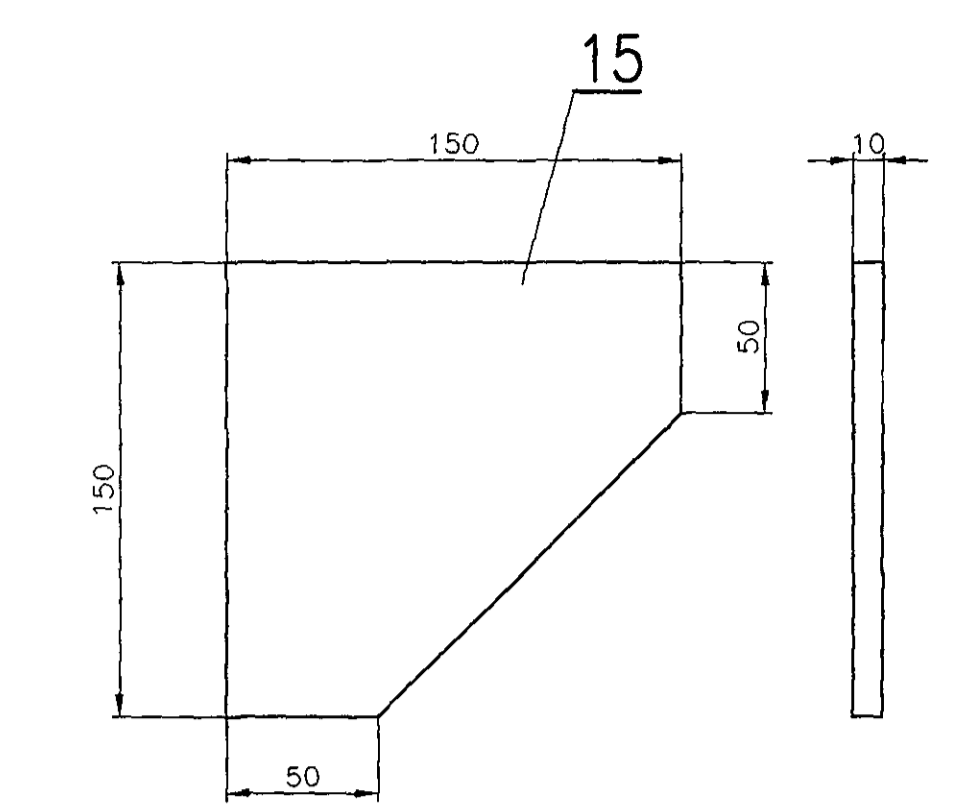
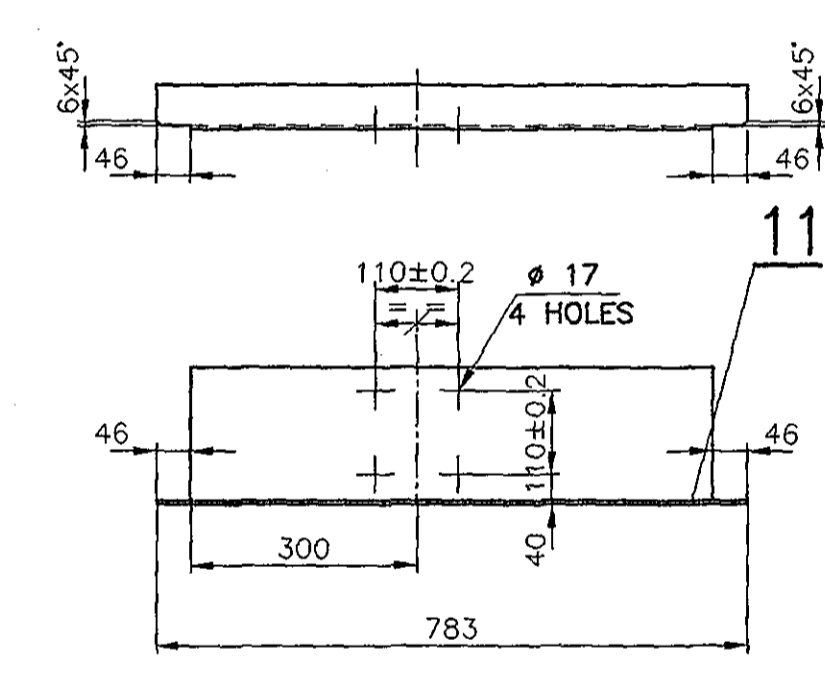
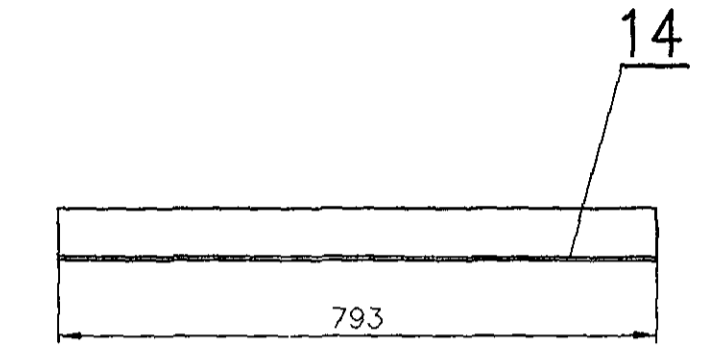
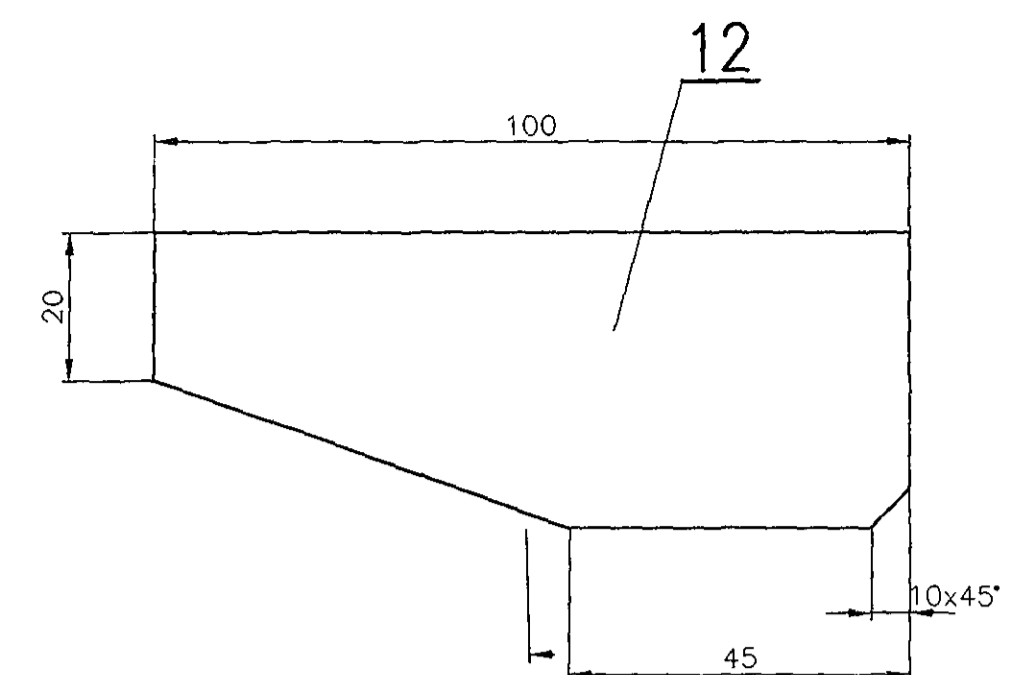
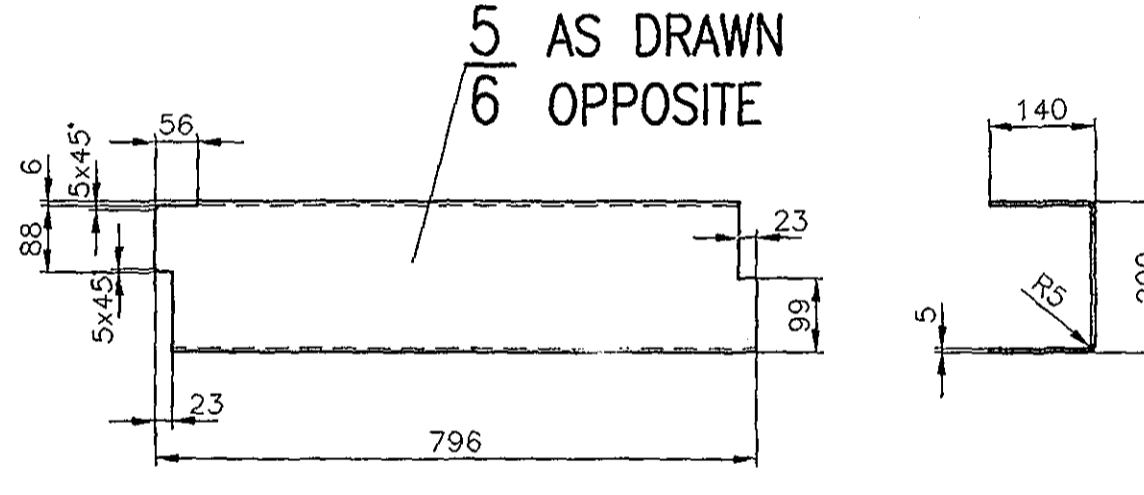
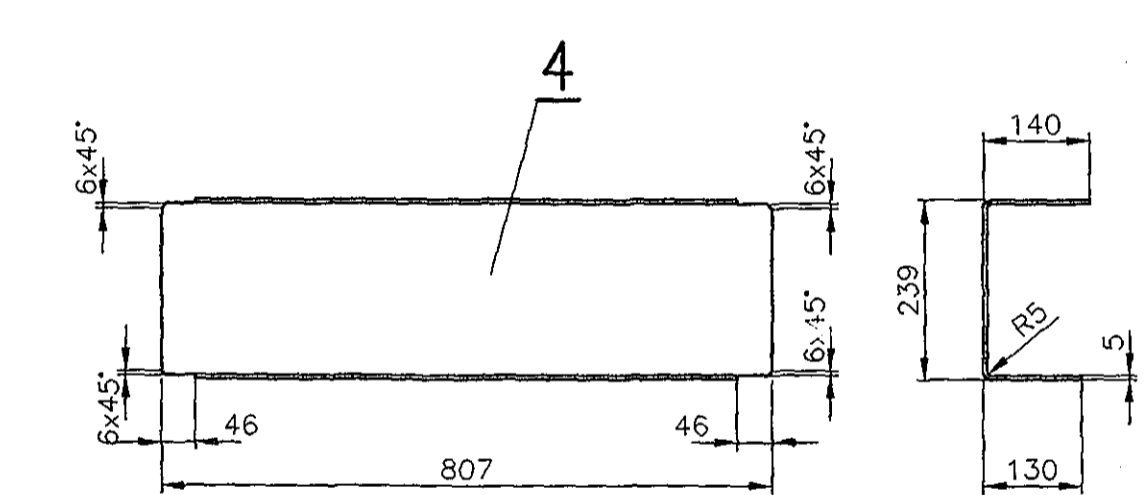
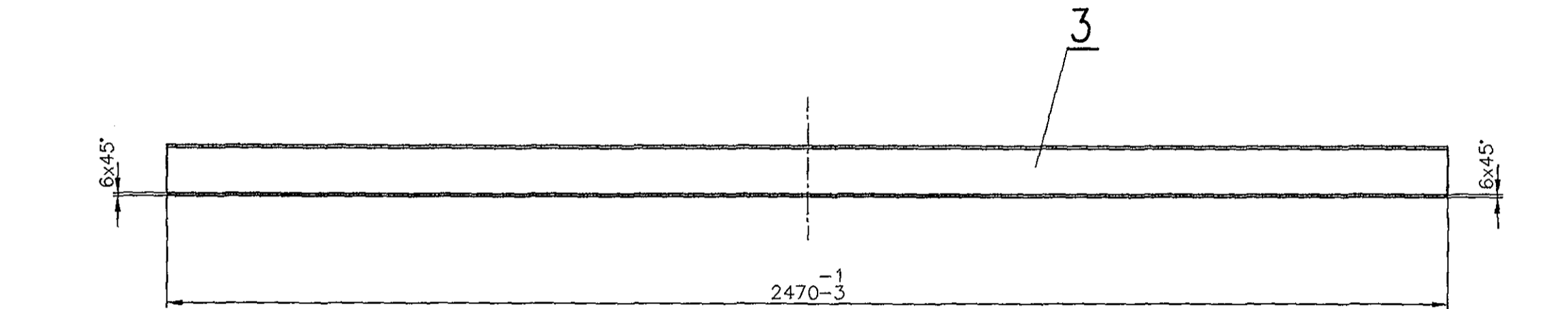
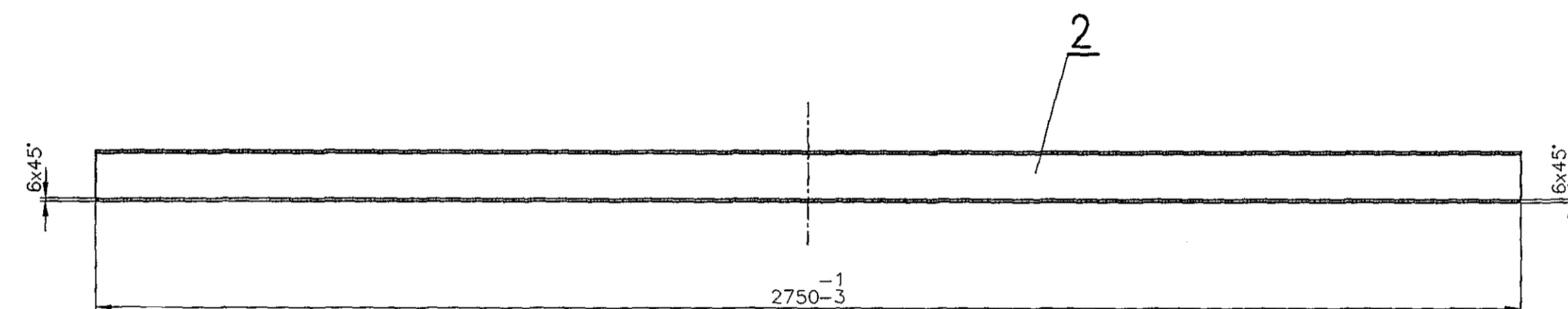
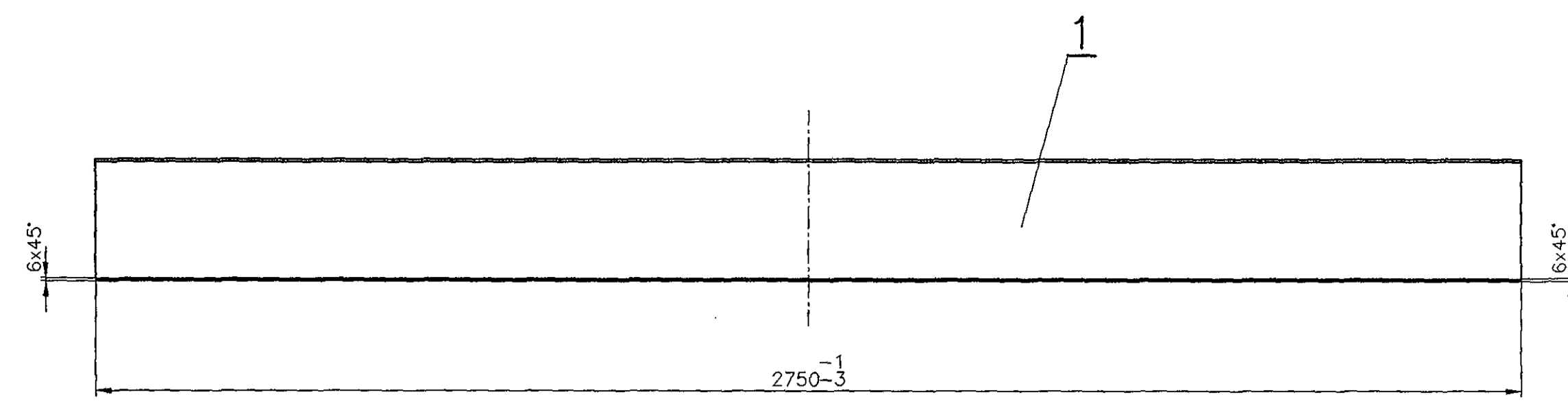
INDIAN RAILWAY STANDARDS

SHEET 3 OF 3

SV/DPC-1-4-007

FORM-IR.A1A-1050X600

V	ROUGH MACHINED	(1)	ROUGH CLEANING	ALTERATIONS
W	FINISH MACHINED	(18)	CHAMFERED	12.2009
VV	FINE FINISH MACHINED	(19)	BURRS REMOVED	RM SIZE OF ITEM-13 CORRECTED FROM 5x205x324 TO 10x205x324.



NO	OFF	DESCRIPTION & DIMENSIONS	ITEM	REF. DRG	MAT. SPEC	WEIGHT/UNIT	REMARKS
		CHANNEL	5X175X290	18	IRS M41-97		
		CHANNEL	5X180X900	17	IRS M41-97		
		CHANNEL	5X180X900	16	IRS M41-97		
		GUSSET	10x150x150	15	IRS M41-97		
		ANGLE	5x110x793	14	IRS M41-97		
		ANGLE	10x205x324	13	IRS M41-97		
		RIB	5x39x100	12	IRS M41-97		
		ANGLE	5x230x783	11	IRS M41-97		
		ANGLE	5x110x788	10	IRS M41-97		
		ANGLE	5x110x788	9	IRS M41-97		
		DOORWAY STIFFENER	5x460x716	8	IRS M41-97		
		DOORWAY STIFFENER	5x460x716	7	IRS M41-97		
		CROSS BEARER	5x460x796	6	IRS M41-97		
		CROSS BEARER	5x460x796	5	IRS M41-97		
		CROSS BEARER	5x489x807	4	IRS M41-97		
		CROSS BEARER	5x167x2470	3	IRS M41-97		
		CROSS BEARER	5x167x2750	2	IRS M41-97		
		CROSS BEARER	5x319x2750	1	IRS M41-97		

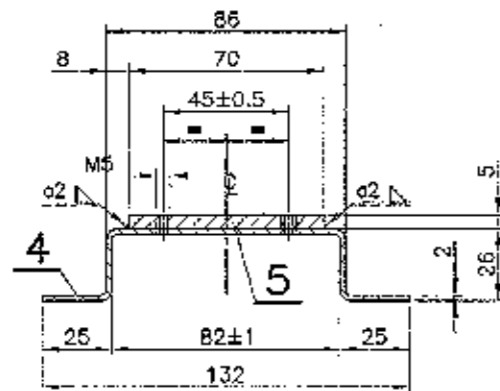
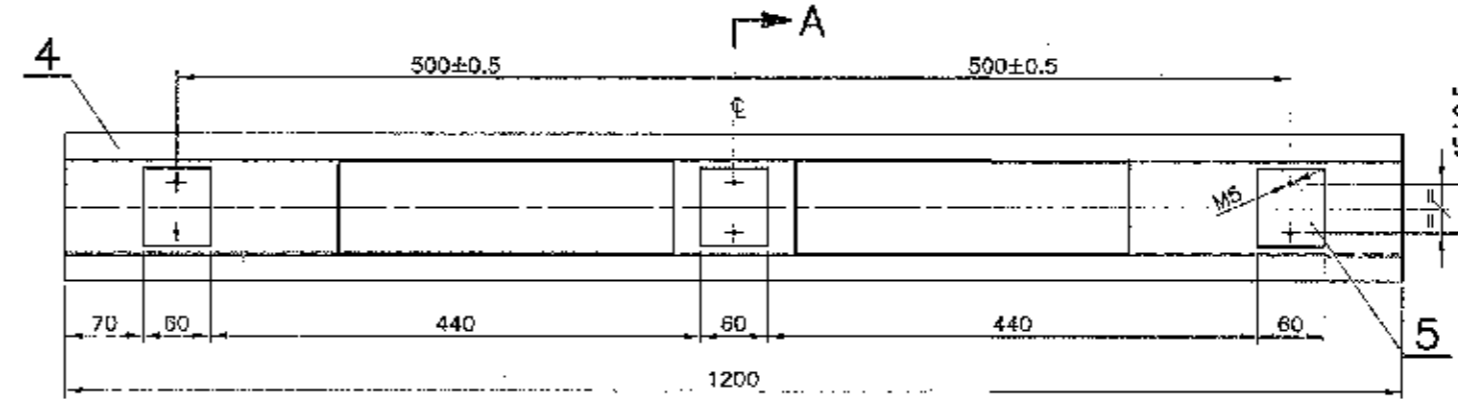
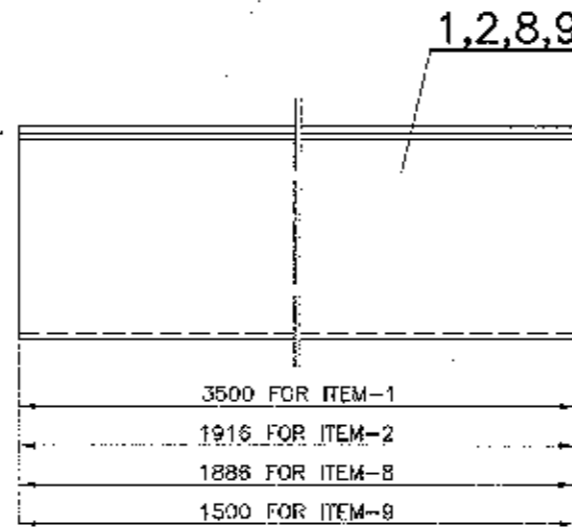
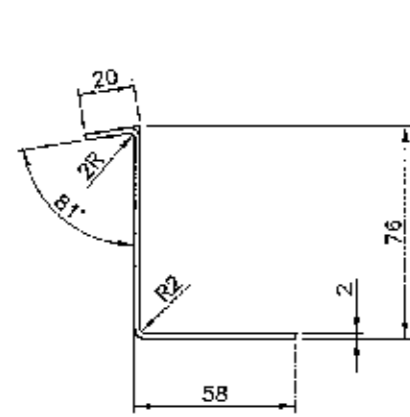
NO	OFF	DESCRIPTION & DIMENSIONS	ITEM	REF. DRG	MAT. SPEC	WEIGHT/UNIT	REMARKS
VI	V	IV	III	II	I		
GROUP- 1-1 UNDER FRAME							SUPERSEDED BY
SUPERSEDES ICF/SR/DMU/DTC/B-1-1-006 ALN/							SUPERSEDES ICF/SR/DMU/DTC/B-1-1-006 ALN/
SCALE							SCALE
1:10							SSE/D
1:2.5							CHD
1:1							ALT
							DRN
							A.SURESH
							08.2009
							ALT
							a
							b
							c
CAD FILE: C:\MD-CAD\469\1-1-006-SC00.DWG							INTEGRAL COACH FACTORY
DATA CODE No. 469							CHENNAI-38
INDIAN RAILWAY STANDARDS							SHEET
28/03/2012 29.08.2009							1 OF 1
ASSEMBLY DRAWINGS							ICF/SR/DMU/DTC/B-1-1-006
DATE OF LATEST ALN. DATE OF FIRST ISSUE. AME/SME							

ALTERATIONS
 12.2009
 RM SIZE OF ITEM-13
 CORRECTED FROM 5x205x324
 TO 10x205x324.
 Sd/- SSE/D Sd/- SME/DSS
 01.2010
 ITEM-18 ADDED.
 DESIGN OF ITEM-16 REVISED.
 LENGTH OF ITEMS-16 & 17
 ALTERED.
 Sd/- SSE/D Sd/- SME/DSS
 03.2012
 HOLES ADDED IN ITEM-18.
 Sd/- SSE/D Sd/- SME/DSS

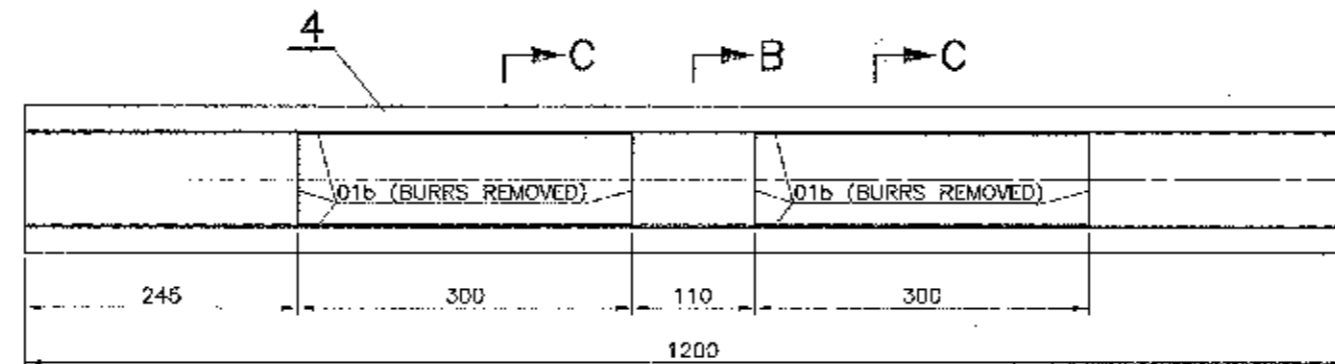
MRM/MC-1-6-018

▽▽ FINISH MACHINED
▽▽ FINE FINISH MACHINED

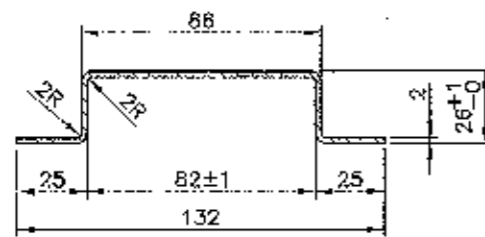
11/2017
ITEMS-8 & 9 ADDED.
COL-1 & ITEMS-3,6 & 7
DELETED.
SSE/D SME/DSS



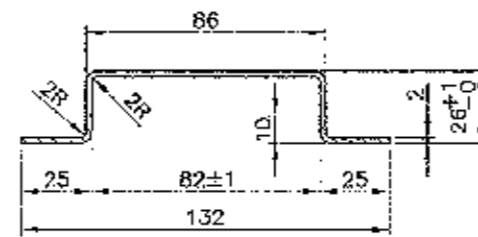
SECTION-AA



← C ← B ← C



SECTION-BB



SECTION-CC

QTY	DESCRIPTION & DIMENSION	ITEM	REF.DRGS	MAT.SPEC	WEIGHT/UNIT	REMARKS
-	ANGLE 2 x 147 x 1500	9		RD90/SPEC. C-K201 X2 OF RI 12		
-	ANGLE 2 x 147 x 1888	8		RD90/SPEC. C-K201 X2 OF RI 12		
4	ANGLE 2 x 41 x 1080	7		RD90/SPEC. C-K201 X2 OF RI 12		
6	ANGLE 2 x 41 x 2010	6		RD90/SPEC. C-K201 X2 OF RI 12		
3	BACK PIECE	5	MRM/MC 1-6-016			ITEM-2
1	BRACKET 2 x 175 x 1200	4		RD90/SPEC. C-K201 X2 OF RI 12		
20	LAMP BRACKET	3	MRM/MC 1-6-018			COL-2
-	ANGLE 2 x 147 x 1916	2		RD90/SPEC. C-K201 X2 OF RI 12		
-	ANGLE 2 x 147 x 3500	1		RD90/SPEC. C-K201 X2 OF RI 12		

PER ASSY. PER COACH

LAMP BRACKET ASSEMBLY

SCALE: 1:5
1:2

SSE/D CHD
ALTD DRN
K.Sriram
K.Sriram

Alpha Alt:- a

INTEGRAL COACH FACTORY
CHENNAI-38

DATA CODE NO. 652

INDIAN RAILWAY STANDARDS

SHEET 1 OF 1

MRM/MC-1-6-018

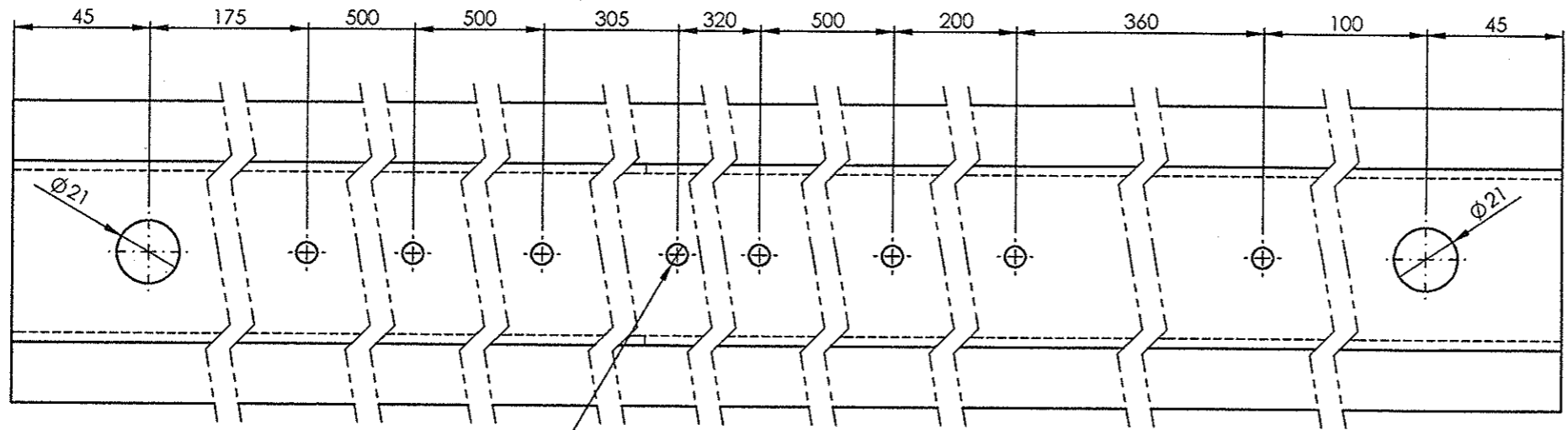
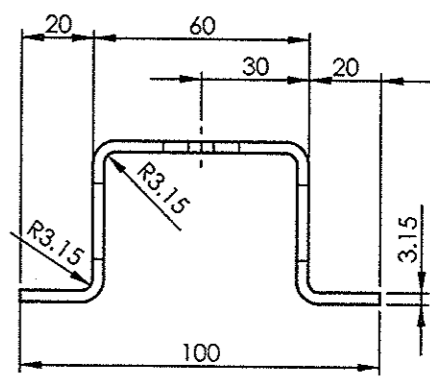
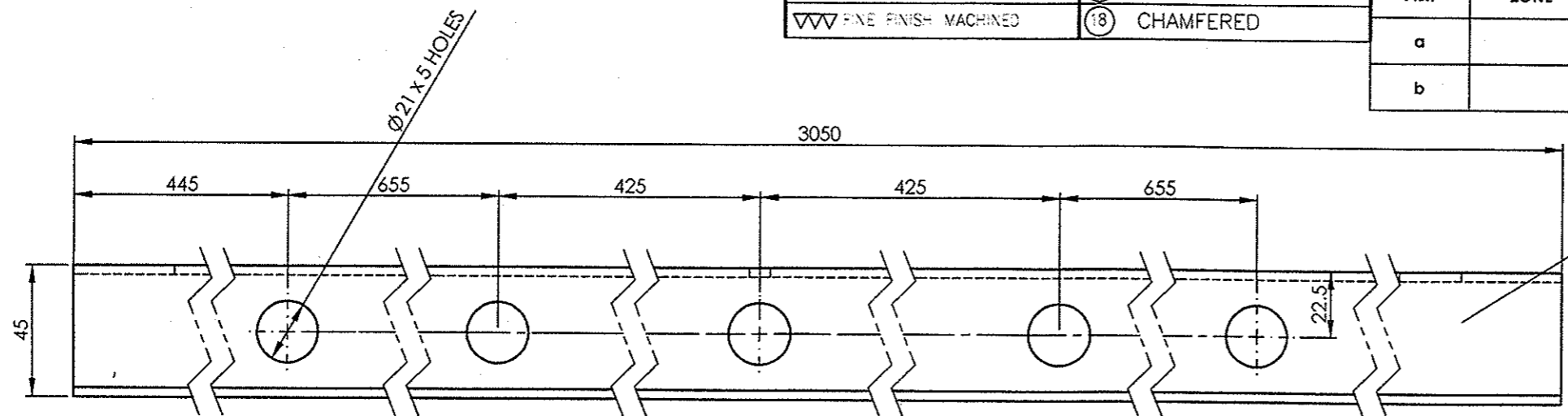
ASSEMBLY DRAWINGS

7/11/2017	12/09/2017	<i>[Signature]</i>
DATE OF LATEST ALT	DATE OF FIRST ISSUE	AME/SME

AAB10024

▽ ROUGH MACHINED	⊖ ROUNDED
▽▽ FINISH MACHINED	⊕ BURRS REMOVED
▽▽▽ FINE FINISH MACHINED	⊖(R) CHAMFERED

REVISIONS			
ALT.	ZONE	DESCRIPTION	APPROVED & DATE
a		2 NOS OF Ø21 HOLES ADDED.	<i>[Signature]</i>
b		LOCATING DIMENSION FOR Ø7 & Ø21 HOLES ADDED.	



ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED. FOR UNTOLERANCED DIMENSIONS AND ROUGHNESS VALUES, REFER DRAWING NO ICF/STD-9-0-001.
 ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER THIS DRAWING INVALID. WELDING SYMBOLS ARE AS PER IS: 813-1986.
 WEIGHT GIVEN IN DRAWING IS FOR INDICATIVE PURPOSE ONLY

REF.DRG.NO.-

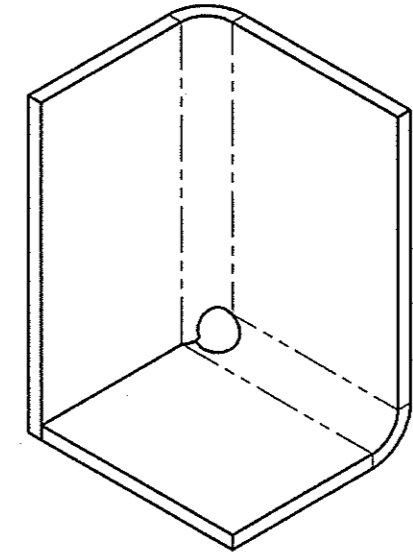
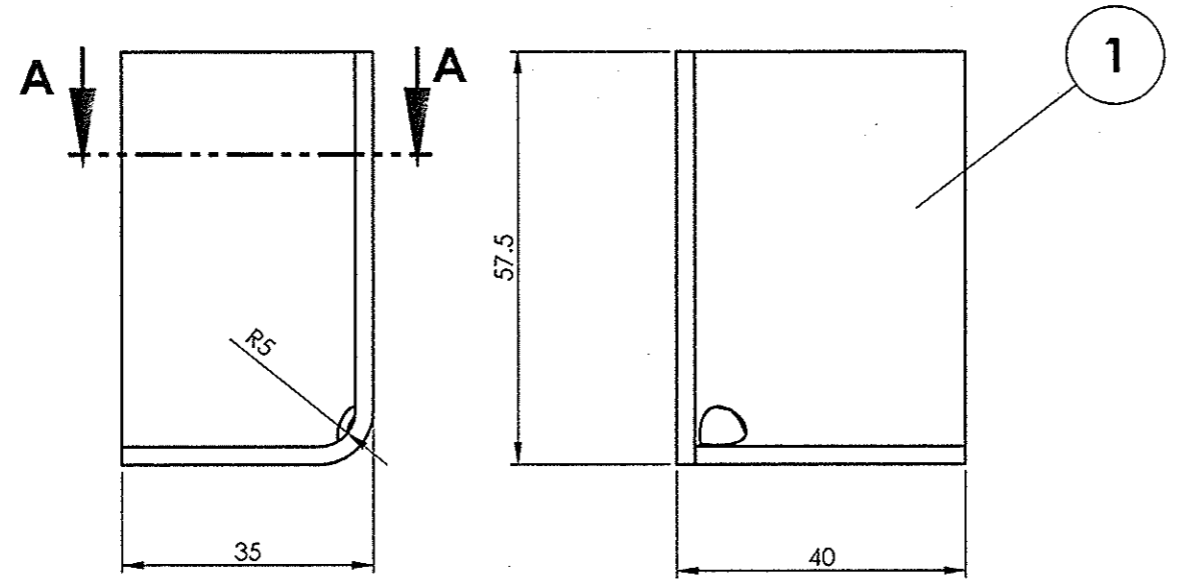
22-02-2018	12-07-2013	<i>[Signature]</i>
DATE OF LATEST ALT.	DATE OF FIRST ISSUE	AME/SME

1	CROSS BEAM	3.15x171x3050	1		RDSO/SPEC C-K201 X2CrNi12	13.383	
QTY.	DESCRIPTION	DIMENSIONS	ITEM NO.	REF. DRGS	MATL.SPEC.	WT/UNIT IN KGS	REMARKS
GROUP: 1-0				SURFACE AREA IN Sq.m.: 1.086		WT/ASSY IN Kgs:	
CROSS BEAM						SCALE	SSE/D
						1:2	CHD
INDIAN RAILWAY STANDARDS INTEGRAL COACH FACTORY, CHENNAI - 600038						ALT. b	MURUGAN P
							D.MOSES
SHEET 1 OF 1						AAB10024	
						A3	

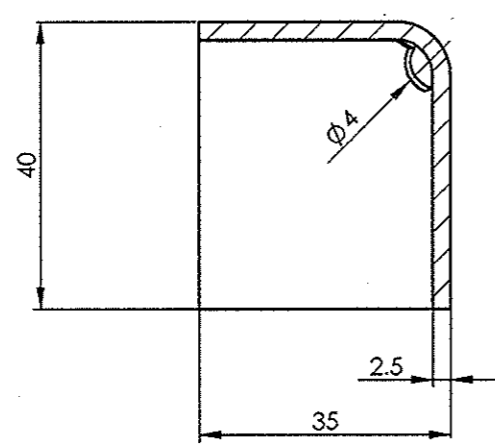
AAB14947

▽ ROUGH MACHINED	① ROUGH CLEANED
▽▽ FINISH MACHINED	② BURRS REMOVED
▽▽▽ FINE FINISH MACHINED	③ CHAMFERED

REVISIONS			
ALT.	ZONE	DESCRIPTION	APPROVED & DATE



ISOMETRIC VIEW



SECTION A-A

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED. FOR UNTOLERANCED DIMENSIONS AND ROUGHNESS VALUES, REFER DRAWING NO ICF/STD-9-0-001. ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER THIS DRAWING INVALID. WELDING SYMBOLS ARE AS PER IS: 813:1986. WEIGHT GIVEN IN DRAWING IS FOR INDICATIVE PURPOSE ONLY

REF.DRG.NO.3 10113.0.20.095.157

DATE OF LATEST ALT.	20/4/17	DATE OF FIRST ISSUE	20/4/17
			SME

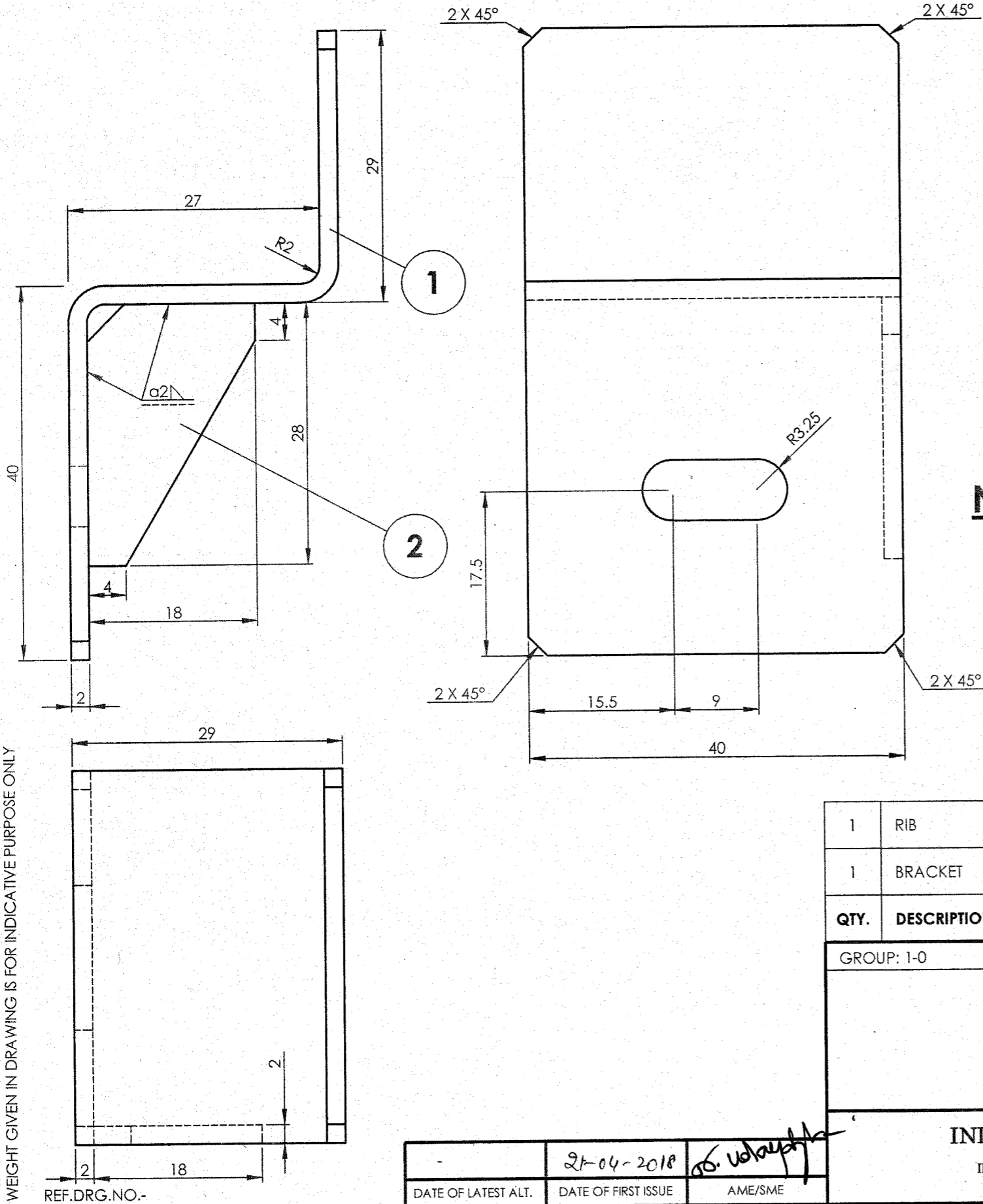
1	BRACKET FOR LUGGAGE RACK	2.5x70x87.5	1		RDSO/SPEC C-K201 X2CrNi12	0.10	
QTY.	DESCRIPTION	DIMENSIONS	ITEM NO.	REF. DRGS	MATL.SPEC.	WT/UNIT IN KGS	REMARKS
GROUP: 1-4		SURFACE AREA IN Sq.m.:		WT/ASSY IN Kgs:			
BRACKET FOR LUGGAGE RACK					SCALE	SSE/D	<i>P. George</i>
					1:1	CHD	
					ALT.	ALTD	
					DRN	G.VIMALA	
INDIAN RAILWAY STANDARDS					SHEET 1 OF 1		
INTEGRAL COACH FACTORY, CHENNAI - 600038					AAB14947		A3

AAD10437

▽ ROUGH MACHINED	⊖ ROUGH CLEANED
▽▽ FINISH MACHINED	⊖⊖ BURRS REMOVED
▽▽▽ FINE FINISH MACHINED	⊖⊖⊖ CHAMFERED

REVISIONS			APPROVED & DATE
ALT.	ZONE	DESCRIPTION	

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED. FOR UNTOLERANCED DIMENSIONS AND ROUGHNESS VALUES, REFER DRAWING NO ICF/STD-9-0-001. ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER THIS DRAWING INVALID. WELDING SYMBOLS ARE AS PER IS: 813-1986. WEIGHT GIVEN IN DRAWING IS FOR INDICATIVE PURPOSE ONLY



WELD TESTING PREFERENCES AS PER EN 15085-3:2007(E) TABLE-4

WELD PERFORMANCE CLASS	QUALITY LEVEL FOR IMPERFECTIONS EN ISO 5817 €	INSPECTION CLASS	VOLUMETRIC TEST RT or UT	SURFACE TEST MPT or DPT	VISUAL EXAMINATION VT
CP C2	B	CT2 \$	NOT REQUIRED	NOT REQUIRED	100%

THE TEST METHODS INDICATED IN THIS TABLE SHALL BE THE MINIMUM CAPABLE OF ENSURING COMPLIANCE OF THE WELDED JOINTS. ADDITIONAL TESTS DEPENDING ON THE MATERIAL, THE DESIGN OR CUSTOMER REQUIREMENTS MAY BE NECESSARY.

\$ FOR INSPECTION CLASS CT2, THE VISUAL EXAMINATION SHALL BE PERFORMED BY PERSONNEL CERTIFIED ACCORDING TO ISO-9712 AND SHALL BE DOCUMENTED.

€ ALL APPLICABLE CLAUSES FOR VISUAL INSPECTION SHALL BE CARRIED OUT.

FOR APPLICABLE WELDING PROCEDURE SPECIFICATION (WPS) REFER DRAWING NO ICF/STD-9-0-999

NOTE:-

1. STAINLESS STEEL ELECTRODE OF SAME COMPOSITION AS PER TABLE-3 OF RDSO/SPEC. CK-201 SHALL BE USED FOR WELDING.
2. ALL WELDING SHALL BE OF TIG UNLESS OTHERWISE SPECIFIED.
3. ALL WELDED JOINTS SPATTERS SHALL BE GROUND.
4. ALL WELDED JOINTS SHALL BE PICKLED AND PASSIVATED BEFORE SURFACE TREATMENT.
5. ALL SHARP CORNERS SHALL BE ROUNDED OFF.

QTY.	DESCRIPTION	DIMENSION	ITEM NO.	REF. DRGS	MATL. SPEC.	WT/UNIT IN KGS	REMARKS
1	RIB	2x18x28	2		SS-409M		
1	BRACKET	2x40x92	1		SS-409M		

GROUP: 1-0	SURFACE AREA IN Sq.m.:	WT/ASSY IN Kgs:
BRACKET		SCALE 2:1
		SSE/D CHD
		ALT. ALTD
		DRN Aswin R

REF.DRG.NO.-	21-04-2018	AME/SME
DATE OF LATEST ALT.	DATE OF FIRST ISSUE	AME/SME

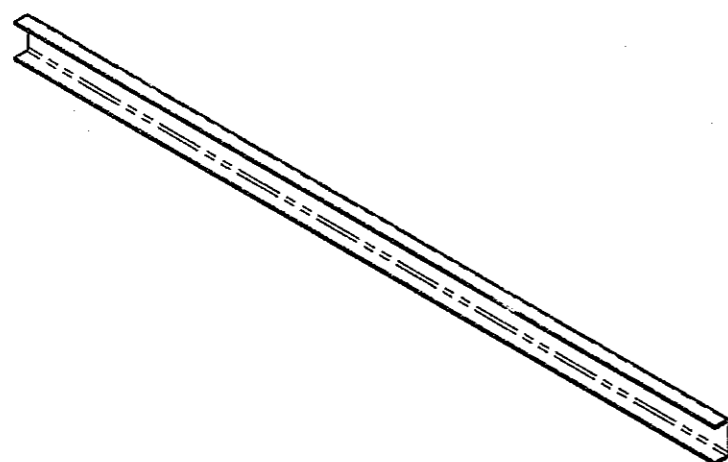
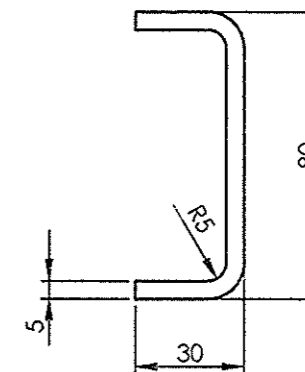
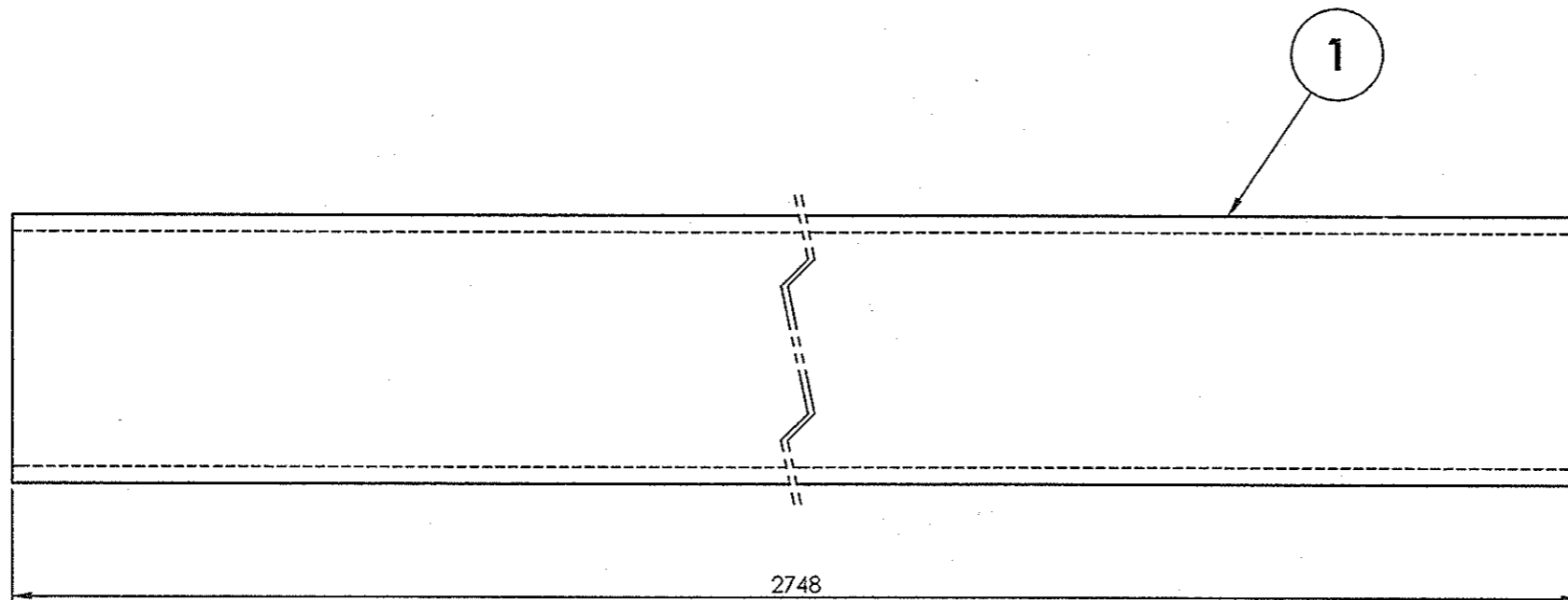
INDIAN RAILWAY STANDARDS		SHEET 1 OF 1
INTEGRAL COACH FACTORY, CHENNAI - 600038		
AAD10437		A3

3177

AAD11244

▽ ROUGH MACHINED	⊖ ROUGH CLEANED
▽▽ FINISH MACHINED	⊖⊖ BURRS REMOVED
▽▽▽ FINE FINISH MACHINED	⊖⊖⊖ CHAMFERED

REVISIONS			APPROVED & DATE
ALT.	ZONE	DESCRIPTION	



ISOMETRIC VIEW

ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED. FOR UNTOLERANCED DIMENSIONS AND ROUGHNESS VALUES, REFER DRAWING NO IC.F/SID.9-0-001.
 ANY MANUAL ALTERATION SHALL AUTOMATICALLY RENDER THIS DRAWING INVALID. WELDING SYMBOLS ARE AS PER IS:813:1986.
 WEIGHT GIVEN IN DRAWING IS FOR INDICATIVE PURPOSE ONLY

REF.DRG.NO.

	23 -10-2017	<i>K. Sathya</i>
DATE OF LATEST ALT.	DATE OF FIRST ISSUE	AME/SME

1	CHANNEL	5x120x2748	1		IRS M-41-1997	13.33	
QTY.	DESCRIPTION	DIMENSIONS	ITEM NO.	REF. DRGS	MATL.SPEC.	WT/UNIT IN KGS	REMARKS
GROUP: 1-1		SURFACE AREA IN Sq.m.:		WT/ASSY IN Kgs:			
CHANNEL					SCALE	SSE/D	<i>K. Sathya</i>
					1:2	CHD	
INDIAN RAILWAY STANDARDS INTEGRAL COACH FACTORY, CHENNAI - 600038					ALT.	ALTD	K.SETHURAMAN
						DRN	
SHEET 1 OF 1							AAD11244
					A3		