

TECHNICAL SPECIFICATIONS FOR CURVE AND PROFILE BENDING MACHINE

Note : Vendor is required to give Pointwise remarks against each point. Any deviation in the offer must be highlighted against that particular feature / item.

Requirment	Vendors remark
1.0 PURPOSE	
The Curve and Profile bending machine shall be used for profiling and spiral curving of Sheet metal strips of Alloy steel for Steam Turbine Strainers. (Refer "ANNEXURE - A" for final shape & dimensions of strip).	
2.0 WORK PIECE MATERIAL	
The Strainer elements to be bent will be Alloy steel (C 0.08-0.12% , Mn 0.3-0.8% , Cr 12.0-14.0%) Rolled stock having Tensile strength up to 800 N/mm ² .	
3.0 TECHNICAL SPECIFICATIONS	
3.1 Width of the Profile roller = 60 mm	
3.2 Diameter of the Profile roller = 80 mm	
3.3 Vertical adjustment of the upper Profile roller = 20 mm	
3.4 Eccentric adjustment of the Back bearing of the Upper shaft (Stepless) = +/- 1.5 mm	
3.5 Linear adjustment of the Inlet table = 30 mm	
3.6 Linear adjustment of the Outlet table = 30 mm	
3.7 Swivelling of the Inlet table = 0 - 10 deg.	
3.8 Swivelling of the Outlet table = 0 - 10 deg.	
3.9 Revolutions of the Profile rollers = 10 rev/min	
3.10 Driving power (A.C.Motor) = Min. 3 Kw	
3.11 Revolutions of the Drive motor = 1500 rev/min	
3.12 Roller Material = High Carbon high Chromium steel	
3.13 Machine should be of suitable height for working convenience of the operator in standing position.	
4.0 ESSENTIAL FEATURES / REQUIREMENTS :	
4.1 The machine & its accessories should be rigid enough so that no vibration is observed during operation.	
4.2 a) Machine shall be supplied with slot in the Guide plate segments for rolling the corrugated strip of size 8 x 1mm in to the required diameters as per following details(mm) :	
1) For Dia 220 –slot OD 209.2 / ID 192.8	
2) For Dia 262 –slot OD 250.2 / ID 235.8	
3) For Dia 294 –slot OD 282.2 / ID 265.8	
4) For Dia 362 –slot OD 350.2 / ID 333.8	
5) For Dia 410 –slot OD 399.2 / ID 382.8	
6) For Dia 476 –slot OD 464.2 / ID 447.8	
7) For Dia 596 –slot OD 560.2 / ID 543.8	
8) For Dia 661 –slot OD 625.2 / ID 608.8	
9) For Dia 836 –slot OD 800.2 / ID 783.8	
Remaining Ring portion of each variant of the segments should also be supplied long with the machine.	
4.2 b) The Inlet guide plate & outlet guide plate segment should of replacable type, so that after wearing, only the guiding plate is to be changed. (Refer "ANNEXURE - I, II, IV & V").	
4.2 c) Outlet guide plate segment as shown will be clamped in the plate type fixture. This plate type fixture will be separate for each outlet guide plate segment. Separate plate type fixture to be supplied for each size of guide plate segment. { Refer Clause 4.3 a) } This plate type fixture will be clamped on Table with T- slots using fasteners. (Refer "ANNEXURE - I, II, IV & V")	

4.2 d-(1) Similarly Inlet guide plate as shown will be clamped in the plate type fixture. This plate type fixture will be clamped on Table with T- slots using fasteners as shown. - Four no. pair of such guide plates are to be supplied as SPARE . (Refer " ANNEXURE - I, II, IV & V ")	
4.2 e) The Inlet & outlet side Tables should have T-slots so that all plate type fixtures can be easily clamped on it using interchangeable fasteners. (Refer " ANNEXURE - I, II, IV ")	
4.2 f) The inlet & outlet Table should have linear motion using screw system. The inlet & outlet Table should have swiveling motion using worm & gear system.(Refer " ANNEXURE - VI, VII ")	
4.2 g) System should be there to lock linear & swiveling motion individually in both inlet & outlet tables. (Refer " ANNEXURE - VI, VII ")	
4.2 h) The linear as well as the swiveling movement of the table must be smooth. Scale in mm is to be provided along linear motion in both tables. Scale in degrees is to be provided along swiveling movement in both the tables.	
4.2 i) The level of inlet table & outlet table and axis of lower & upper spindle should be such that smooth movement & formation of strip is achieved.	
4.3 One spring loaded guide for strip is to be provided before inlet guide table. For reference see attached snap no. The guiding plates in this system should be of replaceable type so that only the plates are required to be replaced after wearout. - Four pair of these plates are to be supplied as SPARE . System should be there so that upper & lower guide plates can be moved up & down, to adjust the level of strip entering the machine. (Refer " ANNEXURE - III ")	
4.4 The rollers are to be clamped on spindles using check nuts etc. Proper system should be there to disassemble the rollers. - Four such pair of check nuts etc. are to be provided as SPARE .	
4.5 Inlet & outlet table movement adjusting screws should have square heads. Replaceable type handles are to be provided with these. These handles should be interchangeable.	
4.6 Arrangement should be there to move the upper spindle up & down. System should be there to lock this movement. (Refer " ANNEXURE -VII ")	
4.7 Arrangement should be there to swivel the upper spindle so that the angle between the two spindles can be adjusted while setting or wear out of rollers or as required for proper strip formation. System should be there to lock this movement. (Refer " ANNEXURE - VII ")	
4.8 a) Suitable arrangement should be there for loading of raw material spools. (Refer " ANNEXURE - VIII, IX ")	
4.8 b)The spindle on which raw material spool will rotate should have bearings for smooth movement.	
4.8 c) This system should have arrangement for quick loading / unloading of raw material spools. The system should be such that the spindle's one side support is fixed & other side support can be easily disassembled to load raw material spools. In this we can remove fasteners of top cover plate & the lower support has hinges at bottom so that the support swivels by 90 degrees thereby allowing removal of side guide plate & loading of raw material spool. (Refer " ANNEXURE - VIII, IX ")	
4.8 d) The height of centerline of spindle of raw material loading system should be around 380 mm from floor. The diameter of support on which raw material spool is loaded is around 400 mm (Refer " ANNEXURE - VIII, IX ")	
4.9 a) Machine shall be supplied with device for stacking the coils after complete curve and profile bending operation. Refer attached snap for reference. The arrangement should be such that the stacking base plate can be moved in various positions within range. In base of base plate there is bearing for smooth movement. Support should be provided below base plate on which it can rest at different positions (Refer " ANNEXURE - X, XI, XII ")	
4.9 b) Two no. base plates should be provided so that first one covers initial half range of bent strip diameters & second one covers remaining range of bent strip diameters. (Refer " ANNEXURE - XII ") { Also Refer Clause no. 4.3 a) }	
4.9 c) The Base plate should have four slots at 90 degrees so that rods / studs can be fastened in the slots. These rods / studs will act as guide on diameter for finally bent strip. (Refer " ANNEXURE - XII ")	
4.9 d) This system should be rigid enough to sustain load of the final bent strip roll.	

4.10 Suitable lighting arrangement should be provided on machine.	
4.11 ON / OFF switch for the machine should be provided on the front side of the machine. See attached snap for reference. (Refer "ANNEXURE - II ")	
4.12 Suitable lubrication system should be provided at all suitable places.	
4.13 The foundation drawing for the machine are to be submitted within two months after the order / LOI has been placed.	
5.0 MANUALS :	
Five Sets of Operation / Maintenance manuals in English language containing Electrical circuit diagram, Detailed assembly Drgs. of each Sub-assly. with part list & part drawings (with material used) should be provided. Manufacturing Drgs. of fast wearing Items, if any, shall also be provided.	
6.0 COLOUR :	
Colour of the Machine shall be Apple green .	
7.0 GUARANTEE :	
Supplier shall provide full and complete Guarantee for Two years trouble free operation after successful commissioning of the machine.	
8.0 SPARES :	
8.1 Spares for Two years trouble free operation are to be provided. Item-wise cost of each Spare shall be indicated under the headings Essential spares and Optional spares.	
8.2 Two spare SETS (4 nos.) of Rollers shall be provided with the Machine.	
8.3 Two nos. Guide (hardened) for feeding the Strip between the Rollers shall be provided.	
8.4 Four no. pair of guide plates (Refer- 4.3 (d-1)).	
8.5 Four pair of guide plates for spring loaded guide (Refer- 4.4)	
8.6 Four no. check nuts are to be provided. (Refer- 4.5)	
8.7 Two SETS of bushes used in the machine.	
8.8 One no. of each type of gear used.	
8.9 Electrical Spares:	
8.9.1 Contractor / Relay - 02 nos. each type.	
8.9.2 O/L Relay - 02 nos. each type.	
8.9.3 Push Button - 05 nos. each type.	
8.9.4 Main Switch - 01 no.	
8.9.5 MPCB / MCB - 02 nos each type.	
8.9.6 Single Phase Preventor - 02 nos. each type.	
9.0 COMMISSIONING & ACCEPTANCE :	
9.1 The machine shall be supplied with complete electrical equipment ready for the connections to the power mains.	
9.2 Details of the Civil work required to be done for the installation of the machine should be specified by the supplier. Civil works will be in the BHEL's scope.	
9.3 The supplier to give prior notice sufficiently in advance (minimum one month from date of despatch) for Pre-despatch Inspection	
9.4 Provisional acceptance of the machine can be made by BHEL at supplier's work prior to despatch to ensure specification compliance and functioning of the machine. Test material shall be provided by BHEL on request and it shall be the responsibility of the supplier to take it to their works. Test samples shall be returned to BHEL . Test samples shall be checked at BHEL . The machine shall only be despatched only after approval of the test samples by BHEL.	
9.5 Final acceptance shall be made at BHEL, Hardwar following successful erection, assembly, commissioning and job proving within specified accuracy.	
9.6 It shall be the responsibility of the supplier to arrange and provide all required items, tools & tackles as required for the commissioning of the machine including foundation bolts etc, sufficient electrical wiring (20 mtrs.), MCBDB with sockets & Plug and other connection accessories as required alongwith the machine. BHEL will provide power mains only.	

9.7 It shall be the sole responsibility of the supplier to rectify any shortcoming in the Design or Operation of the machine observed during commissioning, free of cost.	
10.0 TECHNICAL SUPPLY CONDITION :	
The machine should be able to operate in following technical conditions :	
Power :	
Machine should be suitable to operate on 3-phase A.C. supply of 415 Volts \pm 15%, 50Hz \pm 3%	
Environment :	
Tropical environment consists of dust- laden atmosphere during some part of the year.	
Temperature Minimum 3° C - Maximum 45° C	
Relative Humidity 95% Maximum	
11.0 QUALIFYING CONDITIONS :	
11.1 This is a special purpose Machine and therefore the design and operation of the Machine should preferably be similar to existing machine working at BHEL, Hardwar to ensure similarity of machine operation and interchangeability of toolings. Machine manufacturers interested in the development of the Machine may discuss and study the working of the existing machine at BHEL, Hardwar and shall give a compliance certificate along with the offer.	
11.2 The supplier should be a original machine tool manufacturer of special purpose machines. List of special purpose machines supplied in last five years is to be provided with offer.	



ANNEXURE - I



ON / OFF
SWITCH


SPRING LOADED GUIDE

ANNEXURE-III





ANNEXURE- IV



OUTLET GUIDE PLATE SEGMENT
WITH FIXTURE & TABLE

ANNEXURE - V

LEVER FOR LINEAR
MOVEMENT

LOCKING

LOCKING FOR SWIVELLING
MOVEMENT

LEVER FOR SWIVELLING
MOVEMENT

L.H. SIDE VIEW

ANNEXURE- VI





ROTTLER

ARRANGMENT TO
CHANGE ANGLE OF
UPPER SPINDLE W.R.T.
LOWER SPINDLE

R.H.SIDE VIEW

ANNEXURE-VII



RAW MATERIAL SPOOL LOADING SYSTEM

TOP VIEW

ANNEXURE-VIII



REMOVABLE SIDE
GUIDE PLATE

HINGE

RAW MATERIAL SPOOL LOADING SYSTEM

R.H.SIDE VIEW

ANNEXURE - IX



FINAL BENT STRIP

ARRANGEMENT FOR STACKING
OF FINAL BENT STRIP ROLL

ANNEXURE- X

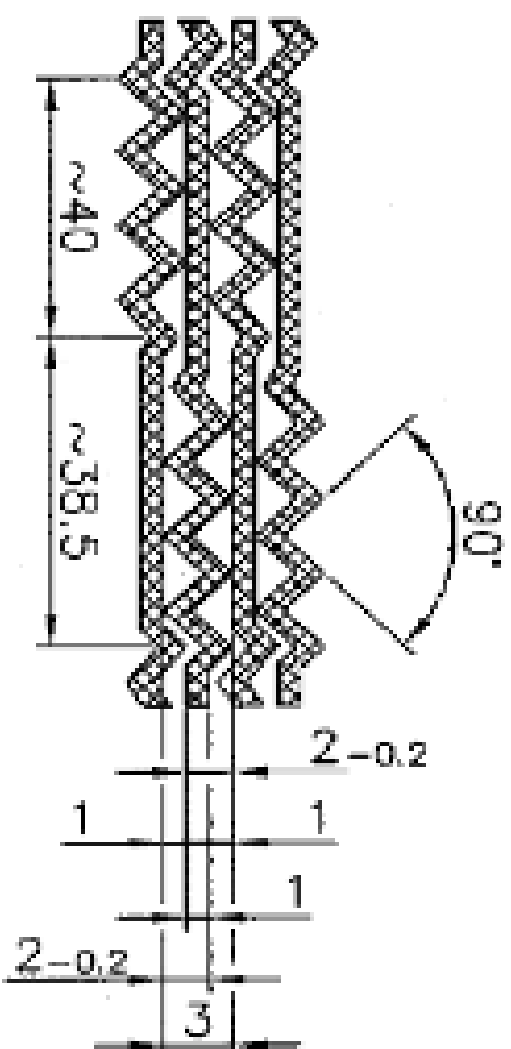
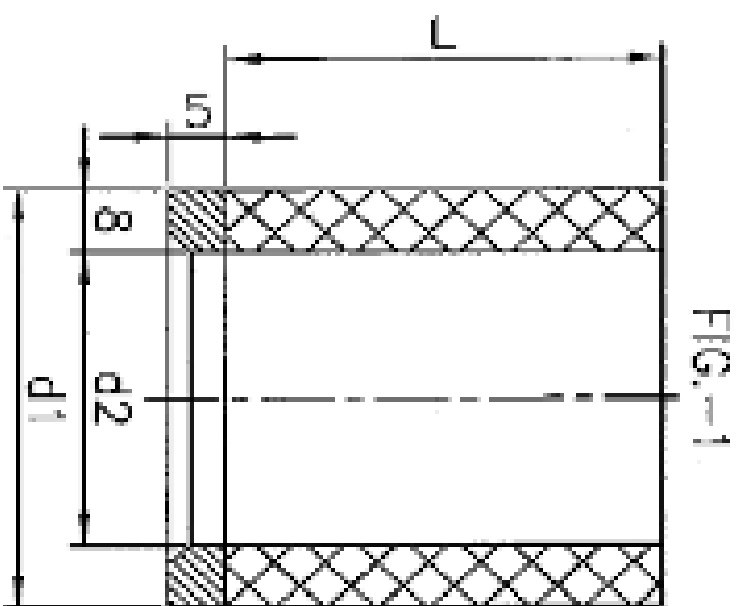


VIEW FROM BOTTOM OF BASE PLATE OF
BENT STRIP STACKING SYSTEM

BASE PLATE WITH FOUR SLOTS



ANNEXURE- XII



ALL DIMENSIONS ARE IN mm

ANNEXURE - A