	TECHNICAL SPECIFICATION OF RATE CONTRACT FOR CONVERSION OF RINGS BY RING ROLLING M/c *CENTRAL FOUNDRY FORGE PLANT* *BHEL, RANIPUR, HARDWAR*	NO.	FTECH 01
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1.0 Description :

This specification governs the quality requirements alloy steels rings manufactured by **Ring Rolling Machine** from ingots/ cake supplied by CFFP. The CFFP-cake/ bloom converted at vendor's work will be supplied to our sister units/ customers after final heat treatment, testing and finish machining.

2.0 Scope of Supply :

2.1 The supplier is to convert the ingots/ cake size to the rings by ring rolling operation. The vendor will quote the ring rolling charges per kg of the Ring. The categories are divided in the following Table-1. Vendor will fill Column "Ring Rolling Charges/ Kg" and "Vendor's Remarks"

Table:1

SNo	Delivery after Ring Rolling				
	OD mm (Min.)	OD mm (Max.)	Wt. Range of the Ring (kg)	Ring Rolling Charges ₹/ Kg	Vendor's Remarks
01	500	1000	Up to 1000 Kg		
02	500	1000	1000 Kg to 2500Kg		
03	1001	1500	Up to 1000 Kg		
04	1001	1500	1000 Kg to 2500Kg		
05	1001	1500	2500 Kg to 5000Kg		
06	1501	2500	Up to 1000 Kg		
07	1501	2500	1000 Kg to 2500Kg		
08	1501	2500	2500 Kg to 5000Kg		

2.2 Delivery Condition of the item: CFFP supplied cake / bloom/ Ingot will be return after ring rolling and proper heat treatment.

2.3 The required cake and bloom will be supplied to vendor will be ultrasonically tested. However, vendor will not be responsible for any rejection due to Ultrasonic defect.

2.4 The vendor will send the dimension report along with the ring.

2.5 Tolerance on Dimensions :

On Outer Diameter : +5,-0
On Inner Diameter : +0, -5
On Height : +5, -0

3.0 Chemical Composition :

Actual chemical composition of the item will be intimated to supplier before sending the material for ring rolling operation. However, the chemistry of the cake/ blooms will be within the limits given below (The Grades are mentioned here are only indicative; there will be more grades in the each category of the rings):

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(All figures are in %)

Grade		C	S	P	Si	Mn	Ni	Cr	Mo	V	Cu	Nb	Al
EN-10222-4 [1] (P355QH)	Min.	---	---	---	0.10	0.90	---	---	---	---	---	---	---
	Max.	0.20	0.015	0.025	0.50	1.65	0.30	0.30	0.08	0.10	0.20	0.05	0.06
AA19331 [2] (20C8)	Min.	0.15	---	---	0.15	0.60	---	---	---	---	---	---	0.02
	Max.	0.25	0.40	0.40	0.35	0.90	0.30	0.30	0.05	0.05	0.25	---	0.05
AA19332 [3] (30C8)	Min.	0.25	---	---	0.15	0.60	---	---	---	---	---	---	0.02
	Max.	0.35	0.40	0.40	0.35	0.90	0.30	0.30	0.15	0.05	0.25	---	0.05
HW19386 (21CrMoNiV4-7)	Min.	0.17	----	----	0.15	0.35	0.50	0.90	0.65	0.25	----	----	---
	Max.	0.25	0.015	0.015	0.35	0.85	0.80	1.20	0.80	0.35	----	----	0.15
HW19382 26NiCrMoV11-5)	Min.	----	----	----	----	----	2.80	1.40	0.30	----	----	----	----
	Max.	0.28	0.015	0.015	0.30	0.40	3.30	1.80	0.45	0.15	----	----	----

Note :

1. $C_{equ} \leq 0.47$; Nb +V ≤ 0.12; N = 0.02% Max
2. Sn : 0.05% Max; B = 0.003% Max ; Cr +Mo +Ni ≤0.50%
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4.0 Process:

Heating For Forging: Due care will be taken in loading the forging in the reheating Furnace. Ingots/ cakes/ bloom should be rest on the furnace stands of approx. size 400 x 400mm which is laid on the Reheating furnace. Care should be taken to avoid flame impingement on the ingots/ cakes/ bloom. The heating rate should be selected in such a way that cracks due to excessive thermal shock will not occur. Sufficient soaking time will be given to ensure uniform temperature is obtained across the cross section of Forging. **Heating rate, soaking time and Forging temperature shall be specified.** Any intermediate heating operation between upsetting/punching and ring rolling is carried out shall also be specified. Overheating and Burning during heating is not acceptable.

5.0 Forging and Ring Rolling:

The Upsetting/indenting/Punching must be carried out on hydraulic forging press of sufficient capacity. Ring Rolling operation shall be carried out on Continuous Ring Rolling machine. End Temperature of Rolling operation must be reported and shall greater than 800° C.

Reduction ratio achieved in each forging operation may also be furnished. Actual dimensions and ovality if any after ring rolling shall be measured and recorded.

6.0 Heat Treatment:

The Rings shall be Normalized/ normalized and tempered or Annealed. The normalizing/ annealing temperature should be selected to achieve the desired hardness depending upon the grade. The final heat treatment cycle will be given after the placement of order. **The Heat Treatment must ensure uniform grain refinement to facilitate proper ultrasonic examination.**

7.0 Hardness :

Hardness of each forging shall be measured on minimum of two place 120°apart on both ends of the ring. The difference between two values for the rings shall not exceed 20 BHN. The hardness of the ring will depend upon the Grade.

8.0 Inspection :

i. Heat Treatment charts.
ii. Dimension. The Ring rolling forging must be free from cracks and overlapping.
iii. Random verification of chemistry (spectro analysis), after completion of process, will done by CFFP-inspector.
iv. CFFP Reserves the right to witness the process at supplier work's.

9.0 Marking:

Before sending the Ring Rolled forging to CFFP following to be punched on each forging and same will punched/ marked in the Ring before dispatch from the vendor's work.

i. Forge Number
ii. Heat Number
iii. Work Order No.
iv. Item name

10.0 Transportation :

Vendor will quote per Kg rate of the ring including the transportation charges from CFFP to Vendor's works (for cake/ bloom) and from vendor's work to CFFP after the ring rolling of the CFFP-Cake/ bloom.

11.0 Loss of material :

i. The technological weight of the cake / bloom (outgoing material) and the delivered ring weight (incoming material) will be given by the Forge Technology-CFFP.
ii. The accounted of difference in the weight shall be treated as scrap and retained by the Vendor.

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