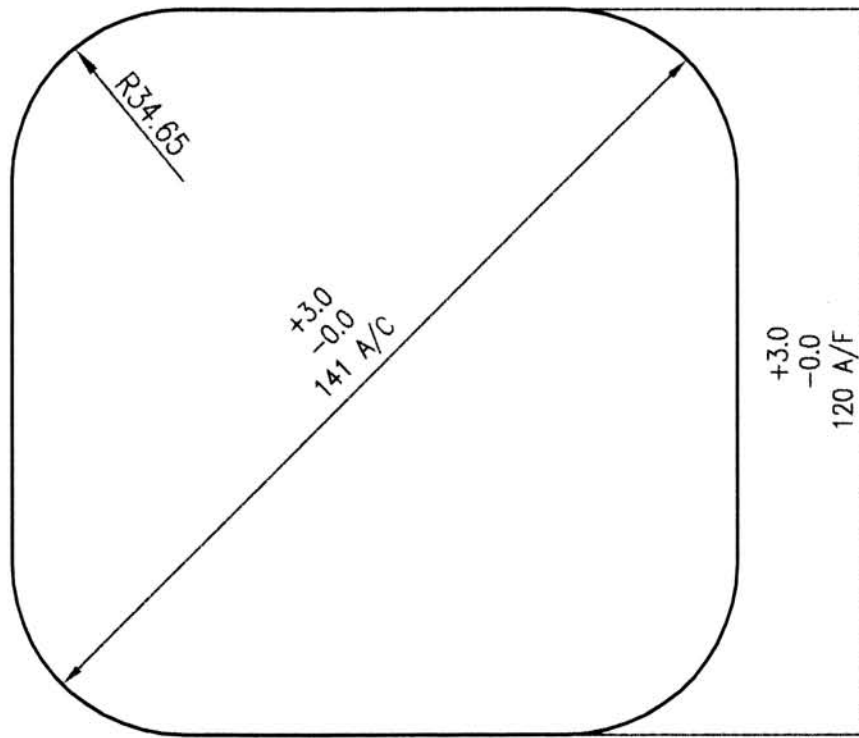


DRG. NO. F-347 M

A M E N D M E N T S

REV	DATE	DESCRIPTION	SIGN



DIMENSIONS ARE IN mm		
THIRD ANGLE PROJECTION		
SCALE -		
2007	NAME	DATE
DRAWN	BAGDE	
TRACED		
CHECKED	<i>[Signature]</i>	23-01-2007
JWM/CDD	<i>[Signature]</i>	
APPVD	WM/SF	23-01-07
	JGM/CM	<i>[Signature]</i>

MATERIAL	STEEL TO SPECN. JSS 9510-1, Grade-SS/B26
NOMENCLATURE	STEEL BILLET
M/C :	
STORE :	130 mm HE SHELL

ORDNANCE FACTORY AMBAJHARI	
DRAWING NO. F-347 M	
SHEET NO.-	1
NO.OF SHEETS -	6
OPERATION -	
COMPT.	FORGED BODY F-262 (LATEST ISSUE)

ORDNANCE FACTORY AMBAJHARI, NAGPUR

R. Bhatnagar
WM/SF 23/11/97

SPECN. NO.

F-347 *M*

SPECIFICATION OF STEEL BILLETS
FOR 130mm HE SHELL

W. M.
JGM/CM

SHEET NO 2

NO.OF.SHT. 6

1 MATERIAL SPECIFICATION: JSS 9510-1, GRADE-SS/B26

2. TABLE 1 : CHEMICAL COMPOSITION

ELEMENTS	PERCENTAGE
C	0.55 - 0.65
Mn	0.50 - 0.80
S	0.05 Max.
P	0.05 Max.
Si	0.17 - 0.40
Cr	0.30 Max.
Ni	0.50 Max.
Cu	0.30 Max.
Sn	0.04 Max.

Note: Atleast 3 sample should be taken in each heat & recorded.

3. MANUFACTURING PROCESS :

3.1. Steel is to be manufactured through EAF/BOF-LRF-VAD/VD-bottom poured ingot route.

Teeming temperature should be maintained such that there is uniform grain structure through out the cross section of ingot and dendritic structure is to be avoided.

3.2. The steel shall be killed and shall be free from harmful defects such as seams, flaws, piping, cracks, porosity, inclusions and surface defects.

3.3. Adequate top and bottom discards are to be given to all ingots to ensure soundness and freedom from piping, porosity & harmful segregation. Size, Shape and Method of Prodn. of the ingots are to be so selected as to minimize segregation and axial unsoundness. This is to be proved by sulphur print, macro-etch, or any other method mutually acceptable to the manufacturer, & purchaser Macro sample shall be selected from billets representing top & bottom for atleast one ingots per plate or six no per heat whichever is max. sample is to be drawn from Top of the first bar of first ingot cast & second sample is to be drawn from bottom of the last bar of last ingot cast.

3.4. Segregation tests are to be carried out according to ASTM A711-S7. The maximum allowable variation between the sampled points being 10%. 3 samples from first, middle & end of the bar from any Ingot of each heat are to be sampled by cutting a slice off the bar.

ORDNANCE FACTORY AMBAJHARI, NAGPUR

[Signature]
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SPECIFICATION OF STEEL BILLETS
FOR 130mm HE SHELL

[Signature]
JGM/CM

SHEET NO. 3

NO.OF.SHT. 6

Sample for chemical analysis is to be selected by taking 15% material from centre & balance along the same diagonal. Each of these chemical analysis are to confirm to Table 1. The chemical composition between each of the three points may not vary by more than that specified in table no 1.

Should any one of the three bars be out of this specification, that bar is to be recorded and scrapped and every bar from that heat is then to be subjected to this segregation test.

3.5. The reduction ratio of ingot to end product should be atleast 6:1

3.6. The billet from the bottom and the top end of each ingot must be marked (B & T resp.)

4. METALLOGRAPHIC ANALYSIS :

4.1. Permissible Inclusion rating :

permissible inclusion rating will be as under ;

2/1 (Thin/Thick) as per IS: 4163-2004 for each type of inclusion A, B, C and D.

4.2. Macro Etch Test : Sample will be six nos per heat/Two nos. per plate Macro Etch test should confirm to grade C1, R2 & S2 of ASTM E 381-2001. Carbon based deposits/carbon dots are undesirable and are to be avoided.

5. ULTRASONIC INSPECTION :

Ultrasonic test as per IS: 8791-1978 class 'A'
100 % bars to be checked.

Two sides of the billets with 90° angle between each other to be scanned over their complete surfaces with suitable overlapping.

6. MECHANICAL PROPERTIES :

6.1. Samples selected from billets for Mechanical test is in Normalised condition. It should satisfy the following mechanical properties.

ORDNANCE FACTORY AMBAJHARI, NAGPUR

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SPECN. NO.

F-347 M

SPECIFICATION OF STEEL BILLETS
FOR 130mm HE SHELL

[Signature]
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SHEET NO. 4

NO.OF.SHT. 6

0.2 % PS = 400 MPa. Min.
U.T.S. = 900 Mpa Max.
Elongation $5.65\sqrt{S_0}\%$ = 12% Min.

Atleast two sample to be checked for above test in each heat.
The heat treatment schedule should be recorded & mentioned in
Test certificate.

7. QUALITY ASSURANCE REQUIREMENTS :

Firm must submit the quality plan giving all details of manu-
facturing process and other requirements.

7.1. Visual inspection.

100% visual inspection of the bars shall be carried out to make
sure that they are free from harmful seams, cracks, embedded
scale and folds.

7.2. Straightness.

Maximum bow 3mm/m.

7.3. Twist.

Maximum 3mm/m.

7.4. Bendness.

permissible bendness 3mm/meter max.

7.5. Hardness.

Hardness 225 BHN max. and 190 BHN min. for shell bar.
Hardness should be uniform from surface to core.

5% of total shell bars to be checked against each heat no. if not
found OK. further 20% to be checked, if not found OK. then 100%
to be checked.

7.6. Surface.

As rolled.

8. DELIVERY REQUIREMENTS :

8.1. Supply.

Supply is to be made in length of 3m to 6m length in multiple
of 395 mm plus 0 to 50 mm extra and maximum 5% short down
to length 2000 mm is acceptable.

Any material which will not fall in the above length range, the
corrospounding end pieces will be rejected by O.F.Aj. Supplier will
replace the same quantity immediately.

8.2. Suitable Post rolling treatment should be given to rolled bars
such that it satisfies the cutting properties when cut the bars
in circular cold Saw / Band machine.

ORDNANCE FACTORY AMBAJHARI, NAGPUR

R. Bhatnagar
23/11/07
WM/SF

SPECN. NO.

F-347 M**SPECIFICATION OF STEEL BILLETS
FOR 130mm HE SHELL**

mm
JGM/CM

SHEET NO.

5

NO.OF.SHT.

6

8.3. Dimension.

Bars shall have the dimensions as per drawing No. F-347 M.

8.4. Shape.

Hot or cold saw at one end & other end gas cut allowed with cut square. Ends to be deburred. How ever bundling is to be done with saw cut end at one direction.

8.5. Marking.

Each bar to be stamped with melt No/cast no. or melt code No. on one end. The melts are to be delivered seperated in bundles. Two tags stating melt No/Cast No and steel brand to be attached to each bundles.

8.6. Colour code.

25mm to 30mm width "BROWN" colour band is to be painted throughout length of each bar on one side. Heat no to be stamped on each bar.

8.7. Bundling.

The shell bar are to be bundled Heat wise with 5 to 6 mm dia M.S. wire or steel strap with a steel tag mentioning steel grade heat no, qty. and firm name Weight of each bundle not to exceed 4 tons.

8.8. A cast must be delivered in its full quantity before the delivery of any other cast may commence.

9. CERTIFICATES :

Test Certificate for parameters as detailed below is to be submitted in triplicate to user along with each consignment.

9.1. Chemical Analysis : as per para 2.

9.2. Mechanical Properties : as per para 6.

9.3. Metallographic Analysis : as per para 4.

9.4. Ultrasonic inspection certificate : as per para 5.

9.5. Hardness certificate : as per para 7.5.

9.6. Dimension Report as per Drawing and Reduction Ratio.

9.7. No of bars and total quantity.

10. Material will be subjected to Surveillance Quality Check on receipt.

ORDNANCE FACTORY AMBAJHARI, NAGPUR	<i>B. Sharma</i> WM/SF 23/11/07	SPECN. NO. F-347 M
	<i>mm</i> JGM/CM	SHEET NO. 6 NO.OF.SHT. 6
SPECIFICATION OF STEEL BILLETS FOR 130mm HE SHELL		

43/07 M	23/01/07	SPECN. MADE IN NEW FORMAT WITH ALL DETIALS. WHICH COVERING THE MONETERING INSTRUCTION ALSO. AUTH: WM/SF L. NO. 2952/DRG/SPECN/SF DT. 20/01/2007	<i>B. Sharma</i> WM/SF
155/05 L	06/06/05	NOTE NO. 1 AMENDED. NOTE NO. 13 ADDED. TOL. NO DIMNS AMENDED AS PER IS:3739-87. REF. WM/SF L.NO. 2952/DRG/SPECN/SF DT.19/05/05	-sd- WM/SF
96/2004 K	10/03/04	IN NOTE NO. 11 REDUCTION RATIO 6:1 WAS 5:1 AUTH: CQA(MET) FAX NO. 07104-237705 DT 09 FEB.2004 AND INST/TECH/MQA-2 DT. 09 FEB.04.	-sd- AWM/SF
322/2003 J	23/09/03	NOTE NO 12 ADDED. AUTH: CQA(MET) L. NO. 130mm/AMN/MQA-2/VII FAX. NO. 07104-237705 DT 15 SEPT.03.	-sd- JGM/SF
311/2003 H	10/09/2003	NOTE NO 1 AMENDED REF. AWM/SF L.NO. 2953/SF SHELL FORGE SHOP DT. 07/09/03. IN NOTE NO. 11 REDUCTION RATIO 5:1 WAS 4:1 AUTH: CQA(MET) FAX. NO. 07104-237705 DT 08 JULY 03 AND INST/TECH/MQA-2 DT. 25 JUNE 03.	-sd- AWM/SF
407/2001 G	30/08/01	NOTE NO 10 AMENDED AS PER JGM/SL-1 L.NO. SS/3210012/M/SL. DT 26/08/2001	-sd- JGM/SL-1
222/2001 F	12/04/2001	NOTE NO 11 & 11 ADDED BASED ON NOTING NO M/SL/856 DT 11/04/2001 APPVD. BY Sr. G.M.	-sd- DGM/E(SL)
90/97 E	04/03/97	225 BHN MAX. WAS 200 TO 225 BHN.	-sd- WM/SF
443/95 D	10/10/95	NOTE NO 10 DELETED AUTH: CQA(MET) L. NO. IFD/AMN/MQA-2, DT 31/08/95	-sd- WM/SF
432/94 C	29/11/94	IN NOTE NO 10 "2/1(THIN/THICK) WAS "2/0 (THIN/THICK) AUTH: CQA (MET) L. NO. INST/MQA-2, DT 15/09/94	-sd- DGM/QA
271/94 B	10/08/94	NOTE NO 10 ADDED.	-sd- DGM/QA
11/94 A	19/01/94	NOTE NO 1 CHANGED.	-sd- WM/SF
REV.	DATE	DESCRIPTION	SIGN

A M E N D M E N T S

ORDNANCE FACTORY AMBAJHARI

COMPILED BY : BAGDE	SPECIFICATION OF STEEL BILLET	SPECN. NO.:	F-347 M
CHECKED BY : <i>DL</i>		SHEET NO.-	6
JWM/CDO <i>B. Sharma</i>		NO.OF SHEETS -	6
APPROVED <i>B. Sharma</i> WM/SF 23/11/07	STORE : 130 mm HE SHELL	COMPT.	FORGED BODY F-262
<i>mm</i> JGM/CM			