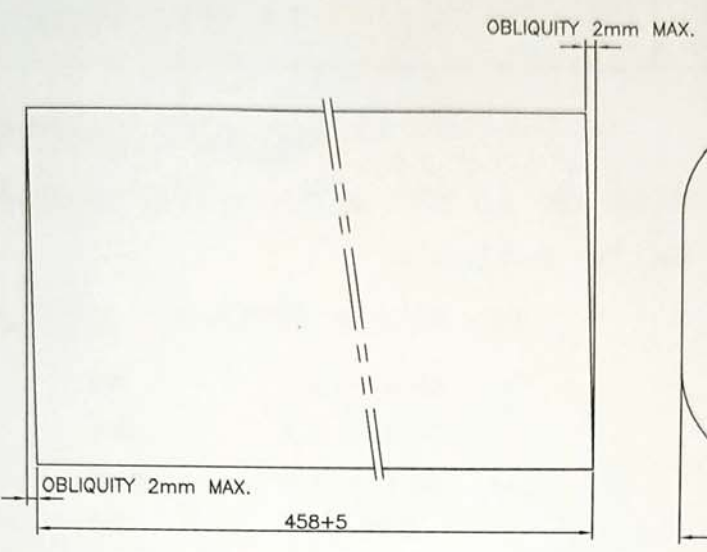
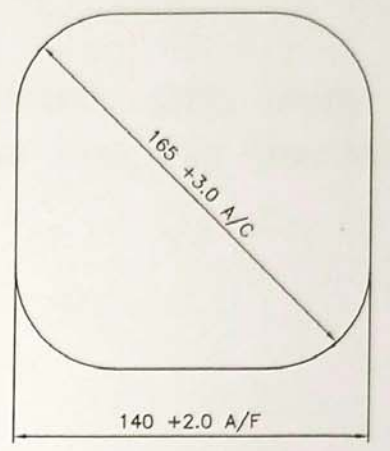


DRG. NO: **F-677** TOL. ON UNTOLERATED DIMNS. ARE AS PER MEDIUM CLASS TO IS: 2102

NOTES :

- 1) PARTED BILLETS ARE TO BE SUPPLIED IN ANNEALED CONDITION.
- 2) PARTING OF BILLETS ARE TO BE GOVERNED BY THE WEIGHT AND NOT BY LENGTH, LENGTH AS MENTIONED IS FOR GUIDANCE ONLY.
- 3) 75-80mm WITH "DARK BLUE" COLOR BAND IS TO BE PAINTED THROUGHOUT THE LENGTH AND PARTED FACE OF EACH PARTED BILLET ON ONE SIDE.
- 4) STENCILING OF HEAT /CAST NO. TO BE DONE WITH WHITE COLOR ON OPPOSITE FACE OF DARK BLUE MARKING EACH PARTED BILLETS.
- 5) ENDS OF EACH PARTED BILLET ARE TO BE SAW CUT & DEBURRED. PLASMA/GAS CUT IS NOT ALLOWED.
- 6) PACKING/PALLETISATION OF PARTED BILLETS SHOULD BE SECURED BY STEEL STRAP TO FACILITATE EASY LOADING/ UNLOADING. PACKING IS TO BE DONE HEAT/CAST WISE WITH STEEL TAG MENTIONING STEEL GRADE, HEAT NO, QUANTITY AND FIRM NAME.
- 7) FOR OTHER SPECIFICATION REFER SHEETS NO 2 TO 6



WEIGHT = 65.20 +1.0kg :

PROVISIONAL

REV.		DATE		NOMENCLATURE		SIGN.	
AMENDMENTS							
DIMENSIONS ARE IN mm				MATERIAL: STA 64			
THIRD ANGLE PROJECTION				NOMENCLATURE: PARTED BILLET			
SCALE : 1 : 2				SPECIFICATION OF			
DRAWN		NAME		DATE		ORDNANCE FACTORAMBAJHARI	
CHECKED				07.10.22		आदर्श फॅक्टरी अम्बाजरी	
HOS/CDD							
DO/SF				07.10.22			
STORE: 155mm L15 A1							
DRG. NO:		F-677		REVIEW NO.:		0	
SHEET NO:		1		NO. OF SHEETS:		6	
COMPT:		FORGED BODY					

ORDNANCE FACTORY AMBAJHARI, NAGPUR

SPECIFICATION OF STEEL BILLETS
FOR 155mm L15 A1

HOS/SF

SPECN. NO.

F-677

DO/SF

SHEET NO. 2

NO.OF.SHT. 6

1. MATERIAL ANALYSIS:

1.1. MATERIAL SPECIFICATION: STA 64 OR ALTERNATE STEEL GRADE
TO 60SiCr8 OF UNI 3545:1980 STANDARD

1.2. CHEMICAL COMPOSITION (STA 64):

C%	0.6 - 0.65
Si%	1.7 - 2.00
Mn%	0.7 - 1.00
S%	0.05 MAX.
P%	0.05 MAX.
Ni%	0.3 MAX.
Cr%	0.4 - 0.6
Mo%	0.1 MAX

2.2 MECHANICAL PROPERTIES

THE TEST IS TO CONDUCTED ON BILLET FROM EACH MELT. THE SAMPLES SELECTED FROM BILLETS FOR MECHANICAL TEST IS REQUIRED TO BE HARDENED AND TAMPERED CONDITION. BILLET SAMPLE IS TO BE FORGED DOWN TO 40mm DIA AND CARRY HEAT TREATMENT OPERATION AS MENTION BELOW

IT SUGGESTED TO FOLLOW

A. 890°C(-10,+10) FOR HARDENING FOLLOWED BY OIL QUENCHING

B. 550°C-660°C FOR TEMPERING IN AIR

AFTER HEAT TREATMENT THE MECHANICAL CHARACTERISTIC SHALL BE

Rp0.2 MPa	Rm MPa	ELONGATION AT BREAK	RESILIENCY IZOD J
770	950	8% min	8
1000	1150		30

2.3 MICROGRAPHIC ANALYSIS

2.3.1 The Test Sample must inherently be fine grain with a grain size (after hardened and temp) of 5-8 ASTM.(Test as per ASTM E 112 or approved equivalent).

2.4 MANUFACTURING PROCESS.

2.4.1 Steel is to be manufactured through EAF/BOF-LRF-VAD/VD-LFVD Bottom poured ingot casting route. The reduction ratio should be at least 6:1

2.4.2 The material must be vacuum degassed and subjected to a hydrogen diffusion cycle to ensure freedom from hydrogen embrittlement and flaking. This must be stated on the release certificate. Hydrogen diffusion cycle is not required if Hydrogen level 2 PPM is achieved.

ORDNANCE FACTORY AMBAJHARI, NAGPUR	HOS/SF	SPECN. NO. F-677
SPECIFICATION OF STEEL BILLETS FOR 155mm L15 A1	DO/SF <i>Deep</i>	SHEET NO. 3
		NO.OF.SHT. 6

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

2.4.4 Material must be supplied in the annealed condition.

2.4.5 Hydrogen Diffusion cycle is mentioned below:

a. Charge the material into furnace which shall be below 55°C

b. Heat at 50°C/h to 300°C±15°C.

c. Soak the material at the temperature for 60min ±15min

d. Heat to 640°C±20°C/10°C

e. Soak at this temperature for 30h±5h.

f. Switch off furnace and cool in furnace to 500°C±20°C

g. At 500°C the charge may be withdrawn from furnace and air cooled irrespective of environmental temperature.

Note: Variation to this method shall be negotiated and the effectiveness proven, prior to implementation at the steel manufacturer. The grain size after annealing shall be greater than ASTM1.

2.4.5 Actual rolling temperature or final furnace temperature at the discretion of the Steel Manufacturer must be recorded and supplied on demand.

2.5 PRE-PRODUCTION SAMPLE:

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

2.6 CLEANLINESS:

2.6.1 Permissible Inclusion rating :

permissible inclusion rating will be as under ;

"2/1 (Thin/Tick) as per IS: 4163-1982 for each type of inclusion A, B, C and D".

2.6.2 Macro Etch Test:

Macro Etch test to grade C1, R2 & S2 of ASTM E381-68 (Re-approved 1974).

2.6.3 Internal Defects:

The Ultrasonic testing shall be carried out in 100% Parted Billet as per Specn. IS:8791-1978: Class - A

ORDNANCE FACTORY AMBAJHARI, NAGPUR

HOS/SF

SPECN. NO.

F-677

SPECIFICATION OF STEEL BILLETS
FOR 155mm L15 A1

DO/SF

SHEET NO. 4

NO.OF.SHT. 6

3. QUALITY ASSURANCE REQUIREMENTS:

3.1 VISUAL INSPECTION:

3.1.1. 100% visual inspection of the parted billet shall be carried out to make sure that they are free from harmful seams, cracks, embedded scales and folds.

3.2 STRAIGHTNESS:

3.2.1 Maximum bow 3mm/m.

3.3. TWIST:

3.3.1. Maximum 5mm/m.

3.4. HARDNESS:

3.4.1. Hardness 240 BHN max.

3.5. SURFACE:

3.5.1. As rolled.

Depth of cracks 1mm max.

Depth of local grinding 3mm max.

3.6. DISCARD, SEGREGATION AND PIPING:

3.6.1. Adequate top and bottom discards are to be given in all cases to ensure soundness and freedom from piping and harmful segregation. This is to be proved by sulphur print, macro-etch, or other method mutually acceptable to the manufacturer, purchaser and the company. Macro sample shall be selected from billets representing top & bottom from 2 ingots per plate (i.e. 4 samples -2 top & 2 Bottom per plate)

3.6.2. Segregation tests are to be carried out according to ASTM A711-67. The maximum allowable variation between the sampled points being 10%. The first, middle and end bars of each ingots are to be sampled by cutting a slice off the bar. A Chemical Analysis at center 15% and 80% along the same diagonal are to be taken. Each of these chemical analysis are to conform to para1.2.

ORDNANCE FACTORY AMBAJHARI, NAGPUR

HOS/SF

SPECN. NO.

F-677

SPECIFICATION OF STEEL BILLETS
FOR 155mm L15 A1

DO/SF

SHEET NO. 5

NO.OF.SHT. 6

4. DELIVERY REQUIREMENTS :

4.1. SUPPLY:

4.1.1. Dimensions and Weight of each Parted Billet to be maintained as per sheet No1 of F-677

4.2. SHAPE:

4.2.1. Cold saw on both ends with cut square.
Ends to be deburred.

4.3. MARKING:

4.3.1. Each parted billet to be stamped with melt No. or melt code No. on one end. The melts are to be delivered seperated in bundles. Two tags stating melt No. and steel brand to be attached to each bundle.

4.4. COLOUR CODE:

4.4.1. 75mm to 80mm width "DARK BLUE" colour band to CODE 631 IS: 5 - 1978 is to be painted throughout the length of each billet on one side.

4.5. A cast must be delivered in its entirety before the delivery of any other cast may commence.

5. CERTIFICATES:

Certificate covering following analysis, steel melting practice and mechanical properties to be sent in triplicate to user.

5.1. Chemical Analysis Certificate:

Certificate of chemical analysis as per para 1.2

5.2. Mechanical Properties Certificate:

Mechanical Properties Certificate as per para 2.2

ORDNANCE FACTORY AMBAJHARI, NAGPUR	HOS/SF	SPECN. NO. F-677
SPECIFICATION OF STEEL BILLETS FOR 155mm L15 A1	<i>Qup</i> DO/SF	SHEET NO. 6
		NO.OF.SHT. 6

- 5.3. Grain size certificate :
A Certificate certifying grain size as specified in para 2.3.1 must be supplied.
- 5.4. Cleanliness certificate:
A certificate to certify cleanliness as specified in para 2.6.1.
- 5.5. Macro Each Certificate:
A certificate to certify Macro etch results as per para 2.6.2.
- 5.6. Annealing:
The certificate shall contain a statement to verify that this has been done.
- 5.6. Ultrasonic inspection certificate:
A certificate to certify Ultrasonic Testing as per para 2.6.3.

REV.	DATE	DESCRIPTION	SIGN

A M E N D M E N T S

ORDNANCE FACTORY AMBAJHARI

COMPILED BY : <i>SD-07/10/22</i>	SPECIFICATION OF STEEL BILLET	SPECN. NO.:	F-677
CHECKED BY :		SHEET NO.-	6
JWM/CDO		NO.OF SHEETS -	6
APPROVED <i>Qup</i> DO/SF <i>07/10/22</i>	STORE 155mm L15 A1	COMPT.	FORGED BODY