



BHARAT HEAVY ELECTRICALS LIMITED

HEEP HARIDWAR INDIA-PIN 249403

FAX NO: 0091 1334 226462

PHONE NO: 0091 1334 285462



REQUIREMENT OF FORGING; GRADE: TI6AL4V

The Heavy Electricals Equipment Plant (HEEP) located in Haridwar, India is one of the major manufacturing plants of Bharat Heavy Electricals Ltd. The core business of HEEP includes design and manufacture of large steam and gas turbines, turbo generators, Defense Items and so on.

Details of items as below:

SI. NO.	MAT CODE	ITEM DISCREPTION	LOT NO.	Quantity (NOS.)	The Delivery Schedule
1	W93078299155	FORGING AS PER DRAWING 2-78299-51590(OTO FORGING DRG. NO.1576-99-159 SIZE: P/N 157699159 GRADE: TI6AL4V	1 st	92	MAY 2024
			2 nd	110	JUNE 2025
			3 rd	88	MAY 2026

SPECIAL INSTRUCTIONS:

1. ALL VENDORS TO PROVIDE POINT WISE REPLY/CONFIRMATION ALONG WITH RELEVANT SUPPORTING DOCUMENTS TO EACH AND EVERY POINT OF **PRE-QUALIFICATION REQUIREMENT/PQR** FOR ALL ENQUIRY ITEMS. NONCOMPLIANCE OF THESE MAY LEAD TO REJECTION OF OFFER AS THESE ARE ESSENTIAL CONDITION FOR PARTICIPATING IN TENDER ENQUIRY.
2. KINDLY UPLOAD/ATTACH THE SPECIFICATION DETAILS/ CATALOGUE OF OFFERED ITEMS.
3. KINDLY ARRANGE TO SUBMIT TECHNO-COMMERCIAL CHECKLIST ALONG WITH YOUR OFFER.
4. VENDOR TO PROVIDE MATERIAL & DIMENSIONAL TEST CERTIFICATES AS PER ENQUIRY.
5. VENDOR TO PROVIDE CERTIFICATE OF CONFORMANCE ALONG WITH MATERIAL DISPATCH.
6. VENDOR TO PROVIDE NON-REMOVABLE IDENTIFICATION OF ALL ITEMS AND THEIR REPORT ACCORDINGLY.

QUALIFYING CONDITIONS FOR TITANIUM FORGING (Grade- Ti6AL4V).

SL.NO	Part no	Material code	Description
1	157699159	W93078299155	FORGING AS PER DRAWING 2-78299-51590 (OTO FORGING DRG. NO.1576-99-159 SIZE: P/N 157699159 GRADE: Ti6AL4V)
2	157699158	W93078299163	FORGING AS PER DRAWING 2-78299-51580 (OTO FORGING DRG. NO. 1576-99-158) SIZE: P/N 157699158 GRADE: Ti6AL4V

Sl.	PQR Requirement	Action	Vendor Response (Yes / No / Enclosed)
1.	who can manufacture or supply TITANIUM FORGING (GRADE: Ti6AL4V) as per drawing 27829951590 & 27829951580 and specification MIL-T-9047/AMS4928/AMS4930	Vendor to specify material grade and specification	
2.	who has read and understood the technical requirements, dimensional aspects, delivery conditions etc. of forging drawings 27829951590 & 27829951580 and specification MIL-T-9047/AMS4928/AMS4930	Vendor to confirm	
3.	Who can provide Material Test Certificate (MTC) from NABL certified / Govt. approved Labs / OEM certified lab.	Vendor to confirm	
4.	Who can provide Certificate of Conformance (COC) (<i>also known as Certificate of Conformity or Certificate of Compliance</i>)	Vendor to confirm	

TECHNICAL PARAMETERS CHECK LIST
DATA VALUES TO BE FILLED AND CONFIRMED BY VENDOR

NOTE: Vendor to input parameters based on the specification of the quoted item.

SN.	PARAMETERS	VALUES	VALUES	UNIT	RESPONSE TYPE	VENDOR RESPONSE
1	MATERIAL CODE	W93078299155	W93078299163	-	-	-
2	MATERIAL SPECIFICATION	MIL-T-9047/ AMS4928 / AMS4930	MIL-T-9047/ AMS4928 / AMS4930	-	Specify Spec. →	
3	MATERIAL GRADE	Ti6AL4V	Ti6AL4V	-	To confirm →	
4	SUPPLY CONDITION	DESCALED AND HEAT TREATED	DESCALED AND HEAT TREATED	-	Input Value →	
5	SHAPE AND SIZE	AS PER DRAWING	AS PER DRAWING	-	To confirm →	
6	CHEMICAL PROPERTIES	AS PER SPECIFICATION MIL-T-9047/ AMS4928/ AMS4930	AS PER SPECIFICATION MIL-T-9047/ AMS4928/ AMS4930	-	To confirm →	
7	MECHANICAL PROPERTIES	AS PER SPECIFICATION MIL-T-9047/ AMS4928/ AMS4930	AS PER SPECIFICATION MIL-T-9047/ AMS4928/ AMS4930	Y	To confirm →	
8	TESTING	AS PER GOVERNING STANDARD	AS PER GOVERNING STANDARD	Y	To confirm →	
9	CERTIFICATION	Certificate of Conformance / Compliance (COC)	Certificate of Conformance / Compliance (COC)	Y	confirm to supply →	
10	VENDOR REMARKS					

Technical drawing of a mechanical part, showing three views: front, side, and top. The drawing includes dimensions and tolerances.

Front View (Top Left):

- Overall width: 130,5
- Overall height: 115,5
- Top flange width: 25,75
- Top flange height: 25,75
- Top flange radius: R.5
- Top flange angle: 15°
- Top flange thickness: 6
- Top flange fillet: R.8
- Top flange fillet: R.5
- Top flange fillet: R.5

Side View (Top Right):

- Overall width: 130,5
- Overall height: 115,5
- Top flange width: 25,75
- Top flange height: 25,75
- Top flange radius: R.5
- Top flange angle: 15°
- Top flange thickness: 6
- Top flange fillet: R.8
- Top flange fillet: R.5
- Top flange fillet: R.5

Top View (Bottom Left):

- Overall width: 130,5
- Overall height: 115,5
- Top flange width: 25,75
- Top flange height: 25,75
- Top flange radius: R.5
- Top flange angle: 15°
- Top flange thickness: 6
- Top flange fillet: R.8
- Top flange fillet: R.5
- Top flange fillet: R.5

Technical Drawing Table:

No. PART.	CARRELLO STAMPATO	No. PEZZI	Ti6AL4V	MATERIALE	TRATTAMENTO	PROTEZIONE	NORMALE
	SOSTITUITO DA	SOSTITUISCE IL	GREZZO Kg	FINITO Kg			
INDICE E DESCRIZIONE DELLE MODIFICHE							
1							
2							
3							
4							
5							
6							
7							
8							

Stamping Symbol:

STAMPATO

Scale and Drawing Information:

SCALA: 1/1

ORIGINE: 1576-23-126

TAVOLA:

1576-99-159-00

Company Information:

S. p. A. OTO-MELARA LA SPEZIA

TITOLO: (COSTR. 76V) CARRELLO

A TERMINI DI LEGGE È VIETATO RIPRODURRE O COMUNICARE A TERZI IL CONTENUTO DEL PRESENTE DISEGNO

NOTES :-

1. MATERIAL SPECIFICATION Ti6 AL-4V.
AS PER AMS 4930

PROPRIETARY DATA

THIS DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT IS TO BE USED ONLY FOR THE PURPOSES AUTHORIZED BY THE COMPANY. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF BHARAT HEAVY ELECTRICALS LIMITED. THE TECHNICAL DATA CONTAINED HEREIN IS RESTRICTED AS TO USE, DISCLOSURE, AND REPRODUCTION AS PER TERMS AND CONDITIONS OF THE SAID AGREEMENT.

01		TROLLEY		W93078299155		2100	
00 REMARKS		ITEM NO.		DRAWING NO.		UNIT WEIGHT	
CARD TYPE 3		28		28 - CARD TYPE-1		28 - CARD TYPE-2	
NO./GR. SP. NO.		STATUS OF ORG.		TYPE OF PRODUCT OR NAME OF CUSTOMER / PROJECT		76/ 62 SRGM	
NAME		SIGN		DATE		NO. OF VAR	
SRM		RMH		2/2/75		14.75	
DEPT. DFP		SCALE		WEIGHT (kg)		REF. TO ASSY. DRG.	
CODE 6580		1:1		2.00		ITEM NO.	
TITLE		DRAWING NO.		SHEET NO. 01		NO. OF SHEETS 01	
TROLLEY (FORGING)		2-78299-51590					
						SIZE A3	

TOLERANCES	CASTING TOLERANCES	FORMING TOLERANCES	OTHER TOLERANCES
LINEAR DIMENSIONS UP TO 100 mm	LINEAR DIMENSIONS UP TO 100 mm	LINEAR DIMENSIONS UP TO 100 mm	OTHER TOLERANCES
± 0.15 mm	± 0.15 mm	± 0.15 mm	OTHER TOLERANCES
± 0.25 mm	± 0.25 mm	± 0.25 mm	OTHER TOLERANCES
± 0.50 mm	± 0.50 mm	± 0.50 mm	OTHER TOLERANCES
± 1.00 mm	± 1.00 mm	± 1.00 mm	OTHER TOLERANCES
± 1.50 mm	± 1.50 mm	± 1.50 mm	OTHER TOLERANCES
± 2.00 mm	± 2.00 mm	± 2.00 mm	OTHER TOLERANCES
± 2.50 mm	± 2.50 mm	± 2.50 mm	OTHER TOLERANCES
± 3.00 mm	± 3.00 mm	± 3.00 mm	OTHER TOLERANCES
± 3.50 mm	± 3.50 mm	± 3.50 mm	OTHER TOLERANCES
± 4.00 mm	± 4.00 mm	± 4.00 mm	OTHER TOLERANCES
± 4.50 mm	± 4.50 mm	± 4.50 mm	OTHER TOLERANCES
± 5.00 mm	± 5.00 mm	± 5.00 mm	OTHER TOLERANCES
± 5.50 mm	± 5.50 mm	± 5.50 mm	OTHER TOLERANCES
± 6.00 mm	± 6.00 mm	± 6.00 mm	OTHER TOLERANCES
± 6.50 mm	± 6.50 mm	± 6.50 mm	OTHER TOLERANCES
± 7.00 mm	± 7.00 mm	± 7.00 mm	OTHER TOLERANCES
± 7.50 mm	± 7.50 mm	± 7.50 mm	OTHER TOLERANCES
± 8.00 mm	± 8.00 mm	± 8.00 mm	OTHER TOLERANCES
± 8.50 mm	± 8.50 mm	± 8.50 mm	OTHER TOLERANCES
± 9.00 mm	± 9.00 mm	± 9.00 mm	OTHER TOLERANCES
± 9.50 mm	± 9.50 mm	± 9.50 mm	OTHER TOLERANCES
± 10.00 mm	± 10.00 mm	± 10.00 mm	OTHER TOLERANCES
± 10.50 mm	± 10.50 mm	± 10.50 mm	OTHER TOLERANCES
± 11.00 mm	± 11.00 mm	± 11.00 mm	OTHER TOLERANCES
± 11.50 mm	± 11.50 mm	± 11.50 mm	OTHER TOLERANCES
± 12.00 mm	± 12.00 mm	± 12.00 mm	OTHER TOLERANCES
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± 14.00 mm	± 14.00 mm	± 14.00 mm	OTHER TOLERANCES
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± 15.00 mm	± 15.00 mm	± 15.00 mm	OTHER TOLERANCES
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± 22.00 mm	± 22.00 mm	± 22.00 mm	OTHER TOLERANCES
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± 25.00 mm	± 25.00 mm	± 25.00 mm	OTHER TOLERANCES
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± 26.00 mm	± 26.00 mm	± 26.00 mm	OTHER TOLERANCES
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± 44.00 mm	± 44.00 mm	± 44.00 mm	OTHER TOLERANCES
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± 45.00 mm	± 45.00 mm	± 45.00 mm	OTHER TOLERANCES
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± 69.00 mm	± 69.00 mm	± 69.00 mm	OTHER TOLERANCES
± 69.50 mm	± 69.50 mm	± 69.50 mm	OTHER TOLERANCES
± 70.00 mm	± 70.00 mm	± 70.00 mm	OTHER TOLERANCES
± 70.50 mm	± 70.50 mm	± 70.50 mm	OTHER TOLERANCES
± 71.00 mm	± 71.00 mm	± 71.00 mm	OTHER TOLERANCES
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± 72.00 mm	± 72.00 mm	± 72.00 mm	OTHER TOLERANCES
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± 73.00 mm	± 73.00 mm	± 73.00 mm	OTHER TOLERANCES
± 73.50 mm	± 73.50 mm	± 73.50 mm	OTHER TOLERANCES
± 74.00 mm	± 74.00 mm	± 74.00 mm	OTHER TOLERANCES
± 74.50 mm	± 74.50 mm	± 74.50 mm	OTHER TOLERANCES
± 75.00 mm	± 75.00 mm	± 75.00 mm	OTHER TOLERANCES
± 75.50 mm	± 75.50 mm	± 75.50 mm	OTHER TOLERANCES
± 76.00 mm	± 76.00 mm	± 76.00 mm	OTHER TOLERANCES
± 76.50 mm	± 76.50 mm	± 76.50 mm	OTHER TOLERANCES
± 77.00 mm	± 77.00 mm	± 77.00 mm	OTHER TOLERANCES
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± 79.00 mm	± 79.00 mm	± 79.00 mm	OTHER TOLERANCES
± 79.50 mm	± 79.50 mm	± 79.50 mm	OTHER TOLERANCES
± 80.00 mm	± 80.00 mm	± 80.00 mm	OTHER TOLERANCES
± 80.50 mm	± 80.50 mm	± 80.50 mm	OTHER TOLERANCES
± 81.00 mm	± 81.00 mm	± 81.00 mm	OTHER TOLERANCES
± 81.50 mm	± 81.50 mm	± 81.50 mm	OTHER TOLERANCES
± 82.00 mm	± 82.00 mm	± 82.00 mm	OTHER TOLERANCES
± 82.50 mm	± 82.50 mm	± 82.50 mm	OTHER TOLERANCES
± 83.00 mm	± 83.00 mm	± 83.00 mm	OTHER TOLERANCES
± 83.50 mm	± 83.50 mm	± 83.50 mm	OTHER TOLERANCES
± 84.00 mm	± 84.00 mm	± 84.00 mm	OTHER TOLERANCES
± 84.50 mm	± 84.50 mm	± 84.50 mm	OTHER TOLERANCES
± 85.00 mm	± 85.00 mm	± 85.00 mm	OTHER TOLERANCES
± 85.50 mm	± 85.50 mm	± 85.50 mm	OTHER TOLERANCES
± 86.00 mm	± 86.00 mm	± 86.00 mm	OTHER TOLERANCES
± 86.50 mm	± 86.50 mm	± 86.50 mm	OTHER TOLERANCES
± 87.00 mm	± 87.00 mm	± 87.00 mm	OTHER TOLERANCES
± 87.50 mm	± 87.50 mm	± 87.50 mm	OTHER TOLERANCES
± 88.00 mm	± 88.00 mm	± 88.00 mm	OTHER TOLERANCES
± 88.50 mm	± 88.50 mm	± 88.50 mm	OTHER TOLERANCES
± 89.00 mm	± 89.00 mm	± 89.00 mm	OTHER TOLERANCES
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± 90.00 mm	± 90.00 mm	± 90.00 mm	OTHER TOLERANCES
± 90.50 mm	± 90.50 mm	± 90.50 mm	OTHER TOLERANCES
± 91.00 mm	± 91.00 mm	± 91.00 mm	OTHER TOLERANCES
± 91.50 mm	± 91.50 mm	± 91.50 mm	OTHER TOLERANCES
± 92.00 mm	± 92.00 mm	± 92.00 mm	OTHER TOLERANCES
± 92.50 mm	± 92.50 mm	± 92.50 mm	OTHER TOLERANCES
± 93.00 mm	± 93.00 mm	± 93.00 mm	OTHER TOLERANCES
± 93.50 mm	± 93.50 mm	± 93.50 mm	OTHER TOLERANCES
± 94.00 mm	± 94.00 mm	± 94.00 mm	OTHER TOLERANCES
± 94.50 mm	± 94.50 mm	± 94.50 mm	OTHER TOLERANCES
± 95.00 mm	± 95.00 mm	± 95.00 mm	OTHER TOLERANCES
± 95.50 mm	± 95.50 mm	± 95.50 mm	OTHER TOLERANCES
± 96.00 mm	± 96.00 mm	± 96.00 mm	OTHER TOLERANCES
± 96.50 mm	± 96.50 mm	± 96.50 mm	OTHER TOLERANCES
± 97.00 mm	± 97.00 mm	± 97.00 mm	OTHER TOLERANCES
± 97.50 mm	± 97.50 mm	± 97.50 mm	OTHER TOLERANCES
± 98.00 mm	± 98.00 mm	± 98.00 mm	OTHER TOLERANCES
± 98.50 mm	± 98.50 mm	± 98.50 mm	OTHER TOLERANCES
± 99.00 mm	± 99.00 mm	± 99.00 mm	OTHER TOLERANCES
± 99.50 mm	± 99.50 mm	± 99.50 mm	OTHER TOLERANCES
± 100.00 mm	± 100.00 mm	± 100.00 mm	OTHER TOLERANCES

TECHNO-COMMERCIAL CHECKLIST

SL. NO.	TERMS & CONDITION	VENDOR CONFIRMATION /REMARKS / REPLY
TENDER DETAILS		
1	BIDDER NAME	
2	GEM BID NO	
QUALITY & TECHNICAL REMARKS		
3	VENDOR TO CONFIRM TO PROVIDE MATERIAL & DIMENSIONAL TEST CERTIFICATES AS PER ENQUIRY	
4	VENDOR TO CONFIRM TO PROVIDE CERTIFICATE OF CONFORMANCE ALONG WITH MATERIAL DISPATCH	
5	VENDOR TO CONFIRM TO PROVIDE NON-REMOVABLE IDENTIFICATION OF ALL ITEMS AND THEIR REPORT ACCORDINGLY.	
COMMERICAL REMARKS		
6	ITEM IS TO BE SUPPLIED AS PER ENQUIRY TECHNICAL SPECIFICATION/DRAWINGS	
7	VENDOR TO CONFIRM THAT DELIVERY SHALL BE IN STAGGERD MANNER AS PER BELOW: 1ST LOT: MAY 2024 2ND LOT: JUNE 2025 3RD LOT: MAY 2026	
8	KINDLY SUBMIT MAKE IN INDIA CERTIFICATE	
9	ARE YOU REGISTERED UNDER MSMED ACT-2006 AS SMALL OR MICRO (KINDLY UPLOAD UAM/UDYAM, WITH CA CERTIFICAFICATE)	
10	KINDLY SUBMIT INTEGRITY PACT	
11	KINDLY UPLOAD/ATTACH THE SPECIFICATION DETAILS/ CATALOGUE OF OFFERED ITEMS.	
12	RISK PURCHASE: IN CASE OF ABNORMAL DELAYS (BEYOND THE MAXIMUM LATE DELIVERY PERIOD AS PER LD CLAUSE) IN SUPPLIES / DEFECTIVE SUPPLIES OR NONFULFILLMENT OF ANY OTHER TERMS AND CONDITIONS GIVEN IN PURCHASE ORDER, BHEL MAY CANCEL THE PURCHASE ORDER IN FULL OR PART THEREOF, AND MAY ALSO MAKE THE PURCHASE OF SUCH MATERIAL FROM ELSEWHERE / ALTERNATIVE SOURCE AT THE RISK AND COST OF THE SUPPLIER. BHEL WILL TAKE ALL REASONABLE STEPS TO GET THE MATERIAL FROM ALTERNATE SOURCE AT OPTIMUM COST. IF BIDDER DOES NOT AGREE TO THE ABOVE RISK PURCHASE CLAUSE, BHEL RESERVES THE RIGHT TO REJECT THE OFFER. IN CASE FOR COMPELLING REASONS BHEL ACCEPTS THE OFFER WITHOUT ACCEPTANCE OF THIS CLAUSE BY THE BIDDER AND IN THE EVENTUALITY OF RISK PURCHASE, APPROPRIATE ACTION WILL BE TAKEN AS PER BHEL EXTANT RULES. THIS WILL BE WITHOUT PREJUDICE TO ANY OTHER RIGHT OF BHEL UNDER THE CONTRACT OR UNDER GENERAL LAW. IN CASE OF BREACH OF CONTRACT, WHEREVER THE VALUE OF SECURITY INSTRUMENTS LIKE PERFORMANCE BANK GUARANTEE AVAILABLE WITH BHEL AGAINST THE SAID CONTRACT IS ATLEAST 10% OF THE CONTRACT VALUE, THE SAME BE ENCASHED. IN CASE THE VALUE OF THE SECURITY INSTRUMENTS AVAILABLE IS LESS THAN 10% OF THE CONTRACT VALUE, THE BALANCE AMOUNT BE RECOVERED FROM OTHER FINANCIAL REMEDIES (I.E. AVAILABLE BILLS OF THE CONTRACTOR, RETENTION AMOUNT, ETC. WITH BHEL) OR LEGAL REMEDIES BE PURSUED.	
13	ACTION AGAINST BIDDERS / VENDOR / SUPPLIER / CONTRACTOR IN CASE OF DEFAULT: IN ORDER TO PROTECT THE COMMERCIAL INTERESTS OF BHEL, BHEL SHALL TAKE ACTION AGAINST SUPPLIES / CONTRACTORS BY WAY OF SUSPENSION OF BUSINESS DEALINGS, WHO EITHER FAIL TO PERFORM OR ARE IN DEFAULT WITHOUT ANY REASONABLE CAUSE, CAUSE LOSS OF BUSINESS/ MONEY/ REPUTATION, INDULGE IN MALPRACTICES, CHEATING, BRIBERY, FRAUD OR ANY OTHER MISCONDUCT OR FORMATION OF CARTELS SO AS TO INFLUENCE THE BIDDING PROCESS OR INFLUENCE THE PRICE ETC. SUSPENSION OF BUSINESS DEALINGS COULD BE IN THE FORM OF “HOLD” OR “BANNING” A SUPPLIER/ CONTRACTOR OR A BIDDER AND SHALL BE AS PER “GUIDELINES FOR SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS/ CONTRACTORS” AVAILABLE AT BHEL’S WEBSITE “https://www.bhel.com/guidelines-suspension-business-dealings-supplierscontractors”	
14	REST GENERAL TERMS AND CONDITIONS AS PER GEM	

MAKE IN INDIA SELF CERTIFICATION

As per Government Public procurement order no. P-45021/2/2017-BE-II dt.15.06.2017 & P45021/2/2017-PP(BE-II) dated 28.05.2018,29.5.2019, 04.6.2020 and amendment dated 16.09.2020, it is hereby certifying that we

.....
..... (supplier name) are(Class-I/Class-II)
local supplier and will meet the requirement of minimum local content of
(50%/20%) as defined in public procurement order dated 04.6.2020 for material against Enquiry no.
..... Details of
location at which local value addition will be made is as follows: -

.....
.....
.....

We also understand, false declarations will be in breach of the code of integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the general financial rules along with such other actions as may be permissible under law.

Note:

As per office order P-45021/102/2019-BE-II-Part (1) (E-50310) Dated 04/03/2021, Bidders can't claim itself as "Class-I local supplier/Class-II local suppliers" by claiming the service such as transportation, insurance, installation, commissioning, training & after sales service support like AMC/CMC etc. as local value addition. Bidder offering imported product will fall under the category of Non-Local supplier.

INTEGRITY PACT**Between**

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____ (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

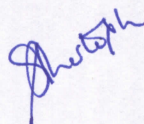
In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

- 1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -
 - 1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - 1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - 1.1.3 The Principal will exclude from the process all known prejudiced persons.
- 1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.



- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process, terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above, the Bidder(s)/ Contractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Shutosh

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

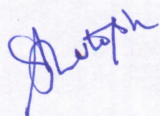
- 6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.
- 6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.
- 6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

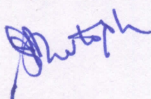
- 8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.
- 8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.
- 8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.



- 8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.
- 8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Principal should be looked into by the CVO of the Principal.
- 8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.
- 8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.
- 8.13 The word 'Monitor' would include both singular and plural.

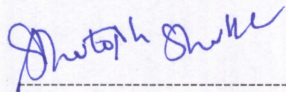
Section 9 - Pact Duration

- 9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.
- 9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.



Section 10 - Other Provisions

- 10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.
- 10.2 Changes and supplements as well as termination notices need to be made in writing.
- 10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.
- 10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.
- 10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.



For & On behalf of the Principal
(Office Seal)

Place HARIWAR
Date _____

Witness: Anupam
(Name & Address) Anupam Kaushik,
Hariwar

For & On behalf of the Bidder/ Contractor
(Office Seal)

Witness: _____
(Name & Address) _____

MIL-T-9047G
15 December 1978
SUPERSEDING
MIL-T-009047F(USA)
25 March 1971 and
MIL-T-9047E
15 June 1970

MILITARY SPECIFICATION

TITANIUM AND TITANIUM ALLOY BARS (ROLLED OR FORGED) AND REFORGING STOCK, AIRCRAFT QUALITY

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers aircraft quality, commercially pure titanium and alpha, alpha-beta and beta titanium alloy rolled or forged bar and reforging stock products.

1.2 Classification. Products shall be of the following compositions, as specified (see 6.2 and Table IX).

Commercially pure titanium

Ti-CP-70

Alpha titanium alloys

Ti-5Al-2.5Sn
Ti-5Al-2.5Sn (ELI)
6Al-2Cb-1Ta-0.8Mo
8Al-1Mo-1V

Alpha-Beta titanium alloy

Ti-3Al-2.5V
Ti-6Al-4V
Ti-6Al-4V (ELI)
Ti-6Al-6V-2Sn
Ti-6Al-2Sn-4Zr-2Mo
Ti-6Al-2Sn-4Zr-6Mo
Ti-7Al-4Mo

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Air Force Materials Laboratory, MXA, WPAFB, Ohio 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 9530

Beta titanium alloy

Ti-8Mo-8V-2Fe-3Al
Ti-11.5Mo-6Zr-4.5Sn
Ti-3Al-8V-6Cr-4Mo-4Zr
Ti-13V-11Cr-3Al

1.3 Condition.

1.3.1 Bars (see 6.1.1). Products shall be hot-worked, with or without subsequent cold finishing, and shall be supplied in one of the following heat treated conditions in accordance with Tables II, III and IV, as specified (see 6.2).

Condition A - Annealed
Condition DA - Duplex annealed.
Condition ST - Solution treated.
Condition STA - Solution treated and aged. (When multiple STA conditions are specified for a given alloy, as in Table IV, the applicable aging temperature shall be added in parenthesis as a suffix).

1.3.2 Heat treatment. Heat treatments shall be accomplished in accordance with MIL-H-81200. Requirements for heat treatments not listed in this specification shall be as agreed upon by the user and contractor or producer.

1.3.3 Reforging stock (see 6.1.2). Products shall be furnished in the condition ordered by the forging manufacturer (see 6.2).

1.4 Finish. Products shall be furnished in the following surface finishes, as ordered (see 6.2). When no surface finish is specified, Surface Finish I shall apply. When permitted by purchaser, product to be machined all over may have an oxygen rich layer, provided such layer is removable within the machining allowance for the part.

1.4.1 Surface Finish I. Ground, machined or otherwise descaled and pickled free of alpha case and other harmful surface contamination, and suitable for ultrasonic inspection.

1.4.2 Surface Finish II. Centerless ground, machined or otherwise specially prepared surface free of alpha case and other harmful surface contamination, and suitable for ultrasonic inspection by the immersion method.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-H-81200	Heat Treatment of Titanium and Titanium Alloys
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STANDARDS

FEDERAL

FED-STD-151	Metals; Test Methods
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MILITARY

MIL-STD-105	Sampling Procedures and Tables
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-163	Steel Mill Products Preparation For Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E8	Tension Testing of Metallic Materials
ASTM E120	Chemical Analysis of Titanium and Titanium-Base Alloys
ASTM E146	Chemical Analysis of Zirconium and Zirconium-Base Alloys

(Application for copies should be addressed to the American Society for Testing and Materials, 1915 Race Street, Philadelphia, PA 19103.)

MIL-T-9047G

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B46.1 Surface Texture

(Application for copies should be addressed to the American National Standards Institute, Incorporated, 1430 Broadway, New York, NY 10018.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

AMS 2241 Tolerances - Corrosion and Heat Resistant
Steel, Bar and Wire
and Titanium and Titanium Alloy Bars and
Wire

AMS 2249 Chemical Check Analysis Limits - Titanium
and Titanium Alloys

AMS 2631 Ultrasonic Inspection of Titanium Alloys

AMS 2643 Structural Examination of Titanium Alloys,
Chemical Etch, Inspection Procedure

ARP 982 Minimizing Stress-Corrosion in Wrought
Titanium Alloy Products

(Application for copies should be addressed to the Society of Automotive Engineers, Incorporated, 400 Commonwealth Drive, Warrendale, PA 15096.)

3. REQUIREMENTS

3.1 Material. Unless otherwise specified (see 6.2), material for products supplied in accordance with this specification shall be produced by multiple melting using consumable electrode practice. The last melting cycle shall be under vacuum.

3.2 Chemical composition. The chemical composition, as determined by heat or lot analysis, shall be as specified in Table I.

3.2.1 Check analysis. Chemical composition variations shall meet the requirements of AMS 2249.

3.3 Tensile properties.

3.3.1 Bars.

3.3.1.1 Commercially pure and alpha-titanium alloys. Tensile properties shall conform to Table II.

TABLE I. Chemical composition, percent by weight. 1/ & 2/

ELEMENTS															
Composition	Al	Sn	Zr	Cb	Ta	Mo	V	Cr	Fe 3/ 5/	C (max)	N (max)	H (max) 4/ 5/	O (max)	Cu or Si as noted	Total Other Elements (max) 5/
COMMERCIALLY PURE TITANIUM															
CP-70	-	-	-	-	-	-	-	-	0.50	0.08	0.05	0.0125	0.40	-	0.30
ALPHA TITANIUM ALLOY															
3Al-2.5V	2.50 -3.50	-	-	-	-	-	2.00 -3.00	-	0.30	0.05	0.02	0.015	0.12	-	0.40
5Al-2.5Sn	4.50 -5.75	2.00 -3.00	-	-	-	-	-	-	0.50	0.08	0.05	0.020	0.20	-	0.40
5Al-2.5Sn (ELI)	4.50 -5.75	2.00 -3.00	-	-	-	-	-	-	0.25 6/	0.05	0.035	0.0125	0.12 6/	-	0.30 7/
6Al-2Cb- 1Ta-0.8Mo	5.50 -6.50	-	-	1.50 -2.50	0.50 -1.50	0.50 -1.00	-	-	0.25	0.05	0.03	0.0125	0.10	-	0.40
8Al-1Mo- 1V	7.35 8.35	-	-	-	-	0.75- 1.25	0.75- 1.25	-	0.30	0.08	0.05	0.015	0.15	-	0.40

TABLE I. Chemical composition, percent by weight. 1/ & 2/ - (Continued)

ELEMENTS															
Composition	Al	Sn	Zr	Cb	Ta	Mo	V	Cr	Fe 3/	C (max)	N (max)	H (max) 4/	O (max)	Cu or Si as noted	Total Other Elements (max) 5/
ALPHA-BETA TITANIUM ALLOY															
6Al-4V	5.50 -6.75	-	-	-	-	-	3.50 -4.50	-	0.30	0.08	0.05	0.015	0.20	-	0.40
6Al-4V (ELI)	5.50 -6.50	-	-	-	-	-	3.50 -4.50	-	0.25	0.08	0.05	0.0125	0.13	-	0.30
6Al-6V- 2Sn	5.00 -6.00	1.50 -2.50	-	-	-	-	5.00 -6.00	-	0.35- 1.00	0.05	0.04	0.015	0.20	8/	0.30
6Al-2Sn- 4Zr-2Mo	5.50 -6.50	1.80 -2.20	3.60 -4.40	-	-	1.80 -2.20	-	-	0.25	0.05	0.04	0.015	0.15	9/	0.30
6Al-2Sn- 4Zr-6Mo	5.50 -6.50	1.75 2.25	3.60 -4.40	-	-	5.50 -6.50	-	-	0.15	0.04	0.04	0.0125	0.15	-	0.40
7Al-4Mo	6.50 -7.30	-	-	-	-	3.50 -4.50	-	-	0.30	0.10	0.05	0.013	0.20	-	0.40
BETA TITANIUM ALLOY															
8Mo-8V- 2Fe-3Al	2.60 -3.40	-	-	-	-	7.50 -8.50	7.50 -8.50	-	1.60 -2.40	0.05	0.05	0.015	0.16	-	0.40
11.5Mo-6Zr- 4.5Sn	-	3.75- 5.25	4.50 -7.50	-	-	10.00 -13.00	-	-	0.35	0.10	0.05	0.020	0.18	-	0.40
3Al-8V-6 Cr-4Mo-4Zr	3.00 -4.00	-	3.50 -4.50	-	-	3.50 -4.50	7.50 -8.50	5.50 -6.50	0.30	0.05	0.03	0.020	0.12	-	0.40
13V-11Cr 3Al	2.50 -3.50	-	-	-	-	-	12.50 -14.50	10.00 -12.00	0.35 max.	0.05	0.05	0.025	0.17	-	0.40

TABLE I. Chemical composition, percent by weight. - Continued

NOTES:

- 1/ Balance is titanium.
- 2/ Yttrium shall not exceed 0.005 (50 ppm).
- 3/ Maximum, unless otherwise specified.
- 4/ Hydrogen shall be determined on each lot of the product as shipped.
- 5/ Need not be determined. Material shall meet this requirement when analyzed. Unless otherwise noted, other elements each shall be 0.10 percent maximum.
- 6/ Iron plus oxygen shall not exceed 0.32 percent.
- 7/ Other elements each shall be 0.05 percent maximum.
- 8/ 0.35 - 1.00 Cu.
- 9/ 0.13 (max) Si

TABLE II. Commercially pure and alpha titanium minimum tensile properties.

Alloy	Thickness, Diameter or Distance Be- tween Flats Inch $\frac{3}{4}$ (mm)	MINIMUM TENSILE PROPERTIES $\frac{1}{4}$			
		Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D $\frac{4}{4}$	Reduction of area Percent $\frac{4}{4}$
COMMERCIALLY PURE TITANIUM					
CP-70	4.00 & under (101.60 & under)	80 (551)	70 (482)	15	30
ALPHA TITANIUM ALLOYS					
5Al-2.5Sn	4.00 & under (101.60 & under)	115 (792)	110 (758)	10 [8]	25 [20]
5Al-2.5Sn (ELI)	3.00 & under (76.20 & under)	100 (689)	90 (620)	10 [8]	25 [20]
	3.00 to 4.00 (76.20 to 101.60)	100 (689)	90 (620)	10 [8]	20 [15]
6Al-2Cb- 1Ta-0.8Mo	4.00 & under (101.60 & under)	103 (710)	95 (655)	10 [8]	20 [15]
8Al-1Mo-1V $\frac{5}{4}$	2.50 & under (63.50 & under)	130 (896)	120 (827)	10	20
	2.50 to 4.00 (63.50 to 101.60)	120 (827)	110 (758)	10 [8]	20 [15]

$\frac{1}{4}$ Apply to products with a cross-sectional area of 16 sq.in. or less. Properties apply in any grain direction.

$\frac{2}{4}$ Unless otherwise noted, properties apply to the annealed condition.

$\frac{3}{4}$ Thickness given as X.XXX to X.XXX shall be read as "Over--to--", inclusive."

$\frac{4}{4}$ Values in brackets [] apply to the short transverse direction for short transverse dimensions of 3.0 inches or greater.

$\frac{5}{4}$ Duplex Annealed (Condition DA) only.

3.3.1.2 Alpha-beta titanium alloys. Tensile properties shall conform to Table III for the condition ordered. If requested, the products shall have the following heat treat response: Products supplied in the annealed condition shall meet the solution treated and aged (STA) properties specified in Table III when heat treated to this condition in accordance with MIL-H-81200, except that composition 6Al-2Sn-4Zr-2Mo shall meet the duplex annealed (DA) properties specified in Table III when heat treated to this condition in accordance with MIL-H-81200.

3.3.1.3 Beta titanium alloys. Tensile properties shall conform to Table IV for the condition ordered. In addition, the products shall have the following heat treat response: Products supplied in the solution treated (ST) condition shall meet the solution treated and aged (STA) properties specified in Table IV when aged to this condition in accordance with MIL-H-81200.

3.3.2 Reforging stock. Tensile properties shall be as ordered by the forging manufacturer (see 6.2).

3.4 Heat treatment. Products supplied in accordance with this specification shall be heat treated in accordance with MIL-H-81200.

3.5 Ultrasonic quality.

3.5.1 Commercially pure, alpha and alpha-beta titanium products. The ultrasonic quality of products 0.500 inch or greater in diameter, thickness or distance between flats shall conform to Table V, as applicable.

3.5.1.1 In addition to meeting the requirements of Table V, products furnished with Surface Finish I shall be capable of meeting the requirements specified herein for Surface Finish II when surface finished in accordance with 1.4.2.

3.5.2 Beta titanium alloy products. When specified (see 6.2), the ultrasonic quality of beta titanium alloy products shall be as agreed upon by the procuring activity and producer.

3.6 Microstructure. Bars shall have a uniform and sound wrought metal structure throughout the entire product and, in addition, the non-beta titanium products other than 6Al-2Cb-1Ta-0.8Mo shall have a microstructure essentially free of prior beta grain boundaries or other evidence of processing above the beta transus. Unless the products show definite non-conformance to these requirements or to micrograph standards agreed upon by the procuring activity and the producer, microstructure shall not be cause for rejection.

TABLE III. Alpha-Beta titanium alloys minimum tensile properties.

Alloy	Condition	Thickness Diameter or Distance Be- tween Flats Inch (mm) $\frac{2}{\text{---}}$	Width (In.) or Cross-Sect. Area Sq. In. $\frac{4}{10^{-4}}$ ($\text{m}^2 \times 10^{-4}$) $\frac{2}{\text{---}}$	MINIMUM TENSILE PROPERTIES 1/			
				Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D $\frac{3}{\text{---}}$	Reduction of Area, Percent $\frac{3}{\text{---}}$
6Al-4V	A	4.00 & under (101.50 & under)	48 max. (309.70)	130 (896)	120 (827)	10	25
		4.00 - 6.00 (101.40 - 152.40)		130 (896)	120 (827)	10 [8]	20 [15]
	STA (Rounds, Squares, Hexagons)	Not Applicable	0.500 & under (12.70 & under)	165 (1137)	155 (1068)	10	20
			0.500 - 1.00 (12.70 - 25.40)	160 (1103)	150 (1034)	10	20
			1.00 - 1.50 (25.40 - 38.10)	155 (1068)	145 (999)	10	20
			1.50 - 2.00 (38.10 - 50.40)	150 (1034)	140 (965)	10	20
			2.00 - 3.00 (50.80 - 76.20)	140 (965)	130 (896)	10	20
			0.500 & under (12.70 & under)	150 (1103)	160 (1034)	10	25
			0.500 - 1.000 (12.70 - 25.40)	155 (1068)	145 (999)	10	20
			1.00 - 1.50 (25.40 - 38.10)	150 (1034)	140 (965)	10	20
STA Rectangles)	1.00 - 1.50 (25.40 - 38.10)	150 (1034)	140 (965)	10	20		
		145 (999)	135 (930)	10	20		

TABLE III. Alpha-Beta titanium alloys minimum tensile properties. - Continued

Alloy	Condition	Thickness Diameter or Distance Be- tween Flats In. $\frac{2}{\text{---}}$ (mm)	Width (In.) or Cross-Sect. Area Sq. In. $\frac{2}{\text{---}}$ ($\text{mm}^2 \times 10^{-4}$)	MINIMUM TENSILE PROPERTIES 1/			
				Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D $\frac{3}{\text{---}}$	Reduction of Area, Percent $\frac{3}{\text{---}}$
6Al-4V	STA (Rectangles)	1.500 - 2.000 (38.10 - 50.80)	2.00 - 4.00 (12.90 - 25.81)	145 (999)	135 (930)	10	20
			4.00 - 8.00 (25.81 - 51.62)	140 (965)	130 (896)	10	20
		2.000 - 3.000 (50.80 - 76.20)	3.00 - 8.00 (19.36 - 51.62)	135 (930)	125 (861)	10	20
6Al-4V (ELI)	A	3.000 - 4.000 (76.20 - 101.60)	4.00 - 8.00 (25.81 - 51.62)	130 (896)	120 (827)	8 [6]	15 [10]
		1.50 & under (42.60 & under)	16 max. (103.23 max.)	130 (896)	120 (827)	10	25
		1.50 - 3.00 (38.10 - 76.20)		125 (861)	115 (793)	10	20
3Al-2.5V	A	1.00 & under (25.40 & under)	Not Applicable	90 (620)	75 (517)	15	30
6Al-6V- 2Sn	A	1.50 & under (42.60 & under)	32 max. (204.46 max.)	148 (1020)	137 $\frac{4}{\text{---}}$ (944)	10	20
		1.50 - 3.00 (38.10 - 76.20)		143 (986)	131 $\frac{4}{\text{---}}$ (903)	10	20
		3.00 - 4.00 (76.20 - 101.60)		137 (944)	129 $\frac{4}{\text{---}}$ (889)	10 [8]	20 [15]

TABLE III. Alpha-Beta titanium alloys minimum tensile properties. - Continued

Alloy	Condition	Thickness or Diameter or Distance Between Flats In. (mm) 2/	Width (In.) or Cross-Sect. Area Sq. In. 10 ⁻⁴ (mm ² X 10 ⁻⁴) 2/	MINIMUM TENSILE PROPERTIES 1/			
				Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D 3/	Reduction of Area, Percent 3/
6Al-6V-2Sn	STA	1.00 & under (42.40 & under)	32 max. (206.46 max.)	175 (1206)	160 (1103)	8	20
		1.00 - 2.00 (25.40 - 50.80)		170 (1172)	155 (1068)	8	20
		2.00 - 3.00 (50.80 - 76.20)		155 (1068)	145 (999)	8	20
		3.00 - 4.00 (76.20 - 101.60)		150 (1034)	140 (965)	8 [6]	20 [15]
6Al-2Sn-4Zr-2Mo	DA	3.00 & under (76.20 & under)	10 max. (64.52 max.)	130 (896)	120 (827)	10	25
	DA	2.00 & under (50.80 & under)	32 max. (206.46 max.)	160 (1103)	150 (1034)	10	25
		2.00 - 4.00 (50.80 - 101.60)		150 (1034)	140 (965)	8 [6]	20 [15]
7Al-4Mo	STA	2.50 & under (63.50 & under)	32 max. (206.46 max.)	170 (1172)	160 (1103)	10	20
		2.50 - 3.00 (63.50 - 76.20)		165 (1138)	155 (1068)	8 [6]	15 [12]
		3.00 - 4.00 (76.20 - 101.60)		160 (1103)	150 (1034)	8 [6]	15 [12]
	A	1.00 & under (25.40 & under)	48 max. (309.70 max.)	145 (999)	135 (930)	10	20
		1.00 - 2.00 (25.40 - 50.80)		140 (965)	130 (896)	10	20
		3.00 - 6.00 (76.20 - 152.40)		140 (965)	130 (896)	10 [8]	20 [15]

TABLE III. Alpha-Beta titanium alloys minimum tensile properties. - Continued

Alloy	Condition	Thickness or Diameter or Distance Between Flats In. (mm) 2/	Width (In.) or Cross-Sect. Area Sq. In. $\cdot 10^{-4}$ ($\text{m}^2 \times 10^{-4}$)	MINIMUM TENSILE PROPERTIES 1/		
				Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D 3/
7Al-4Mo	STA	1.00 & under (25.40 & under) 1.00 - 2.00 (25.40 - 50.80) 2.00 - 4.00 (50.80 - 101.60)	48 max. (309.70 max.)	170 (1172)	160 (1103)	8
				160 (1103)	150 (1034)	8
				150 (1034)	140 (965)	8 [6]
						15 [12]

1/ Unless otherwise noted, properties apply in any grain direction.

2/ Thicknesses given as X.XXX - X.XXX shall be read as "Over--to--inches, inclusive".

3/ Values in brackets [] apply to the short transverse direction for short transverse dimensions of 3.0 inches or greater.

4/ Maximum yield strength shall not exceed the minimum yield strength by more than 25 ksi.

TABLE IV. Beta titanium alloys minimum tensile properties.

Alloy	Condition	Thickness, Diameter or Distance Be- tween Flats 1/ Inches (mm)	MINIMUM TENSILE PROPERTIES 2/			
			Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D 3/	Reduction of Area, Percent 3/
8Mo-8V- 2Fe-3Al	ST	2.00 & under (50.80 & under)	130 (896)	120 (827)	10	24
		2.00 - 4.00 (50.80 - 101.60)	125 (861)	120 (827)	8 [6]	16 [12]
11.5Mo- 6Zr-4.5Sn	STA	2.00 & under (50.80 & under)	180 (1241)	170 (1172)	8	16
		2.00 - 4.00 (50.80 - 101.60)	180 (1241)	170 (1172)	6 [4]	12 [10]
	ST	1.625 & under (41.27 & under)	110 (756)	90 (620)	15	50
		1.625 - 3.00 (41.27 - 76.20)	100 (689)	90 (620)	15	50
3Al-8V- 6Cr-4Mo- 4Zr		3.00 - 4.00 (76.20 - 101.60)	100 (689)	90 (620)	10	35
	STA 1075F	3.00 & under (76.20 & under)	135 (930)	130 (896)	12	40
	STA 925F	1.625 & under (41.27 & under)	180 (1241)	175 (1206)	8	22
		1.625 - 3.00 (41.27 - 76.20)	180 (1241)	175 (1206)	6	10
3Al-8V- 6Cr-4Mo- 4Zr	ST	1.50 & under (38.10 & under)	125 (861)	120 (827)	10	30
		1.50 - 4.00 (38.10 - 101.60)	120 (827)	115 (793)	10 [8]	25 [20]

TABLE IV. Beta titanium alloys minimum tensile properties. - Continued

Alloy	Condition	Thickness, Diameter or Distance Be- tween Flats <u>1/</u> Inches (mm)	MINIMUM TENSILE PROPERTIES <u>2/</u>			Reduction of Area, Percent <u>3/</u>
			Tensile Strength ksi (MPa)	Yield Strength at 0.2 Percent Offset ksi (MPa)	Elongation Percent in 4D <u>3/</u>	
3Al-8V- 6Cr-4Mo- 4Zr	STA	1.50 & under (38.10 & under)	190 (1310)	180 (1241)	8	15
		1.50 - 3.00 (38.10 - 76.20)	180 (1241)	170 (1172)	8 [6]	15 [5]
		3.00 - 4.00 (76.20 - 101.60)	170 (1172)	160 (1103)	8 [3]	15 [5]
13V-11Cr- 3Al	ST	7.00 & under (177.80 & under)	125 (861)	120 (827)	10	25
	STA	4.00 & under (101.60 & under)	170 (1172)	160 (1103)	6 [2]	10 [5]

1/ Thicknesses given as X.XXX - X.XXX shall be read as "over---to---inches, inclusive".

2/ Apply to products with a cross-sectional area of 16 square inches or less. Unless otherwise noted, properties apply in any grain direction.

3/ Value in brackets [] apply to short transverse direction for products with a short transverse dimension of 3.000 inches or greater.

TABLE V. Minimum ultrasonic quality levels.

Product Thickness, Diameter or Distance Between Flats Inches (Millimeters) <u>2/</u>	Ultrasonic Classification <u>1/</u>	
	Surface Finish I (see 1.4 and 6.2)	Surface Finish II (see 1.4 and 6.2)
0.500 - 2.500, Incl. (12.70 - 38.10, Incl.)	A1	A
Over 1.500 - 6.000, Incl. (Over 38.10 - 152.40, Incl.)	A	A1
Over 6.000 - 14.000, Incl. (Over 152.40 - 355.60, Incl.)	B	A

1/ Acceptance classes shall be in accordance with AMS 2631 as specified for Grade 1 material.

2/ Surface area to be scanned shall be as specified in AMS 2631, except that the minimum size for round and flat-faced products shall be 0.500 inch in diameter or distance between flats.

3.6.1 Reforging stock shall have a microstructure as ordered by the forging manufacturer (see 6.2).

3.7 Dimensional tolerances.

3.7.1 Rolled Bar. Tolerances shall conform to AMS 2241.

3.7.2 Forged Bar and Reforging stock. Tolerances shall conform to Table VI.

3.8 Identification of product.

3.8.1 Bars. Each bar 0.5 inch and greater in diameter or least width of flat surface shall be marked in a row of characters recurring at intervals not greater than three feet. Marking shall include the basic number and revision letter of this specification, producer's name or trademark, mill heat or lot number, composition (1.2), heat treat condition (1.3), and finish (1.4). The characters shall be of such size and clarity as to be legible with unaided normal vision and shall be applied using a suitable marking fluid, whose residue shall contain not more than traces of halogen bearing compounds and which shall be capable of being removed in hot alkaline cleaning solution without rubbing. The markings shall have no deleterious effect on the product or the performance of parts, and shall be sufficiently stable to withstand normal handling.

3.8.1.1 Bars smaller in size than specified in 3.8.1 shall be securely bundled or containerized (crated, boxed, etc.,) for shipping. Each bundle or container shall be marked at both ends with the following identification: the number and revision letter of this specification, producer's name or trademark, heat and lot numbers, composition (1.2), heat treat condition (1.3), and finish (1.4). This identification shall be marked on the container or on durable tags securely attached to the bundle or container.

3.8.2 Reforging stock. Identification shall be as specified by the forging manufacturer (see 6.2).

3.9 Workmanship. Products shall be uniform in quality and condition, free of alpha-case and other harmful surface contamination, clean, sound, and free from foreign materials and from internal imperfections detrimental to fabrication or performance of parts.

TABLE VI. Forged bar and reforcing stock dimensional tolerances.

Size, Millimeters	Dimensional Tolerance, Inches (mm), (Except Width and Straightness) ^{1/}						Width Tolerance Millimeters
	Over	Over	Over	Over	Over	Over	
Thickness Range	0.250-1.000 (6.35-25.40) Incl.	1.000-2.000 (25.40-50.80) Incl.	2.000-4.000 (50.80-101.60) Incl.	4.000-10.000 (101.50-254.00) Incl.	10.000-12.000 (254.00-304.80) Incl.		
Width Range							
Over 1.000-2.000 (25.40-50.80) Incl.	+3/64, -0 (+1.19, -0)	+1/16, -0 (+159, -0)	-	-	-	-	+1/8, -0 (+3.17, -0)
Over 2.000-4.000 (50.80-101.60) Incl.	+1/16, -0 (+1.59, -0)	+1/4, -0 (+6.35, -0)	+1/4, -0 (+6.35, -0)	-	-	-	+1/4, -0 (+6.35, -0)
Over 4.000-6.000 (101.60-152.40) Incl.	-	+1/4, -0 (+6.35, -0)	+1/4, -0 (+6.35, -0)	+3/8, -0 (+9.53, -0)	-	-	+3/8, -0 (+9.53, -0)
Over 6.000-10.000 (152.60-254.00) Incl.	-	+3/8, -0 (+9.53, -0)	+3/8, -0 (+9.53, -0)	+3/8, -0 (+9.53, -0)	-	-	+1/2, -0 (+12.70, -0)
Over 10.000-12.000 (254.00-304.80) Incl.	-	-	+3/8, -0 (+9.53, -0)	+3/8, -0 (+9.53, -0)	+1/2, -0 (+12.70, -0)	-	+5/8, -0 (+15.87, -0)

^{1/} Straightness Tolerance: Maximum deviation from straightness (bow) up to 60 inches (1.524 X 10³ mm) in length shall not exceed 1/8-inch (3.175 mm) and for lengths greater than 60 inches (1.524 X 10³ mm) shall not exceed L/480 inch (L/1.2192 X 10⁴ mm), where "L" denotes length in inches (mm).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure products and services conform to prescribed requirements. The word "inspections" in this case refers to the inspection and tests specified in Table VII.

4.2 Lot. A lot shall consist of products of the same mill heat, size and shape processed at the same time.

4.3 Sampling.

4.3.1 Bar. Sampling shall be accomplished in accordance with Table VII.

4.3.2 Reforging Stock. Sampling shall be as specified by the forging manufacturer.

4.4 Quality conformance examination. Bar products shall be examined in accordance with the following provisions. Reforging stock shall be examined as specified by the forging manufacturer (see 6.2).

4.4.1 Visual examination. Samples selected in accordance with Table VII shall be visually examined for conformance to the surface finish (1.4), identification (3.8), and workmanship (3.9) requirements. Surface roughness measurement shall be in accordance with ANSI B46.1.

4.4.2 Metallographic examination.

4.4.2.1 Macrostructure. A specimen at least 0.5 inch long by full cross-section from each end of each sample selected in accordance with Table VII shall be macrostructurally examined for conformance to the workmanship requirements of 3.9. Unless otherwise specified or approved by the procuring activity (see 6.2), macrostructural examination shall be performed in accordance with AMS 2643.

4.4.2.2 Microstructure. In addition to the macrostructure examination required by AMS 2643, conformance to the microstructure (3.6) and workmanship (3.9), requirements shall be determined by examining at least one polished and etched specimen from each sample selected in accordance with Table VII. Examination of microstructure and for alpha-case shall be made at an approximate magnification of 250X and 100X, respectively. Other magnifications shall be used as required to ensure acceptable quality.

TABLE VII. Bar products quality conformance sampling.

Inspection or Test	Samples		
	Heat <u>1/</u>	Lot <u>2/</u>	
Visual Examination	<u>3/</u>	Random samples per MIL-STD-105, Inspection Level II, AOL of 1.5.	
Dimensional Inspection			
Chemical Analysis	Each Ingot <u>4/ 5/</u>	Random samples per MIL-STD-105, Inspection Level S-3, Acceptance No. of Zero. <u>4/</u>	
Tensile Test and Metallographic Examination	<u>3/</u>	Lot Quantity (Bars)	Sample Quantity per Lot (Random Bars)
			Tensile Tests Metallographic Examination
			2 1
			4 2
			6 3
	<u>3/</u>	1-15 16-50 51-150 151-500 Over 500	5
			8
			<u>6/</u> <u>7/</u>
Ultrasonic Inspection	<u>3/</u>	per 4.5.2	

1/ Unit of sample is ingot.

2/ Unit of sample is bar of as processed (rolled or forged and heat treated) length.

3/ Not applicable.

4/ Either heat or lot analysis is acceptable, except that hydrogen shall be determined on each lot.

5/ Complete ingot analysis shall be available to the procuring activity.

6/ Eight bars plus additional bars as required above for equivalent quantities over 500.

7/ Four bars plus additional bars as required above for equivalent quantities over 500.

4.5 Quality conformance inspection.

4.5.1 Dimensional inspection. Samples selected in accordance with Table VII for dimensional inspection shall be measured for conformance to the applicable dimensional tolerance.

4.5.2 Ultrasonic inspection. When required (see 3.5 through 3.5.2), all products 0.500 inch or greater in diameter, thickness or distance between flats shall be inspected in accordance with AMS 2631 for conformance to the applicable ultrasonic quality requirements. Ultrasonically inspected material shall be identified as agreed upon by the procuring activity and producer (see 6.2).

4.5.3 Packing. Each shipment shall be inspected for conformance to the packing and marking requirements specified in 3.8.1.1 and Section 5.

4.6 Quality conformance tests.

4.6.1 Chemical analysis. Conformance to the chemical composition requirements shall be determined either by heat or lot analysis of samples selected in accordance with Table VII using ASTM E120 methods of chemical analysis or FED-STD-151, Method 112.2 of spectrochemical analysis. Hydrogen analysis shall be in accordance with ASTM E146 and shall be determined on each lot of material as shipped. Other analytical methods may be used with the written approval of the procuring activity.

4.6.1.1 In case of dispute, the results of chemical analysis by the ASTM E120 and E146 methods shall govern.

4.6.2 Tension tests. Conformance to the tensile properties requirement shall be determined by sampling each lot in accordance with Table VII and testing tensile specimens excised from each sample in accordance with Table VIII. The products shall be tested in the heat treat condition ordered (see 6.2). If requested, alpha-beta titanium products supplied in the annealed condition (A) or duplex annealed condition (DA), as applicable, and beta titanium products supplied in the solution treated condition (ST) shall be tested for heat treat response to condition STA tensile properties, and the test results shall be reported. Tension tests shall be accomplished in accordance with ASTM E8, except that the rate of strain will be 0.003 to 0.007 inch per inch per minute through the yield strength and then is increased so as to produce failure in approximately one additional minute. In case of dispute over the tensile test results, a referee test shall be performed on a tensile machine having a strain pacer and using a strain rate of 0.005 inch per inch per minute through the yield strength and a minimum cross-head speed of 0.10 inch per minute above the yield strength.

TABLE VIII. Tension specimen requirements.

Product	Size, Inch (Millimeters)		Tension Specimen	
	Thickness, Diameter or Distance Be- tween Flats	Width	Configu- ration <u>2/</u> <u>3/</u>	Test Direction and Location
Round Square and Hexagonal Bar	0.375-1.500 Incl. (9.52-38.10) Incl.	<u>1/</u>	R1, R2 or R3	Longitudinal from center of cross section.
	Over 1.500 (Over 38.10)	<u>1/</u>	R1, R2 or R3	Longitudinal from between mid-radius and center of cross-section
Rectangu- lar Bar	0.375-0.500, Incl. (9.52-12.70 Incl.)	3.000 and under (76.20 & under)	F2 or R3	Longitudinal from center of cross- section
	Over 0.500 (Over 12.70)	Over 3.000 (Over 76.20)	R1, R2 R3	Longitudinal and transverse from between mid-radius and center of <u>4/</u> cross-section.

1/ Not applicable.

2/ R1, R2 and R3 designates specimens corresponding to round tension specimens as specified in ASTM E8 for 0.500, 0.350 and 0.250 inch nominal diameters in the reduced test section, respectively. In case of dispute, the results obtained from testing the largest possible of these three specimen sizes shall govern.

3/ F2 designates standard sheet-type specimens with a 1/2 inch width reduced test section as specified in ASTM E8 for rectangular tension specimens.

4/ Transverse specimen shall be in the short transverse dimension for products with short transverse dimension of 3.000 inches and greater.

4.7 Rejection and retests.

4.7.1 Rejection. Failure of the test samples to meet the requirements of this specification shall be cause for rejection of the represented lot, except that retesting in accordance with 4.7.2 shall be permitted in the case of non-conformance to the tensile property requirements.

4.7.2 Retests. Duplicate tensile specimens shall be tested from each failed bar in the original sampling. Retest specimens shall be taken from the area adjacent to the failed tensile specimen. Failure of any retest specimens to meet the tensile property requirements shall be cause for: (a) rejection of the sample bars represented by failed tensile specimens and (b) 100 percent tensile testing of the entire lot. Only bars which meet the requirements of this specification shall be accepted.

4.7.3 Replacement of test specimens. Replacement of test specimens for reasons other than inferior or defective material shall be in accordance with FED-STD-151.

5. PACKAGING

5.1 Application. The requirements of Section 5 apply only to direct purchases by or direct shipments to the Government.

5.2 Unless otherwise specified, products shall be separated by size, heat number and heat treat condition when packed for shipment.

5.3 Packing.

5.3.1 Level A - For domestic shipment and storage and overseas shipment. Products shall be packed in accordance with the requirements of MIL-STD-163, as referenced for stainless steel.

5.3.2 Level C - Minimum military pack (for domestic shipment) with immediate use at initial destination. Packages which require over-packing for acceptance by the carrier shall be packed in exterior-type shipping containers in a manner that will assure safe transportation at the lowest rate to the point of delivery. Container shall meet, as a minimum, the requirements of rules and regulations applicable to the mode of transportation.

5.4 Marking of shipments. In addition to any special marking required by the contract or order (see 6.2), shipping containers shall be marked in accordance with MIL-STD-129. The identification shall be composed of the following information listed in the order shown.

MIL-T-9047G

- (a) Stock No. or other identification number as specified in the purchase document 1/
- (b) TITANIUM OR TITANIUM ALLOY BAR, as applicable
- (c) Heat No. _____ Length _____ (inches)
- (d) Width (inches) Thickness or Diameter (inches)
- (e) Number and revision letter of this Specification
- (f) Composition _____
- (g) Heat Treatment Condition _____
- (h) Gross Weight _____
- (i) Manufacturer's Name or Trademark _____

1/ NOTE: The contractor shall enter the Federal Stock No. specified in the purchase document or as furnished by the procuring activity. When the Federal Stock No. is not provided or available from the procuring activity, leave space therefore and enter the Stock No. or other identification when provided by the procuring activity.

6. NOTES

6.1 Intended use.

6.1.1 Bar is a finished mill product intended for structural applications in airborne vehicles and equipment.

6.1.2 Reforging stock is a semi-finished mill product which requires further hot reduction and appropriate thermal treatment to meet the tensile properties and microstructure requirements of this specification or applicable forging specifications prior to structural use.

6.2 Ordering data. Procurement documents shall state the following as applicable:

- (a) Title, number, revision letter and amendment number (if any) of this specification.

- (b) Composition (1.2).
- (c) Heat treat condition (1.3).
- (d) Finish (1.4)
- (e) Melting practice if other than specified in 3.1.
- (f) Reforging stock tensile properties (3.3.2).
- (g) Ultrasonic quality of titanium alloys, when required (3.5.2 and 4.5.2).
- (h) Microstructure standards, when required (3.6 and 3.6.1).
- (i) Reforging stock identification (3.8.2) and sampling for quality conformance examination, inspection and tests (4.3.2).
- (j) Macrostructure examination of other than specified (4.4.2.1).
- (k) Identification of ultrasonic inspected products (4.5.2).
- (l) Packing level (5.3).

6.3 Stress corrosion. Certain processing procedures and service conditions may cause these titanium products to be subject to stress corrosion cracking. ARP 982 recommends practices to minimize the susceptibility to such stress corrosion cracking.

6.4 Cross-reference. Table IX shows the correlation between the composition classifications used in this specification and those used in earlier revisions of MIL-T-9047.

Custodians:

Air Force - 11
DSA-IS

Preparing activity:

Air Force - 11

(Project Number: 9530-0174)

Review activities:

Air Force - 99
Army - MR
Navy - AS

TABLE IX. Cross-reference composition classifications.

MIL-T-9047D	MIL-T-9047E and MIL-T-009047F	MIL-T-9047G
Type I commercially pure Ti Comp. A - unalloyed	Alpha Alloys Comp. 1 - unalloyed	Commercially Pure Ti CP-B
Type II Alpha Titanium Alloys 1/ Comp. A - 5Al-2.5Sn Comp. B - 5Al-2.5Sn (ELI) Comp. C - 5Al-5Zr-5Sn Comp. D - 8Al-1Mo-1V 1/	Alpha Alloys 1/ Comp. 2 - 5Al-2.5Sn Comp. 3 - 5Al-2.5Sn (ELI) 2/ Comp. 5 - 8Al-1Mo-1V 1/	Alpha Titanium Alloys 3Al-2.5V 5Al-2.5Sn 5Al-2.5Sn (ELI) 2/ 8Al-1Mo-1V 6Al-2Cb-1Ta-0.8Mo
Type III Alpha-Beta Ti Alloy Comp. A - 6Al-4V Comp. B - 6Al-4V (ELI) Comp. C - 6Al-6V-2Sn Comp. D - 7Al-4Mo Comp. E - 4Al-4Mn Comp. F - 5Al-1.5Fe-1.5Cr-1.5Mo Comp. G - 11Sn-5Zr-2Al-1Mo Comp. H - 4Al-3Mo-1V Comp. I - 6Al-2Sn-4Zr-2Mo 1/	Alpha-Beta Alloys Comp. 6 - 6Al-4V Comp. 7 - 6Al-4V (ELI) Comp. 8 - 6Al-6V-2Sn Comp. 9 - 7Al-4Mo 2/ 2/ Comp. 10 - 11Sn-5Zr-2Al-1Mo 2/ Comp. 11 - 6Al-2Sn-4Zr-2Mo Comp. 14 - 6Al-2Sn-4Zr-6Mo	Alpha-Beta Ti Alloys 6Al-4V 6Al-4V (ELI) 6Al-6V-2Sn 7Al-4Mo 2/ 2/ 2/ 2/ 6Al-2Sn-4Zr-2Mo 6Al-2Sn-4Zr-6Mo
Type IV Beta Ti Alloys Comp. A - 13V-11Cr-3Al 1/ 1/ 1/	Beta Alloys Comp. 12 - 13V-11Cr-3Al Comp. 13 - 11.5Mo-6Zr-4.5Sn 1/ 1/	Beta Titanium Alloys 13V-11Cr-3Al 11.5Mo-6Zr-4.5Sn 8Mo-8V-2Fe-3Al 3Al-8V-6Cr-4Mo-4Zr

INSTRUCTIONS In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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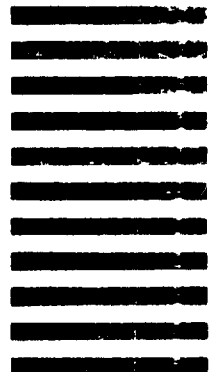
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1 DOCUMENT NUMBER

2 DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

b ADDRESS (Street, City, State, ZIP Code)

4 TYPE OF ORGANIZATION (Mark one)

☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

OTHER (Specify) _____

5 PROBLEM AREAS

a Paragraph Number and Wording

b Recommended Wording

c Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER (Last First MI) - Optional

b WORK TELEPHONE NUMBER (Include Area Code) - Optional

c MAILING ADDRESS (Street, City State ZIP Code) - Optional

8 DATE OF SUBMISSION (YYMMDD)

(TO DETACH THIS FORM, CUT ALONG THIS LINE)

1. ALL VENDORS TO PROVIDE POINT WISE REPLY/CONFIRMATION ALONG WITH RELEVANT SUPPORTING DOCUMENTS TO EACH AND EVERY POINT OF **PRE-QUALIFICATION REQUIREMENT/PQR** FOR ALL ENQUIRY ITEMS. NON-COMPLIANCE OF THESE MAY LEAD TO REJECTION OF OFFER AS THESE ARE ESSENTIAL CONDITION FOR PARTICIPATING IN TENDER ENQUIRY.
2. KINDLY UPLOAD/ATTACH THE SPECIFICATION DETAILS/ CATALOGUE OF OFFERED ITEMS.
3. KINDLY ARRANGE TO SUBMIT **TECHNO-COMMERCIAL** CHECKLIST ALONG WITH YOUR OFFER.
4. VENDOR TO PROVIDE MATERIAL & DIMENSIONAL TEST CERTIFICATES AS PER ENQUIRY.
5. VENDOR TO PROVIDE CERTIFICATE OF CONFORMANCE ALONG WITH MATERIAL DISPATCH.
6. VENDOR TO PROVIDE NON-REMOVABLE IDENTIFICATION OF ALL ITEMS AND THEIR REPORT ACCORDINGLY.
7. DELIVERY SHALL BE IN STAGGERD MANNER AS PER BELOW TABLE.

Sl. NO.	MAT CODE	ITEM DISCREPTION	LOT NO.	Quantity (NOS.)	The Delivery Schedule
1	W93078299155	FORGING AS PER DRAWING 2-78299-51590(OTO FORGING DRG. NO.1576-99-159 SIZE: P/N 157699159 GRADE: Ti6AL4V	1 st	92	MAY 2024
			2 nd	110	JUNE 2025
			3 rd	88	MAY 2026
2	W93078299163	FORGING AS PER DRAWING 2-78299-51580(OTO FORGING DRG. NO. 1576-99-158) SIZE: P/N 157699158 GRADE: Ti6AL4V	1 st	93	MAY 2024
			2 nd	110	JUNE 2025
			3 rd	88	MAY 2026

8. KINDLY ARRANGE TO SUBMIT SIGNED AND STAMPED INTEGRITY PACT.
9. KINDLY MENTION THE GEM TENDER NO IN THE EMD NARRATION/REMARKS, WHILE SUBMITTED THE EMD THROUGH NEFT/RTGS.
10. VENDORS MUST ALSO REMIT THE REQUISITE **EMD (EARNEST MONEY DEPOSIT)** AS MENTIONED IN THE BID DOCUMENTS. IF EMD IS NOT SUBMITTED BY ANY VENDOR, THEN THEIR OFFER SHALL NOT BE CONSIDERED. MSEs OR START-UPS AS RECOGNIZED BY DPIIT ARE EXEMPTED FROM SUBMISSION OF EMD.

QUANTUM OF EMD AMOUNT TO BE SUBMITTED BY BIDDER WILL BE AS PER BELOW TABLE:

Material Code	EMD Amount (INR)
W93078299155	₹ 6,00000
W93078299163	

THE EMD SHALL REMAIN VALID FOR A PERIOD OF 45 (FORTY-FIVE) DAYS BEYOND THE FINAL BID VALIDITY PERIOD.

EMD SHALL NOT CARRY ANY INTEREST.

FORFEITURE OF EMD

- I) A BIDDER'S EMD WILL BE FORFEITED IF THE BIDDER WITHDRAWS OR AMENDS ITS/HIS TENDER OR IMPAIRS OR DEROGATES FROM THE TENDER IN ANY RESPECT WITHIN THE PERIOD OF VALIDITY OF THE TENDER OR IF THE SUCCESSFUL BIDDER FAILS TO FURNISH THE REQUIRED PERFORMANCE SECURITY WITHIN THE SPECIFIED PERIOD MENTIONED IN THE TENDER.
- II) EMD BY THE TENDERER TO BE WITHHELD IN CASE ANY ACTION ON THE BIDDER IS ENVISAGED UNDER THE PROVISIONS OF EXISTANT "GUIDELINES ON SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS/ CONTRACTORS" AND FORFEITED/ RELEASED BASED ON THE ACTION AS DETERMINED UNDER THESE GUIDELINES.

11. PERFORMANCE SECURITY:

TO ENSURE DUE PERFORMANCE OF THE CONTRACT, PERFORMANCE BANK GUARANTEE (PBG) OR SECURITY DEPOSIT (SD), HEREAFTER REFERRED AS PERFORMANCE SECURITY IS TO BE OBTAINED FROM THE SUCCESSFUL BIDDER AWARDED THE CONTRACT.

TOTAL AMOUNT OF PERFORMANCE SECURITY SHALL BE **5 %** OF TOTAL PO VALUE.

PERFORMANCE SECURITY IS TO BE FURNISHED BY 14 DAYS AFTER DATE OF PO AND IT SHOULD REMAIN VALID FOR A PERIOD OF 60 DAYS BEYOND THE DATE OF COMPLETION OF ALL CONTRACTUAL OBLIGATIONS OF THE SUPPLIER, INCLUDING WARRANTY OBLIGATIONS.

PERFORMANCE SECURITY MAY BE FURNISHED IN THE FOLLOWING FORMS:

- (I) LOCAL CHEQUES OF SCHEDULED BANKS (SUBJECT TO REALIZATION)/ PAY ORDER/DEMAND DRAFT/ ELECTRONIC FUND TRANSFER IN FAVOUR OF BHEL.
- (II) BANK GUARANTEE FROM SCHEDULED BANKS / PUBLIC FINANCIAL INSTITUTIONS AS DEFINED IN THE COMPANIES ACT. THE BANK GUARANTEE FORMAT SHOULD HAVE THE APPROVAL OF BHEL.
- (III) FIXED DEPOSIT RECEIPT ISSUED BY SCHEDULED BANKS / PUBLIC FINANCIAL INSTITUTIONS AS DEFINED IN THE COMPANIES ACT (FDR SHOULD BE IN THE NAME OF THE CONTRACTOR, A/C BHEL).
- (IV) SECURITIES AVAILABLE FROM INDIAN POST OFFICES SUCH AS NATIONAL SAVINGS CERTIFICATES, KISAN VIKAS PATRAS ETC. (HELD IN THE NAME OF CONTRACTOR FURNISHING THE SECURITY AND DULY ENDORSED/ HYPOTHECATED/ PLEDGED, AS APPLICABLE, IN FAVOUR OF BHEL).
- (V) INSURANCE SURETY BOND.

(NOTE: BHEL WILL NOT BE LIABLE OR RESPONSIBLE IN ANY MANNER FOR THE COLLECTION OF INTEREST OR RENEWAL OF THE DOCUMENTS OR IN ANY OTHER MATTER CONNECTED THEREWITH) FOR E-PAYMENT, THE RTGS DETAILS ARE MENTIONED AS BELOW:

Bank Details	SWIFT Details of bank
STATE BANK OF INDIA RANIPUR BRANCH, OPP: BHEL MAIN GATE, SECTOR-5, RANIPUR, HARIDWAR, UTTRAKHAND, INDIA PIN CODE: 249403	SWIFT NO: SBININBB225 CC ACCOUNT NO :10667995458 IFSC CODE: SBIN0000586

THE PERFORMANCE SECURITY WILL BE FORFEITED AND CREDITED TO BHEL'S ACCOUNT IN THE EVENT OF A BREACH OF CONTRACT BY THE SUPPLIER. THE PERFORMANCE SECURITY SHALL NOT CARRY ANY INTEREST

12. KINDLY ARRANGE TO SUBMIT MAKE IN INDIA SELF CERTIFICATION.

13. MSE/MII: THE SUPPLIER NEEDS TO SUBMIT/UPDATE MSE/MII CREDENTIALS ON GEM PORTAL DURING PROFILE UPDATION/ OFFER SUBMISSION STAGE. THE MSE DATA SUBMITTED IS CROSS VERIFIED BY GEM WITH GOVT. OF INDIA UDYAM/NSIC DATABASE THROUGH API INTEGRATION ON REAL TIME BASIS AND FOR MII, A SELF DECLARATION IS BEING GIVEN AND AUTHENTICATED BY AADHAR OTP. IF THE SELLER FAILS TO CLAIM MSE/MII PROVISION ON GEM PORTAL AT PROFILE UPDATION/BID SUBMISSION STAGE, THE SAID SELLER WILL BECOME INELIGIBLE FOR GETTING THE MSE/MII BENEFITS FOR THAT BID AUTOMATICALLY. THE VENDOR CAN ALWAYS CONTACT THE GEM HELPDESK, IN CASE OF ANY ISSUES.

14. THE PRICE QUOTE BY BIDDER SHOULD BE INCLUSIVE OF GST & SHOULD BE ON BHEL HEEP HARIDWAR STORES BASIS.

15. BIDDER'S OFFER IS LIABLE TO BE REJECTED IF THEY DON'T UPLOAD ANY OF THE CERTIFICATES / DOCUMENTS SOUGHT IN THE BID DOCUMENT, ATC AND CORRIGENDUM IF ANY.

16. **RISK PURCHASE:** IN CASE OF ABNORMAL DELAYS (BEYOND THE MAXIMUM LATE DELIVERY PERIOD AS PER LD CLAUSE) IN SUPPLIES / DEFECTIVE SUPPLIES OR NONFULFILLMENT OF ANY OTHER TERMS AND CONDITIONS GIVEN IN PURCHASE ORDER, BHEL MAY CANCEL THE PURCHASE ORDER IN FULL OR PART THEREOF, AND MAY ALSO MAKE THE PURCHASE OF SUCH MATERIAL FROM ELSEWHERE / ALTERNATIVE SOURCE AT THE RISK AND COST OF THE SUPPLIER. BHEL WILL TAKE ALL REASONABLE STEPS TO GET THE MATERIAL FROM ALTERNATE SOURCE AT OPTIMUM COST. IF BIDDER DOES NOT AGREE TO THE ABOVE RISK PURCHASE CLAUSE, BHEL RESERVES THE RIGHT TO REJECT THE OFFER. IN CASE FOR COMPELLING REASONS BHEL ACCEPTS THE OFFER WITHOUT ACCEPTANCE OF THIS CLAUSE BY THE BIDDER AND IN THE EVENTUALITY OF RISK PURCHASE, APPROPRIATE ACTION WILL BE TAKEN AS PER BHEL EXISTANT RULES. THIS WILL BE WITHOUT PREJUDICE TO ANY OTHER RIGHT OF BHEL UNDER THE CONTRACT OR UNDER GENERAL LAW.

IN CASE OF BREACH OF CONTRACT, WHEREVER THE VALUE OF SECURITY INSTRUMENTS LIKE PERFORMANCE BANK GUARANTEE AVAILABLE WITH BHEL AGAINST THE SAID CONTRACT IS ATLEAST 10% OF THE CONTRACT VALUE, THE SAME BE ENCASHED. IN CASE THE VALUE OF THE SECURITY INSTRUMENTS AVAILABLE IS LESS THAN 10% OF THE CONTRACT VALUE, THE BALANCE AMOUNT BE RECOVERED FROM OTHER FINANCIAL REMEDIES (I.E. AVAILABLE BILLS OF THE CONTRACTOR, RETENTION AMOUNT, ETC. WITH BHEL) OR LEGAL REMEDIES BE PURSUED.

17. ACTION AGAINST BIDDERS / VENDOR / SUPPLIER / CONTRACTOR IN CASE OF DEFAULT:

IN ORDER TO PROTECT THE COMMERCIAL INTERESTS OF BHEL, BHEL SHALL TAKE ACTION AGAINST SUPPLIES / CONTRACTORS BY WAY OF SUSPENSION OF BUSINESS DEALINGS, WHO EITHER FAIL TO PERFORM OR ARE IN DEFAULT WITHOUT ANY REASONABLE CAUSE, CAUSE LOSS OF BUSINESS/ MONEY/ REPUTATION, INDULGE IN MALPRACTICES, CHEATING, BRIBERY, FRAUD OR ANY OTHER MISCONDUCT OR FORMATION OF CARTELS SO AS TO INFLUENCE THE BIDDING PROCESS OR INFLUENCE THE PRICE ETC.

SUSPENSION OF BUSINESS DEALINGS COULD BE IN THE FORM OF "HOLD" OR "BANNING" A SUPPLIER/ CONTRACTOR OR A BIDDER AND SHALL BE AS PER "GUIDELINES FOR SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS/ CONTRACTORS" AVAILABLE AT BHEL'S WEBSITE <https://www.bhel.com/guidelines-suspension-business-dealings-supplierscontractors>

18. BIDDERS ARE ADVISED TO CHECK APPLICABLE GST ON THEIR OWN BEFORE QUOTING. BUYER WILL NOT TAKE ANY RESPONSIBILITY IN THIS REGARDS. GST REIMBURSEMENT WILL BE AS PER ACTUALS

OR AS PER APPLICABLE RATES (WHICHEVER IS LOWER), SUBJECT TO THE MAXIMUM OF QUOTED GST %.

19. BIDDER SHALL SUBMIT THE FOLLOWING DOCUMENTS ALONG WITH THEIR BID FOR VENDOR CODE CREATION:

A. COPY OF PAN CARD B. COPY OF GSTIN C. COPY OF MSE CERTIFICATE

20. DEDICATED /TOLL FREE TELEPHONE NO. FOR SERVICE SUPPORT: BIDDER/OEM MUST HAVE DEDICATED/TOLL FREE TELEPHONE NO. FOR SERVICE SUPPORT.

21. DATA SHEET OF THE PRODUCT(S) OFFERED IN THE BID, ARE TO BE UPLOADED ALONG WITH THE BID DOCUMENTS. BUYERS CAN MATCH AND VERIFY THE DATA SHEET WITH THE PRODUCT SPECIFICATIONS OFFERED. IN CASE OF ANY UNEXPLAINED MISMATCH OF TECHNICAL PARAMETERS, THE BID IS LIABLE FOR REJECTION.

22. SCOPE OF SUPPLY (BID PRICE TO INCLUDE ALL COST COMPONENTS): ONLY SUPPLY OF GOODS AS PER ENQUIRY.

23. PRODUCTS SUPPLIED SHALL BE NONTOXIC AND HARMLESS TO HEALTH. IN THE CASE OF TOXIC MATERIALS, MATERIAL SAFETY DATA SHEET MAY BE FURNISHED ALONG WITH THE MATERIAL.

24. WHILE GENERATING INVOICE IN GEM PORTAL, THE SELLER MUST UPLOAD SCANNED COPY OF GST INVOICE AND THE SCREENSHOT OF GST PORTAL CONFIRMING PAYMENT OF GST.

25. PAYMENT TERMS SHALL BE AS PER FOLLOWINGS:

- a) **FOR NON-MSES BIDDER:** 100% payment along with taxes, freight & insurance will be made after receipt and acceptance of material and within 90 days from the date of invoice subject to submission of non-discrepant documents within 15 days of supply as per terms and conditions of Purchase Order (THIS IS IN SUPERSESSION OF 10 DAYS' TIME AS PROVIDED IN CLAUSE 12 OF GEM GTC).
- b) **FOR MSES BIDDER:** For MSEs (covered under MSME Act) which are registered and periodically renewed with BHEL, the payment will be made within 45 days or as prescribed in the relevant act. Benefits of MSE (such as EMD Waiver, Tender fee exemption, Price preference, Payment preference etc.) will be given only to those MSE Vendors who are manufacturers of offered items against the NIT. No MSE benefits shall be provided to Agents / Stockists /Dealers / Traders etc. for the items offered but not manufactured by themselves."
- c) **FOR MEDIUM ENTERPRISES:** 100% payment along with taxes, freight & insurance will be made after receipt and acceptance of material and within 60 days from the date of invoice subject to submission of non-discrepant documents within 15 days of supply as per terms and conditions of Purchase Order.
- d) Please note that vendor to adhere to the payment terms as per above. No deviation in payment terms shall be accepted. Vendor to submit their offer accordingly.