Sl No	Material Code.	Material Description	Spec-Var	Purch Req No.	Quantity (KG)
1	HY1070364754	FLAT 75X46-SS-H&T GR X20CR13	HY10764	5000034937	10000
2	HY1070364819	FLAT 89X55-SS-H&T GR X20CR13	HY10764	5000035003	15000
3	HY1070366080	FLAT 34X21-SS-GR X22CRMOV121	HY10766	5000035002	10000
4	HY1070366161	FLAT 41X26-SS-GR X22CRMOV121	HY10766	5000034938	10000
5	HY1070366447	FLAT 56X35-SS-GR X22CRMOV121V	HY10766	5000034939	20000
6	HY1070366510	FLAT 65X40-SS-GR X22CRMOV121	HY10766	5000035000	20000
7	TC9751863015	SS FLAT 24X13 NTPC (HY10766)	TC51863-01	5000035001	5000

SPECIAL INSTRUCTIONS - GeM

1. Material supply tolerance shall be +/- 10% of the ordered Qty.
2. Third Party Inspection is applicable. BHEL appointed TPI will inspect the enquiry items and charges to BHEL account.
3. Please follow the link >> https://dipp.gov.in/public-procurements for all circulars. Evaluation will be done accordingly.
4. All items should be dispatched to BHEL, RC Puram, Hyderabad-502032
5. Item wire evaluation will be done for arriving at lowest bids.
6. Guarantee/Warranty as per BHEL specification. Unless otherwise specified in the specification, guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply/replacement whichever is earlier
7. Technical PQC, Financial PQC shall be submitted.
8. Delivery shall be 4 months from the date of PO.
9. Quality Plan sent along with Specification shall be followed.
10. For clarifications please email us evinodkumar@bhel.in (or) bnarasimha@bhel.in (or) surendar@bhel.in
11. Quoted price shall be inclusive of all taxes.
12. 100% payment along with taxes, duties, freight & insurance will be made within 75 days from the date of LR/invoice. However payment would be done only after receipt of original documents, including GR clearance at BHEL stores. For MSEs (covered under MSME Act) which are registered and periodically renewed with BHEL, this period will be 45 days.

Supplier Declaration:

I _____(Supplier Name) declare that the above points are noted and Confirmed while submitting the quotation.

Authorized Signature & Stamp

(_____) Vendor Name

ANNEXURE - B

PRE QUALIFYING CRITERIA FOR SUPPLIERS OF BLADE FLATS OF GRADES X22 Cr Mo V 121 (HY10766) AND X 20Cr13 (HY10764)

Suppliers of the blade flats shall confirm / fulfill the following conditions:

1.0 MANUFACTURING AND TESTING FACILITIES:

The details of the manufacturing and testing facilities of the Mills / manufacturer shall be submitted in the format enclosed as Annexure-C for assessment by BHEL. The company catalogues or company's website addresses which gives complete information as required by this tender conditions can also be provided along with the offer.

Only manufacturers are permitted to quote for the present tender. No trader/intermediaries will be accepted for ordering.

2.0 FIRST PIECE QUALIFICATION / PROCESS QUALIFICATION:

Suppliers shall explicitly confirm their acceptance for the process qualification as specified in HY10766 Rev.11 & HY10764 Rev.11. However, if any of the suppliers are able to submit the evidences of their supplies of Steam turbine blade flats to M/s Siemens, Germany or already supplying blade flats to BHEL Hyderabad, they can be considered for the waiver of process qualification.
(In case of supplies made to M/s Siemens Germany, the evidences like purchase order copies and corresponding material test certificates, creep test reports as applicable, etc. shall be submitted.)

3.0 HIGH TEMPERATURE TESTS (For "process qualification" when waiver as per 2.0 above is not applicable)

AA) CREEP TESTS FOR X22 CrMoV121Material grade:

i) All the manufacturers who are required to carry out Process Qualification as per Clause 2.0 mentioned above shall explicitly confirm their acceptance for carrying out creep tests on the sample of the first lot of the blade flats of material X22 Cr Mo V 121 (HY10766) as per the following test parameters.

No. of samples to be tested	:	One
Test temperature	:	550 °C (Minimum)
Stress, Min	:	180 MPa (Minimum)
Minimum time before rupture	:	1000 hrs.

Samples for creep test will be approved by BHEL Hyderabad before carrying out creep tests. The test reports will be reviewed and the dispatch clearance for the first lot will be given only after acceptance of creep test results for the above orders by BHEL Hyderabad

ii) If the manufacturer has already tested any sample of same grade of material (utilizing same manufacturing processes and facilities by them which will be used for the supply of blade flats as per the present enquiry) for creep testing as per the above given test parameters, then the "Creep test certificate" clearly indicating the above test parameters in the test report can be submitted along with their technical offer for consideration of waivel for creep tests requirement for the present enquiry.

4.0 INSPECTION OF THE FIRST LOT OF EACH MATERIAL GRADE AND SIZE OF THE BLADE FLATS where process qualification is applicable:

Inspection of the first lot of each material grade and size will be carried out in the presence of BHEL Hyderabad representative / TPIA as per order conditions. A QAP shall be submitted along with the technical offer for review and acceptance by BHEL.

(The QAP as given in BHEL specifications is not applicable for the present tender for the suppliers who are required to undergo process qualification and creep tests as per Clause no. 2.0 & 3.0 above).

5.0 PAST EXPERIENCE:

i) The manufacturers who are having experience of manufacturing and supplying blade flats for OEMs of steam turbines (including BHEL and Siemens Germany) will be considered for the present enquiry subjected to the fulfiment of requirements mentioned against Clause 2.0 and 3.0.

ii) The vendor shall submit at least one reference including unpriced PO copy and manufacturer's test certificates as evidences for any of the size range mentioned in the items of this enquiry with minimum quantity of 2000 Kg. Reference PO shall not be more than five years old from the date of enquiry.

(The vendors who has supplied blade flats to BHEL Hyderabad in the past will be acceptable based on the review of records available with BHEL)

ANNEXURE -C

DETAILS OF THE MILLS SUPPLYING BLADE FLATS TO BHEL HYD

BHEL ENQ. NO. : DATE:

1.0	**ORGANISATIONAL INFORMATION**			**BHEL REMARKS**
1.1	MILL NAME :			
1.2	HEAD OFFICE ADDRESS: TELEPHONE NO. WEB SITE			
1.3	FACTORY / WORKS ADDRESS: TELEPHONE NO. E-MAIL (of the chief contact person)			
1.4	BRANCH OFFICE / MARKETING OFFICE ADDRESS TELEPHONE E-MAIL(of the chief contact person)			
2.0	MANUFACTURING FACILITIES:			
2.1	MELTING FACILTIES :		CAPACITY / SIZE	
2.2	HOT / COLD ROLLING OR/AND FORGING FACILITIES		CAPACITY / SIZE	
2.3	HEAT TREATMENT FACILITIES (INCLUDING QUENCHING FACILITIES) FOR MINIMUM 2.5m OF LENGTHS)			
2.4	STRAIGHTENING FACILITIES			
2.5	TESTING FACILITIES:			
TESTING FACILITY		EQUIPMENTS/MACHINES	CAPACITY / SIZE	
2.51	CHEMICAL			
2.52	MECHANICAL TEST			
2.53	MPI/DP			
2.54	ULTRASONIC TEST (Dimensions/Straightness measurement)			
2.55	OTHER FACILITIES			
3.0	**MILLS PAST EXPERIENCE / CREDENTIALS**			
3.1	CUSTOMER REFERENCE LIST OF SAME ITEMS			
3.2	MILLS PRODUCTION RANGE (SIZE AND MATERIAL GRADES)			
3.3	COPY OF VALID ISO 9000 CERTIFICATE FOR THE MILL			
3.4	ANY OTHER INFORMATION LIKE REGISTRATION / SUPPLIES TO SISTER UNITS OF BHEL WITH EVIDENCES (OPTIONAL INFORMATION)			

Note: 1) The above data shall be furnished / certified by the manufacturer or mill only. Data certified by any other agencies will not be accepted
2) Any of the process / operation is sub-contracted, shall be mentioned by giving the details of the facilities and tie - up letter.
2) Mills catalogues shall also be provided
3) The above information will be used for scrutinizing the technical offers for the above mentioned enquiry

SIGNATURE AND COMPANY STAMP OF THE MILL

Financial Criteria for Pre-qualification

The minimum average annual financial turnover of the supplier during the last 3 financial should not be less than Rs.86 Lakhs and positive net worth as per latest balance sheet.

Vendors shall enclose the last three financial years balance sheets and Profit & loss statements duly audited and certified by Charted Accountant.

In case of final audited balance sheet / Profit & Loss statement for the last year is not available, provisional statement for the same duly certified by Charted Accountant must be submitted.

In case audited financial statements have not been submitted for any of three years as indicated above, then the applicable audited statements submitted by bidders against the requisite three years will be averaged for three years i.e total divided by three.

Other incomes shall not be considered for arriving at annual financial turnover / sales. For evaluation purpose, only revenue from operations shall be considered.

VACUUM DEGASSED / ESR STAINLESS STEEL BARS FOR STEAM TURBINE BLADES, HARDENED & TEMPERED (GRADE: X20 Cr 13)

1.0 GENERAL:

This specification governs the requirements of vacuum degassed / ESR processed, hardened & tempered stainless steel bars of grade X 20 Cr 13 for steam turbine blades.

2.0 APPLICATION:

For manufacture of steam turbine blades suitable for working temperatures up to 400°C.

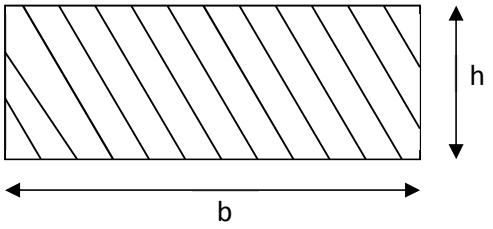
3.0 CONDITION OF DELIVERY:

Hot rolled/forged, Hardened & Tempered, sand/shot blasted and suitably protected with rust preventive coating, meeting the dimensions and tolerances required as per clause 4.0.

4.0 DIMENSIONS AND TOLERANCES:

4.1 Dimensions: Unless otherwise specified in the order, the bars shall be supplied in random lengths of 2 to 5 meters with a maximum of 10% shorts down to 1 metre. Other dimensions shall be as specified in the order.

4.2 Tolerances: The tolerances on cross sectional dimensions shall be as follows**.**



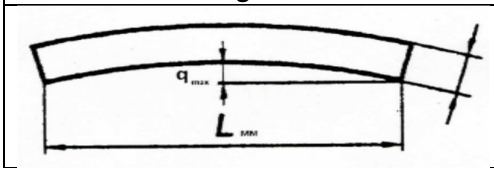
Note: The corners of the flats shall not have any radius.

4.2.1 Tolerances and Dimensions:

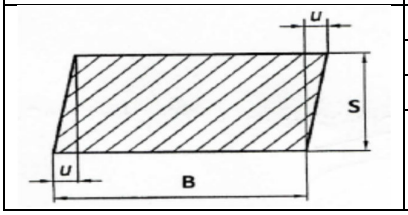
'b'width across flats, mm	Allowable deviation on 'b' mm	'h' thickness mm	Allowable deviation on 'h' mm
Upto 35	+1.5	Upto 20	+ 1.0
Over 35 and upto 75	+ 2.0	Over 20 and upto 40	+ 2.0
Over 75	+ 3.0	Over 40	+ 3.0

Note: Bending of the bars shall not be more than 1mm/metre at any section throughout the length of bars in supply condition. Bulging on the sides shall not be more than 0.01 x b and 0.01 x h respectively.

4.2.2 Straightness tolerances (q_{max}) for rectangular section bar:

Straightness	Value of q_{max} (mm)	Condition
	(Lx1.5)/2000	B & S both ≤ 110
	(Lx2)/2000	B or S > 110

4.2.3 Out of section tolerance for rectangular section bar:

Out of section	Nominal Thickness (mm)	Tolerance (mm)
	10 < S ≤ 25	u ≤ 0.5
	25 < S ≤ 40	u ≤ 1.0
	40 < S ≤ 80	u ≤ 1.5
	S > 80	u ≤ 3.0

5.0 MANUFACTURING AND INSPECTION SEQUENCE PLAN (MIP):

Before starting production, the manufacturer shall submit the following documentation to BHEL.

5.1 A manufacturing & inspection sequence plan (MIP) which is released after the prototype qualification, establishing the quality assured sequence of operations like steel melting, rolling/forging, heat treatment and inspection plan. Information about internal & external specifications shall also be mentioned in MIP. Every change in the established process or MIP needs written permission of BHEL.

5.2 Test instructions for non-destructive testing & destructive testing, which are performed, as part of manufacturer's quality assurance shall also be submitted. The test instructions shall include precise information on the test procedures, sample location plan (illustrated by sketches).

6.0 MANUFACTURE:

6.1 The steel shall be manufactured by basic electric furnace process and subsequently vacuum degassed / electroslag remelted.

6.2 The vacuum system shall have the capacity to maintain a vacuum of 2 torr or lesser during vacuum degassing process for the sufficient time so as to lower the gas contents in the steel.

6.3 The ingot castings shall be used for the manufacture of bars. A reduction ratio of 4 (minimum) shall be maintained from the ingot to final bar size. The information regarding the ingot size to the concerned final bar size shall be mentioned in the MIP.

7.0 HEAT TREATMENT

7.1 The following heat treatment is suggested to achieve the mechanical properties specified in Cl.12.0 of this specification.

Harden in air or oil at 900 - 1050°C
Tempering temperature shall not be less than 650°C

7.2 If the bars need be straightened after heat treatment then the bars shall be stress relieved after the straightening operation at 30° C below the actual tempering temperature with a slow cooling rate.

7.3 The process parameters shall be selected with a view to achieve lowest possible residual stresses. The distortion of the finish machined part caused by slight residual stresses from the rolling/forging & heat treatment process shall not occur.

8.0 FREEDOM FROM DEFECTS:

8.1 The bars shall be free from cracks, scabs, seams and other harmful defects.

8.2 Decarburization and other material defects shall not exceed the dimensional tolerances as specified in clause 4.2.

9.0 FINISH:

9.1 The surface of the bars shall be smooth without any laps, rolled in scales etc. Dents roll marks, and scratches are permitted provided their depth does not exceed half the tolerance limits specified in clause 4.0.

9.2 The edges of bars shall be cut square by sawing or shearing and no crop ends are permissible.

10.0 TEST SAMPLES:

10.1 **For Chemical Analysis:** One sample for chemical analysis shall be taken from each melt.

10.2 **For Mechanical tests:** Bars of same size shall be grouped into lots belonging to same melt and heat treatment batch. This shall be treated as a single test unit and subjected to mechanical testing as per following plan.

10.2.1 The uniformity of the strength of the bars belonging to one lot (same melt and heat treatment batch of same size of bars = test unit) shall be verified by hardness test as per EN ISO 6506-1 or any other reputed international method. The hardness test shall be performed on 10% of each test unit, however on atleast 10 bars or on all the bars if the test unit comprises of less than 10 bars. The greatest permissible difference in hardness in a lot (test unit) shall not exceed 35 HBW.

10.2.2 Hardness tests are to be performed after all heat treatments including a possible stress relieving are undertaken.

10.2.3 Mechanical properties shall be determined on the hardest and softest bars identified by the hardness tests conducted as per 10.2.1 and 10.2.2.

10.2.4 The test samples locations shall be as per Annexure A and B. If the cross section of the bar is more than 200 cm^2, then mechanical properties must be determined both in the centre of the bar and at the side of the bar. With the exception of toughness, the difference in the properties across the bar cross section shall not exceed 7.5%.

10.2.5 The specimen for Metallography shall be taken in longitudinal direction with a minimum cross section area of 320 mm^2.

The positions of the specimens given in the Annexure A and B are meant for guidance only. Details concerning the locations of the specimens are to be agreed mutually and must be included in MIP with a sketch.

11.0 CHEMICAL COMPOSITION:

Heat analysis (in weight %) shall be achieved as follows**.**

Element	C	Si	Mn	P	S	Cr	Ni
Minimum	0.17	0.10	0.30	--	--	12.50	0.30
Maximum	0.22	0.60	0.80	0.030	0.020	14.00	0.80

12.0 MECHANICAL PROPERTIES:

The material in final delivery condition shall comply with the following mechanical properties.

Properties	0.2 %Yield Strength N/mm^2	Tensile Strength N/mm^2	% Elongation	Reduction in area %	Impact energy, J	Hardness HBW
Minimum	600	800	15	50	20	240
Maximum	--	950	--	--	--	280

NOTE: 1) The tensile test shall be carried out in accordance with EN10002 resp. ASTM E8M (round tension test specimen with L_o = 50 mm and d_o = 10 mm) or any other reputed National/International standard.

2) The Charpy V – notch impact test shall be performed with standard test specimens in accordance with EN: 10045 or any other reputed National/International standard. An impact test shall consist of three specimens from a single test location; the minimum average value shall be as specified above. Only one value of the three can be below the specified minimum, but in no case below 14 J. All the three test results shall be reported in test certificate.

3) HBW 10/3000 or HBW 5/750 shall be used for hardness tests.

13.0 METALLOGRAPHY TESTS:

The examination of the cleanliness must be performed in the centre of one bar per lot. It can be conducted before or after the heat treatment. The microstructure must be uniform and free from porosity, excessive segregation and other in-homogeneities. The following properties concerning delta-ferrite and inclusions shall be achieved.

13.1 Delta ferrite content shall be less than 5%. Delta ferrite content shall be determined in a manner consistent with the evaluation technique described in ASTM E 45 Method A (Worst Field Method at a Magnification of 100X) with the specimen orientation in longitudinal direction. The distribution and size of delta ferrite must be such that it does not result in indication during MPI examination of the ready-machined surface.

13.2 Inclusion content shall be tested as per ASTM E 45 Method A and with following limits.

13.2.1 "Thin series" inclusions shall not exceed 2.0 for Type A, B, C and 2.5 for Type D.

13.2.2 "Heavy series" inclusions shall not exceed 1.5 for all Types i.e. A, B, C and D.

13.2.3 All the type and sizes of the inclusions mentioned in 13.2.1 and 13.2.2 can exist simultaneously.

13.2.4 Maximum number and size of globular inclusions (type D):

IR (D) = (n1 + 2.5 n2) $\leq$ 10
IR (D) is converted to an area of 160 mm^2.
n= number of globular inclusions.

n1 (25 μm – 50 μm); n2 (51 μm – 75 μm)

The size pertains not only to the globular inclusions themselves, but also the subsequent cavities, which can occur beside them. Inclusions and cavities which are more than 75 μm are not allowed.

13.3 **Grain size:** The grain size must be measured at the softest and the hardest bar after all heat treatments are performed. Grain size 4 or finer per ASTM E 112 or DIN 50601 must be achieved.

A deviation from the average size of more than 2 grain size is not permissible.

14.0 EXTERNAL AND INTERNAL QUALITY/NON DESTRUCTIVE TESTING:

14.1 **Test Scope:** The following NDT inspections shall be performed after all heat treatments are performed including stress relieving operations.

- Visual inspection of all bars
- UT of all flats shall be subjected to ultrasonic testing as per BHEL Standard HY 0850179, Rev 01 and acceptance norm shall be as per HY 0850179, Rev. 01. The UT shall be carried out in dispatch condition

  Requirements: 100% of the volume shall be examined with the stipulated recording level of the material.

14.2 Criteria for Recording Limits and Decision on Further Use:

a) Surface defects: Indication of surface defects, e.g., scoring caused by the rolling process are to be ground at least at both ends, in the center of the indications and in increments of ca.250 mm to check the extension below the surface. Surface defects extending $\geq$1 mm or greater than half the specified dimensional tolerances below the surface are not permissible.

15.0 MATERIAL IDENTITY TEST:

At the time of delivery, all the bars shall be subjected to identification test by Spark test method or any other reliable means to ascertain that the material supplied is as required by the specification. Details of the instrument and the methodology followed shall be reported in Test certificate.

16.0 PROCESS QUALIFICATION:

A qualification review, performed jointly by the purchaser and supplier, is required before starting production for the first order. The process qualification review will include following as a minimum requirement.

16.1 This initial process qualification is required for each manufacturing, heat treatment and testing facility

16.2 The parameters used or stipulated during this phase form the basis of the MIP.

16.3 In addition to the scope of testing and examination stipulated in this specification, the following tests and examinations shall be performed.

16.3.1 Tensile and impact tests in transverse direction. If required, the sub-size test specimens may be used for the testing.

16.3.2 Hot tensile test: In accordance with ISO 6892-2 or equivalent standard, a tensile test in longitudinal direction has to be performed at 500^0C**.** The following properties must be achieved:

0.2% Proof stress (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Reduction in area (%)
≥380	≥480	≥20	≥60

16.3.3 Determination of FATT according to ASTM A 370. FATT of < 30°C shall be achieved. Testing shall be carried out on minimum 10 specimens.

16.3.4 Magnetic particle testing: The distribution, type and size of micro-structural in-homogeneities (e.g. delta ferrite and segregation) shall not cause MP indications.

16.4 The MIP plan shall include the hot yield test. The manufacturer shall submit the results of tests conducted on the hardened and tempered samples of the steel produced by them of this grade of material.

17.0 INSPECTION AT SUPPLIER'S WORKS:

The representative of BHEL shall have free access to the supplier's works at all times during the execution of the order, to satisfy himself that the material is produced as per the quality requirements of this specification. All reasonable facilities shall be extended to him free of charge. He may also witness the sampling testing and marking called for in this specification.

18.0 QUALITY PLAN:

18.1 Vendor shall follow the Quality Plan Ref. BHEL/HY10764/Blade flats S-QAP Rev.02 attached as Annexure 'C' unless conditions stipulated in Cl.18.2 & 18.3 are applicable. A duly signed and stamped copy of this QAP shall be submitted by the vendor along with the technical offer.

18.2 In case Customer / Project related additional requirements are applicable in the enquiry / tender, vendor may be asked to submit a separate QP including such requirements.

18.3 In case of new vendors or first time supplies for the sizes mentioned in BHEL enquiry, a separate QP shall be submitted for approval by BHEL.

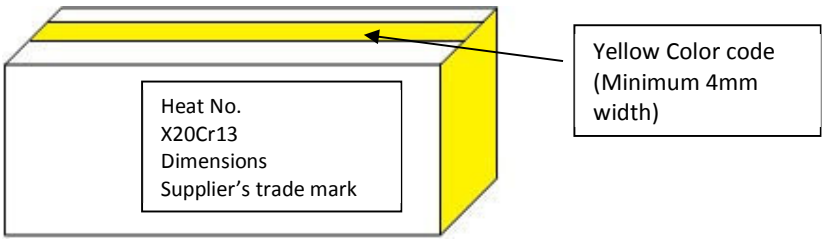
19.0 TEST CERTIFICATE:

Three copies of the test certificate shall be furnished (in English) giving the following details:

a) Specification No.: HY10764 Rev.11
b) BHEL Order No.
c) Name of the supplier.
d) Melt No.
e) Process of Manufacture
f) Heat treatment batch no. and HT charts
g) Results of chemical analysis and mechanical tests (including hardness test results).
h) Results of Metallographic tests with representative Photomicrographs.
i) Results of Ultrasonic tests.
j) Dimensional Inspection Report
k) Results of any additional test (if applicable as per order)
l) Confirmation of 'Material identity test' on all bars

20.0 MATERIAL IDENTIFICATION MARKING:

Marking of each individual bar at the front and side face shall be done as given below. For easy identification of the material during usage, each bar shall be painted with Yellow color code along the length of the bar on any of its face as indicated below:



Supplier shall ensure that the 'Yellow color' code is clearly visible in the final dispatch condition of the material.

21.0 PACKING:

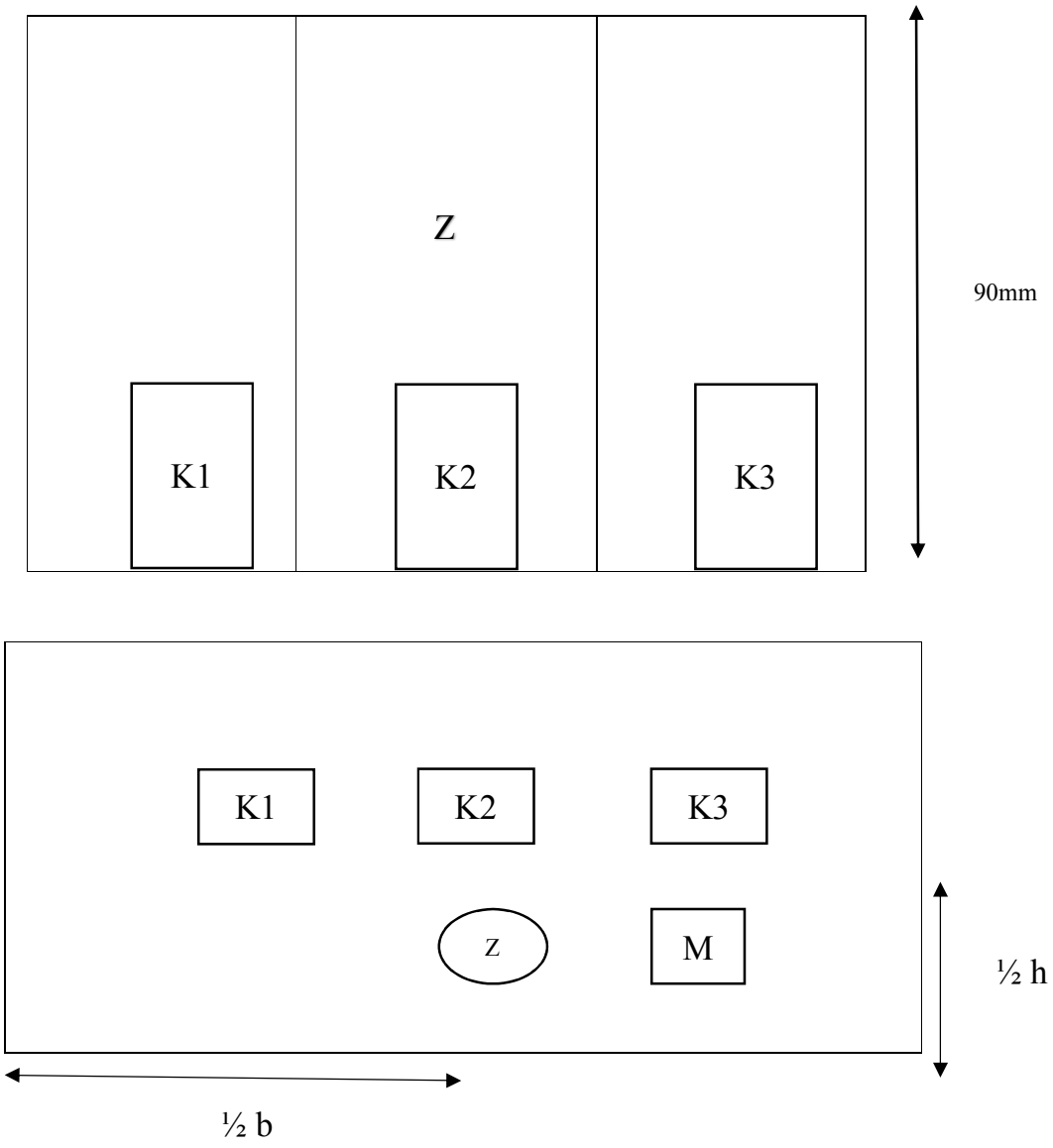
The bars shall be suitably packed to prevent from corrosion and damage during transit.

22.0 REJECTION AND REPLACEMENT:

In the event of any material proving defective during the course of further processing or testing at BHEL, such material shall be rejected and the supplier shall make immediate arrangements to replace the same free of cost after all the commercial terms and conditions are satisfied.

ANNEXURE A

TEST SAMPLES LOCATIONS PLAN (CROSS SECTION AREA < = 200 CM^2)

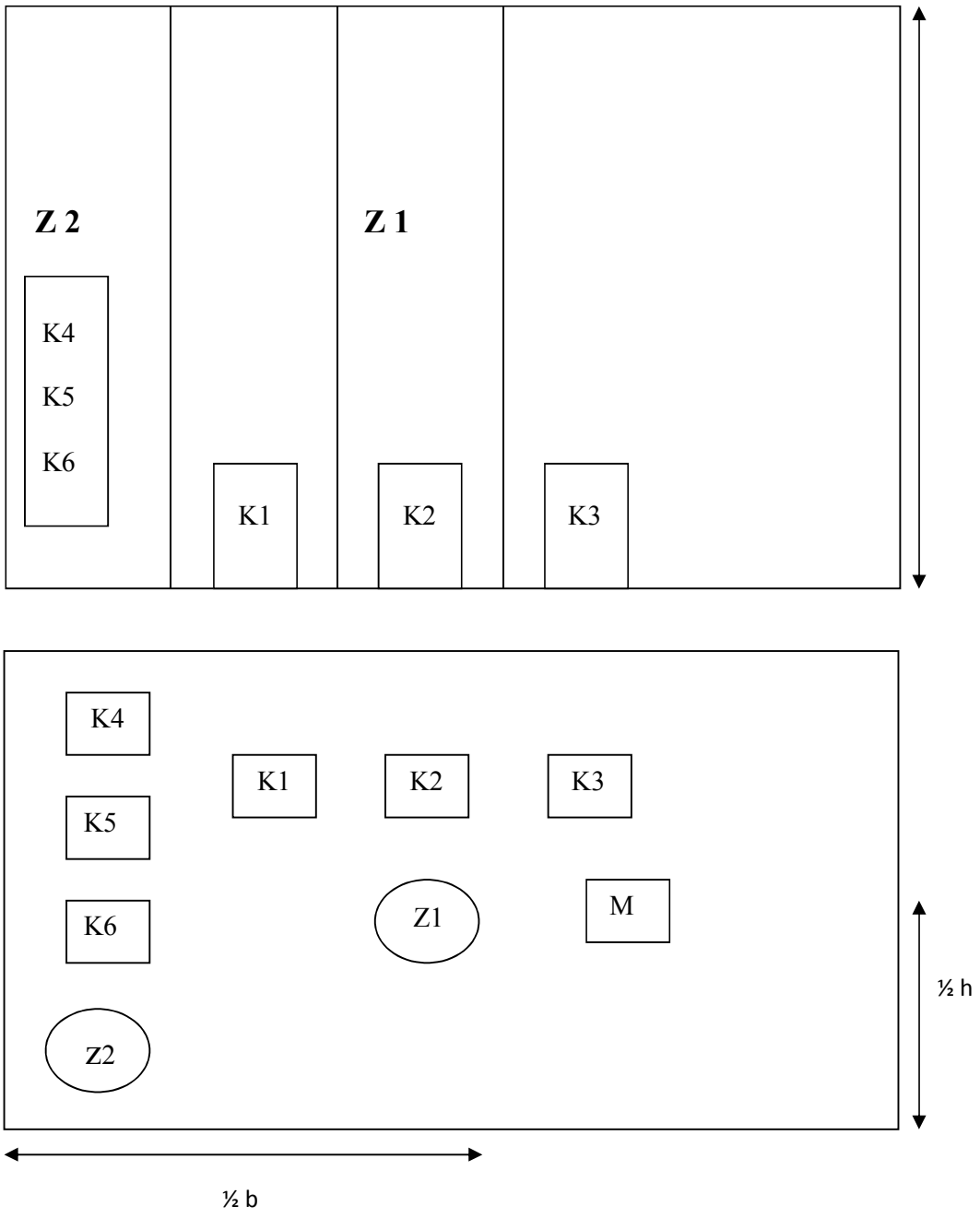


Z = TENSILE SPECIMENS (LONGITUDINAL DIRECTION)
K1, K2 & K3 = IMPACT SPECIMENS
M = METALLOGRAPHY SPECIMENS

NOTE: Make sure that all specimens are located in the middle of the material thickness

ANNEXURE B

TEST SAMPLES LOCATIONS PLAN (CROSS SECTIONAL AREA > 200 CM²)



Z1, Z2 = TENSILE SPECIMENS (LONGITUDINAL DIRECTION)
K1 TO K6 = IMPACT SPECIMENS
M = METALLOGRAPHY SPECIMENS

Annexure C

VENDOR'S NAME & ADDRESS	STANDARD QUALITY PLAN (BLADE FLATS)	HY 10764 REV 11 (PAGE 10 OF 11)
	BHEL ENQ/ P.O. No.	QP No.: BHEL/HY10764/Blade flats SQAP Rev.03
	Date	PAGE 1 of 2

SL No	Operation	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms	Format of Record	* D	Agency P	Agency W	Agency V	Remarks
1.	Melting & Refining (ESR or VD Process)	Chemical composition	Major	Chemical analysis	Each melt	HY 10764 Rev. 11	HY 10764 Rev. 11	Test certificate	√	2	-	1	
2.	Hot rolling / Forging & Cutting	Dimensions	Minor	Dimensional	100%	Internal Standard	Internal Standard			2	-	1	
3.	Heat treatment	Soaking time & temperature	Major	Verification of HT time & temperature charts	All cycles	HY 10764 Rev. 11	HY 10764 Rev. 11	Original HT charts	√	2	-	1	
4.	Dimensional inspection	Dimension & tolerances	Major	Dimensional checking	100%	As per PO & Spec.	As per PO & Spec.	Dimensional report	√	2	1	-	Refer Note - 4
5.a	Mechanical properties	Hardness	Major	Hardness test	Each lot	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	1	-	
5.b		Tensile properties (0.2% Y.S, UTS, %El, % RA) & toughness	Major	Tensile & Impact testing	Hardest & softest bar from each lot	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	1	-	
6.a	NDT	Visual	Major	Surface defects & finish	Each bar	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	1	-	
6.b		UT	Major	Sub-surface defects	Each bar	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	1	-	

Legend:	Prepared by	Approved by	#Vendor's confirmation
• P Perform; W Witness; V Verification; • Indicate 1 for BHEL or BHEL nominated Inspection agency & 2 for vendor/sub vendor as appropriate against each component /characteristic under P, W & V columns. • * For items marked √ (tick) in column D, test certificates shall be submitted to BHEL for records.	Signature and Stamp Sachin Katiyar वरिष्ठ अभियंता / गुणवत्ता आश्वासन Sr. Engineer / Quality Assurance भा.इ.एल. हैदराबाद BHEL HYD	Signature and Stamp QUALITY ASSURANCE BHEL HYDERABAD B.Ashok Kumar AGM / QA 8-7-21	Signature and Stamp

Annexure C													
VENDOR'S NAME & ADDRESS			STANDARD QUALITY PLAN (BLADE FLATS)					HY 10764 REV 11 (PAGE 11 OF 11)					
			BHEL ENQ. /P.O No.					QP No.: BHEL/HY10764/Blade flats S-QAP Rev.03					
			Date					PAGE 2 of 2					
SL No.	Operation	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms	Format of Record	* D	Agency P	Agency W	Agency V	Remarks
7.a	Metallurgical testing	Inclusion rating, microstructure & % delta ferrite	Major	Microstructure	One sample per lot	HY 10764 Rev. 11	HY 10764 Rev. 11	TC with micro-structure photographs	√	2	-	1	
7.b		Grain size	Major	Microstructure	On hardest & softest bar per lot	HY 10764 Rev. 11	HY 10764 Rev. 11		√	2	-	1	
8.	Material identity test	Material grade	Major	Chemical analysis	Each bars	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	1	-	
9.	Packing, marking & color code	Packing & marking	Major	Hard Punching and Colour code	All bars	HY 10764 Rev. 11	HY 10764 Rev. 11			2	-	1	
10.	Verification & Certification	Documentation	major	Verification	All bars	HY 10764 Rev. 11	HY 10764 Rev. 11	TC	√	2	-	1	Endorsement of all documents by TPIA

Note:

1) This SQAP is applicable along with BHEL approved frozen Manufacturing Process Plan only.
2) Additional requirements as per BHEL customer / project and purchase order will also be applicable.
3) This SQAP is not applicable for first time supplies of the material as per HY10764, for which a separate MPP and QAP shall be submitted. In such cases process qualification requirements will be also be applicable.
4) The following shall be ensure & certified:
   a. Size & Length of each bar as per purchase order.
   b. Straightness of all bars.
   c. Defect free surfaces.
   d. Marking & punching on all bars.

Legend:	Prepared by	Approved by	#Vendor's confirmation
• P Perform; W Witness; V Verification; • Indicate 1 for BHEL or BHEL nominated Inspection agency & 2 for vendor/sub vendor as appropriate against each component /characteristic under P, W & V columns. • * For items marked √ (tick) in column D, test certificates shall be submitted to BHEL for records.	Signature and Stamp सचिन कटियार Sachin Kaliyar वरिष्ठ अभियंता / गुणवत्ता आश्वासन Sr. Engineer / Quality Assurance BHEL HYD-32	Signature and Stamp QUALITY ASSURANCE B.Ashok Kumar AGM / QA 8-7-21	Signature and Stamp

#To be submitted along with the technical offer.

VACUUM DEGASSED / ESR STAINLESS STEEL BARS FOR STEAM TURBINE BLADES, HARDENED & TEMPERED (GRADE: X22 Cr Mo V 121)

1.0 GENERAL:

This specification governs the requirements of vacuum degassed / ESR processed, hardened & tempered stainless steel bars of grade X 22 Cr Mo V121 for steam turbine blades.

2.0 APPLICATION:

For manufacture of steam turbine blades suitable for working temperature from 400-550°C.

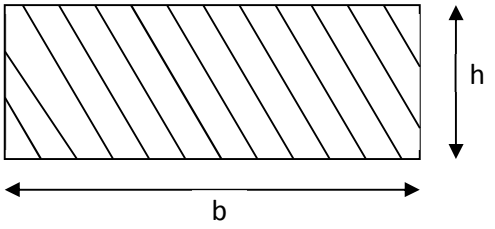
3.0 CONDITION OF DELIVERY:

Hot rolled/forged, Hardened & Tempered, sand/shot blasted and protected with rust preventive coating, meeting the dimensions and tolerances required as per Clause 4.0.

4.0 DIMENSIONS AND TOLERANCES:

4.1 Dimensions: Unless otherwise specified in the order, the bars shall be supplied in random lengths of 2 to 5 meters with a maximum of 10% shorts down to 1 metre. Other dimensions shall be as specified in the order.

4.2 Tolerances: The tolerances on cross sectional dimensions shall be as follows**.**



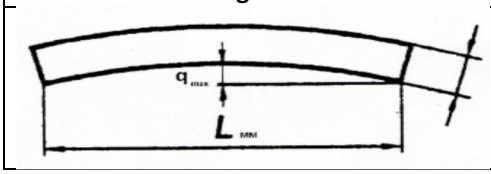
Note: The corners of the flats shall not have any radius.

4.2.1 Tolerance on dimensions:

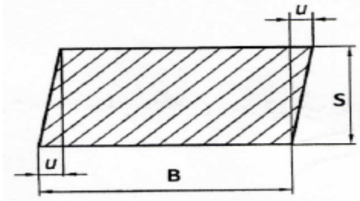
'b'width across flats, mm	Allowable deviation on 'b' mm	'h' thickness mm	Allowable deviation on 'h' mm
Upto 35	+1.5	Upto 20	+ 1.0
Over 35 and upto 75	+ 2.0	Over 20 and upto 40	+ 2.0
Over 75	+ 3.0	Over 40	+ 3.0

Note: Bending of the bars shall not be more than 1mm/metre throughout the length of bars in supply condition. Bulging on the sides shall not be more than 0.01 x b and 0.01 x h respectively.

4.2.2 Straightness tolerances (q_{max}) for rectangular section bar:

Straightness	Value of q_{max} (mm)	Condition
	(Lx1.5)/2000	B & S both ≤ 110
	(Lx2)/2000	B or S > 110

4.2.3 Out of section tolerance for rectangular section bar:

Out of section	Nominal Thickness (mm)	Tolerance (mm)
	10 < S ≤ 25	u ≤ 0.5
	25 < S ≤ 40	u ≤ 1.0
	40 < S ≤ 80	u ≤ 1.5
	S > 80	u ≤ 3.0

5.0 MANUFACTURING AND INSPECTION SEQUENCE PLAN (MIP):

Before starting production the manufacturer shall submit the following documentation to BHEL.

5.1 A manufacturing & inspection sequence plan (MIP) included with tensile test at 600^0C and creep test released after the prototype qualification, establishing the quality assured sequence of operations like steel melting, rolling/forging, heat treatment and inspection plan. Information about internal & external specifications shall also be mentioned in MIP. Every change in the established process or MIP needs written permission of BHEL.

5.2 Test instructions for non-destructive testing & destructive testing, which are performed, as part of manufacturer's quality assurance shall also be submitted. The test instructions shall include precise information on the test procedures, sample location plan (illustrated by sketches).

6.0 MANUFACTURE:

6.1 The steel shall be manufactured by basic electric furnace process and subsequently vacuum degassed / electroslag remelted.

6.2 The vacuum system shall have the capacity to maintain a vacuum of 2 torr or lesser during vacuum degassing process for the sufficient time so as to lower the gas contents in the steel.

6.3 The ingot castings shall be used for the manufacture of bars. A reduction ratio of 4 (minimum) shall be maintained from the ingot to final bar size. The information regarding the ingot size to the concerned final bar size shall be mentioned in the MIP.

7.0 HEAT TREATMENT

7.1 The following heat treatment is suggested to achieve the mechanical properties specified in Cl.12.0 of this specification.

Harden in air or oil at 1020-1070°C
Tempering temperature shall not be less than 650°C

7.2 If the bars need be straightened after heat treatment then the bars shall be stress relieved after the straightening operation at 30° C below the actual tempering temperature with a slow cooling rate.

7.3 The process parameters shall be selected with a view to achieve lowest possible residual stresses. The distortion of the finish machined part caused by slight residual stresses from the rolling & heat treatment process shall not occur.

7.4 The details of the actual heat treatment cycle followed shall be furnished in the Test Certificate.

8.0 FREEDOM FROM DEFECTS:

8.1 The bars shall be free from cracks, scabs, seams and other harmful defects.

8.2 Decarburization and other material defects shall not exceed the dimensional tolerances as specified in Cl. 4.2

9.0 FINISH:

9.1 The surface of the bars shall be smooth without any laps, rolled in scales etc. Dents roll marks, and scratches are permitted provided their depth does not exceed half the tolerance limits specified in clause 4.

9.2 The edges of bars shall be cut square by sawing or shearing and no crop ends are permissible.

10.0 TEST SAMPLES:

10.1 **For Chemical Analysis:** One sample for chemical analysis shall be taken from each melt.

10.2 **For Mechanical tests:** Bars of same size shall be grouped into lots belonging to same melt and heat treatment batch. This shall be treated as a single test unit and subjected to mechanical testing as per following plan.

10.2.1 The uniformity of the strength of the bars belonging to one lot (same melt and heat treatment batch of same size of bars = test unit) shall be verified by hardness test as per EN ISO 6506-1 or any other reputed international method. The hardness test shall be performed on 10% of each test unit, however on atleast 10 bars or on all the bars if the test unit comprises of less than 10 bars. The greatest permissible difference in hardness in a lot (test unit) shall not exceed 35 HBW.

10.2.2 Hardness tests are to be performed after all heat treatments including a possible stress relieving are undertaken.

10.2.3 Mechanical properties shall be determined on the hardest and softest bars identified by the hardness tests conducted as per 10.2.1 and 10.2.2.

10.2.4 The test samples locations may be as per Annexure A and B. If the cross section of the bar is more than 200 cm^2, then mechanical properties must be determined both in the centre of the bar and at the side of the bar. With the exception of toughness, the difference in the properties across the bar cross section shall not exceed 7.5%.

10.2.5 The specimen for Metallography shall be taken in longitudinal direction with a minimum cross section area of 320 mm^2.

The positions of the specimens given in the Annexure A and B are meant for guidance only. Details concerning the locations of the specimens are to be agreed mutually and must be included in MIP with a sketch.

11.0 CHEMICAL COMPOSITION:

Heat analysis (in weight %) shall be achieved as follows**.**

Element	C	Si	Mn	P	S	Cr	Mo	Ni	V
Minimum	0.18	0.10	0.30	--	--	11.00	0.80	0.30	0.25
Maximum	0.24	0.50	0.80	0.020	0.020	12.50	1.20	0.80	0.35

12.0 MECHANICAL PROPERTIES:

The material in final delivery condition shall comply with the following mechanical properties.

Properties	0.2 %Yield Strength, N/mm^2	Tensile Strength, N/mm^2	% Elongation	% Reduction in area	Impact energy, J	Hardness (BHN)
Minimum	700	900	11	35	20	265
Maximum	--	1050	--	--	--	310

NOTE: 1) The tensile test shall be carried out accordance with EN10002 resp. ASTM E8M (round tension test specimen with L_o = 50 mm and d_o = 10 mm) or any other reputed National/International standard.

2) The Charpy V – notch impact test shall be performed with standard test specimens in accordance with EN: 10045 or any other reputed National/International standard. An impact test shall consist of three specimens from a single test location; the minimum average value shall be as specified above. Only one value of the three can be below the specified minimum, but in no case below 14 J. All the three test results shall be reported in test certificate.

3) HBW 10/3000 or HBW 5/750 shall be used for hardness tests.

13.0 METALLOGRAPHY TESTS:

The examination of the cleanliness must be performed in the centre of one bar per lot. It can be conducted before or after the heat treatment. The microstructure must be uniform and free from porosity, excessive segregation and other in-homogeneities. The following properties concerning delta-ferrite and inclusions shall be achieved.

13.1 Delta ferrite content shall be less than 5%. Delta ferrite content shall be determined in a manner consistent with the evaluation technique described in ASTM E 45 Method A (Worst Field Method at a Magnification of 100X) with the specimen orientation in longitudinal direction. The distribution and size of delta ferrite must be such that it does not result in indication during MPI examination of the ready-machined surface.

13.2 Inclusion content shall be tested as per ASTM E 45 Method A and with following limits.

13.2.1 "Thin series" inclusions shall not exceed 2.0 for Type A, B, C and 2.5 for Type D.

13.2.2 "Heavy series" inclusions shall not exceed 1.5 for all Types i.e. A, B, C and D.

13.2.3 All the type and sizes of the inclusions mentioned in 13.2.1 and 13.2.2 can exist simultaneously.

13.2.4 Maximum number and size of globular inclusions (type D):

IR (D) = (n1 + 2.5 n2) $\leq$ 10
IR (D) is converted to an area of 160 mm^2.
n= number of globular inclusions.

n1 (25 μm – 50 μm); n2 (51 μm – 75 μm)

The size pertains not only to the globular inclusions themselves, but also the subsequent cavities, which can occur beside them. Inclusions and cavities which are more than 75 μm are not allowed.

13.3 **Grain size:** The grain size must be measured at the softest and the hardest bar after all heat treatments are performed. Grain size 4 or finer per ASTM E 112 or DIN 50601 must be achieved.

A deviation from the average size of more than 2 grain size is not permissible.

14.0 EXTERNAL AND INTERNAL QUALITY/NON DESTRUCTIVE TESTING:

14.1 Test Scope: The following NDT inspections shall be performed after all heat treatments including stress relieving operations are completed on the bars

- Visual inspection of all bars
- UT: All flats shall be subjected to ultrasonic testing as per BHEL Standard HY 0850179, Rev. 01 and acceptance norm shall be as per HY 0850179, Rev. 01. The UT shall be carried out in dispatch condition of the material.

14.2 Criteria for Recording Limits and Decision on Further Use:

a) Surface defects: Indication of surface defects, e.g., scoring caused by the rolling process are to be ground at least at both ends, in the center of the indications and in increments of ca.250 mm to check the extension below the surface. Surface defects extending $\geq$1 mm or greater than half the specified dimensional tolerances below the surface are not permissible.

15.0 HIGH TEMPERATURE PROPERTIES:

The supplier shall guarantee the elevated temperature properties as per EN10269 for this grade of material.

16.0 MATERIAL IDENTITY TEST:

At the time of delivery, all the bars shall be subjected to identification test by Spark test method or any other reliable means to ascertain that the material supplied is as required by the specification. Details of the instrument and the methodology followed shall be reported in Test certificate.

17.0 PROCESS QUALIFICATION:

A qualification review, performed jointly by the purchaser and supplier, is required before starting production for the first order. The process qualification review will include the following as a minimum requirement.

17.1 This initial process qualification is required for each manufacturing, heat treatment and testing facility

17.2 The parameters used or stipulated during this phase form the basis of the MIP.

17.3 In addition to the scope of testing and examination stipulated in this specification, the following tests and examinations shall be performed.

17.3.1 Tensile and impact tests in transverse direction. If required, the sub-size test specimens may be used for the testing.

17.3.2 Hot tensile test: In accordance with ISO 6892-2 or equivalent standard, a tensile test in longitudinal direction has to be performed at 600^0C**.** The following properties must be achieved:

0.2% Proof stress (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Reduction in area (%)
≥285	≥380	≥18	≥60

17.3.3 Determination of FATT according to ASTM A 370. FATT of < 25°C shall be achieved. Testing shall be carried out on minimum 10 specimens.

17.3.4 Magnetic particle testing: The distribution, type and size of micro-structural in-homogeneities (e.g. delta ferrite and segregation) shall not cause MP indications.

17.4 The manufacturer shall provide the sample to BHEL for evaluation or testing before carrying out creep tests at any suitable labs. Only sample which are evaluated and certified by BHEL shall be subjected to creep tests.

17.5 The MIP plan shall include the Creep and hot yield test. The manufacturer shall submit the results of creep tests conducted on the hardened and tempered samples of the steel produced by them of this grade of material. The test parameters like test temperature, duration of test and number of test samples shall be mutually agreed upon between the manufacturer and BHEL. The results of these creep tests shall form the basis of high temperature property guarantee to be given by the manufacturer for their supplies of blade flats as per Cl.15.0.

18.0 INSPECTION AT SUPPLIER'S WORKS:

The representative of BHEL shall have free access to the supplier's works at all times during the execution of the order, to satisfy himself that the material is produced as per the quality requirements of this specification. All reasonable facilities shall be extended to him free of charge. He may also witness the sampling testing and marking called for in this specification.

19.0 QUALITY PLAN:

19.1 Vendor shall follow the Quality Plan Ref. BHEL/HY10766/Blade flats S-QAP Rev.02 attached as Annexure 'C' unless conditions stipulated in Cl.19.2 & 19.3 are applicable. A duly signed and stamped copy of this QAP shall be submitted by the vendor along with the technical offer.

19.2 In case Customer / Project related additional requirements are applicable in the enquiry / tender, vendor may be asked to submit a separate QP including such requirements.

19.3 In case of new vendors or first time supplies for the sizes mentioned in BHEL enquiry, a separate QP shall be submitted for approval by BHEL.

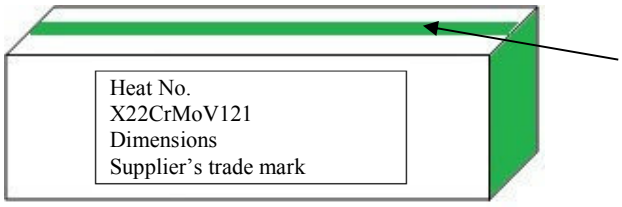
20.0 TEST CERTIFICATE:

Three copies of the test certificate shall be furnished (in English) giving the following details:

a) Specification No.: HY10766 Rev.11
b) BHEL Order No.
c) Name of the supplier.
d) Melt No.
e) Process of Manufacture
f) Heat treatment batch no. and HT charts.
g) Results of chemical analysis and mechanical tests (including hardness test results).
h) Results of Metallographic tests with representative Photomicrographs.
i) Results of Ultrasonic tests.
j) Dimensional inspection report
k) High temperature guarantee certificate
l) Confirmation of 'Material identity test' on all bars
m) Results of any additional test (if applicable as per order)

21.0 MATERIAL IDENTIFICATION MARKING:

Marking of each individual bar at the front and side face shall be done as given below. For easy identification of the material during usage, each bar shall be painted with Green color code along the length of the bar on any of its face as indicated below:



Supplier shall ensure that the green color code is clearly visible in the final dispatch condition of the material.

22.0 PACKING:

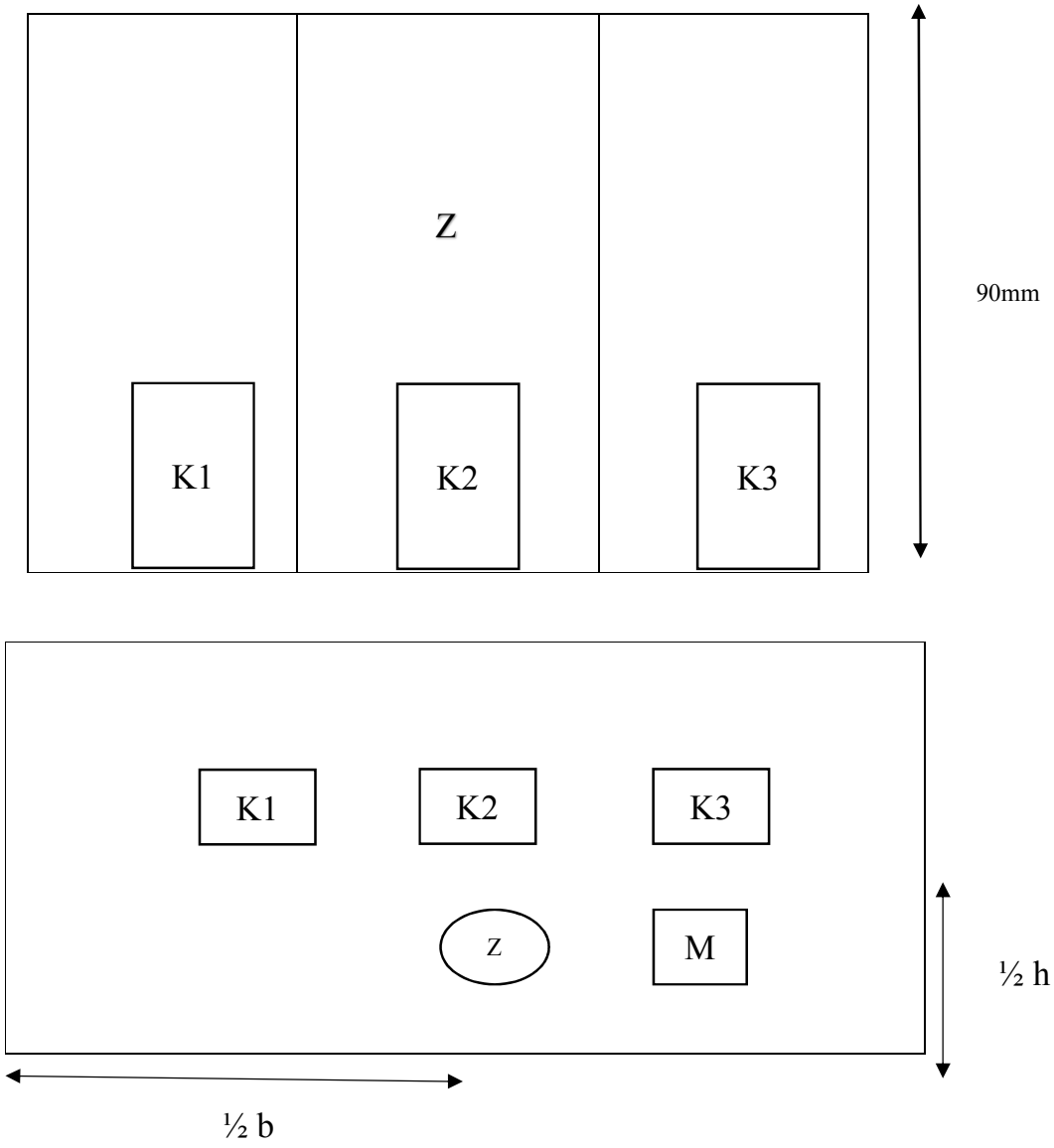
The bars shall be suitable packed to prevent from corrosion and damage during transit. Bars of lengths within 1 metre variation are to be separately bundled to avoid bending during transit or storage.

23.0 REJECTION AND REPLACEMENT:

In the event of any material proving defective during the course of further processing or testing at BHEL, such material shall be rejected and the supplier shall make immediate arrangements to replace the same free of cost after all the commercial terms and conditions are satisfied.

ANNEXURE A

TEST SAMPLES LOCATIONS PLAN (CROSS SECTION AREA < = 200 CM^2)

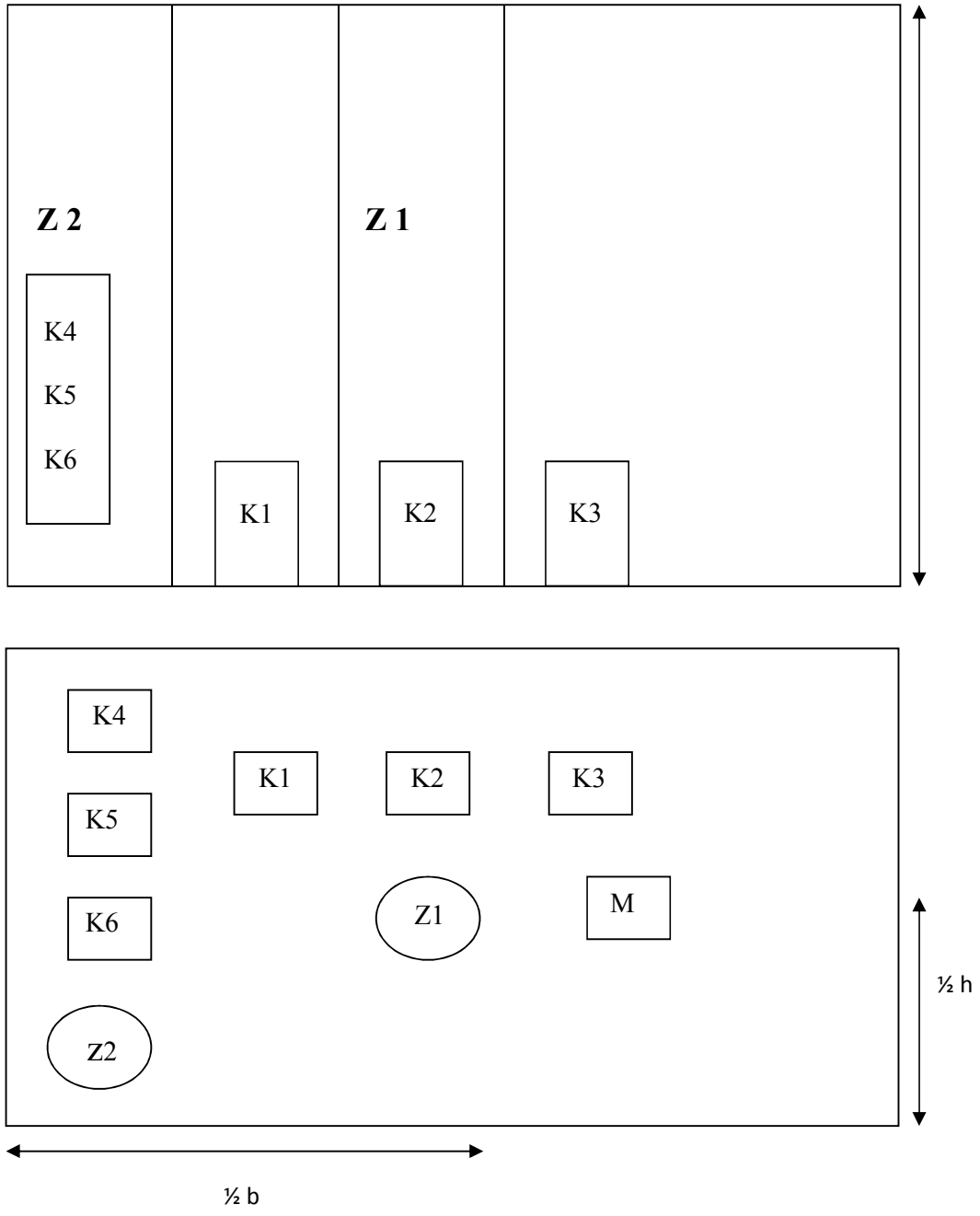


Z = TENSILE SPECIMENS (LONGITUDINAL DIRECTION)
K1, K2 & K3 = IMPACT SPECIMENS
M = METALLOGRAPHY SPECIMENS

NOTE: Make sure that all specimens are located in the middle of the material thickness

ANNEXURE B

TEST SAMPLES LOCATIONS PLAN (CROSS SECTIONAL AREA > 200 CM²)



Z1, Z2 = TENSILE SPECIMENS (LONGITUDINAL DIRECTION)
K1 TO K6 = IMPACT SPECIMENS
M = METALLOGRAPHY SPECIMENS

Annexure C

VENDOR'S NAME & ADDRESS	**QUALITY PLAN (BLADE FLATS)**	**HY 10766 REV 11 (PAGE 10 OF 11)**
	BHEL ENQ/ P.O. No.	QP No.: BHEL/HY10766/Blade flats SQAP Rev.03 PAGE 1 of 2
	Date	

SL No	Operation	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms	Format of Record	* D	Agency P	Agency W	Agency V	Remarks
1.	Melting & Refining (ESR or VD Process)	Chemical composition	Major	Chemical analysis	Each melt	HY 10766 Rev. 11	HY 10766 Rev. 11	Test certificate	√	2	-	1	
2.	Hot rolling / Forging & Cutting	Dimensions	Minor	Dimensional	100%	Internal Standard	Internal Standard			2	-	1	
3.	Heat treatment	Soaking time & temperature	Major	Verification of HT time & temperature charts	All cycles	HY 10766 Rev. 11	HY 10766 Rev. 11	Original HT charts	√	2	-	1	
4.	Dimensional inspection	Dimension & tolerances	Major	Dimensional checking	100%	As per PO & Spec.	As per PO & Spec.	Dimensional report	√	2	1	-	Refer Note - 4
5.a	Mechanical properties	Hardness	Major	Hardness test	Each lot	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	1	-	
5.b		Tensile properties (0.2% Y.S, UTS, %El, % RA) & toughness	Major	Tensile & Impact testing	Hardest & softest bar from each lot	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	1	-	
6.a	NDT	Visual	Major	Surface defects & finish	Each bar	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	1	-	
6.b		UT	Major	Sub-surface defects	Each bar	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	1	-	

Legend:

- P Perform; W Witness; V Verification;
- Indicate 1 for BHEL or BHEL nominated Inspection agency & 2 for vendor/sub vendor as appropriate against each component /characteristic under P, W & V columns.
- * For items marked √ (tick) in column D, test certificates shall be submitted to BHEL for records.

Prepared by

Sachin Katiyar

सचिन कटियार
Sachin Katiyar
वरिष्ठ अभियंता / गुणवत्ता आश्वासन
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Signature and Stamp

Approved by

QUALITY ASSURANCE
B.Ashok Kumar
AGM / QA
5.7.24
BHEL HYDERABAD

Signature and Stamp

#Vendor's confirmation

Signature and Stamp

Annexure C

VENDOR'S NAME & ADDRESS	**QUALITY PLAN (BLADE FLATS)**	HY 10766 REV 11 (PAGE 11 OF 11)
	BHEL ENQ. /P.O No. Date	QP No.: BHEL/HY10766/Blade flats SQAP Rev.03 PAGE 2 of 2

SL No.	Operation	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms	Format of Record	* D	Agency P	Agency W	Agency V	Remarks
7.a	Metallurgical testing	Inclusion rating, microstructure & % delta ferrite	Major	Microstructure	One sample per lot	HY 10766 Rev. 11	HY 10766 Rev. 11	TC with micro-structure photographs	√	2	-	1	
7.b		Grain size	Major	Microstructure	On hardest & softest bar per lot	HY 10766 Rev. 11	HY 10766 Rev. 11		√	2	-	1	
8.	Material identity test	Material grade	Major	Chemical analysis	Each bars	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	1	-	
9.	High temp. properties	Guarantee for elevated temperature properties as per EN10269.				HY 10766 Rev. 11	HY 10766 Rev. 11		√	2	-	1	Guarantee certificate shall be submitted
10.	Packing, marking & color code	Packing & marking	Major	Hard punching & colour code	All bars	HY 10766 Rev. 11	HY 10766 Rev. 11			2	-	1	
11.	Verification & Certification	Documentation	major	Verification	All bars	HY 10766 Rev. 11	HY 10766 Rev. 11	TC	√	2	-	1	Endorsement of all documents by TPIA

Note:

1) This SQAP is applicable along with BHEL approved frozen Manufacturing Process Plan (MPP) only.
2) Additional requirements as per BHEL customer / project and purchase order will also be applicable.
3) This SQAP is not applicable for first time supplies of the material as per HY10766, for which a separate MPP and QAP shall be submitted. In such case process qualification requirements will be also be applicable.
4) The following shall be ensure & certified:
   a. Size & Length of each bar as per purchase order.
   b. Straightness of all bars.
   c. Defect free surfaces.
   d. Marking & punching on all bars.

Legend:	Prepared by	Approved by	#Vendor's confirmation
• P Perform; W Witness; V Verification; • Indicate 1 for BHEL or BHEL nominated Inspection agency & 2 for vendor/sub vendor as appropriate against each component /characteristic under P, W & V columns. • * For items marked √ (tick) in column D, test certificates shall be submitted to BHEL for records.	Signature and Stamp सचिन कटियार Sachin Katiyar वरिष्ठ अभियंता / गुणवत्ता आश्वासन Sr. Engineer / Quality Assurance एच.ई.एल. हैदराबाद, BHEL,HYD-32	Signature and Stamp QUALITY ASSURANCE BHEL HYDERABAD B.Ashok Kumar AGM / QA 8-7-21	Signature and Stamp

#To be submitted along with the technical offer.

BLADING MATERIALS FOR NTPC STEAM TURBINES

1.0 PURPOSE : This standard specifies the requirements of Blading Materials for NTPC Steam Turbines.

2.0 TECHNICAL REQUIREMENTS :

2.1 The supply shall be as per Plant Purchase Specification No. **HY10766**

2.2 Material is to be procured as per approved Vendor list of NTPC.

3.0 BHEL CODIFICATION AND EXECUTION:

As per variant table given below.

Var No	Material description	Material Code
01	SS FLAT 24x13	TC9751863015
02	SS FLAT 33x17	TC9751863023
03	SS FLAT 34x21	TC9751863031
04	SS FLAT 41x26	TC9751863040
05	SS FLAT 56x35	TC9751863058

RECORD OF REVISIONS

REV NO.	DATE	REVISION DETAILS	REVISED	APPROVED
00	**27/08/2004**	**NEW**	**TSP**	**CNVR**
01	**17/01/2015**	**NOTE 2.2 ADDED VAR 04 ADDED**	**TSP**	**DSR**
02	**03/03/2018**	**VAR 05 ADDED**	**TSP**	**PAK**

Annexure-1

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 _____ _____ _____ . 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 Independent External Monitor(s), 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. He commits himself to observe the following principles during his 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 will 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 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 from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 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.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all bidders who do not sign this 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 Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is 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 Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.

8.4 The Principal will provide to the Monitor 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 Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending 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, the matter should be examined by the full panel of IEMs jointly as far as possible, 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 CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9 IEM 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 organization should be looked into by the CVO of the concerned organisation.

8.10 If the Monitor has 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 Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP 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. Issues like warranty / guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made/ lodged during currency of IP, 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 agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement 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 agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

For & On behalf of the Bidder/ Contractor

(Office Seal)

Place----------

Date----------

Witness:_____

(Name & Address) _____

_____

Witness:_____

(Name & Address) _____

_____