

**COPYRIGHT AND CONFIDENTIAL**  
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED,  
 It must not be used directly or indirectly in any way detrimental to the interest of the company.

**TECHNICAL SPECIFICATION**  
**FOR SUPPLY OF**  
**MODULE MOUNTING STRUCTURE (MMS)**

**PROJECT** : **1X50 MWp SPV POWER PLANT,NTPC,MANDSAUR,MP**

**CUSTOMER** : **NATIONAL THERMAL POWER CORPORATION LIMITED**



### A. INTRODUCTION

National Thermal Power Corporation Ltd (NTPC), a premier Maharatna public sector undertaking in the field of power generation, is setting up a 250 MWp solar PV power plant, primarily at two villages Runija & Gujerkhedi (Tehsil Suwasra), Mandasaur Dist., Madhya Pradesh state.

The entire 250 MWp solar PV power plant comprises of five nos. blocks of capacity 50 MWp each. BHEL is setting up in P4 block of 50 MWp capacity.

Plant Location	:	Mandasaur District
State	:	Madhya Pradesh
Nearest Important Town	:	Suwasra (Tehsil)
Nearest Railway Station	:	Suwasra
Nearest Airport	:	Udaipur
Nearest National Highway:		NH-14

The PV modules shall be mounted on metallic structures called Module Mounting Structures (MMS). This document describes the technical specification for MMS.

### B. SCOPE

This specification covers the supply of structural elements for MMS (refer annexure-1) as detailed below:


Variant No.	Scope of Supply	BHEL Material Code	Remarks
01	Supply of Column Posts	PY9760052016	Includes channel section with hinge plate (welded connection), punctured holes in both channel and hinge plate, etc.
02	Supply of Fasteners	PY9760052032	SS304 and Class A2-70
03	Supply of Super Structure of MMS (balance structural elements in MMS like rafters, purlins, bracings etc.)	PY9760052024	Includes Rafter sections with welded cleats and hinge plate, Purlin sections with slotted holes, Bracings, Angles with punctured holes, etc.


### C. MATERIAL SPECIFICATION

MMS frames, post, cap plate, assembly of the structures, etc. shall conform to Indian standards as mentioned in the list of code. Refer Annexure-1 for details of structural members. All cold formed sections shall be minimum yield stress 350MPa and Hot rolled sections of minimum yield stress 250MPa.

IS: 2062 - Hot Rolled Medium and High Tensile Structural Steel

IS: 811 - Cold Formed Light Gauge Structural Steel Sections

TD-106-2 Rev No. 5	Form No.		<p align="center"><b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b></p> <p align="center"><b>BHEL RCPURAM, HYDERABAD –32</b></p>	Doc.No: <b>PY60052</b> Rev No.: 00 Page 3 of 6
<p align="center"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</p>		<p>MMS column post shall be minimum 3.15 mm and the minimum thickness of light gauge members shall be 2 mm, all without galvanization.</p> <p><b>All materials shall be fabricated in shop such that welding in field shall not be required. Activities like Welding, Galvanisation, Punching of holes etc., are not allowed at site.</b></p> <p><b>D. CONNECTIONS</b></p> <p>All fasteners (nuts, bolts and washers) shall be of Stainless Steel (SS304) and Class A2-70 as per IS: 1367.          All bolts shall be tighten with designed torque mechanically.</p> <p>Connection of column post and rafter/beam shall be of hinge plate and bolt system as indicated in the drawing (refer Annexure-1).</p> <p><b>E. COATING FOR STRUCTURAL STEEL WORKS</b></p> <p>MMS frames, post, cap plate, assembly of the structures, etc. shall be of MS hot dip galvanized. Hot dip galvanization shall be as per IS: 4759 and the coating minimum thickness shall be maintained by 85 micron.</p> <p>IS: 4759 - Hot-dip zinc coatings on structural steel and other allied products</p> <p><b>F. SUB VENDOR FOR STRUCTURAL STEEL</b></p> <p>Vendor shall procure the raw materials (steel sheets/strips/plates etc as per BHEL drawing) from main steel producers like SAIL, TISCO, RINL, Essar Steel, Ispat Industries, JSW Steel, Lloyds Steel Industries, Jindal Steel &amp; Power and Sunflag Steel &amp; Iron Co., Bhandara [ only for rounds (15-105mm), flats (45-120 mm width &amp; 4.75-28 mm thick), hex rods (15.5-42 mm) and wire rods (5.5-38 mm)].</p> <p><b>F. INSPECTION</b></p> <p><u>For MMS Super Structure:</u>          If required by end customer, vendor shall organize for assembly of one set of MMS structure components to demonstrate fitting and clearances of parts. For the above, it is Bidder's responsibility to arrange other structural/equivalent members of MMS that are mentioned in Annexure-1 and not in bidder's scope of supply for completeness of Assembly.</p> <p><b>G. MANUFACTURING QUALITY PLAN (MQP)</b></p> <p>A typical sample of MQP for the MMS items is enclosed along with this tender. Vendor shall use this document as reference for preparation and submission of test reports. Refer Annexure-2.</p> <p><b>H. TESTING AND TEST REPORTS</b></p> <p>For every lot of dispatch, vendor shall submit MTC (Material Test Certificate) and other Factory Acceptance/Routine test reports as per MQP. BHEL/NTPC shall provide dispatch clearance after verifying that the documents are in order.</p>		
Ref. Doc.				

TD-106-2 Rev No. 5	Form No.		<p align="center"><b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b></p> <p align="center"><b>BHEL RCPURAM, HYDERABAD –32</b></p>	Doc.No: <b>PY60052</b>
				Rev No.: 00
				Page 4 of 6
<p align="center"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>In the absence of MTC of raw materials from the sub-vendor, certificate from NABL approved third party laboratory shall be furnished for one sample of each type of section per offered lot.</p> <p>BHEL/NTPC reserves the rights to carry out surveillance visits at the works of vendor/ galvanizer to check/ monitor the MMS structure manufacturing/ galvanizing processes as and when required.</p> <p>Random samples may also be selected from the works or from the site (after supply) for testing at NTPC approved third party laboratory. Testing charges shall be borne by the vendor.</p> <p><b>I. MARKING INSTRUCTIONS</b></p> <p><i>For MMS Column posts and Super Structure:</i> All items shall have unique identification number (Numbering system shall be furnished by BHEL after placing PO. Bidder shall ensure the same before dispatch of material to site). The identification number of each item shall be stencilled with red paint in bold letters on every part on 100% basis.</p> <p><b>J. PACKING INSTRUCTIONS</b></p> <p><i>For MMS Column posts and Super Structure:</i> The MMS items shall be packed in bundles with steel straps. Necessary precautionary provisions (strips of plastic, fiber, rubber etc) shall be used to prevent the steel straps from damaging the galvanized surface. Adequate quantity of steel straps shall be provided depending upon the length of MMS items. Bundles shall be with appropriate lot quantity (50 Nos, 100 Nos etc per bundle) to facilitate ease of handling and accounting. Bundles shall be provided with name tags giving part number, quantity and month of manufacturing.</p> <p><i>For Fasteners:</i> Hardware shall be supplied in plastic wrapped hessian cartons/plastic wrapped thick cardboard cartons to avoid bursting and spillage of contents during transport and storage at site. Each carton shall be clearly identified with the type of hardware packed in it and its quantity. Cartons shall be in weight not exceeding 30 kg for easy handling and storage at site.</p> <p><b>K. NOTES TO BIDDER</b></p> <p>a) Bidders are advised to contact BHEL for essential technical queries in writing during pre-bid stage. In case no such clarifications are sought during pre-bid stage, it will be assumed that bidder has no comments or observations on BHEL's specification and no deviations from the specifications are taken by the bidder.</p> <p>b) Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder.</p> <p>c) In the event of any conflict between these specifications, drawings, related standards, codes etc. the vendor shall refer the matter to the purchaser for clarifications during pre-bid stage.</p> <p>d) Quantities mentioned are tentative requirement. Based on the actual requirement, quantity can be increased or decreased by about 30% on overall qty. Final BOQ will be informed before price bid opening. Unit rates shall be applicable for the revised BOQ also.</p>				
Ref. Doc.				



#### L. DELIVERY SCHEDULE

The schedule for delivery of items at site shall be as follows:

- a) For Supply of MMS columns (BHEL Material Code: PY9760052016)

Schedule of Delivery	% Quantity
05 weeks from PO date	30
08 weeks from PO date	30
12 weeks from PO date	40

- b) For Supply of Fasteners (BHEL Material Code: PY9760052032)

Schedule of Delivery	% Quantity
05 weeks from PO date	30
08 weeks from PO date	30
12 weeks from PO date	40

- c) For Supply of Super Structure of MMS (BHEL Material Code: PY9760052024)

Schedule of Delivery	% Quantity
05 weeks from PO date	30
08 weeks from PO date	30
12 weeks from PO date	40

For a), b) & c) above, Bidder to supply all members in its scope in proportions required for erection of complete Module Mounting Structure i.e., each lot supplied shall contain all the members(parts) in scope of bidder.

#### M. LIST OF ANNEXURES

Following input documents and specifications are enclosed to facilitate the bidder to furnish the offer:

Annexure No.	Document/ Drawing Title	Doc. No.	Rev
1	GA of MMS (For tender purpose only)	PY-DS-1-M068-1260-01	00
2	QAP Guidelines and Format	ANNEXURE-2	00
3	Pre-Bid Queries format	ANNEXURE-3	00
4	No deviation format	ANNEXURE-4	00
5	Price bid format	ANNEXURE-5	00

Notes: In case if bidder found any document/annexure no. listed in the technical specification and is missing from the attachment, it is bidder's responsibility to highlight the missing attachment.







## QAP GUIDELINES & FORMAT

( ANNEXURE)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

**Note :**


1. Typical /Indicative /Standard QAP(s) for equipment /package is attached as a reference document and to be used by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.
2. No deviation to the typical QAP is acceptable.

**COPYRIGHT AND CONFIDENTIAL**

The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED,  
it must not be used directly or indirectly in any way detrimental to the interest of the company.

**GUIDELINES TO VENDORS FOR  
PREPARATION OF QUALITY ASSURANCE PLAN**


1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.
2. Each page of QAP shall contain the following information.
  - a) Vendor's name & address.
  - b) Customer: BHEL, Hyderabad.
  - c) Project.
  - d) BHEL Product Standard Number/revision number as referred in P.O.
  - e) BHEL Purchase Order Number & Date.
  - f) Product as per P.O. description.
  - g) QAP Number (unique and shall not repeat)/revision number/date.
  - h) Page number and number of pages
3. QAP shall contain four parts / stages as follows.
  - a) Raw materials and bought out items.
  - b) In process Control / Inspection.
  - c) Final assembly, Inspection & Testing.
  - d) Painting, preservation & packing.
4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).
5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)
6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.
7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)
8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)
9. Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.
10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.
11. Please refer 'Agency' in QAP format.  
Under P: Perform, W: Witness, V: Verify  
Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR  
2: (Vendor / Sub vendor)

Form No.	 <b>HYDERABAD</b>	<b>PRODUCT STANDARD</b> PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE-2 Rev No. 00 Page 3 of 3
<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, Under Witness (W) column use 1. Under 'Verify' column, use code1.</p> <p>12. Under 'D' please put ( <input type="checkbox"/> Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.</p> <p>13. Vendor's signature &amp; stamp should be available on each page of QAP.</p> <p>14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification &amp; Approved Drawings.</p> <p>15. The following operations/characteristics/check points may be included (AS APPROPRIATE)</p> <ol style="list-style-type: none"> <li>a) Visual check</li> <li>b) Dimensional check</li> <li>c) Mechanical and Chemical properties.</li> <li>d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)</li> <li>e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.</li> <li>f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.</li> <li>g) Verification of test certificate for protection class for the enclosures.</li> <li>h) Mechanical functioning of switches.</li> <li>i) Continuity of earthing and provision of earth points.</li> <li>j) Colour coding of wiring, size, tightness &amp; dressing of wiring.</li> <li>k) Review of test certificates of assembled items, raw materials, internal test reports etc.</li> <li>l) Witness of functional checks, which may include mechanical run &amp; electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.</li> <li>m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.</li> <li>n) Material identification ( for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)</li> <li>o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.</li> <li>p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)</li> <li>q) All tests as per BHEL Product Standard &amp; approved drawings including Type tests and Routine tests on individual items and on System as a whole.</li> <li>r) Packing and Preservation.</li> </ol> <p>16. <b>QAP Format enclosed.</b></p> <p>17. <b>Typical Manufacturing QAP(s) is /are attached.</b></p>		
Ref. Doc			



SL NO		COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
											P	W	V	
<b>1.0</b>		<b>RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>												
1.1	Raw Materials	Mechanical & Chemical Properties	Major	Mech., Chem. Analysis	One per Lot/Batch /Heat	BHEL Spec / Approved Drawing	MTC	✓	2	-	1			
<b>2.0</b>		<b>INPROCESS INSPECTION</b>												
2.1		Mechanical Analysis (UTS, YS, EL)	Major	Mech. Analysis	One per Lot/Batch /Heat		MTC / TC	✓	2	2	1			
2.2		Visual, Dimensions, Markings, Finish etc.	Major	Visual, Measurement	100%		ITR	✓	2	2	1			
<b>3.0</b>		<b>FINAL INSPECTION &amp; TESTING</b>												
3.1	Module Mounting Structures	Visual, Dimensions, Markings, Finish etc.	Major	Visual, Measurement	10%	BHEL Spec / Approved Drawing	IR	✓	2	1	-			
3.2		Galvanization# (Uniformity, Thickness of Coating)	Major	Measurement	One per Lot/Batch /Heat		TC/ITR	✓	2	1	-	# for Galvanized items		
<b>4.0</b>		<b>PRESERVATION &amp; PACKING</b>												
4.1		Painting (Shade, DFT)#	Major	Visual	Random	BHEL Spec / Approved Drawing	TC	✓	2		1	# as applicable		
4.2		Packing#	Major	Visual	100%		Packing Slip	✓	2	-	1	#Seaworthy packing for export orders		

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (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.

		<b>TYPICAL MANUFACTURING QUALITY PLAN</b>						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: <b>Module Mounting Structures</b> BHEL TECH SPEC:			REV NO:		DATE:			
		PAGE 2 OF 6											
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	

Notes:-

1. This Standard MQP should be read along with specification (Latest revision as per PO), approved drawings & approved datasheet (as applicable).
2. Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

Abbreviations:-

MTC	-	Material Test certificate	TC	-	Test Certificate
IR	-	Inspection Report	ITR	-	Internal Test Report
UTS	-	Ultimate Tensile Strength	YS	-	Yield Strength
EL.	-	Elongation	PMI	-	Positive Material Identification
MPI	-	Magnetic Particle Inspection	LPT	-	Liquid Penetrant Test
IBR	-	Indian Boiler Regulations	NDE	-	Non Destructive Examination
RT	-	Radiography Test	UT	-	Ultrasonic Test

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (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.



**COPYRIGHT AND CONFIDENTIAL**  
 The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.

**DEVIATION FROM SPECIFICATION**

If the proposal submitted has got any deviation from the technical stipulations in the bidding document, the Bidder shall tabulate below the full particulars of such deviations and shall sign below. Additional sheets may be enclosed, if necessary. Deviation is to be furnished with mention of specific clause numbers. Technical and commercial deviations to scope of supply and services, shall be indicated separately. Bidders shall bring put only those deviations which are impractical to meet (or) not advisable

SI.No	CLAUSE NO.	DESCRIPTION AS PER SPECIFICATION	DEVIATION BY BIDDER

We confirm that all the deviations/exceptions to the Technical Specification PY60052, Job Specification and enclosures including reference documents attached are listed in this Annexure only. No other deviations or exceptions even if mentioned elsewhere shall be considered for any technical/ commercial evaluation or for ordering.

Signature of Bidder's  
 Authorized representative .with date.....

Date .....



BHARAT HEAVY ELECTRICALS LIMITED  
PROJECT ENGINEERING AND SYSTEMS DIVISION

PRICE BID FORM AT								
RFQ No. _____		Dt. _____		Due D _____		ate(Tech Bid): _____		
S.No	Description	Qty	Unit	Unit Rate (Rs.)	Total Value (unit Rate x Qty) (Rs.)	TAXES & DUTIES (%)		
						ED	CST	VAT
1	PY9760052024: Supply of Super Structure of MMS (balance structural elements in MMS like rafters, purlins, bracings etc.) as per BHEL spec PY60052	17,00,000	kg					
						TAXES & DUTIES (%)		
						ST	Other Cess	
2	Packing & Forwarding							
3	Insurance							
4	Freight							

**NOTES:**

- Pl. quote only base rate; Indicated prices for P&F, Freight, Insurance will be considered as extra over and above base price Taxes & Duties will be considered extra.  
Indicate ED, CST, VAT as applicable, as on date
- BHEL will split the order between two bidders.  
Lowest (L1) bidder will be awarded 60% (i.e ~10,20,000 kg) of above requirement  
L1 bidder's price will be counter offered to L2 bidder on his acceptance, balance 40% (i.e ~6,80,000 kg) of above requirement will be ordered on L2 bidder.
- In case L2 bidder does not accept the counter offer at L1 bidder's price, the counter offer will be extended to subsequent bidders as per ranking.
- For the purpose of the matching the price of L1 bidder, other bidders would have to necessarily reduce all components including taxes & duties on pro-rata basis such that the summation of revised / reduced/ arithmetically corrected quote price with taxes & duties shall be equal to the L1 bidder's price.
- In case award of 40% remains undecided up to the last ranking bidder following the above procedure, balance 40% shall be awarded to L1 bidder.
- A quantity tolerance of +3 % (no negative tolerance) is allowed in despatches based on actual numbers required for the project. Payment shall be made on actual despatches
- Measurement of weight shall be on the finished product and Vendor shall submit certified Weigh Bridge documents for empty truck & loaded truck.

*The Price bid shall be submitted in the above format (reproducing is acceptable, but shall contain all the above content including notes), duly signed & stamped by authorised signatory of bidder.*