

Form No:	 PE&SD	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION		PY 52 188	
		TECHNICAL SPECIFICATION		Rev. No. 04	
		PRE-FABRICATED PIPING PACKAGE		Page 1 of 11	

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1.0 INTENT OF SPECIFICATION

- 1.1 The intent of this specification is to establish the minimum requirements of engineering, fabrication, assembly, quality, inspection, shop testing, shop painting, marking, packaging for preservation, weather protection and transportation for the Pre-fabricated Piping Package.
- 1.2 It is not the intent to completely specify all the details of fabrication. Nevertheless, the finished product shall confirm to highest standards of engineering & fabrication and shall be capable of performing in continuous commercial operation in a manner acceptable to the Purchaser and end customer.
- 1.3 The individual pipes and piping components which will be used as part of the pre-fabricated piping package shall conform to the requirements of latest version of applicable ASME/IS dimensional standards and ASTM/IS material standards as specified in clause 4.1.

2.0 LEGEND / GLOSSARY OF TERMS

Purchaser : BHEL
Owner : BHEL's Customer
Bidder : Eligible vendors from whom offers are received against the Enquiry
Vendor : Successful Bidder of the Package on whom Order is placed

3.0 SCOPE OF SUPPLY / SERVICES

- 3.1 The following items / services shall be included in the scope of bidder. The list covers only the broader scope of supply & services and bidder shall refer and follow the detailed scope / requirements specified in this specification and the relevant project's job specification:
- Pre-fabricated Piping Package (including loose piping material) fabricated in line with the philosophy detailed in Cl. No. 4.2 (exact quantity shall be as per Job Specification of the project)
 - Engineering, material sourcing / manufacturing, fabrication, assembly, surface preparation, shop painting, marking, packaging and transport of the pre-fabricated piping package
 - Inspection & Testing at Vendor's works
 - Obtaining purchaser's approval on all applicable engineering documents
 - Documentation as specified in this specification including necessary statutory approvals, test certificates etc.
 - Coordinating and arranging applicable statutory approvals from government/ non-government bodies/ agencies.
 - Correction of mismatches found w.r.t approved drawings without any price implication. (to be carried at site)
 - Rectification of damages caused during transportation without any price implication. (to be carried at site)

Refer Doc	LAYOUTS & PIPING ENGINEERING PROJECT ENGINEERING & SYSTEMS DIVISION	PREPARED	CHECKED	APPROVED	DATE
		 V UDAY	 RAGHAVENDRA	 SRIKANTH G	01.07.16

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3.2

Any additional item, material, services etc., which are not specifically mentioned in this document, but required to make the pre-fabricated piping package complete in all respects, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/ applicable codes/ standards, good engineering practices, shall be deemed to be covered under the scope of this specification.

3.3

It will be the bidder’s sole responsibility to specifically highlight any of the missing items required for the proper & intended use of the pre-fabricated piping packages as a part of their offer. In case nothing is highlighted by the bidder, it will be assumed that all the major items are included in the bidder’s scope of supply for the desired operation.

4.0

TECHNICAL REQUIREMENTS:

4.1

APPLICABLE STANDARDS

Bidder shall follow the related standards referred herein and shall be of the latest edition prior to the date of purchaser’s enquiry:

ANSI

American National Standards Institute.

ASME

American Society of Mechanical Engineers

ASTM

American Society for Testing and Materials

ASME B 31.1

Power Piping

ASME B 31.3

Process Piping

IBR

Indian Boiler Regulations

ASME B 36.10

Welded and Seamless Wrought Steel Pipe

ASME B 36.19

Stainless Steel Pipe

ASME B 16.1

Gray Iron Pipe Flanges and Flanged Fittings

ASME B 16.5

Pipe Flanges and Flanged Fittings

ASME B 16.9

Factory made Wrought Buttwelding Fittings

ASME B 16.11

Forged Fittings, Socket Welding and Threaded

ASME B 16.25

Buttwelding Ends

ASTM A105

Std Spec for Carbon Steel Forgings for Piping Applications

ASTM A106

Std Spec for Seamless Carbon Steel Pipe for High Temperature Service

ASTM A123

Std Spec for Zinc (Hot-Dip Galvanised) Coatings on Iron and Steel Products

ASTM A182

Std Spec for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, Valves and Parts for High Temperature Service

ASTM A234

Std Spec for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM A312

Std Spec for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes

ASTM A335

Std Spec for Seamless Ferritic Alloy Steel Pipe for High Temperature Service

ASTM A403

Std Spec for Wrought Austenitic Stainless Steel Piping Fittings

API 5L

Std Spec for Line Pipes

ASTM A333

Std Spec for Low Temperature Carbon and Alloy Steel pipes

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ASTM A530	Std Spec for General Requirements for Specialised Carbon and Alloy Steel Pipe
ASTM A671	Std Spec for Electric Fusion Welded Steel Pipe for Atmospheric and Lower Temperatures
ASTM A672	Std Spec for Electric Fusion Welded Steel Pipe for High Pressure and Moderate Temperatures
ASTM A 350	Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
ASTM A 420	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
MSSP-75	Specification for High-Test, Wrought, Butt-Welding Fittings
MSSP-44	Steel Pipeline Flanges

4.2 **FABRICATION METHODOLOGY OF PRE-FABRICATED PIPING PACKAGE**

4.2.1 Pre-fabricated Piping Package supply is limited only to fabricated Piping spools and Fittings according to the Approved Isometrics. All other materials like Valves, Flanges, Gaskets, Stud Nuts, Steam Traps, Strainers, Pipe Hangers, Insulation and Instrumentation are excluded from the scope of supply.

4.2.2 The piping assemblies shall be fabricated as per the approved isometrics and other referred standards and technical specifications.

4.2.3 Vendor shall fulfill all the requirements of documentation as detailed under clause no .6.0.

4.2.4 Vendor shall start fabrication only after receipt of approval from the purchaser on the documentation submitted by the vendor.

4.2.5 The scope of pre-fabrication activity includes:

- Spooling.
Cutting the Pipes to required lengths and edge preparation of the cut Pipe spools as per the approved fabrication Isometrics. Vendor to ensure that the Weld gaps required for site welding are properly taken care while spooling.
- Edge preparation of fittings to match to corresponding pipe sizes.
- Welding of stubs and branch connections.
Unless otherwise specified, all pipe to pipe branch connections shall be with reinforcement pad. Reinforcement pad diameter shall be at least equal to 2 times OD of the branch pipe. For all the pipe to pipe branch connections, the branch connection shall have a minimum projection of 200mm above the header pipe surface.
- Welding of shoe pads for Pipe supports.
Pipe support shoe pads wherever required as per the approved drawings, shall be fabricated from the parent pipe. Alternatively vendor may fabricate the

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same from a 10mm thick plate of equivalent material. The exact dimension of the shoe pad shall be as per Job specification.

The approximate number of shoe pads envisaged to be welded shall be as per BOM provided as Annexure to the Job specification. Final number of shoe pads shall be as per the Engineering isometrics that will be issued post order placement.

➤ Surface preparation, Primer and Painting of the finished piping spools and pipe fittings as per job specification.

➤ Marking of all spools (stamped & stenciled)

4.2.6 Pipe spooling shall be carried out in such a way so as to have minimum field joints at site. While doing so, maximum transportable size of 6.0m length to be kept in view. Spool length to be maximized to the extent possible considering the above.

4.2.7 All welding shall be carried out as per the WPS specified in the Job specification.

4.2.8 For IBR Piping Package, Vendor shall comply with all statutory requirements and take necessary approvals from CIB before start of fabrication, as per Indian Boiler Regulations (IBR). Vendor shall furnish IBR Form-III A for Pipes and IBR Form-III C for Pipe Fittings, duly filled and certified.

5.0 SPECIAL INSTRUCTIONS TO BIDDER

5.1 This specification shall be read in conjunction with Project's Job Specification for Pre-fabricated Piping Package. In case of any discrepancy arising between this specification, applicable standards and the job specification & its enclosures, it shall be bidder's sole responsibility to clearly bring out/ highlight the same distinctively in his pre-bid queries within 6 working days from the receipt of enquiry, so as to enable purchaser to furnish their decision/ clarification. If such issues/ requirements are not duly addressed by bidder during the pre-bid stage and if such issues/ requirements are observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.

5.2 Any other specific fabrication requirement which is mandated as per governing design code or statutory requirements, but not listed elsewhere in this specification or its enclosures shall be deemed to be included in the basic price quoted by the bidder.

5.3 Bidder to quote strictly as per BHEL's price format. Any tampering/ modification/ change of the BHEL's price format is not allowed and the bidder's offer is liable for rejection.

5.4 Compliance with this specification shall not relieve the bidder of the responsibility of producing pre-fabricated piping package of proper design, materials and workmanship to meet the specified operating conditions.

5.5 The design information, specifications and datasheets etc indicate only the minimum requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.

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with offer). Offer without deviation list will not be evaluated & shall be liable for rejection.

6.2 AFTER PLACEMENT OF PO BEFORE START OF FABRICATION

6.2.1 Purchaser shall issue the Engineering Isometrics to successful bidder post order within 7 working days from placement of Order.

6.2.2 The Spool numbering philosophy shall be discussed and agreed mutually between vendor and purchaser, after placement of PO.

6.2.3 Vendor shall review all the Engineering Isometrics and shall prepare and submit the following (editable copies prepared in AutoCAD/Excel/Word) for Purchaser's approval **within 10 working days after receipt of Engineering Isometrics**:

- Fabrication isometrics with all the spools clearly marked. A spool table with the weights of the individual spools to be indicated on the fabrication isometric.
- Drawings of the Pipe Spools thus marked on the fabrication isometrics
- Cutting Plan (for information)
- Comprehensive Quality Assurance Plan. This Q.A. Plan is subject to approval by Purchaser and/or owner (The Q.A. Plan shall be comprehensive & shall include all inspection & test requirements of material, manufacturing, painting, packing, check points as per approved drawings and BOM)

6.2.4 Vendor shall start fabrication only after receipt of approval from the purchaser on the documentation submitted by the vendor.

6.2.5 For IBR package, the vendor shall take the necessary statutory approvals from CIB of the respective state where the vendor works are located, on the pipe spools drawings, before start of fabrication.

6.3 BEFORE DISPATCH

6.3.1 The following documents / drawings shall be submitted by vendor during final shop testing & before dispatch of the Piping pre-fabricated package:

- Final as-fabricated isometrics
- Final as-fabricated spool drawings
- Guarantee and all test certificates for the pre-fabricated spools and material test certificates for all the input raw materials for review and acceptance by purchaser and / or owner as per approved QAP.
- Statutory approvals / certificates (including for those items procured from sub-vendors)

6.3.2 For IBR package, the vendor shall submit all the required documents as mandated by CIB to enable the erection agency at site to take necessary approvals from CIB of the respective state where Erection is done. All requisite documents in required numbers shall be submitted by Vendor.

6.4 AFTER DISPATCH

Vendor shall furnish the details like LR numbers, Invoice details, Weight details etc for all the dispatches. **The data shall be furnished for every individual spool number / part**

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number.

Same shall be furnished in a spread sheet progressively as per schedule of dispatches.

6.5

SUBMISSION & REVIEW OF DOCUMENTS POST ORDER

6.5.1

Revisions in drawings/ documents shall be clearly marked within clouds or Triangle mark indicating the revision mark. Revisions without clouding shall not be considered, reviewed and approved. All the revised drawings / documents shall be associated with comments compliance report.

6.5.2

The approval and /or review by the purchaser / owner shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

7.0

SURFACE PREPARATION, PAINTING & COLOUR

7.1

All the pre-fabricated piping, pipe fittings and any other loose material shall be properly cleaned, surface prepared and painted before dispatch.

7.2

Surface preparation, Painting and Colour shall be as specified in the Job specification.

8.0

DISPATCH & SHIPPING

8.1

All packages shall properly be packed for transportation by ship/ rail or trailer.

8.2

The packages may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage for adverse atmospheric conditions such as high humidity, salinity, heavy rains etc.

8.3

The following minimum packing procedures shall be followed:

➤ Prior to shipment, Vendor to ensure that all items are dry, clean and free from moisture, dirt and loose foreign material of all kinds.

➤ All the items shall be protected from rust, corrosion, and mechanical damage during transportation and shipment.

➤ All the machined surfaces (to be welded at site) shall be protected by coating with easily removable rust preventive. Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.

➤ All the items shall properly be packed to prevent damage during transit, loading, unloading and storage.

➤ Pipe spool / fittings ends shall be suitably protected against damage and ingress of foreign material including water, and the protectors shall be securely and tightly attached.

8.4

Dispatches shall be drawing wise i.e., all the material pertaining to a drawing shall be dispatched as a set.

8.5

All the loose items shall be packed in gunny bags. The pipe spools / gunny bags shall be packed (in line with the requirements of clause nos 8.1 to 8.3), numbered and the same shall be linked to the LR numbers while furnishing the dispatch information as per clause no 6.4.

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8.6 It shall be bidder’s sole responsibility to protect all the material during period of transportation against corrosion, incidental damage due to adverse atmospheric conditions, rough handling in transit including delays in transit. Bidder shall be responsible for any damage to material due to above reasons and shall take necessary corrective action at site without any price implication.

9.0 DEVIATIONS TO SPECIFICATIONS

9.1 Bidder to note that all the applicable deviations / clarifications shall be listed separately in the format attached with the job specification and submitted to BHEL as a part of technical bid. All such applicable deviations / clarifications shall have cross reference to the specifications / annexures with proper reasons for the deviations for purchaser’s consideration. Any such applicable deviations /clarification not listed under the above section, even if reflected in any other portion of the bidder’s proposal shall not be considered applicable.

9.2 Except for those deviations/ variations covered as a part of pre bid clarification, it will be the responsibility of the bidder to fully meet the intent and the requirements of the specification within the quoted price. No other deviation whatsoever from this specification, except for those have been specifically agreed by purchaser as a part of pre-bid clarification shall be considered.

9.3 In case the bidder considers requirement of any other accessories / auxiliaries essential for safe and satisfactory operation of the equipment, he shall recommend the same along with reasons in a separate section as a part of pre-bid query to enable purchaser take a suitable decision on the requirement of the same.

9.4 Information like Bill of materials (BOM) and typical specifications etc., enclosed by the bidder as a part of their bid, shall be retained for information only and shall not be referred by contractor as contractual agreement. No implication shall be admissible on the basis of these documents during any stage of contract execution.

10.0 QUALITY REQUIREMENTS, INSPECTION & TESTING

10.1 Inspection shall be either by purchaser, owner or purchaser’s appointed third party agency as per the approved QAP.

10.2 Vendor is responsible for performance of all tests and inspection to ensure that the supplied package meets the requirements of this specification. Vendor may use their own facilities or any approved laboratory acceptable to purchaser / owner. Purchaser / owner reserves the right to inspect and witness any test prior to dispatch and as per “HOLD-POINTS” defined in the QA plan. Vendor shall give reasonable notice in writing of the date and place of any test and inspection by purchaser / owner.

10.3 Unless otherwise specified, BHEL reserves the right to test and inspect all the items at the Bidder works.

10.4 Vendor to produce Welder Qualification Certificates for purchaser’s review before start of fabrication. Alternatively purchaser may ask for Welder Qualification Testing at shop, which shall be witnessed and certified by a qualified third party agency and shall be reviewed by Purchaser/TPIA.

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10.5 IBR qualified welders are required for IBR Piping fabrication. Vendor to produce the certificates for purchaser's review before start of fabrication.

10.6 **Witness Inspection**

Vendor shall offer all the items for pre-dispatch inspection and the following tests/ checks shall be carried out as a minimum:

- Physical and Dimensional Check.
- Review of all certificates and test reports as indicated at 10.7 below.
- BOM check
- Painting workmanship and finish
- Additional tests, if any – As per Job specification

10.7 **Testing Procedure**

Test procedure shall include but not be limited to the following list of tests. All the tests being conducted shall clearly be brought out in the Quality Assurance Plan (QAP) by Vendor.

10.7.1 Positive Material Identification (PMI)

100% PMI shall be carried out for all Stainless Steel and Alloy Steel Material in presence of Purchaser/TPIA at the time of dispatch. Purchaser/TPIA at their discretion may choose to sample the lot for PMI.

10.7.2 Dimensional and physical check.

10.7.3 NDT on the Welds

The welds shall be tested per the document "Details of Welding, Testing & Inspection" provided in the Job specification.

Hydrostatic test is excluded for the individual fabricated spools at shop. However, vendor to produce the Hydrostatic test reports of the raw material, wherever applicable.

Though Hydrostatic test is excluded for the individual fabricated spools at shop, it is the sole responsibility of the vendor to ensure required quality of the materials and welds. If any defects (which are not attributable to field welds) were to be found at the time of field Hydrostatic Test of the Piping system, then the Vendor shall take necessary corrective action at site his own expenses. No claim for any additional price will be allowed.

11.0 QUALITY ASSURANCE PLAN (QAP)/ INSPECTION AND TEST PLAN (ITP)

11.1 It is a document generated by the supplier with complete listing of various inspection stages, tests, material certification requirements and parties involved with their respective roles in inspection; indicating the requirements of Hold (H),Witness (W) Inspection, and Review (R) of Quality control documents / records for an item. QAP and ITP are considered synonymous.

11.2 The bidder shall submit inspection & testing Quality Assurance Plan for all critical raw materials, shop manufacture items, sub-vendor supplied items, shop testing of items etc. Guidelines for preparing the QAP will be submitted as part of the Enquiry. Bidder to submit their QAP strictly according to these Guidelines, without which their offer is liable for rejection.

11.3 The shop QAP shall be approved by Purchaser / Owner and may indicate hold points. The vendor shall furnish minimum two weeks' time for all such shop inspection / testing - hold points

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11.4 All shop testing shall be conducted by vendor at their own cost and measuring and testing equipment shall be made available by them and all shall have valid calibration certificate.

11.5 All material test certificates and inspection test reports shall be submitted to Purchaser / owner for review / approval and final dispatch clearance note.

11.6 The following definitions are provided for reference of the bidders while preparing QAP.

11.6.1 **HOLD POINT:** A Hold Point is a stage designated in the ITP/QAP, which requires Witness Inspection by TPIA and / or PMC/ OWNER before supplier can proceed with further processing, except where prior written permission for further processing or waiver of Witness Inspection by PMC / OWNER is obtained.

11.6.2 **WITNESS POINT:** A Witness point is a stage designated in the ITP/QAP, which requires witness inspection by TPIA, PMC and / or Owner. EPCC/LSTK CONTRACTOR / Supplier shall perform the activity after proper notification has been given to TPIA / PMC and OWNER for witnessing the activity. The CONTRACTOR/ Supplier is not obliged to hold further processing, if TPIA / PMC and / or OWNER are not available to witness the activity or does not provide the comments before the date notified with proper notification period.

11.6.3 **REVIEW POINT:** A review point is a stage designated in the ITP/QAP which requires the concerned agencies i.e. Purchaser / TPIA / PMC / Owner, to verify the documents for their correctness and to confirm that the said documents meet the requirements laid down.

11.6.4 **THIRD PARTY INSPECTION AGENCY (TPIA):** Third Party Inspection Agency means an inspection agency appointed by the Purchaser / EPCC / LSTK Contractor for carrying out Inspection and witness of tests of items and material being procured by the Purchaser for the Project.

11.6.5 **INSPECTION CATEGORY:** Inspection category determines the scope of Inspection for the Supplier, TPIA, PMC / OWNER for various items and material depending upon their use, serviceability, safety criteria and complexity.

12.0 PRICE BID FORMAT

12.1 Bidders to quote strictly as per BHEL’s price format. No other format is acceptable. Any tampering/ modification/ change of the BHEL’s price format is not allowed and the bidder’s offer is liable for rejection.

12.2 All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

12.3 The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing “Price Bid-Do not Open”

12.4 Bidder shall confirm the submission of the unpriced bid as part of their technical offer

13.0 VARIANT TABLE

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Var No	Project	Package Description	Project's Job Specification	Material Code
01	NIRMA 70 MW STG	Pre-fab Piping Package (IBR)	PEMC-06898	PY9752188010
02	NIRMA 70 MW STG	Pre-fab Piping Package (Non-IBR)	PEMC-06899	PY9752188028
03	RSPL 3x16.65 MW STG	Pre-fab Piping Package (IBR)	PEMC-6876	PY9752188036
04	RSPL 3x16.65 MW STG	Pre-fab Piping Package (Non-IBR)	PEMC-6900	PY9752188044
05	TATA STEEL-1x40 MW STG	Pre-fab Piping Package (IBR)	PEMC-07082	PY9752188052
06	RFCL RAMAGUNDAM	Pre-Fab Piping Package (NIBR)	PY-IZ-4-M095-8601-01	PY9752188060
07	ONGC HAZIRA	Pre-Fab Piping Package (NIBR)	PEMC-07331	PY9752188079
08	ONGC URAN	Pre-Fab Piping Package (NIBR) CS NACE	PEMC-07384	PY9752188087
09	ONGC URAN	Pre-Fab Piping Package (NIBR) SS NACE	PEMC-07384	PY9752188095
10	HPCL VIZAG	Pre-Fab Piping Package (NIBR)		PY9752188109
11	ONGC URAN LGC	LTCS PIPING PACKAGE	PEMC-07394	PY9752188117

IBR: IBR CERTIFICATION REQUIRED
NIBR: IBR CERTIFICATION NOT REQUIRED.

14.0 RECORD OF REVISIONS

Rev No	Date	Revision Detail	Revised by	Approved by
00	01.07.2016	FIRST ISSUE	-	-
01	15.09.2016	CLAUSE NO 8.5 REVISED	UDAY KUMAR V	SRIKANTH G
02	22.12.2016	VARIANT-05 ADDED	IMRAN	SRIKANTH G
03	02.02.2018	VARIANT 06,07 ADDED	SVNR	SRIKANTH
04	12.01.2019	VARIANT 08,09,10 ADDED	G PARAMESH	SRIKANTH