

		BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION PROJECTS ENGINEERING MANAGEMENT						
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	TYPE OF DOC.	Technical Specification			NAME	Vyom	Vyom	SK Shukla
	TITLE CLAMPS & CONNECTOR				SIGN			
					DATE			
					GROUP	TBEM	W.O. No	81002
	CUSTOMER	POWERGRID CORPORATION OF INDIA LIMITED NEW DELHI						
	PROJECT	765kV Indigenous Development Project at Wardha S/S						
LOA No.	C-01812-S048-3/ CA-I /2549 & CA-II/2550 dated 30.05.2008							
COPYRIGHT & CONFIDENTIAL The Information in this document is the property of BHARAT HEAVY ELECTRICALS LIMITED This must not be used directly or indirectly in anyway detrimental to the interest of the Company.		CONTENTS						
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SECTION-1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES.

1.0 SCOPE

This specification covers design, manufacture, supply and delivery of Clamps & Connectors, spacers, Tee connectors etc.

1.1 SPECIFIC TECHNICAL REQUIREMENTS

1.1.1 Technical Particulars for spacers and Clamp & Connectors

<u>Highest system voltage</u>	<u>765kV</u>	<u>420kV</u>	<u>33 kV</u>
Short circuit current of ----- kA for -----	40 kA for 1 Sec	50 kA for 1 sec	25 kA for 3 sec
Continuous Current	3150A	3150A	630 A

1.2 BILL OF QUANTITIES

Bill of Quantities/Item descriptions.

<u>S No</u>	<u>DESCRIPTION</u>	<u>UOM</u>	<u>Nos</u>	<u>SPARE</u>	<u>QTY</u>
1	ONE SIDE RIGID AND ONE SIDE EXPANSION TYPE TERMINAL CONNECTOR FOR 765KV POST INSULATORS SUITABLE FOR 4.5 INCH ALUMINIUM TUBE (OD-120MM) (765KV,3150A)	NOS	3	0	3
2	EXPANSION TYPE BIMETTALIC TERMINAL CONNECTOR SUITABLE FOR 765 KV TRANSFORMER STUD AND 4.5 INCH ALUMINIUM TUBE (OD-120MM) (RATING - 765 KV,3150 A)	NOS	1	0	1
3	L TYPE CONNECTOR OVER POST INSULATOR SUITABLE ALUMINUM TUBE TO ALUMINUM TUBE OF 120 MM OD (Rating - 765 KV / 3150 A)	NOS	1	0	1
4	L TYPE - TEE CONNECTOR-CONNECTOR SUITABLE ALUMINUM TUBE TO ALUMINUM TUBE OF 120 MM OD (Rating - 765 KV / 3150 A)	NOS	1	0	1
5	ONE SIDE RIGID AND ONE SIDE EXPANSION TYPE TERMINAL CONNECTOR SUITABLE FOR 400 kV POST INSULATOR AND 4.5 INCH ALUMINIUM TUBE (OD-	NOS	5	0	5

	120MM) (400 KV,3150A)				
6	EXPANSION TYPE BIMETTALIC TERMINAL CONNECTOR SUITABLE FOR 400 KV TRANSFORMER STUD AND 4.5 INCH ALUMINIUM TUBE (OD-120MM) (400 KV,3150 A)	NOS	1	0	1
7	L TYPE CONNECTOR TERMINAL CONNECTOR OVER POST INSULATOR SUITABLE FOR 4.5 INCH ALUMINUM TUBE TO 4.5 INCH ALUMINIUM TUBE (OD-120MM) (Rating - 400 KV / 3150 A)	NOS	1	0	1
8	Aluminium SLEEVES for 4.5 inch AluminumTube (3150 A)	Nos	18	0	18
9	TEE CONNECTOR SUITABLE FOR 4.5 INCH ALUMINIUM TUBE (OD-120MM) ON RUN AND QUAD ACSR CONDUCTOR ON TAP (765 kV ,3150 A)	NOS	1	0	1
10	TEE CONNECTOR SUITABLE FOR 4.5 INCH ALUMINIUM TUBE (OD-120MM) ON RUN AND TWIN ACSR MOOSE CONDUCTOR ON TAP (400 kV ,3150 A)	NOS	1	0	1
11	STRAIGHT CONNECTOR SUITABLE FOR 4.5 Inch ALUMINIUM TUBE TO 4.5 Inch ALUMINIUM TUBE (OD-120MM) (400 kV , 3150 A)	NOS	1	0	1
12	CORONA BELL FOR 4.5 INCH ALUMINIUM TUBE (OD-120 MM) FOR 400 KV	NOS	1	0	1

The following may be noted.

1. The Individual Item may vary upto any extent and can even be deleted.
2. However the overall contract value may vary upto +/- 30% during contract execution stage.

1.3 Type Test

Bidder shall submit valid type test reports of all clamps and connectors (as per relevant IEC/IS Standard). The Bidder should have conducted type test on Identical or similar equipment / components to those offered within last 10 years from the date of Bid Opening. In case type test reports are found technically not acceptable to BHEL/Powergrid the Type Test shall be conducted without cost and delivery implication to BHEL.

1.4 Quality Plan

Bidder to follow valid PGCIL approved Quality Plan as per PGCIL procedure. In case the bidder don't have PGCIL approved QP, it will be the bidder's responsibility to get its QP approved directly from the ultimate customer.

1.5 Drawings / Documents

The drawings / documents submitted shall be project and product specific and shall incorporate following details.

Project Name : 765kV Indigenous Equipment Development Project at Wardha
Customer Name : Powergrid
Contractor : BHEL

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SECTION 2

STANDARD SPECIFICATION

2.1 GENERAL

This section covers the general technical requirements of spacers and clamps & connectors. In case of any discrepancies between the requirements mentioned in this section and those specified in other section of this specification, the latter shall prevail and shall be treated as binding requirements.

2.1.1 Technical Particulars for spacers and Clamp & Connectors

Nominal system voltage	:	765 kV / 400kV / 33 kV
Highest system voltage	:	800 kV / 420 kV / 36 kV
Current Rating	:	3150A / 3150A / 630A
Short circuit current for	:	40 kA / 50 kA / 25 kA for 1sec / for 3 sec
Frequency	:	50 Hz $\pm$ 5%
System Earthing	:	--- Effectively earthed ---
Spacing between sub-conductors of the bus	:	450mm
Maximum working tension :		
a) Quad Conductor (Kg):		4000
Visual Corona withstand V :		580 kV

2.2 Applicable Standards

The spacers and clamps & connectors shall strictly conform to the following Indian and International standards as appropriate :

List of Standards :

IS 617:1994	Aluminium and aluminium alloy ingots and castings for general engineering purposes.
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IS 1363 (All Parts):2002	Hexagon head bolts, screws and nuts of product grade C
IS 1364 (All Parts):2002	Hexagon head bolts, screws and nuts of product grades A and B
IS 1367 (Part I):2002	Technical Supply Conditions for threaded fasteners.
IS 1367 (Part 2):2002	Technical Supply Conditions for threaded fasteners.
IS 1367 (Part 3):2002	Technical Supply Conditions for threaded fasteners.
IS 1367 (Part 13):1983	Technical Supply Conditions for threaded fasteners.
IS 2121:1981 (Part -1 & 2)	Specification for conductors and earthwire accessories for overhead power lines
IS 2121:1992 (Part -3)	Specification for conductors and earthwire accessories for overhead power lines.
IS 2121:1991 (Part -4)	Specification for conductors and earthwire accessories for overhead power lines
IS 5561:1970	Electric power connectors.
IS 2633:1986	Methods for testing uniformity of coating of zinc coated articles.
IS 1573:1986	Electroplated coating of Zinc on Iron and Steel
IS 3138:1966	Hexagonal Bolts & Nuts (M42 to M150)
IS 4218 (Parts 1,2 & 4) 2001	Metric Screw Threads
IS 4218:(Part 3):1999	Metric Screw Threads
IS 4218:(Part 6):1978	Metric Screw Threads

IS 10162:1982	Spacers & spacer dampers for twin horizontal bundle conductors
ISO 272	Fasteners: Hexagonal Products -Width across Flats.
ISO 898	Fasteners, Screws & Studs
NEMA CC1	Electric power connectors for sub-station
NEMA CC3	Connectors for use between Aluminium or Aluminium-Copper Overhead Conductors.
IS 816:1969	Code of practice for use of metal arc welding for general construction in mild steel.
IS 4759:1996	Hot dip zinc coatings on structural steel and other allied products.
IS 2633:1986	Methods for testing uniformity of coating of zinc coated articles.
IS 2629:1985	Recommended practice for hot dip galvanising of iron and steel.

2.3 Clamps and Connectors

2.3.1 All the current carrying parts shall be designed and manufactured to have minimum resistance. Maximum tension per conductor is expected to be 1000kg in case of 220kV and 2000kg in case of 400kV. Clamps and fittings shall be so designed that the equipment shall not be subject to any abnormal stresses due to thermal changes in conductor. All the clamps and fittings shall enable the connection to be as short as possible. Wherever possible they shall be in two separate halves. No U bolts shall be used. Corona control ring shall be of such design and shape that they will prevent visual discharge forming on the hardware assemblies. They shall have minimum thickness of 2.5mm. All similar parts, particularly the removable one shall be interchangeable with one another.

2.3.2 The clamps and connectors shall be made of materials listed below:-

- a) For connecting ACSR conductor material designation 4600 of IS 617:1994 for

bolted type.

- b) For connecting equipment terminals made of copper or brass to ACSR/AAC conductor, Bimetallic connector made from aluminium alloy casting conforming to designation 4600 of IS 617:1994, with 2mm thick cast copper liner shall be provided. Alternatively equivalent bimetallic strip can be provided.
- c) For connecting GI shield wire : Forged steel.
- d) Bolts, nuts, plan washers shall be hot dip galvanized & spring washers of spring steel (E.G.)
- e) Wherever crimping is involved , such clamps shall be forged /extruded.
- f) For copper to copper and copper to brass or brass connectors- copper alloy of the following composition shall be used:

Zinc	2 to 3%
Lead	2 to 2.5%
Tin	0.6 to 1.5%
Iron	0.5 to 1.0%
Copper	92% to 94%

The impurities if present shall not exceed the limits as indicated, below:

Nickel	0.03%
Antimony	0.03%
Manganese	0.04%
Silicon	0.04%
Phosphorous	0,04%

- g) All casting shall be free from below holes surface blisters and shall be rounded off.
- h) All sharp edges and corners shall be blurred and rounded off.
- i) Thickness of the clamps and connectors shall not be less than 10mm.
- j) Bolts and nuts shall have hexagonal heads and threads as per Indian standard. Rated torque of the nuts shall be indicated on drawing.

- k) For bimetallic clamps or connectors copper alloy liner of minimum thickness 2mm shall be cast integral with the aluminium alloy body. Equivalent bimetallic sleeve/ strips can also be provided.
- k) For flexible connectors, braids or laminated straps shall be made from tinned copper strips or aluminium laminates depending upon the clamp. All Aluminium conductors of adequate current, mechanical stability & flexibility can also be provided.
- l) Each clamp/ connector shall be identified with respective BOM & Drawing number.
- m) The clamp shall be designed to carryout the same current as the conductor as specified in the specification. The temperature rise when carrying full load current shall not exceed 75°C for site ambient temperature.
- n) Clamps and connectors shall be designed to be corona controlled. Corona extinction voltage for 400KV & 220 KV class clamps shall not be less than 320KV (rms) & 156 KV respectively and R.I.V. level shall not be more than 1000 micro volts at the test voltage specified in respective sections.
- p) There should not be any significant change in Radio interference of associated conductor with & without clamps & fittings.
- q) **Designs:**

Responsibility of satisfactory design of the clamps/connectors to safely withstand the specified mechanical stresses and carry the rated current without exceeding the temperature rise specified, shall solely rest with the bidder.

2.3.3 Clamps and Connectors-Tests

A. Type Tests

The clamps and connectors shall be subject to type tests as per IS-5561-1970. Type tests shall be carried out on three clamps and connectors of each type and design. All clamps and connectors shall also be type tested as per applicable clause no. as indicated against each test for the following in addition to the other tests indicated in IS-5561.

- i) Temperature Rise test
- ii) Short time current test
- iii) Resistance test

- iv) Tensile test
- v) Dimensional Check
- vi) Galvanization Test (Where applicable)
- vii) Visual Corona & RIV test (for 400 & 220 kV systems)

B. Acceptance Test

Following acceptance tests shall be carried out as per applicable clause no. of IS:5561:1970 indicated against each test :

- i) Resistance test
- ii) Tensile test
- iii) Dimensional Check
- iv) Galvanization Test (Where applicable)

C. Routine Test

Following Routine tests shall be carried out as per applicable clause no. of IS:5561:1970 indicated against each test :

- i) Visual Check
- ii) Dimensional Check

2.4 SPACERS

2.4.1 General :

Spacer shall conform to IS : 10162. The spacers are to be located at a suitable spacing to limit the short circuit forces and also to avoid snapping of sub conductors during short circuit conditions. Necessary spacer span calculation shall be provided by the contractor during engineering for the approval

2.4.2 Constructional Features

- a) No magnetic material shall be used in the fabrication of spacers except for GI bolts and Nuts.

- b) Spacer design shall be made to take care of fixing and removing during installation and maintenance
- c) The design of the spacers shall be such that the conductor does not come in contact with any sharp edge.

2.4.3 Tests

Each type of spacer shall be subjected to at least the following type tests, acceptance tests and routine tests in addition to all other tests specified in IS 10162:

A. Type Tests

- a) **Clamp slip tests**
The sample shall be installed on test span of twin conductor bundle string or quadruple conductor bundle string (as applicable) at a tension of 44.2kN. One of the clamps of the sample when subjected to a longitudinal pull of 2.5kN parallel to the axis of the conductor shall not slip on the conductor. The permanent displacement between the conductor and the clamp of sample measured after removal of the load shall not exceed 1.0 mm. Similar tests be performed on the other clamps of the same sample.
- b) Fault current test as per CI 5.14.2 of IS : 10162
- c) Corona Extinction Voltage test (Dry)
This test shall be performed as per procedure mentioned at Annexure-B section –2. Minimum corona extinction voltage shall be 320kV (rms) line to ground for 400 kV , 156kV (rms) line to ground for 220kV spacers respectively.
- d) RIV Test (Dry)
This test shall be performed as per procedure mentioned at Annexure-B, Section-2. Max. radio interference voltage for frequency between 0.5 MHz and 2 MHz at 320KV rms for 400KV system (1000 micro volts) and 156kV rms for 220kV system (1000 micro volts)
- e) Resilience test (where applicable)
- f) Log decrement test (applicable only for spacer dampers)
- g) Compression test.
- h) Galvanising test.
- i) Movement test
- j) Clamp bolt torque test

- k) Assembly torque test
- l) Tensile load test
- m) Compression and pull off test.
- n) Vibration test
- o) Magnetic power loss test

B. Acceptance Test (As per IS : 10162 (Latest Version))

- a) Visual examination
- b) Dimensional verification
- c) Movement test
- d) Clamp slip test
- e) Clamp bolt torque test (if applicable)
- f) Assembly torque test
- g) Compression test
- h) Tension test
- i) Galvanising test
- j) Hardness test for neoprene (if applicable)

The shore hardness of different points on the elastometer surface of cushion grip clamp shall be measured by shore hardness meter. It shall be between 65 to 80.

- k) Ultimate Tensile Strength Test (where applicable)

The UTS of the retaining rods shall be measured. It shall not be less than 35 kg/Sq. Mm.

C Routine test

- a) Visual examination

- b) Dimensional verification

ANNEXURE-B

CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST

1. General

Unless otherwise stipulated, all equipment (except Auto Transformer & Shunt Reactor) together with its associated connectors, where applicable, shall be tested for external corona both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV).

2. Test Levels:

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

3. Test Methods for RIV:

- 3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 Mhz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.
- 3.2 Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107-1964, except otherwise noted herein.
- 3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.
- 3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, 115% and 130% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 400 kV, 220 KV is listed in the detailed specification together with maximum permissible RIV level in microvolts.
- 3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.
- 3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.

4. Test Methods for Visible Corona

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 130% of RIV test voltage and maintained there for five minutes. In case corona inception does not take place at 130 %, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions, at all voltage steps i.e. 85%, 100%, 115% and 130%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energised connectors. The photographs shall be framed such that test object essentially, fills the frame with no cut-off.

- 4.1 The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.
- 4.2 In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of all the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by Purchaser's inspector, after determining the best camera locations by trial energisation of test object at a voltage which results in corona.
- 4.3 The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.
- 4.4 However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Purchaser's inspector if, in his opinion, it will not prejudice other test.

5. Test Records:

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:

- a) Background noise before and after test.
- b) Detailed procedure of application of test voltage.
- c) Measurements of RIV levels expressed in micro volts at each level.
- d) Results and observations with regard to location and type of interference sources detected at each step.
- e) Test voltage shall be recorded when measured RIV passes through 100 microvolts in each direction.
- f) Onset and extinction of visual corona for each of the four tests required shall be recorded.

SECTION-3

PROJECT DETAILS

SITE INFORMATION

	Particular	Details
a)	Customer	Power Grid Corporation of India Limited
b)	Project Title	765kV Indigenous development Project at Wardha S/S
c)	Location	Wardha (Maharashtra)
d)	Transport Facilities	By Road/By Rail
SITE CONDITIONS		
a)	Max. ambient air temp.	50°C
b)	Min. ambient air temp.	0°C
c)	Max. design ambient temp.	50°C
d)	Design reference temp.	50°C
e)	Max. RH	100%
f)	Min. RH	0 %
g)	Design reference RH	100 %
h)	Altitude	<1000 MSL
i)	Pollution Severity	High Pollution level (25mm/kV)
j)	Seismic Zone	As per IS 1893
WIND DATA		
a)	Wind velocity	As per IS
b)	Average No. of thunderstorm days per annum	As per IS

SECTION -4

GUARANTEED TECHNICAL PARTICULARS FOR SPACERS (To be submitted by the supplier at the contract execution stage)

Sr. Description	Spacers for AAC BULL Quadruple Conductor with sub- conductor spacing of 450 mm
-----------------	---

1. Maker's Name and country
2. Type
3. Suitable for (type of conductor bundle)
4. Spacing between subconductors
 - i) Along run of line mm
 - ii) At suspension insulator string mm
 - iii) At jumpers
5. Distance between support clamps and first spacer.
 - i) At tension point mm
 - ii) At suspension position mm
 - iii) At jumpers.
6. Minimum number of spacers
 - i) Per span
 - ii) Per jumper
7. Maximum distance between adjacent spacer of each phase.

- i) Along run of line (meters)
- ii) In jumper connections (metres)
- 8. Whether the spacer performs satisfactorily.
 - i) Under normal full load current.
 - ii) Under fault conditions.
- 9. Ultimate strength
 - i) Compression load in kg.
 - ii) Tensile load in kg.
- 10. Movement which can be accommodated by the unit :
 - i) Longitudinal mm
 - ii) Vertical mm
 - iii) Torsional (Angular) (degree)
- 11. a) Corona extinction voltage (kV)
 - i) Dry
 - ii) Wet
 - b) Core loss per unit in watts at rated voltage:
 - i) Dry condition:
 - ii) Wet condition:
 - c) Corona interference voltage at one mega hertz:
 - c1 Dry conditions at-
 - i) Normal rated line voltage.

ii) 20% above rated line voltage

c2 Wet condition:

i) Normal rated line voltage

ii) 5% above the rated line
voltage.

13. Weight

14. Magnetic power loss in
watts at 600A, A.C.
at 50 C.S.

15. Standards to which materials
will be manufactured and listed.

16. Any other useful information.

17. Packing details.

18. Complete dimensioned drawing
enclosed (Yes/No)

Name of firm:-----

Signature of

Tenderer : -----

Designation :-----

Place :-----

Date :-----

SECTION -4

GUARANTEED TECHNICAL PARTICULARS FOR CLAMPS AND CONNECTORS (To be submitted by the supplier at the contract execution stage)

1. Manufacturer's Name and address.
2. Manufacturer's Name and address.
3. Applicable Technical Standards.
4. Application.
5. Manufacturer's type
6. For connection to-
 - 6.1 Conductor size and arrangement
 - 6.2 Equipment terminal size and terminal.
7. Material of clamps/fittings (state percentage composition of constituents and impurities present).
 - 7.1 Clamp body.
 - 7.2 Bolts, nuts & plain washers.
 - 7.3 Spring washers.
 - 7.4 Liners if any.
8. Maximum contact resistance (ohms)
Continuous current rating of the clamps/fittings
9. Maximum temp. rise of the clamps/fittings over ambient temp (50°C) when carrying full load current (°C)
10. Maximum temp. rise of the clamps/fittings over ambient temp. (50°C) when carrying an estimated fault current of 40KA for 1 sec. (°C)
 - i) Rated terminal load
 - ii) Minimum failing load.

11. Factor of safety
12. Minimum thickness of any part.
13. Weight of each type of clamp complete with hardware fittings (KG)
14. Machining accuracy of matching surface.
15. Service Indoor/outdoor.
16. Major dimensions of the clamps/fittings (with accompanied drawings).
17. Mechanical test.
 - i) Heat run test
 - ii) Material Composition tests.
 - iii) Tests for checking blow, holes cracks etc.
18. List of routine test to be carried out.
19. Whether the type tests are already carried out if Yes, enclose the type test certificates.
20. Details of the type tests to be carried out if not carried out earlier.
21. List of testing facilities available at your works for carrying out above type tests & routine tests & mechanical tests. If facilities not available at your works, please indicate the name and address of the firm/institute where these shall be carried out.

Name of the firm:-----

Signature of the Tenderer:-----

Designation:-----

Place :-----

Date :

ANNEXURE – C

NO DEVIATION CERTIFICATE

It is confirmed that there is no deviation and the offer is in full compliance with the specification. It is also confirmed that there are no deviations in any other form such as comments, variations and or exceptions. Further it is confirmed that at all drawings/ data sheets/ QP/ type tests reports shall be submitted to BHEL for organizing approval of ultimate customer. Also, furnishing of all relevant information/ repetition of type tests (if required for meeting the specification requirement) shall be carried out by us at no extra cost to BHEL and without affecting delivery requirements.

Signature of the authorized representative of Bidder

Name _____

Designation_____

Place_____

Date_____

Company Seal