

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b>	<b>PY 52 093</b>
		<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	
		<b>TECHNICAL SPECIFICATION</b>	
		<b>HALF COUPLING SOCKET WELDING/THREADED</b>	Rev. No. 02
			Page 1 of 2

**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.

## 1.0 GENERAL

- 1.1 This standard specifies requirements related to Designation, Material, Size, Dimensions and other information required for ordering purposes of Socket Welding/Threaded Half Couplings/Vertical Inserts made of Carbon Steel/Stainless Steel/Alloy Steel of Class Designation 3000/6000/9000 as per ASME B16.11.
- 1.2 The Half Couplings supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.11 "FORGED FITTINGS, SOCKET-WELDING AND THREADED" and comply with the following additional requirements.
- 1.3 This specification is applicable for Half Couplings of Sizes NPS ½" to NPS 4".

## 2.0 MATERIAL:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified in BHEL Enquiry / Order.

- 2.1 Carbon Steel : Forging to ASTM A105.  
*Galvanizing as per ASTM A123, if specified.*
- 2.2 Stainless Steel : Forging to ASTM A182 Gr F304 / F321/F316
- 2.3 Alloy Steel : Forging to ASTM A182 Gr F11/F22.

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.11 (Latest edition).

## 4.0 SIZE AND CLASS DESIGNATION:

Half Coupling Size (NPS in inches), Class Designation (CL3000 / CL6000 / CL9000) and End Connection (SW-Socket Welded/SC-Screwed) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 1" Socket Welding Carbon Steel Half Coupling of Class Designation 3000, shall be designated as:





*HALF CPLNG CS (A105) 1" CL3000 SW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	12.05.2016	UPDATED GALVANIZATION CLAUSE 2.1	 G.KALYAN	 SRIKANTH G


Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>	PREPARED	CHECKED	APPROVED	DATE
	<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 093</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 02
		<b>HALF COUPLING SOCKET WELDED</b>	Page 2 of 2

**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.

01	30.04.2021	Material F316 added.	 M.A.MOQEET	 SRIKANTH G
----	------------	----------------------	---	---

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b>	<b>PY 52 093</b>
		<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	Rev. No. 02
		<b>TECHNICAL SPECIFICATION</b>	Page 1 of 2
		<b>HALF COUPLING SOCKET WELDING/THREADED</b>	

**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.

## 1.0 GENERAL

- 1.1 This standard specifies requirements related to Designation, Material, Size, Dimensions and other information required for ordering purposes of Socket Welding/Threaded Half Couplings/Vertical Inserts made of Carbon Steel/Stainless Steel/Alloy Steel of Class Designation 3000/6000/9000 as per ASME B16.11.
- 1.2 The Half Couplings supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.11 "FORGED FITTINGS, SOCKET-WELDING AND THREADED" and comply with the following additional requirements.
- 1.3 This specification is applicable for Half Couplings of Sizes NPS ½" to NPS 4".

## 2.0 MATERIAL:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified in BHEL Enquiry / Order.

- 2.1 Carbon Steel : Forging to ASTM A105.  
*Galvanizing as per ASTM A123, if specified.*
- 2.2 Stainless Steel : Forging to ASTM A182 Gr F304 / F321/F316
- 2.3 Alloy Steel : Forging to ASTM A182 Gr F11/F22.

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.11 (Latest edition).

## 4.0 SIZE AND CLASS DESIGNATION:

Half Coupling Size (NPS in inches), Class Designation (CL3000 / CL6000 / CL9000) and End Connection (SW-Socket Welded/SC-Screwed) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 1" Socket Welding Carbon Steel Half Coupling of Class Designation 3000, shall be designated as:





*HALF CPLNG CS (A105) 1" CL3000 SW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	12.05.2016	UPDATED GALVANIZATION CLAUSE 2.1	 G.KALYAN	 SRIKANTH G


Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>	PREPARED	CHECKED	APPROVED	DATE
	<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 093</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 02
		<b>HALF COUPLING SOCKET WELDED</b>	Page 2 of 2

**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.

01	30.04.2021	Material F316 added.	 M.A.MOQEET	 SRIKANTH G
----	------------	----------------------	---	---

Form No:	<div><div><div>बी एच ई एल</div><div></div><div>PE&amp;SD</div></div></div>	<div><div><div>BHARAT HEAVY ELECTRICALS LIMITED</div><div>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</div></div></div>	<div><div>PY 52 094</div></div>
		<div><div>TECHNICAL SPECIFICATION</div></div>	<div><div>Rev. No. 02</div></div>
		<div><div>FULL COUPLING SOCKET WELDING / THREADED</div></div>	<div><div>Page 1 of 1</div></div>

**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.

## 1.0 GENERAL

- 1.1 This standard specifies requirements related to Designation, Material, Size, Dimensions and other information required for ordering purposes of Socket Welding/Threaded Full Couplings made of Carbon Steel/Stainless Steel/Alloy Steel of Class Designation 3000/6000/9000 as per ASME B16.11.
- 1.2 The Full Couplings supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.11 "FORGED FITTINGS, SOCKET-WELDING AND THREADED" and comply with the following additional requirements.
- 1.3 This specification is applicable for Full Couplings of Sizes NPS ½" to NPS 4".

## 2.0 MATERIAL:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified in BHEL Enquiry / Order.

- 2.1 Carbon Steel : Forging to ASTM A105  
*Galvanizing as per ASTM A123, if specified.*
- 2.2 Stainless Steel : Forging to ASTM A182 Gr F304/F316/F321
- 2.3 Alloy Steel : Forging to ASTM A182 Gr F11/F22

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.11 (Latest edition).

## 4.0 SIZE AND CLASS DESIGNATION:

Full Coupling Size (NPS in inches), Class Designation (CL3000 / CL6000 / CL9000) and End Connection (SW-Socket Welded/SC-Screwed) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 1" Socket Welded Carbon Steel Full Coupling of Class Designation 3000, shall be designated as:







*FULL CPLNG CS (A105) 1" CL3000 SW.*



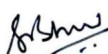
## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 - Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	22.03.2016	Clause no 2.1 updated to include Galvanizing Specification	 FRK	 SRIKANTH G
02	19.09.2022	New Grades are added in SS	 G PARAMESH	 SRIKANTH G

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>	PREPARED	CHECKED	APPROVED	DATE
	<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 101</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 01
		<b>ELBOW 90D, LONG RADIUS,</b> <b>CARBON STEEL, BUTT WELDING</b>		Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding Elbows 90D supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Butt Welding Elbows of Sizes NPS½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Elbows of size NPS ½" to 14":  
Seamless Construction according to ASTM A234 Gr WPB.
- 2.2 For Elbows of size NPS 16" to 48":  
Welded Construction according to ASTM A234 Gr WPB-W.
- 2.3 *Galvanizing shall be carried out as per ASTM A123, if specified.*

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Elbow Size (NPS in inches) and Wall thickness (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 10" Sch 40 Carbon Steel 90D Elbow, shall be designated as:


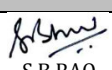


*ELBOW 90D CS (A234WPB) 10" SCH 40 BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	20.07.2018	Clause 2.0 updated to include Galvanizing Specification.	 G. KALYAN	 SRIKANTH G

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 102</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 00
		<b>ELBOW 90D, LONG RADIUS, STAINLESS STEEL, BUTT WELDING</b>		Page 1 of 2

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding 90D Elbows supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Butt Welding Elbows of Sizes NPS½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Elbows of size NPS ½" to 14":  
Seamless Construction according to ASTM A403 Gr WP304 or ASTM A403 Gr WP321
- 2.2 For Elbows of size NPS 16" to 48":  
Welded Construction according to ASTM A403 Gr WP304-WX or ASTM A403 Gr WP321-WX

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Elbow Size (NPS in inches) and Wall thickness (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 10" Sch 40S Stainless Steel 90D Elbow, shall be designated as:

*ELBOW 90D SS (A403WP304) 10" S40S BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:

- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.








+++

## RECORD OF REVISIONS:


Rev No	Date	Revision Detail	Revised by	Approved by
--------	------	-----------------	------------	-------------

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15



	Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b>		<b>PY 52 102</b>					
			<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		Rev. No. 00					
			<b>TECHNICAL SPECIFICATION</b>		Page 2 of 2					
			<b>ELBOW 90D, LONG RADIUS, CARBON STEEL, BUTT WELDING</b>							
<div><div><p><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></div><table><tr><td>00</td><td>20.07.2015</td><td>FIRST ISSUE</td><td> SRIKANTH G</td><td> S B RAO</td></tr></table></div>						00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO						



Form No:	 <b>PE&amp;SD</b>	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 103</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 01
		<b>REDUCER, CONCENTRIC,</b> <b>CARBON STEEL, BUTT WELDING</b>		Page 1 of 2

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding Concentric Reducers supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Concentric Reducers of sizes NPS ½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Concentric Reducers of Larger End size NPS ½" to 14":  
Seamless Construction according to ASTM A234 Gr WPB.
- 2.2 For Concentric Reducers of Larger End size NPS 16" to 48":  
Welded Construction according to ASTM A234 Gr WPB-W.

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Sizes of Large and Small ends of the Reducer (NPS in inches) and their corresponding Wall thicknesses (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A Concentric Reducer of Size 12" STD x 10" STD Carbon Steel, shall be designated as:  
*CRDCR CS 12" x 10" STD x STD BW*




A Concentric Reducer of Size 12" schedule 20 x 10" schedule 30 Carbon Steel, shall be designated as:  
*CRDCR CS 12" x 10" SCH 20 x SCH 30 BW*


A Concentric Reducer of Size 12" Thickness 10mm x 10" Thickness 8mm Carbon Steel, shall be designated as:  
*CRDCR CS 12" x 10" THK 10 X THK 8 BW*

## 6.0 TECHNICAL DELIVERY CONDITIONS:




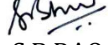
- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++


Refer Doc	LAYOUTS & PIPING ENGINEERING	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 <b>PE&amp;SD</b>	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 103</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 01
		<b>REDUCER, CONCENTRIC, CARBON STEEL, BUTT WELDING</b>	Page 2 of 2

**RECORD OF REVISIONS:**

Rev No	Date	Revision Detail	Revised by	Approved by
01	02.05.2017	UPDATED S.NO.5: DESIGNATION	 G.KALYAN	 SRIKANTH G
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO

**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.

Form No:	<div><div><div>बी एच ई एल</div><div></div><div>PE&amp;SD</div></div></div>	<div><div>BHARAT HEAVY ELECTRICALS LIMITED</div><div>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</div></div>	<div>PY 52 105</div>
		<div>TECHNICAL SPECIFICATION</div>	<div>Rev. No. 00</div>
		<div>REDUCER, CONCENTRIC, STAINLESS STEEL, BUTT WELDING</div>	<div>Page 1 of 1</div>

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.

## 1.0 GENERAL

- 1.1 The Butt Welding Concentric Reducers supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Concentric Reducers of sizes NPS ½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Concentric Reducers of Larger End size NPS ½" to 14":  
Seamless Construction according to ASTM A403 Gr WP304 or ASTM A403 Gr WP321.
- 2.2 For Concentric Reducers of Larger End size NPS 16" to 48":  
Welded Construction according to ASTM A403 Gr WP304-WX or ASTM A403 Gr WP321-WX

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Sizes of Large and Small ends of the Reducer (NPS in inches) and their corresponding Wall thicknesses (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A Concentric Reducer of Size 12" Sch 10S x 10" Sch 10S Stainless Steel, shall be designated as:


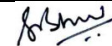
*CRDCR SS 12" x 10" Sch 10S x 10S BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>	PREPARED	CHECKED	APPROVED	DATE
	<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 <b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> <b>PE&amp;SD</b>	<b>PY 52 106</b>		
		<b>TECHNICAL SPECIFICATION</b>		
		<b>REDUCER, ECCENTRIC, STAINLESS STEEL, BUTT WELDING</b>		
			Rev. No. 00	Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding Eccentric Reducers supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Eccentric Reducers of sizes NPS½" to NPS48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Eccentric Reducers of Larger End size NPS½" to 14":  
Seamless Construction according to ASTM A403 Gr WP321.
- 2.2 For Eccentric Reducers of Larger End size NPS16" to 48":  
Welded Construction according to ASTM A403 Gr WP321-WX.

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Sizes of Large and Small ends of the Reducer (NPS in inches) and their corresponding Wall thicknesses (Schedule) shall be as per BHEL Enquiry/ Order.

## 5.0 DESIGNATION:

An Eccentric Reducer of Size 8" Sch 40S x 4" Sch 40S Stainless Steel 321 Grade, shall be designated as:


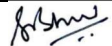
*ERDCR SS321 8" x 4" Sch 40S x 40S BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 SB RAO

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 SB RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 110</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 01
		<b>ELBOW 90D/45D</b> <b>SOCKET WELDING/THREADED</b>		Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 This standard specifies requirements related to Designation, Material, Size, Dimensions and other information required for ordering purposes of Socket Welded/Threaded Elbows 90 Degree / 45 Degree made of Carbon Steel / Stainless Steel / Alloy Steel of Class Designation 3000 / 6000 / 9000 as per ASME B16.11.
- 1.2 The Elbows supplied according to this spec shall conform to the requirements of latest version of ASME Standard B16.11 "FORGED FITTINGS, SOCKET-WELDING AND THREADED" and comply with the following additional requirements.
- 1.3 This specification is applicable for Elbows of Sizes NPS ½" to NPS 4".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified in BHEL Enquiry / Order.

- 2.1 Carbon Steel : Forging to ASTM A105  
*Galvanizing as per ASTM A123, if specified.*
- 2.2 Stainless Steel : Forging to ASTM A182 Gr F304/F321
- 2.3 Alloy Steel : Forging to ASTM A182 Gr F11/F22

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.11 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Elbow Type (90D - 90 Degree/ 45D - 45 Degree), Elbow Size (NPS in inches), Class Designation (CL3000/ CL6000/ CL9000) and End Connection (SW-Socket Welded/SC-Screwed) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 1" Socket Welding Carbon Steel Elbow 90D of Class Designation 3000, shall be designated as: *ELBOW 90D CS (A105) 1" CL3000 SW.*





A 2" Threaded Carbon Steel (Galvanized) Elbow 45D of Class Designation 6000, shall be designated as: *ELBOW 45D CS (GALV) 2" CL6000 SC.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 - Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	20.07.2018	Generally revised to include 45D Elbows and Galvanizing Specification.	 G.KALYAN	 SRIKANTH G

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 <b>PE&amp;SD</b>	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 111</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 03
		<b>TEE, STRAIGHT/REDUCING,          SOCKET WELDING/THREADED</b>		Page 1 of 2

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.

## 1.0 GENERAL

- 1.1 This standard specifies requirements related to Designation, Material, Size, Dimensions and other information required for ordering purposes of Socket Welded/Threaded Straight/Reducing Tees made of Carbon Steel / Stainless Steel / Alloy Steel of Class Designation 3000 / 6000 / 9000 as per ASME B16.11.
- 1.2 The Tees supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.11 "FORGED FITTINGS, SOCKET-WELDING AND THREADED" and comply with the following additional requirements.
- 1.3 This specification is applicable for Tees of Sizes NPS ½" to NPS 4".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified in BHEL Enquiry / Order.

- 2.1 Carbon Steel : Forging to ASTM A105  
*Galvanizing as per ASTM A123, if specified.*
- 2.2 Stainless Steel : Forging to ASTM A182 Gr F304/F316
- 2.3 Alloy Steel : Forging to ASTM A182 Gr F11/F22

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.11 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Type of Tee (Straight / Reducing), Tee Size (NPS in inches of Large-Run and Small-Branch Ends), Class Designation (CL3000 / CL6000 / CL9000) and End Connection (SW-Socket Welded/SC-Screwed) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 1" Socket Welding Carbon Steel Straight Tee of Class Designation 3000, shall be designated as:

*TEE STRT CS (A105) 1" CL3000 SW.*




A 1.5" x 1" Threaded Carbon Steel (Galvanized) Reducing Tee of Class Designation 3000, shall be designated as:


*RDTEE CS (A105-GALV) 1.5" X 1" CL3000 SC.*

## 6.0 TECHNICAL DELIVERY CONDITIONS:







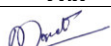
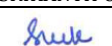
- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 - Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.11.

+++

Refer Doc	LAYOUTS & PIPING ENGINEERING	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 <b>PE&amp;SD</b>	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 111</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 03
		<b>TEE, STRAIGHT/REDUCING, SOCKET WELDING/THREADED</b>	Page 2 of 2


**RECORD OF REVISIONS:**

Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	22.03.2016	Clause no 2.1 updated to include Galvanizing Specification	 FRK	 SRIKANTH G
02	20.07.2018	Generally revised to include Reducing Tees.	 FRK	 SRIKANTH G
03	30.04.2021	F316 material added	 M.A.MOQEET	 SRIKANTH G

**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.



Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 113</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 01
		<b>ELBOW 45D, LONG RADIUS, STAINLESS STEEL, BUTT WELDING</b>	Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding 45D Elbows supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Butt Welding Elbows of Sizes NPS½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Elbows of size NPS ½" to 14":  
Seamless Construction according to ASTM A403 Gr WP304, ASTM A403 Gr WP316 & ASTM A403 Gr WP321
- 2.2 For Elbows of size NPS 16" to 48":  
Welded Construction according to ASTM A403 Gr WP304-WX, ASTM A403 Gr WP316-WX & ASTM A403 Gr WP321-WX

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Elbow Size (NPS in inches) and Wall thickness (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 10" Sch 40S Stainless Steel 45D Elbow, shall be designated as:





*ELBOW 45D SS (A403WP304) 10" S40S BW.*



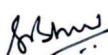
## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++


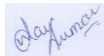

## RECORD OF REVISIONS:


Rev No	Date	Revision Detail	Revised by	Approved by
00	20.07.2015	FIRST ISSUE	 SRIKANTH G	 S B RAO
01	16.09.2022	Grade WP316 added, updated as Rev.01	 G PARAMESH	 SRIKANTH G

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 CH MANOJ	 SRIKANTH G	 S B RAO	20.07.15

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY 52 279</b>	
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 00	
		<b>PIPING ITEMS PACKAGE</b>		Page 1 of 7	

<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.	<b>1.0 INTENT OF SPECIFICATION</b>
	<p>1.1 Piping Package is the Package of Pipes, Valves, Strainers, BW Pipe fittings, Forged Pipe Fittings, Flanges, Gaskets, Bolting material etc., supplied in loose condition, procured from the vendors as per the provided approved vendor list.</p> <p>1.2 The intent of this specification is to establish the minimum requirements of procurement, quality, inspection, marking, packaging for preservation, weather protection and transportation of the Piping Package.</p> <p>1.3 The individual Pipes and piping components supplied as part of the 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 4.0 and the Bill of Material document.</p> <p><b>2.0 LEGEND / GLOSSARY OF TERMS</b></p> <p>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</p> <p><b>3.0 SCOPE OF SUPPLY / SERVICES</b></p> <p>3.1 <b>Procurement and Supply of Piping Package:</b></p> <ul style="list-style-type: none"> <li>➤ Procurement and Supply of Piping Package (Pipes, Valves, Strainers, BW Pipe fittings, Forged Pipe Fittings, Flanges, Gaskets, Bolting material etc., in loose condition).</li> <li>➤ Piping package items to be supplied and their Quantity shall be as per the Bill of Material document.</li> <li>➤ Piping package items shall be sourced as per the Specifications/Standards indicated against each of the components in the Bill of Material document.</li> <li>➤ The Piping package items shall be sourced only from the vendors as indicated in the approved vendor list for each category of components.</li> <li>➤ Vendor's scope includes only material sourcing, inspection, testing, marking, packaging and transport of the piping package.</li> <li>➤ <b>Vendor can manufacture any of the items if they are one of the approved sources for that item as per the Approved vendor list.</b></li> <li>➤ Inspection &amp; Testing at Vendor's works.</li> <li>➤ Spooling, Edge preparation, Welding, Surface preparation, Painting are NOT part of the Scope of Supply.</li> </ul> <p>3.2 For IBR Piping Package, Vendor shall comply with all statutory 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.</p> <p>3.3 Any additional item, material, services etc., which are not specifically mentioned in this document, but required to make the 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.</p>

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 G PARAMESH	 G UDAY	 SRIKANTH G	10.01.2020

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 279</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 00
		<b>PIPING ITEMS PACKAGE</b>	Page 2 of 7

#### 4.0 APPLICABLE STANDARDS


Bidder shall follow the related standards referred herein (but not limited to) 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
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
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
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
IS 1239 P1	Indian Standard Spec for Steel Tubes, Tubulars and other Steel Fittings (Part 1 Steel Tubes)
IS 1239 P2	Indian Standard Spec for Steel Tubes, Tubulars and other Steel Fittings (Part 2 Steel Sockets Tubular and other Steel Pipe Fittings)
IS 3589	Indian Standard Spec for Steel Pipes for Water and Sewage
IS 2062	Indian Standard Spec for Hot Rolled Low, Medium and High Tensile Structural Steel

**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.



Form No:



PE&SD

**BHARAT HEAVY ELECTRICALS LIMITED**  
**PROJECT ENGINEERING & SYSTEMS DIVISION**

**PY 52 279**

**TECHNICAL SPECIFICATION**

Rev. No. 00

**PIPING ITEMS PACKAGE**

Page 4 of 7

**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.

**7.0 DOCUMENTATION**

**7.1 ALONG WITH THE OFFER**  
 Bidder shall submit the following documents / drawings along with the offer, with respect to every item of the Purchaser's specifications. Any offer not confirming to this requirement is liable for rejection.

- Copy of purchaser's specification (Technical specification, Job Specification, Bill of Material, Approved Vendor List and all Annexures) and Check list duly stamped & signed by the Bidder.
- Deviation list, if any, in the format attached with this specification (In case of no deviation, 'NIL' to be mentioned in the format, duly signed and to be submitted along with offer). Offer without deviation list will not be evaluated & shall be liable for rejection.

**7.2 BEFORE DISPATCH**

**7.2.1** The following documents / drawings shall be submitted by vendor during final inspection & before dispatch of the Piping package:

- Material test certificates for all the Piping package items for review and acceptance by purchaser and / or owner as per approved QAP.
- Statutory approvals / certificates.

**7.2.2** For IBR Piping Package, Vendor shall comply with all statutory as per Indian Boiler Regulations (IBR). Vendor shall furnish IBR Form-IIIA for Pipes and IBR Form-IIIC for Pipe Fittings, duly filled and certified.

**7.3 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 item of the piping package.** Same shall be furnished in a spread sheet progressively as per schedule of dispatches.

**8.0 DISPATCH & SHIPPING**


**8.1** All items shall properly be packed for transportation by ship/ rail or trailer. Packing shall be as per the Specification and the relevant TDC document.

**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.
- Pipes / fittings ends shall be suitably protected against damage and ingress of foreign material including water, and the protectors shall be securely and tightly attached.



Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 279</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 00
		<b>PIPING ITEMS PACKAGE</b>	Page 5 of 7

**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.

8.4 All the items 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 7.3.

8.5 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 without any price implication.

**9.0 QUALITY REQUIREMENTS, INSPECTION & TESTING**

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

9.2 Vendor is responsible for successful inspection of all the piping package items to ensure that the supplied package meets the requirements of this specification.

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

9.4 **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 Material Test Certificates and test reports as indicated at 9.5 below.
- Bill of Material Check.
- Additional tests, if any – As per Job specification

9.5 **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.

9.5.1 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.


9.5.2 Dimensional and physical check.

**Hydrostatic test is excluded for individual pipe spools at Vendor’s works.** However, vendor to produce the Hydrostatic test reports conducted by OEM, wherever applicable.

Though Hydrostatic test is excluded for the individual pipe spools at vendor’s works, 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.





Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52 279</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 00
		<b>PIPING ITEMS PACKAGE</b>	Page 7 of 7

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.

## 11.0 PRICE BID FORMAT

- 11.1 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.
- 11.2 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.
- 11.3 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".
- 11.4 Bidder shall confirm the submission of the unpriced bid as part of their technical offer.



## 12.0 VARIANT TABLE


Var No	Project	Package Description	Project's Job Specification	Material Code
01	ONGC Uran Cogen	Piping Package (Non IBR)	PEMC-7440	PY9752279015
04	STP HYRIDWAR	PIPING ITEM PKG FOR STP HARIDWAR PROJ		PY9752279040
05	HPVP VIZAG- 1 MLD	Piping package (Non IBR) From HPEP Hyderabad Store	PEMC -07481	PY9752279058
06	RLNG FC - IOCL BARAUNI	Piping package (Non IBR) From HPEP Hyderabad Store	PEMC-07484	PY9752279066

**IBR:** IBR CERTIFICATION REQUIRED

**NIBR:** IBR CERTIFICATION NOT REQUIRED.

## 13.0 RECORD OF REVISIONS

Rev No	Date	Revision Detail	Revised by	Approved by
00	10.01.2020	FIRST ISSUE	 G PARAMESH	 SRIKANTH G

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY52302</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 00
		<b>REDUCER, CONCENTRIC, STAINLESS STEEL, BUTT WELDING</b>		Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding Concentric Reducers supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Concentric Reducers of sizes NPS½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Concentric Reducers of Larger End size NPS ½" to 14":  
Seamless Construction according to ASTM A403 Gr WP316
- 2.2 For Concentric Reducers of Larger End size NPS 16" to 48":  
Welded Construction according to ASTM A403 Gr WP316-WX

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Sizes of Large and Small ends of the Reducer (NPS in inches) and their corresponding Wall thicknesses (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A Concentric Reducer of Size 12" Sch 10S x 10" Sch 10S Stainless Steel, shall be designated as:


*CRDCR SS 12" x 10" Sch 10S x 10S BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:


- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 - Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	23.04.2021	FIRST ISSUE		 SRIKANTH G

Refer Doc	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 M.A.MOQEET	 G PARAMESH	 SRIKANTH G	30.04.21

Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		<b>PY52303</b>
		<b>TECHNICAL SPECIFICATION</b>		Rev. No. 00
		<b>ELBOW 90D, LONG RADIUS,</b> <b>STAINLESS STEEL, BUTT WELDING</b>		Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welding 90D Elbows supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Butt Welding Elbows of Sizes NPS½" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Elbows of size NPS ½" to 14":  
Seamless Construction according to ASTM A403 Gr WP316
- 2.2 For Elbows of size NPS 16" to 48":  
Welded Construction according to ASTM A403 Gr WP316-WX

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Elbow Size (NPS in inches) and Wall thickness (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 10" Sch 40S Stainless Steel 90D Elbow, shall be designated as:


*ELBOW 90D SS (A403WP304) 10" S40S BW.*




## 6.0 TECHNICAL DELIVERY CONDITIONS:

- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	30.04.2021	FIRST ISSUE		 SRIKANTH G

	<b>LAYOUTS &amp; PIPING ENGINEERING</b>  <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	PREPARED	CHECKED	APPROVED	DATE
		 M.A.MOQEET	 G PARAMESH	 SRIKANTH G	30.04.21



## CORPORATE STANDARD

AA 085 14 02

Rev. No. 04

PAGE 1 OF 4

### TECHNICAL, DELIVERY CONDITIONS FOR ANSI-PIPE FITTINGS

#### 1.0 SCOPE:

This standard stipulates the technical delivery conditions for socket-welding fittings like elbows, tees, couplings etc. to ANSI: B16.11 and seamless butt-welding fittings like elbows, tees, reducers etc. to ANSI: B16.28.

#### 2.0 TECHNICAL REQUIREMENTS

This socket-welding fittings shall comply with ANSI: B16.11 and butt-welding fittings with ANSI: B16.28 with the following specific requirements.

**2.1** Pressure class, schedule and size : Pressure class and size for socket-welding fitting, schedule and size for butt-welding fittings shall be as specified in the enquiry/order.

**2.2 Material Specification:** The material of the fittings shall be as per enquiry/order. The material shall generally comply with the following, unless otherwise specified.

**a) Socket welding fittings:** Socket welding fittings shall be manufactured by forging to the following material specification:

Carbon Steel (Low Temperature Service)	: ASME : SA 350 Gr : LF1
Carbon Steel (High Temperature Service)	: ASME : SA 105
Alloy Steel (High Temperature Service)	: ASME : SA 182 Gr : F22
Stainless Steel	: ASME : SA 182 Gr : F321

**b) Butt-Welding fittings:** Butt-welding fittings shall be manufactured as per the relevant standards to the following material specification:

Carbon Steel (Low Temperature Service)	: ASME : SA 420 Gr : WPL6
Carbon Steel (High Temperature Service)	: ASME : SA 234 Gr : WPB
Alloy Steel (High Temperature Service)	: ASME : SA 234 Gr : WP11
	: ASME : SA 234 Gr : WP22
Stainless Steel	: ASME : SA 403 Gr : WP321

**2.3 Heat treatment:** The fittings shall be properly heat treated as per the relevant material specification:

**2.4 Dimensions, Tolerances and Finish :** The dimensions and tolerances, shall be strictly as per ANSI: B16.11 for forged steel fittings, socket welding and threaded, B16.9 for factory made wrought steel Butt-Welding fittings. For allowable imperfections and finish of the fittings relevant clause as per ASME : SA 234/SA 403/SA 420 shall be applicable for carbon alloy and stainless steel fittings.

#### Revisions :

CI 20.8.13 of MOM of WG-SMC+RP

#### APPROVED :

INTERPLANT  
STANDARDIZATION COMMITTEE (WG-SMC+RP)

Rev. No. 04

Amd.No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt: 15.12.2004

Dt :

Year :

HYDERABAD

Corp. R&D

August 1980



All fittings shall be shot blasted both inside and outside to remove rust, scale and other foreign materials. The surface shall be clean, smooth and without any scales, burrs etc. Vendor shall note the method to be employed in their Quality Assurance Plan for approval by BHEL representative/Customers.

- 2.5 Edge Preparation:** Unless otherwise specified, the butt welding fittings shall be supplied with edge preparation for welding with the connecting pipe. The edge preparation shall be as per ANSI : B 16. 25.

### 3.0 CHEMICAL COMPOSITION AND PROCESS:

- 3.1 Carbon percentage shall be limited as specified in the following table:

Sl No.	Grade	Connecting pipe wall thickness	C%
1.	A105, WPC	All	0.25
2.	WPB, WPBW	All	0.25

- 3.2 Fittings shall be of seamless construction only unless otherwise specified in the purchase order. Fittings of nominal bore NB 50 and below shall be of forged construction only.

- 3.3 Fittings shall be forged, wherever specified in the purchase order. The forgings must be as close as possible to the final shape and size.

- 3.4 All the plates used for manufacturing of plate formed fittings shall be ultrasonically tested by either of the following:

i) ASME SA 435 and acceptance standards as in SA 435 except that adjacent discontinuity indications shall be separated from each other by a distance equal to or no longer than the larger of the indications, unless both the adjacent defects can be contained in a circle of diameter equal to the acceptance standards of a single defect.

ii) ASME SA 578 and acceptance standard shall be as per Level-1 of SA 578

### 4.0 INSPECTION AND CERTIFICATION:

- 4.1 Mechanical and Chemical Testing:** Material used for manufacture of the fittings shall be tested for mechanical properties and chemical composition as relevant material standards.

- 4.2 Magnetic particle Examination:** Knuckle of reducers, outer bend portion of elbows and neck portion of tees shall be magnetic particle examined after final heat treatment in accordance with practice ASME SE 709 for all carbon steel and alloy steel fittings for all schedule for sizes 2" inclusive and above.

- 4.3 Liquid Penetrant Examination:** Knuckle of reducers, outerbend portion of elbows and neck portion of tees shall be liquid penetrant examined after final heat treatment in accordance with practice ASME SE 165 for all stainless steel fittings for all schedules for sizes 2" inclusive and above.

- 4.4 Acceptance Criteria for MPE and LPE Tests:** The acceptance criterial for MPE and LPE tests shall be in accordance with Appendix 6 and 8 of ASME, Sec. VIII Div. 1

**All surfaces to be examined shall be free of :**

- relevant lines indications.
- relevant rounded indications greater than 3/16 inch.
- Four or more relevant rounded indications in a line separated by 1/16 inch or less (edge to edge)
- An indication of imperfection may be larger than the imperfection that causes it, however, the size of the indication is the basis for acceptance evaluation



## CORPORATE STANDARD

AA 085 14 02

Rev. No. 04

PAGE 3 OF 4

**4.5 Wrinkless:** The inner bend portion of Elbows shall be free from wrinkles and Tool marks.

### **5.0 CERTIFICATE:**

5.1 All fittings shall be delivered along with test certificates in English.

5.2 Fittings to material specification ASME SA 105, SA 182 Gr.F22, SA 234 Gr.WPB and WP22 shall be inspected and the test certificates shall be countersigned by an inspecting authority approved under Appendix "C" of Indian Boiler Regulations.

5.3 Fittings to material specification ASME 350 Gr.LF1, SA 182 Gr.F321, SA 420 Gr.WPL6 and SA 403 Gr.WP 321 shall be subjected to inspection by authorities nominated by BHEL and the test certificates shall be countersigned by them.

5.4 Three original Test certificates shall be submitted.

### **6.0 GUARANTEE CERTIFICATE:**

The supplier shall furnish a guarantee certificate stating that fittings supplied are capable of withstanding without failure, leakage or impairment of their serviceability, a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material.

### **7.0 QUALITY PLAN:**

A quality plan incorporating the process adopted by the supplier and conforming to the requirements of this specification shall be submitted for approval. Manufacturing shall commence only after the approval of the quality plan by BHEL.

### **8.0 MARKING, PRESERVATION AND PACKING:**

8.1 **Marking:** The following details shall be punched on each fitting:

- a) Manufacturer's name and trade mark
- b) Pressure class ( in case of socket welding fittings)
- c) Nominal size
- d) Schedule No. (in case of butt welding fittings)
- e) Type of fitting
- f) Material specification grade
- g) Melt No.
- h) Test certificate number
- i) Mark of inspection authority

### **8.2 Presentation:**

Before despatch, the fittings shall be dried and cleaned and the entire surface shall be well coated with a good quality rust preventive coating that will not become fluid and run-off at 65°C.

### **8.3 Packing:**

All fittings shall be provided with HDPE end covers to protect the weld edge preparation and to protect the internal surfaces. The fittings shall be wrapped by bitumen paper/tar paper/polyethylene paper to avoid water ingress during transit/handling in transporter's godown. Fittings shall be packed in a sound closed wooden/steel box.

### **9.0 REFERRED STANDARDS (Latest Publications Including Amendments):**

- 1) ANSI B 16.9, B 16.11, B 16.25 & B 16.28
- 2) ASME SA 105, SA 182, SA 234, SA 350, SA 403, SA 420 SA, SA 435, SA 578, SE 165 & ASME SE 709.

AA 085 14 02

Rev. No. 04

PAGE 4 OF 4


## CORPORATE STANDARD



## ANNEXURE-I : TEST CERTIFICATE PROFORMA FOR FORGINGS

SUPPLIER'S NAME AND ADDRESS											
TEST CERTIFICATE FOR FORGINGS											
1. Customer;						9. Reduction Ratio } Ingot to Bloom Bloom to Blank					
2. TC No. & Date;						10. Batch No.;					
3. PO No.;						11. Heat/Melt No.					
4. Process of Melting Ingot;						12. Spec. No.					
5. Deoxidisation Process;						13. Test Bar Size & Nos.					
6. Forging Method;						14. Supplier of the ingot/billet/ Bloom and TC reference.					
7. BHEL's Reference for Approval of Bloom											
8. Discard: Top _____%, Bottom _____%											
15. FORGINGS COVERED BY TEST CERTIFICATE											
S.No.		Drawing No. & Item No.				Description				Quantity & Weight	
16. CHEMICAL COMPOSITION (PERCENT)											
Element		C	Si	Mn	S	P					
As Per Specn.		Min.									
		Max.									
Actual Values											
17. HEAT TREATMENT (To be accompanied by Recorder Chart, Whenever called for)											
Condition		Heating Rate, °C/hr.		Temp. °C		Soaking Time, Hrs.		Cooling Rate, °C/hr		Cooling Medium	
18. MECHANICAL PROPERTIES											
		T.S. N/mm <sup>2</sup>	Y.S. 0.5/0.2% Proof N/mm <sup>2</sup>	% Elongation 5.65√So GL	% R.A. Min.	Hardness BHN (Min. 3 values)	Impact Value Joules	Bend Test			
								Angle of bend	Dia of mandrel	Result	
As Per Specn.		Min.									
		Max.									
Actual Values											
19. SURFACE FINISH (When called for in the order/drg.)											
20. DIMENSIONAL INSPECTION											
21. NON-DESTRUCTIVE TESTS											
Nature of Test		Acceptance level		Instrument used		Range		Results		Any other detail	
Ultrasonic											
Radiographic											
Dye penetrant/ Magnetic Particle											
22. METALLOGRAPHIC EXAMINATION (To be conducted if called for and photo micrographs to be attached along with a report)											
Location of Sample		Etchant used		Magnification		Constituent observed		Relative %			
Microstructure		Macroetch		Inclusion Rating							
23. OTHER TESTS IF ANY (MICROSCOPIC, SULPHUR PRINTS, ETC)											
24. IDENTIFICATION OF FORGINGS AS PER PURCHASE SPEC.											
We hereby certify that the items mentioned above have been tested and inspected in our presence and are found to be in accordance with drawings, specifications and purchase order.											
SIGNATURE, NAME & SEAL OF THE INSPECTING OFFICER DATE:						SIGNATURE, NAME & SEAL OF THE CHIEF OF QUALITY CONTROL/ CHIEF METALLURGIST OF THE SUPPLIER DATE:					
INSTRUCTIONS											
a) Details of all heat treatment processes carried out should be furnished sequentially in 17.											
b) Test certificates are to be furnished as per Purchase order and specification, in A4 size preferably in transparent paper.											
c) All the entries including signature should be in block colour ink.											
d) If testing is done by outside agencies, the original TCs shall be furnished.											
e) The actual TC may run into more than one A4 size paper, if needed, to facilitate filling up of details.											



Form No:	 PE&SD	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>	<b>PY 52331</b>
		<b>TECHNICAL SPECIFICATION</b>	Rev. No. 00
		<b>CAP STAINLESS STEEL</b> <b>(A403 GRWP316)BW</b>	Page 1 of 1

**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.

## 1.0 GENERAL

- 1.1 The Butt Welded Cap supplied according to this specification shall conform to the requirements of latest version of ASME Standard B16.9 "Factory-Made Wrought Butt welding Fittings" and comply with the following additional requirements.
- 1.2 This specification is applicable for Butt Welding Cap of Sizes NPS 0.5" to NPS 48".

## 2.0 MATERIAL & CONSTRUCTION:

Material, Construction, Chemical Composition, Mechanical Properties, Heat Treatment, Testing and other requirements related to Material shall be in accordance with the ASTM Standard (latest version) as specified below:

- 2.1 For Cap of size NPS 0.5" to NPS 48":  
Seamless Construction according to ASTM A403 Gr WP316.

## 3.0 DIMENSIONS, TOLERANCES AND OTHER REQUIREMENTS:

Shall be as per ASME B16.9 (Latest edition).

## 4.0 SIZE AND THICKNESS:

Cap Size (NPS in inches) and Wall thickness (Schedule) shall be as per BHEL Enquiry/Order.

## 5.0 DESIGNATION:

A 10" Sch 40 Stainless Steel CAP, shall be designated as:



CAP 10" SCH 40 BW SS (A403WP316)




## 6.0 TECHNICAL DELIVERY CONDITIONS:

- 6.1 Unless otherwise specified on the order, IBR certification is not required.
- 6.2 All other requirements shall be as per BHEL Corporate Standard AA0851402 – Technical Delivery Conditions for Pipe Fittings. ASME Standard B16.28 referred in this TDC shall be read as ASME B16.9.

+++

## RECORD OF REVISIONS:

Rev No	Date	Revision Detail	Revised by	Approved by
00	16.09.22	FIRST ISSUE	 IMRAN	 SRIKANTH G

Refer Doc	LAYOUTS & PIPING ENGINEERING	PREPARED	CHECKED	APPROVED	DATE
	PROJECT ENGINEERING & SYSTEMS DIVISION	 IMRAN	 G KALYAN	 SRIKANTH G	16.09.22