

TD-106-1 Rev No. 5	Form No.		PRODUCT STANDARD OIL FIELD EQUIPMENT HYDERABAD		OE 57143 Rev No. 01 PAGE 1 of 6
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. <u>COLD-FORMED SEAMLESS/WELDED CARBON STEEL STRUCTURAL TUBE/PIPE</u> 1.0 GENERAL: This specification governs the requirements of cold formed seamless/welded carbon steel structural tube and pipe to ASTM: A500, Gr. B and Gr. C. 2.0 APPLICATION: The structural tubing of rectangular and square cross sections, pipe used in the fabrication of Mast and Sub-structures of Oil Rigs. 3.0 COMPLIANCE WITH STANDARDS: The tub/pipe shall conform to the latest version of ASTM: A500, Gr. B/ Gr. C. 4.0 DIMENSIONS AND TOLERANCES: 4.1 Sizes: The sizes (Outside dimensions and nominal wall thickness) of the tubes/pipes shall be as specified in the purchase order. Unless otherwise stated, the tubes/pipes shall be supplied in lengths of 20' (6.096 m) or 40' (12.192 m) as indicated in the purchase order. 4.2 Tolerances: Shall be as per ASTM: A500 (Latest). 5.0 MANUFACTURE: The tubes/pipes shall be manufactured by seamless/welding process. 6.0 END CONDITION: The ends of the structural tubes/pipes shall be plain and burrs shall be removed on both outside and inside.					
Ref. Doc	Revisions: Refer to record of revisions:	Prepared: ARUN	Approved: RAJEEV	Date: 20.09.2019	

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7.0 CHEMICAL ANALYSIS:

The chemical composition of the material Gr. B shall be as follows:

Element (%)		C	P	S	Cu	Mn
Ladle Analysis	Min.	-	-	-	0.20	
	Max.	0.26	0.035	0.035	-	1.35
Permissible variation in product analysis		+0.04	+0.01	+0.01	-0.02	+0.05

The chemical composition of the material Gr. C shall be as follows:

Element (%)		C	P	S	Cu	Mn
Ladle Analysis	Min.	-	-	-	0.20	
	Max.	0.23	0.035	0.035	-	1.35
Permissible variation in product analysis		+0.04	+0.01	+0.01	-0.02	+0.05

8.0 MECHANICAL PROPERTIES:

The mechanical properties of the square and rectangular tubes and pipes shall be as follows:

Grade	Tensile Strength min. (N/mm ²)	Yield Strength min. (N/mm ²)	% Elongation min. (L=50mm)
Gr. B	400	315	23
Gr. C	510	414	21

NOTE:

- The elongation value applies to tubes with wall thickness 4.57 mm (0.180") and over. For wall thicknesses under 0.180" (4.57 mm), the minimum elongation shall be calculated by the formula. Elongation % min. $L=2'' (50.8 \text{ mm}) = 61t+12$. Where t = nominal wall thickness of tubing in inches.
- Tensile testing shall be done as per ASTM A 370 or any other reputed national/international standard.

8.1 FLATTENING TEST FOR PIPES

Flattening test shall be carried out in accordance with ASTM A500 latest edition

9.0 TEST SAMPLES:

9.1 **For Chemical Analysis:** One sample per melt shall be taken for chemical analysis.

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9.2 For Mechanical tests:

9.2.1 One tension test as specified in clause 8.0 shall be made from a length of tube/pipe representing each lot.

9.2.2 The term 'lot' shall apply to all tubes/pipes of the same nominal size and wall thickness that are produced from the same heat of steel.

10.0 INSPECTION AT SUPPLIER'S WORKS:

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

11.0 RETEST:

If the results of the mechanical tests representing any lot fail to conform the requirements of clause 8.0, then the lot can be retested using additional tubing/piping of double the original number from the same lot.

The lot shall be acceptable if each of the sample confirm to the specified requirements during retest. The tubing/piping shall be rejected if it fails to meet the retest requirement.

12.0 TEST CERTIFICATE:

12.1 Five copies of the test certificate with the following details shall be furnished.

- a) BHEL Order No.
- b) BHEL Specification No. OE 57143 / Rev. XX
- c) ASTM reference: ASTM A500 and GR.
- d) Melt No.
- e) Consignment/Identification No.
- f) Results of Product analysis.
- g) Results of Mechanical tests.

12.2 The test certificate shall be signed by the chief of Quality/Chief metallurgist of the supplier and BHEL representative.

13.0 MARKING:

The following details shall be punched at one end of the tubes and encircled by paint.

- a) Melt No.
- b) Supplier's mark

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In addition to the above, the following details shall also be marked on each tube. c) BHEL Order No. d) OE 57143 Rev.XX, VAR XX e) ASTM: A500, Gr. B /Gr. C f) Size & Length g) Weight h) Consignment/Identification No. 14.0 REJECTION & REPLACEMENT: In the event of the material proving defective in the course of further processing at BHEL, the same shall be rejected notwithstanding any previous acceptance. The supplier shall replace the material at his own cost and the rejected material shall be returned after all the commercial conditions are satisfied. <u>VARIANT TABLE</u> <table border="1"> <thead> <tr> <th>VAR. NO.</th> <th>Size, inch</th> <th>GRADE</th> <th>Material code</th> </tr> </thead> <tbody> <tr><td>01</td><td>RECT TUBE CS 6" X 4" X 0.375" (GR. C)</td><td>C</td><td>OE9757143014</td></tr> <tr><td>02</td><td>RECT TUBE CS 6" X 3" X 0.375" (GR. C)</td><td>C</td><td>OE9757143022</td></tr> <tr><td>03</td><td>RECT TUBE CS 6" X 3" X 0.3125" (GR. C)</td><td>C</td><td>OE9757143030</td></tr> <tr><td>04</td><td>RECT TUBE CS 6" X 3" X 0.3125" (GR. B)</td><td>B</td><td>OE9757143049</td></tr> <tr><td>05</td><td>RECT TUBE CS 6" X 2" X 0.3125" (GR. B)</td><td>B</td><td>OE9757143057</td></tr> <tr><td>06</td><td>RECT TUBE CS 6" X 2" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143065</td></tr> <tr><td>07</td><td>RECT TUBE CS 5" X 3" X 0.25" (GR. B)</td><td>B</td><td>OE9757143073</td></tr> <tr><td>08</td><td>RECT TUBE CS 5" X 2" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143081</td></tr> <tr><td>09</td><td>RECT TUBE CS 4" X 3" X 0.25" (GR. B)</td><td>B</td><td>OE9757143090</td></tr> <tr><td>10</td><td>RECT TUBE CS 4" X 3" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143103</td></tr> <tr><td>11</td><td>RECT TUBE CS 4" X 2" X 0.25" (GR. B)</td><td>B</td><td>OE9757143111</td></tr> <tr><td>12</td><td>RECT TUBE CS 4" X 2" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143120</td></tr> <tr><td>13</td><td>RECT TUBE CS 3" X 2" X 0.25" (GR. B)</td><td>B</td><td>OE9757143138</td></tr> <tr><td>14</td><td>RECT TUBE CS 3" X 2" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143146</td></tr> <tr><td>15</td><td>RECT TUBE CS 3" X 1.5" X 0.125" (GR. B)</td><td>B</td><td>OE9757143154</td></tr> <tr><td>16</td><td>SQ TUBE CS 5" X 0.25" (GR. B)</td><td>B</td><td>OE9757143162</td></tr> <tr><td>17</td><td>SQ TUBE CS 4" X 0.25" (GR. B)</td><td>B</td><td>OE9757143170</td></tr> <tr><td>18</td><td>SQ TUBE CS 4" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143189</td></tr> <tr><td>19</td><td>SQ TUBE CS 3.5" X 0.25" (GR. B)</td><td>B</td><td>OE9757143197</td></tr> <tr><td>20</td><td>SQ TUBE CS 3.5" X 0.1875" (GR. B)</td><td>B</td><td>OE9757143200</td></tr> <tr><td>21</td><td>SQ TUBE CS 3" X 0.25" (GR. B)</td><td>B</td><td>OE9757143219</td></tr> <tr><td>22</td><td>SQ TUBE CS 2" X 0.25" (GR. B)</td><td>B</td><td>OE9757143227</td></tr> <tr><td>23</td><td>SQ TUBE CS 1.5" X 0.125" (GR. B)</td><td>B</td><td>OE9757143235</td></tr> <tr><td>24</td><td>SQ TUBE CS 1.25" X 0.125" (GR. B)</td><td>B</td><td>OE9757143243</td></tr> <tr><td>25</td><td>SQ TUBE CS 1.5" X 0.091" (GR. B)</td><td>B</td><td>OE9757143251</td></tr> <tr><td>26</td><td>SQ TUBE CS 1.25" X 0.091" (GR. B)</td><td>B</td><td>OE9757143260</td></tr> </tbody> </table>				VAR. NO.	Size, inch	GRADE	Material code	01	RECT TUBE CS 6" X 4" X 0.375" (GR. C)	C	OE9757143014	02	RECT TUBE CS 6" X 3" X 0.375" (GR. C)	C	OE9757143022	03	RECT TUBE CS 6" X 3" X 0.3125" (GR. C)	C	OE9757143030	04	RECT TUBE CS 6" X 3" X 0.3125" (GR. B)	B	OE9757143049	05	RECT TUBE CS 6" X 2" X 0.3125" (GR. B)	B	OE9757143057	06	RECT TUBE CS 6" X 2" X 0.1875" (GR. B)	B	OE9757143065	07	RECT TUBE CS 5" X 3" X 0.25" (GR. B)	B	OE9757143073	08	RECT TUBE CS 5" X 2" X 0.1875" (GR. B)	B	OE9757143081	09	RECT TUBE CS 4" X 3" X 0.25" (GR. B)	B	OE9757143090	10	RECT TUBE CS 4" X 3" X 0.1875" (GR. B)	B	OE9757143103	11	RECT TUBE CS 4" X 2" X 0.25" (GR. B)	B	OE9757143111	12	RECT TUBE CS 4" X 2" X 0.1875" (GR. B)	B	OE9757143120	13	RECT TUBE CS 3" X 2" X 0.25" (GR. B)	B	OE9757143138	14	RECT TUBE CS 3" X 2" X 0.1875" (GR. B)	B	OE9757143146	15	RECT TUBE CS 3" X 1.5" X 0.125" (GR. B)	B	OE9757143154	16	SQ TUBE CS 5" X 0.25" (GR. B)	B	OE9757143162	17	SQ TUBE CS 4" X 0.25" (GR. B)	B	OE9757143170	18	SQ TUBE CS 4" X 0.1875" (GR. B)	B	OE9757143189	19	SQ TUBE CS 3.5" X 0.25" (GR. B)	B	OE9757143197	20	SQ TUBE CS 3.5" X 0.1875" (GR. B)	B	OE9757143200	21	SQ TUBE CS 3" X 0.25" (GR. B)	B	OE9757143219	22	SQ TUBE CS 2" X 0.25" (GR. B)	B	OE9757143227	23	SQ TUBE CS 1.5" X 0.125" (GR. B)	B	OE9757143235	24	SQ TUBE CS 1.25" X 0.125" (GR. B)	B	OE9757143243	25	SQ TUBE CS 1.5" X 0.091" (GR. B)	B	OE9757143251	26	SQ TUBE CS 1.25" X 0.091" (GR. B)	B	OE9757143260
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VAR. NO.	Size, inch	GRADE	Material code
27	RECT TUBE CS 3" X 2" X 0.3125" (GR. B)	B	OE9757143278
28	SQ TUBE CS 5" X 0.375" (GR. B)	B	OE9757143286
29	SQ TUBE CS 2.5" X 0.25" (GR. B)	B	OE9757143294
30	PIPE OD 12.75" X 0.375" THK (GR. B)	B	OE9757143308
31	PIPE OD 10" X 0.5" THK (GR. C)	C	OE9757143316
32	PIPE OD 10.75" X 0.365" THK (GR. B)	B	OE9757143324
33	PIPE OD 8.625" X 0.719" THK (GR. B)	B	OE9757143332
34	PIPE OD 6.625" X 0.432" THK (GR. B)	B	OE9757143340
35	PIPE OD 3.5" X 0.4375" THK (GR. C)	C	OE9757143359

