

Furnace-Welded Steel Pipe

GE Material B4Y10 identifies furnace-welded steel pipe by butt-welding similar to ASTM A 53, as follows:

Open-hearth or basic oxygen

<u>GE designation</u>	<u>Description</u>
B4Y10A	Standard weight, black, both ends threaded, one coupling
B4Y10A2	Standard weight, galvanized, both ends threaded, one coupling
B4Y10A3	Standard weight, black, both ends threaded, one coupling, PED certified material
B4Y10A4	Standard weight, galvanized, both ends threaded, one coupling, PED certified material
B4Y10B	Extra strong, black, plain ends
B4Y10B2	Extra strong, galvanized, plain ends
B4Y10B3	Extra strong, black, plain ends, PED certified material
B4Y10B4	Extra strong, galvanized, plain ends, PED certified material
B4Y10C	Double extra strong, black, plain ends
B4Y10C2	Double extra strong, galvanized, plain ends
B4Y10C3	Double extra strong, black, plain ends, PED certified material
B4Y10C4	Double extra strong, galvanized, plain ends, PED certified material
B4Y10D1	Standard weight, black, plain ends
B4Y10D2	Standard weight, galvanized, plain ends
B4Y10D3	Standard weight, black, plain ends, PED certified material
B4Y10D4	Standard weight, galvanized, plain ends, PED certified material

ALTERNATE MATERIAL:

For GE Energy Commercial orders, see Specification D50A152 for potential alternate materials.

For GE Rail orders, see Specification B50E205 for potential alternate materials.

REFERENCED DOCUMENTS:

ASTM A 53	Pipe, Steel, Black And Hot-Dipped, Zinc-Coated, Welded And Seamless
ASTM A 370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A 700	Standard Practice for Packaging, Marking , and loading Methods for Steel Products for Domestic Shipment
ASTM A 751	Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
ASTM E 8	Standard Test Methods for Tension Testing of Metallic Materials
GE B4A22.....	Low-Carbon Steel Seamless Pipe
GE B4A32.....	Electric-resistance-Welded Steel Pipe
GE Energy specification:	
D50A152	Alternate Material Approved for Manufacture of Power Generation Commercial Orders
GE Rail specification:	
B50A205	Global Alternate Materials
European Union:	
Directive (97/23/EC).	Pressure Equipment Directive (PED) (1)
EN 10204	Metallic Products – Types of Inspection Documents

(1) With Guidelines by the Safety Technology Authority (TUKES), Helsinki, Finland

ABBREVIATIONS:

"Incl" shall signify "include or included."

"Excl" shall signify "exclude or excluded."

CHEMICAL COMPOSITION: %

Phosphorus, max 0.08

Sulfur, max 0.06

The ladle analysis made by the manufacturer to determine the percentages of the elements required under this specification shall be reported to the purchaser or his representative in a certificate of test when specified on purchase order or otherwise.

A product analysis (formerly check analysis) may be made by the purchaser from a sample representing each lot. The chemical composition thus determined shall conform to the requirements of this specification.

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MECHANICAL PROPERTIES:

	Open-hearth or basic oxygen
Tensile strength, psi, (MPa) (2), min	45,000 (310) (2)
Yield point, psi, (MPa), min	25,000 (170)
Elongation in 8 inch (200 mm), %, min	20 (3)
When standard round 2 inch (50 mm) gage length test specimen is used	30

- (2) These and subsequent equivalent SI metric units and values are provided for information only and are not intended for specification purposes.
- (3) Gage distances for measuring elongation for nominal sizes 3/4 inch (19 mm) and smaller shall be as follows:

Nominal pipe size			Gage length	
inch		mm	inch	mm
3/4 and 1/2		19 and 13	6	150
3/8 and 1/4		9.5 and 6.4	4	100
1/8		3.2	2	50

Hydrostatic test – This material shall withstand hydrostatic test pressures as listed in Table 1.

Bend test – For pipe two inches (50 mm) and under in nominal diameter, a sufficient length of pipe shall stand being bent cold through 90 degrees (1.6 radians) around a cylindrical mandrel. The diameter of which is twelve times the nominal diameter of the pipe, without developing cracks at any portion, and without opening the weld. Double extra heavy pipe over 1 1/4-inch (32 mm) diameter is not subject to the bend test.

Flattening test – For standard weight and extra strong pipe over two inches (50 mm) in nominal diameter, a section of pipe not less than 4 inches (100 mm) in length shall be flattened cold between parallel plates in three steps. The weld shall be located 90 degrees (1.6 radians) from the line of direction of force. During the first step, which is a test for quality of the weld, no cracks or breaks on the inside, outside or end surfaces shall occur until the distance between the plates is less than three fourths of the original outside diameter for butt-welded pipe. As a second step, the flattening shall be continued. During the second step, which is a test for ductility exclusive of the weld, no cracks or breaks on the inside, outside or end surfaces shall occur until the distance between the plates is less than 60 percent of the original outside diameter. During the third step, which is a test for soundness, the flattening shall be continued until the specimen breaks or the opposite walls of the pipe meet. Evidence of laminated or unsound material or of incomplete weld that is revealed during the entire flattening test shall be cause for rejection. Superficial ruptures as a result of surface imperfections shall not be cause for rejection.

ADDITIONAL REQUIREMENTS:

GE Energy applications utilize B4Y10A3, A4, B3, B4, C3, C4, D3 and D4. For these classes, material certification of chemical and physical analysis test results shall be provided in accordance with EN10204 3.1B, 3.1C, or 3.2 Certificate of Specific Product Control. Additionally, documentation shall be provided demonstrating that the material supplier conforms to the appropriate quality assurance system described by Annex I, paragraph 4.3 of the Pressure Equipment Directive (97/23/EC) as clarified by TUKES guideline 7/16. In addition, the material manufacturer shall provide documentation demonstrating that welding procedures have been certified by a Notified Body in accordance with the Pressure Equipment Directive (97/23/EC).

Process – Steel for GE Materials B4Y10A, A2, A3, A4, B, B2, B3, B4, C, C2, C3, C4, D1, D2, D3 and D4 shall be made by the open-hearth or basic oxygen process.

Finish – Each end of standard weight pipe for GE Materials B4Y10A, A2, A3 and A4 shall be threaded and each length of threaded pipe shall be provided with one coupling. Standard weight pipe for GE Materials B4Y10D1, D2, D3 and D4 shall be furnished with plain ends. Extra strong and double extra strong pipe shall be furnished with plain ends. All burrs at the ends shall be removed. Finished pipe shall be reasonably straight and free from injurious defects.

Galvanizing – For the galvanized grades, the weight of zinc coating shall not be less than 2.0 ounces per square foot (0.61 kg/m²) of total coated surface.

IDENTIFICATION:

Each length of pipe shall be legibly marked by rolling, stamping or stenciling with the manufacturer's name or trade name, the kind of pipe (furnace-butt-welded), the use of open-hearth or basic oxygen XS for extra strong, XXS for double extra strong, and the length. On small diameter pipe which is bundled, this information may be legibly stamped on a metal tag securely attached to each bundle.

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REFEREE METHODS:

Chemical composition	ASTM A 751
Tensile tests	ASTM E 8
Hydrostatic test	ASTM A 53
Weight of zinc coating	ASTM A 53

STANDARD WEIGHTS, DIMENSIONS AND TEST PRESSURES:
TABLE 1 – CUSTOMARY UNITS

Nominal size, mm	Outside diameter, mm	B4Y10A, A2 A3 A4, D1, D2, D3, D4		B4Y10A, A2, A3, A4		B4Y10D1, D2, D3, D4	B4Y10B, B2, B3, B4			B4Y10C, C2, C3, C4		
		Thicknes s, mm	Test pres- sure MPa	Threads per mm	Wt / m T & C, kg	Wt / m plain, kg	Thick ness, mm	Wt / ft plain, kg	Test pres- sure MPa	Thick ness, mm	Wt / ft plain, kg	Test pres- sure MPa
3.2	10	1.73	4.8	1.1	0.36	0.36	2.41	0.46	5.9	–	–	–
6.4	14	2.24	4.8	0.7	0.63	0.63	3.02	0.80	5.9	–	–	–
9.5	17	2.31	4.8	0.7	0.85	0.85	3.20	1.10	5.9	–	–	–
13	21	2.77	4.8	0.6	1.26	1.26	3.73	1.62	5.9	7.47	2.54	6.9
19	27	2.87	4.8	0.6	1.68	1.68	3.91	2.19	5.9	7.82	3.63	6.9
25	33	3.38	4.8	0.5	2.50	2.50	4.55	3.23	5.9	9.09	5.45	6.9
32	42	3.56	6.9	0.5	3.39	3.38	4.85	4.46	9.0	9.70	7.75	9.7
38	48	3.68	6.9	0.5	4.06	4.05	5.08	5.40	9.0	10.16	9.54	9.7
51	60	3.91	6.9	0.5	5.48	5.43	5.54	7.47	9.0	11.07	13.44	9.7
64	73	5.16	6.9	0.3	8.66	8.62	7.01	11.40	9.0	14.02	20.39	9.7
76	89	5.49	6.9	0.3	11.34	11.28	7.62	15.25	9.0	–	–	–
89	102	5.74	8.3	0.3	13.69	13.56	8.08	18.62	11.7	–	–	–
102	114	6.02	8.3	0.3	16.21	16.06	8.56	22.29	11.7	–	–	–

TABLE 1 – REFERENCE METRIC UNITS

Nominal size, inch	Outside diameter, inch	B4Y10A, A2, A3 A4, D1, D2, D3, D4		B4Y10A, A2, A3, A4		B4Y10D1, D2, D3, D4	B4Y10B, B2, B3, B4			B4Y10C, C2, C3, C4		
		Thicknes s, inch	Test pres- sure psi	Threads per inch	Wt / ft T & C, pound	Wt / ft plain, pound	Thick ness, inch	Wt / ft plain, pound	Test pres- sure psi	Thick ness, inch	Wt / ft plain, pound	Test pres- sure psi
1/8	0.405	0.068	700	27	0.24	0.24	0.095	0.31	850	–	–	–
1/4	0.540	0.088	700	18	0.42	0.42	0.119	0.54	850	–	–	–
3/8	0.675	0.091	700	18	0.57	0.57	0.126	0.74	850	–	–	–
1/2	0.840	0.109	700	14	0.85	0.85	0.147	1.09	850	0.294	1.71	1000
3/4	1.050	0.113	700	14	1.13	1.13	0.154	1.47	850	0.308	2.44	1000
1	1.315	0.133	700	11	1.68	1.68	0.179	2.17	850	0.358	3.66	1000
1 1/4	1.660	0.140	1000	11	2.28	2.27	0.191	3.00	1300	0.382	5.21	1400
1 1/2	1.900	0.145	1000	11	2.73	2.72	0.200	3.63	1300	0.400	6.41	1400
2	2.375	0.154	1000	1/2	3.68	3.65	0.218	5.02	1300	0.436	9.03	1400
2 1/2	2.875	0.203	1000	8	5.82	5.79	0.276	7.66	1300	0.552	13.70	1400
3	3.500	0.216	1000	8	7.62	7.58	0.300	10.25	1300	–	–	–
3 1/2	4.000	0.226	1200	8	9.20	9.11	0.318	12.51	1700	–	–	–
4	4.500	0.237	1200	8	10.89	10.79	0.337	14.98	1700	–	–	–



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TOLERANCES:

Weight

B4Y10A, A2, A3, A4, B, B2, B3, B4, D1, D2, D3, D4 $\pm 5\%$
B4Y10C, C2, C3, C4 $\pm 10\%$

Outside Diameter:

Nominal diameter		Tolerance in outside diameter			
		Over		Under	
inch	mm	inch	mm	inch	mm
1/8 to 1 1/2 incl 2 and over	3.2 to 38 incl 51 and over	1/64	0.4	1/32	0.8
$\pm 1\%$ from standard specified					

Wall thickness – Minimum wall thickness at any point – not more than 12.5% under nominal wall thickness specified.

Lengths:

B4Y10A, A2, A3, A4, D1, D2, D3, D4 16–22 foot (4.9 to 6.7 meters) (4) (5)95% (min) of shipment
B4Y10B, B2, B3, B4, C, C2, C3, C4 12–22 foot (3.7 to 6.7 meters)95% (min) of shipment
6–12 foot (1.8 to 3.7 meters)5% (max) of shipment

(4) Not more than 5% may be “jointers” which are two pieces coupled together.

(5) When ordered with plain ends, 5% may be in lengths of 12 to 16 feet (3.7 to 4.9 meters).

CERTIFICATE OF TEST:

When requested, the supplier shall submit promptly to the purchaser at the point of delivery a certificate of test in triplicate showing the results of tests for chemical analysis and properties required by this specification. This certificate shall be addressed to the section, unit, or person specified on the purchase order, and shall contain the GE designation, the purchase order number, and the quantity shipped so that the certificate may be identified with the shipment.

PACKING AND MARKING:

All material shall be separated by size for shipment, and carefully packed in accordance with ASTM A 700 in such a manner to avoid damage or loss during shipment. When lift size is not specified on the purchase order, standard AISI lift will be acceptable.

Each shipment shall be legibly marked with the weight, the purchase order number, the manufacturer's name, and the GE designation.

DOCUMENT REVISION STATUS:

<u>Rev</u>	<u>Description</u>	<u>Rev date</u>
S3	Added metric units	1977 Dec 16
S4	Cancelled E and F designations	1978 Dec 29
S5	Added referenced documents, alternate materials for GE Energy and GE Rail, PED certified materials	2006 Jul 31