outokumpu
stainless steel & high performance alloys

North American Version
Imperial Units

Stainless Rebar

Outokumpu is a producer of high quality stainless steel rebar. Production is managed at our ISO 9001 certified mill in Richburg, South Carolina where we produce imperial sizes from #4 through #10 per ASTM A955-11 and later versions.

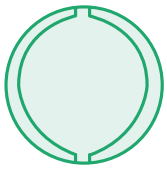
We also produce metric sizes from 8mm to 25mm to either the BS6744 or ASTM A955 standards at our mill in Sheffield, UK. 32 mm is supplied by our Richburg facility to complete the UK program.

Outokumpu produces two-sided rebar at our UK mill, and 3-sided design rebar at our Richburg, SC mill. This 3-sided cross-section is due to a unique 3-roll design in the mill that imparts three longitudinal ribs onto the rebar, and it is included in ASTM A955-11. (See drawings).

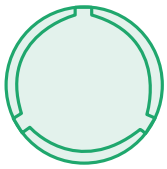
Outokumpu offers stainless reinforcement bars in austenitic and duplex grades in various sizes—available in coils, straight lengths, or cut and bent to order. The selective use of stainless steel rebar is ideal for concrete reinforcement in areas where road salts are used or where there is exposure to sea water. Additionally, the non-magnetic properties of the austenitic grades are well-suited for other applications such as medical, military, and scientific.

Outokumpu is the world's leader in the development and production of duplex stainless steels. Our lean duplex LDX 2101® is an ideal choice for concrete reinforcement. In addition to excellent corrosion resistance in concrete and high strength, LDX 2101 has a lower nickel content than austenitic or other duplex grades, offering better price stability. Because of its reduced life-cycle cost, LDX 2101 has been used around the world on projects with a design life expectancy in excess of 100 years.

*Two-sided design



**Three-sided design



Stainless Steel Types

				Typical Composition %			
Steel Type	UNS	ASTM	EU Norm	Cr	Ni	N	Mo
Austenitic	S30400	304	1.4301	18.3	8.3	0.07	—
Lean Duplex	S32101	LDX 2101	1.4162	21.5	1.5	0.22	0.3
Lean Duplex	S2304	2304	1.4362	22.7	4.7	0.15	0.3
Duplex	S2205	2205	1.4462	21.3	4.6	0.15	3.1

Mechanical Properties for ASTM A955

ASTM Grade	Minimum Tensile Strength (ksi)	Minimum Yield Strength (ksi)	Minimum % Elongation 8 inch
Grade 60	90	60	20
Grade 75	100	75	20

Mechanical Properties for BS6744

Grade	0.2% proof Strength, Rp0.2 (Mpa)	Stress ratio, Rm/Rp0.2 (min.)	Elongation at fracture, A5 (min.) %	Total elongation at max force, Agt (min.) %
200	200	1.10	22	5
500	500	1.10	22	5
650	650	1.10	14	5

a Rm is the ultimate tensile strength. b 1 Mpa=1N/mm2.

ASTM A955-11

Nominal Weight, lb/ft [Nominal Mass, kg/m][1]			Nominal Dimension[2]			Deformation Requirements, in. [mm] Maximum Gap per side[3]			
Bar Designation #	400 Series; Duplex Alleys	300 Series	Diameter, in. [mm]	Cross-Sectional Area, in.^{2} [mm^2]	Perimeter, in.[mm]	Max Average Spacing	Min Average Height	Two-Sided Bar	Three-Sided Bar
3 [10]	0.374 [0.556]	0.378 [0.562]	0.375 [9.5]	0.11 [71]	1.178 [29.9]	0.262 [6.7]	0.015 [0.38]	0.143 [3.6]	0.097 [2.5]
4 [13]	0.679 [1.011]	0.686 [1.021]	0.500 [12.7]	0.20 [129]	1.571 [39.9]	0.350 [8.9]	0.020 [0.51]	0.191 [4.9]	0.129 [3.3]
5 [16]	1.048 [1.559]	1.058 [1.575]	0.625 [15.9]	0.31 [199]	1.963 [49.9]	0.437 [11.1]	0.028 [0.71]	0.239 [6.1]	0.162 [4.1]
6 [19]	1.495 [2.225]	1.511 [2.248]	0.750 [19.1]	0.44 [284]	2.356 [59.8]	0.525 [13.3]	0.038 [0.97]	0.286 [7.3]	0.194 [4.9]
7 [22]	2.038 [3.032]	2.059 [3.064]	0.875 [22.2]	0.60 [367]	2.749 [69.8]	0.612 [15.5]	0.044 [1.12]	0.334 [8.5]	0.226 [5.8]
8 [25]	2.685 [3.995]	2.713 [4.037]	1.000 [25.4]	0.79 [510]	3.142 [79.8]	0.700 [17.8]	0.050 [1.27]	0.383 [9.7]	0.259 [6.6]
9 [29]	3.396 [5.053]	3.441 [5.106]	1.128 [28.7]	1.00 [645]	3.544 [90.0]	0.790 [20.1]	0.056 [1.42]	0.431 [10.9]	0.292 [7.4]
10 [32]	4.312 [6.416]	4.358 [6.484]	1.270 [32.3]	1.27 [819]	3.990 [101.3]	0.889 [22.6]	0.064 [1.63]	0.487 [12.4]	0.329 [8.3]
11[36]	5.296 [7.880]	5.352 [7.964]	1.410 [35.8]	1.56 [1006]	4.430 [112.5]	0.987 [25.1]	0.071 [1.80]	0.540 [13.7]	0.365 [9.3]
14 [43]	7.64 [11.37]	7.72 [11.49]	1.693 [43.0]	2.25 [1452]	5.32 [135.1]	1.185 [30.1]	0.085 [2.16]	0.648 [16.5]	0.438 [11.1]
18 [57]	13.59 [20.22]	13.72 [20.43]	2.257 [57.3]	4.00 [2581]	7.09 [180.1]	1.58 [40.1]	0.102 [2.59]	0.864 [21.9]	0.584 [14.8]

1 The 400 and Duplex-Alloy Series is based on a density of 489.59 lb/ft^3 [7833.4 kg/m^3]. The 300 Series is based on a density of 494.78 lb/ft^3 [7916.5 kg/m^3]. Density varies with alloy content which may result in a variation of several percent.

2 The nominal dimensions of a deformed bar are equivalent to those of a round bar having the same weight [mass] per foot [meter] as the deformed bar.

3 The maximum gap (measured as a chord) between the ends of the deformations shall not exceed 25 %/n of the nominal perimeter of the bar, where n is the number of longitudinal gaps or longitudinal ribs around the perimeter of the bar.

Stainless Steel Types—Mill Source

Steel Type	UNS	ASTM	EU Norm	Mill
Austenitic	S30400	304	1.4301	UK only
Lean Duplex	S32101	LDX 2101	1.4162	UK/Richburg
Lean Duplex	S32304	2304	1.4362	UK/Richburg
Duplex	S32205/S31803	2205	1.4462	Richburg only

Note: Other alloys, sizes, and specifications may be available upon request. Please contact Outokumpu for specific requirements

Specifications

ASTM A955, BS6744.

Features

Surface Finishing: De-scaled or shot-blasted and pickled.

Packaging:

Coils

- from Richburg – Up to 4000 lbs
- from UK –1650 lbs (750 kg)

Straight Lengths

- from Richburg – up to 40 ft. in length in 2000–2500 lb. bundles. (10 ft. min.)
- from UK –up to 11.7 m in containers (3 m min.)

Packing per ASTM A700:

- Standard Practices for Packaging, Marking, and Loading Methods for Steel products for Shipments.

Cut and bend capabilities:

Our UK plant offers cutting and bending services up to #10 (32mm) per customer drawings upon request.

Tolerances on the BS6744 mass per meter

Nominal size mm	Tolerances on mass per meter run %
6mm	±9.0
7mm to 12mm	±6.0
Above 12mm	±4.5

Stainless Rebar Size Chart

ASTM A955	mm Sizes	Canada Sizes	Inch Equivalent	Outokumpu Sizes	
				Richburg	UK
	8		0.315		X
#3	9.5		0.375		
	10		0.394		X
	11.3	10M	0.445		
	12		0.472		X
#4	12.7		0.500	X	
	14		0.551		X
#5	15.9		0.625	X	
	16	15M	0.630	X	X
#6	19.1		0.750	X	
	19.5	20M	0.768	X	
	20		0.787		X
#7	22.2		0.875	X	
	25	25M	0.984		X
#8	25.4		1.000	X	
#9	28.7		1.129	X	
	29.9	30M	1.180	X	
#10	32		1.270	X	X
	35	35M	1.378		

Corrosion Resistance—Typical rankings

UNS	ASTM	Corrosion Resistance		
		PREn	CPT	CCTL (@ room temp)
S30415	304LN	23	< 50°F	≈2.5%
S31603**	316L	25	≈ 75° F	≈ 5.3%
S32101	LDX 2101	26	≈ 67° F	≈ 6.0%
S32304	2304	26	≈ 73° F	≈ 6.5%
S32205	2205	35	≈ 125° F	> 10%

Ref. 1: Randström et al., Testing for Chloride Threshold Levels of Stainless Reinforcing Bar, 18th International Corrosion Congress, Stockholm, 2011, Paper # 250

**The values listed correspond to a version of 316L that contains 2.6% Molybdenum

Weights per meter for BS6744 metric size rebar (in Kgs/meter)

Nominal size	Nominal Cross-Sectional Area	Nominal mass per meter run Stainless Steel Designation		
mm	mm^2	1.4301/1.4311 (304LN)	1.4436 (316L/316LN)	1.4162/1.4362/1.4462 (LDX/2304/2205)
6	28.3	0.224	0.226	0.221
8	50.3	0.397	0.402	0.392
10	78.5	0.620	0.628	0.612
12	113.1	0.893	0.905	0.882
16	201.1	1.589	1.609	1.569
20	314.2	2.482	2.514	2.451
25	490.9	3.878	3.927	3.829
28	615.8	4.865	4.926	4.803
32	804.2	6.353	6.434	6.266

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