

Welded Steel Fabric

NatSteel Holdings Pte Ltd

22 Tanjong Kling Road
Singapore 628048
T: +65 6265 1233
F: +65 6265 8317
E: sales@natsteel.com.sg
W: www.natsteel.com.sg

Co. Reg. No. 200810196Z

© 2007 NatSteel Holdings Pte Ltd. All rights reserved.
No portion of this publication may be produced or
copied in any form or by any means without the
written permission of NatSteel Holdings Pte Ltd.



Cert no:
SS 200810196Z
SS ISO 9001:2000



Cert no:
200810196Z
SS ISO 14001:2004



Cert no:
OHSAS 200810196Z
OHSAS 18001:1999




Australian Certification
Authority for
Reinforcing Steel



NatSteel Holdings –

partnering the construction industry for over 40 years



Wire rods in production at NatSteel Holdings' rolling mill

NatSteel Holdings, a wholly-owned subsidiary of **Tata Steel** — the world's top ten largest steel producer, has supported the construction industry in Singapore for over 40 years.

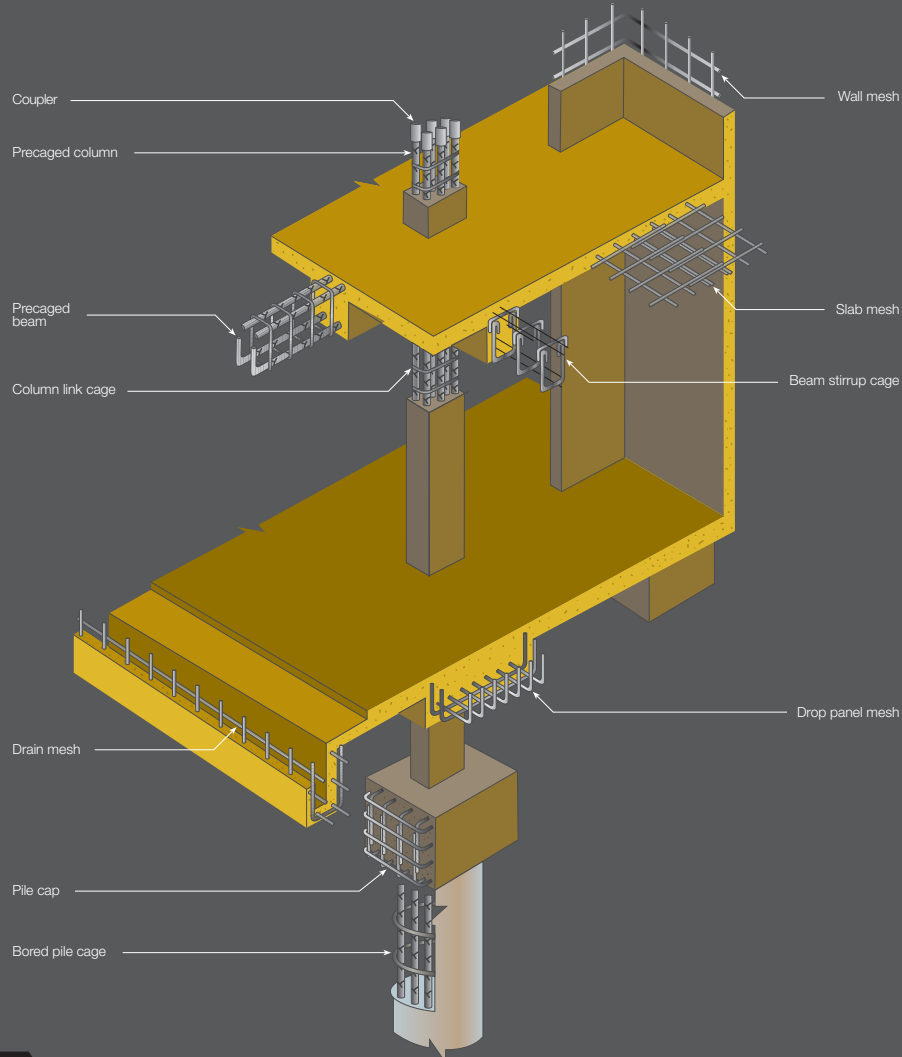
We are the only steel mill in Singapore. Our downstream boasts one of the largest single prefabrication operations in the world, with a capacity of 400,000 metric tonnes for cut-and-bend and precaging.

Our steel products are widely used in the construction of residential, institutional, industrial and commercial buildings, as well as infrastructural works.

The NatSteel Holdings Group employs over 3,500 employees across Singapore, Australia, China, Malaysia, Philippines, Thailand and Vietnam. We have an annual production capacity of more than 2 million tonnes of high quality steel products that cater to the construction industry.

Today, NatSteel Holdings is well-placed to tap into Tata Steel's extensive resources to further expand in the region and achieve our vision of becoming a world-class steel producer.

Fig.1: Different parts of a building reinforced with NatSteel Holdings' products



Welded steel fabric comes in rectangular or square steel reinforcement grids. It consists of a series of parallel, longitudinal and transverse cold-worked and high-yield wires welded at regular intervals.

The welds in both plain and high-bond deformed cold-worked wires contribute to the bonding and anchorage values in concrete. It is used as reinforcement for slabs, walls, floors/ceilings and drainage systems.

Advantages of using Welded Steel Fabric

- Replaces traditional steel-cutting and fixing on-site
- Reduces...
 - reliance on site labour
 - site congestion
- Improves buildability and productivity

We provide:

- Radiation-free steel that complies with radiation specifications of SS18:1999 and SS32:1999, assuring the public of their health and safety
- Consistent quality
- In-house processes and procedures that ensure traceability down to the order level
- Strong after-sales service to manage orders
- Professional technical team
- Just-In-Time (JIT) delivery
- Mechanised production process
- Products that can comply with SS18:1999, SS32:1999, BS 4482:1985, BS 4483:1998 or AS/NZS 4671:2001

Our Value-Add

As a socially responsible organisation, we are committed to providing you quality products, service and support.

NatSteel Holdings' **standard mesh**, ready for delivery





Mesh production at NatSteel Holdings

Specifications: Welded Steel Fabric

Table 1: Standards

Standards	Yield strength (N/mm ²) (MPa)	Weld shear load (N)
SS18:1999 Cold-reduced steel wire for the reinforcement of concrete and the manufacture of welded fabric	500	NA
SS32:1999 Welded steel fabric for the reinforcement of concrete	500	250 x area of the larger wire (for plain wires) 150 x area of the larger wire (for ribbed wires)
BS 4482:1985 Cold-reduced steel wire for the reinforcement of concrete	460	NA
BS 4483:1998 Steel fabric for the reinforcement of concrete	460	115 x area of the smaller wires
AS/NZS 4671:2001 Steel reinforcing materials	500	250 x area of the larger wires

Table 2: Unit weight

Wire diameter (mm)	6	7	8	9	10	11	12	13
Mass (kg/m ²)	0.222	0.302	0.395	0.499	0.617	0.746	0.888	1.042

Specifications: Standard

Table 3: Standard Metric Fabric

SS:32 Ref. no.	BS 4483 Ref. no.	Wire spacing (mm)		Wire diameter (mm)		Cross-sectional area (mm ² /m)		Nominal mass (kg/m ²)
		Main	Cross	Main	Cross	Main	Cross	
SQUARE FABRIC: A-SERIES								
A13	-	200	200	13	13	664	664	10.43
A12	-	200	200	12	12	566	566	8.89
A11	-	200	200	11	11	475	475	7.46
A10	A 393	200	200	10	10	393	393	6.16
A 9	-	200	200	9	9	318	318	4.99
A 8	A 252	200	200	8	8	252	252	3.95
A 7	A 193	200	200	7	7	193	193	3.02
A 6	A 142	200	200	6	6	142	142	2.22
A 5	A 98	200	200	5	5	98	98	1.54
SQUARE FABRIC: D-SERIES								
D13	-	100	100	13	13	1327	1327	20.86
D12	-	100	100	12	12	1131	1131	17.75
D11	-	100	100	11	11	950	950	14.92
D10	-	100	100	10	10	785	785	12.32
D 9	-	100	100	9	9	636	636	9.98
D 8	-	100	100	8	8	503	503	7.90
D 7	-	100	100	7	7	385	385	6.04
D 6	-	100	100	6	6	283	283	4.44
RECTANGULAR FABRIC: B-SERIES								
B13	-	100	200	13	10	1327	393	13.50
B12	B 1131	100	200	12	8	1131	252	10.90
B11	-	100	200	11	8	950	252	9.43
B10	B 785	100	200	10	8	785	252	8.14
B 9	-	100	200	9	8	636	252	6.97
B 8	B 503	100	200	8	8	503	252	5.93
B 7	B 385	100	200	7	7	385	193	4.53
B 6	B 283	100	200	6	7	283	193	3.73
NSH Ref. SQUARE FABRIC: E-SERIES								
E13	-	150	150	13	13	885	885	13.91
E12	-	150	150	12	12	754	754	11.84
E11	-	150	150	11	11	633	633	9.95
E10	-	150	150	10	10	523	523	8.22
E 9	-	150	150	9	9	424	424	6.66
E 8	-	150	150	8	8	335	335	5.26

Table 4: Standard Metric Fabric (F-mesh)

Ref. no.	Main wire		Cross wire		Cross-sectional area		Mass per unit area (kg/m ²)
	Size* (mm)	Spacing (mm)	Size* (mm)	Spacing (mm)	Main (mm ² /m)	Cross (mm ² /m)	
2F11130	2D11	130	H8	800	1463	63	11.97
2F12150	2D12	150	H8	800	1508	63	12.33
2F10100	2D10	100	H7	800	1571	48	12.72
F13080	D13	80	H8	800	1660	63	13.52
2F12130	2D12	130	H8	800	1741	63	14.16
2F13150	2D13	150	H8	800	1770	63	14.39
2F11100	2D11	100	H8	800	1901	63	15.41
2F10080	2D10	80	H7	800	1964	48	15.78
2F13130	2D13	130	H8	800	2043	63	16.52
2F11080	2D11	80	H8	800	2377	63	19.14
2F13100	2D13	100	H8	800	2655	63	21.33
2F12080	2D12	80	H8	800	2828	63	22.69
2F13080	2D13	80	H8	800	3319	63	26.54

* H refers to cold-reduced plain wire; D refers to cold-reduced ribbed wire

Characteristics of F-mesh:

- One-directional
- Main wires/bars resist the structural load, while cross wires serve as carrier wires at regular intervals of 800mm
- Wide cross-wire spacing
- Manageable width of 1.0m to 1.5m

To achieve the structural reinforcement needed, two layers of F-mesh are placed at right angles to each other (as shown in Fig.2).

Fig.2: Placing sequence for F-mesh

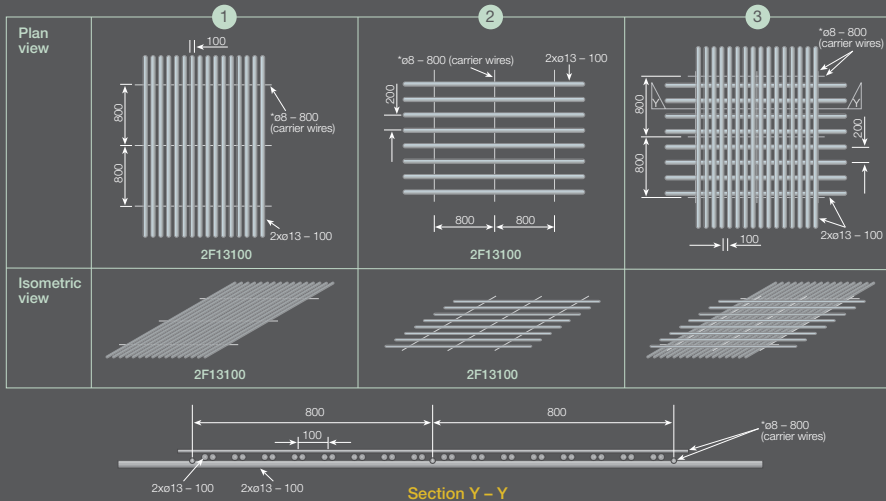
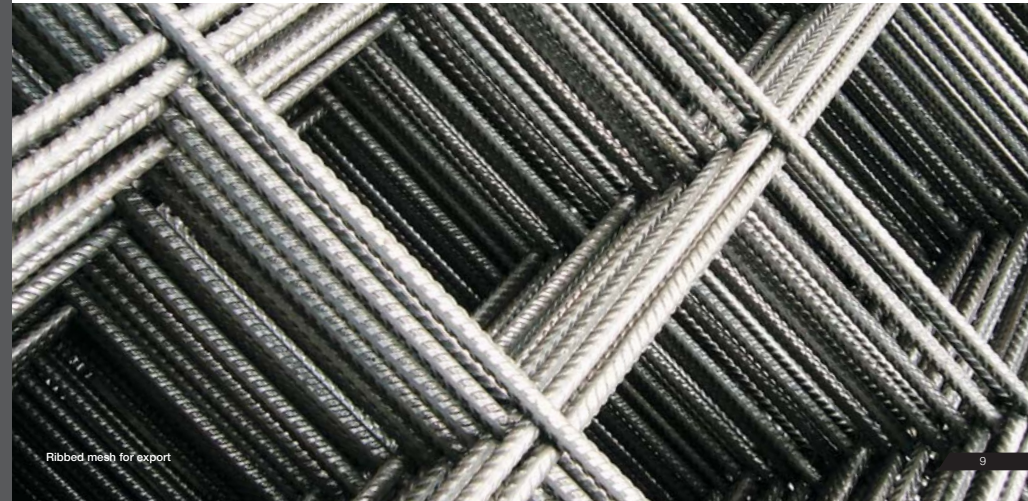


Table 5: Substitution of NatSteel Fabric for High Tensile Bars

Bars		Substitution of NatSteel Fabric for High Tensile Bars			
Diameter (mm)	Spacing (mm)	Area (mm ² /m)	Equivalent Area (mm ² /m)	Recommended NatSteel Fabric (mm ² /m)	
10	75	1047	993	D12 B12 (1311)	
	100	786	745	D10 B10 (785)	
	125	628	596	D9 B9 (636)	
	150	524	497	D8 B8 (503)	
	175	449	426	D8 B8 (503)	
	200	393	373	D7 B7A B7 (385) A10 (393)	
	250	314	298	A9 (318) B8A (335)	
13	300	262	248	A8 (252) D6 B6 (283)	
	100	1327	1259	D13 B13 (1328)	
	125	1062	1007	D12 B12 (1131)	
	150	885	839	D11 B11 (950)	
	175	759	719	D10 B10 (785)	
	200	664	630	D9 B9 (636)	
	250	531	504	D8 B8 (503)	
16	300	442	420	D8 B8 (503)	
	150	1341	1271	D13 B13 (1328)	
	175	1149	1090	D12 B12 (1131)	
	200	1005	954	D11 B11 (950)	
	250	804	763	D10 B10 (785)	
300	670	636	D9 B9 (636)		



Ribbed mesh for export

Detailing

Consultants can specify the length of mesh that penetrates into beams (as shown in Fig.3).

Fig.3: Example of indicating fabric placement in drawings

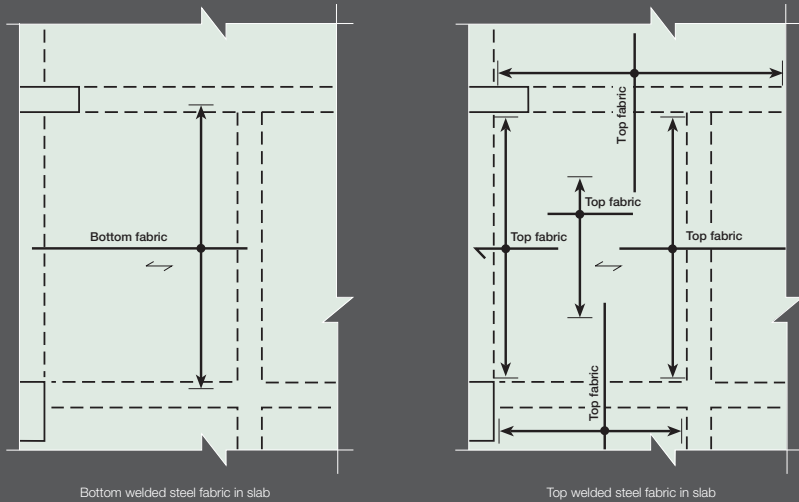


Table 6: Standard anchorage details

Location	Anchorage detail		Anchorage length (A)	
	At end support	At intermediate support	One-way	Two-way
Main wire			A = 100mm (min.) For wire $\phi < 10\text{mm}$	A = 100mm (min.) For wire $\phi < 10\text{mm}$
			A = 150mm (min.) For wire $\phi \ge 10\text{mm}$ & for twin wires	A = 150mm (min.) For wire $\phi \ge 10\text{mm}$ & for twin wires
Cross wire			A = 50mm (min.) For all cross wire diameter unless otherwise stated	A = 100mm (min.) For wire $\phi < 10\text{mm}$
				A = 150mm (min.) For wire $\phi \ge 10\text{mm}$ & for twin wires

Fabric lap

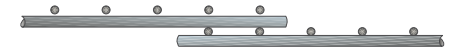
Plain welded steel fabric bonds to concrete by the positive mechanical anchorage at each intersection. Deformed (ribbed) welded steel fabric achieves bonding and anchorage with its ribbed surface and welded intersections.

According to the SS:32 standard, the minimum weld shear stress requirement for plain welded steel fabrics is 250MPa. Based on this requirement, a lap splice with two overlapping and welded intersections is sufficient to deliver full yield strength. Fig.4 shows some lap lengths which are commonly used.

Fig.4: Types of fabric lap

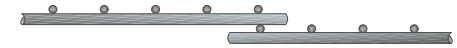
Full yield strength layered lap

- Commonly used for plain welded steel fabric
- Staggered arrangement to avoid accumulation of laps



Half yield strength layered lap

- May be used for side laps across beams



Flying ends lap

- A form of in-plane lapping where one sheet has a lap length overhang without welded intersections



Other mesh products

Beam Stirrup Cage

Beam stirrup cages consist of a series of bent, double-legged stirrups welded together with carrier wires.

Fig.5: A typical stirrup cage with two parts – beam stirrup cage and beam capping

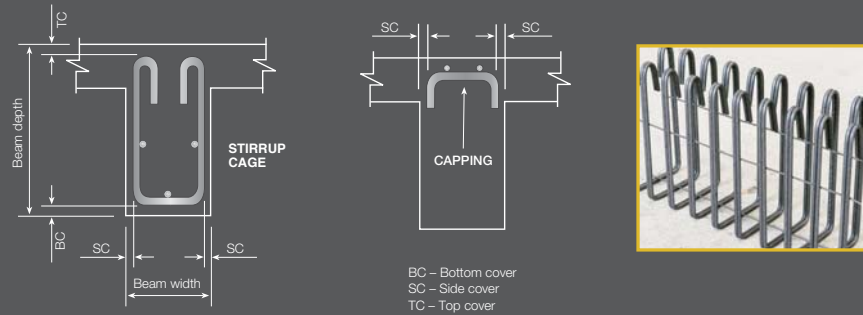


Table 7: Product notation for beam stirrup cages

'S' for open stirrup	Material code* ('R' or 'D')	Diameter of stirrup	Stirrup spacing	'd' for double stirrups (to be omitted for single stirrups)
S	R	10	250	d

* R refers to plain mild steel bar; D refers to cold-reduced ribbed wire

We can customise our beam stirrups to any given width and depth. Although the dimensions of beam cappings depend on each designer's requirements, the preferred beam capping cage type is SR10-300 with a hook length of 120mm.

Column Link Cage

We customise column link cages to fit any column of regular dimensions.

Fig.6 illustrates the details of a rectangular-shaped column steel cage before the main reinforcing bars have been inserted into the sides/corners of the closed loop of the links.

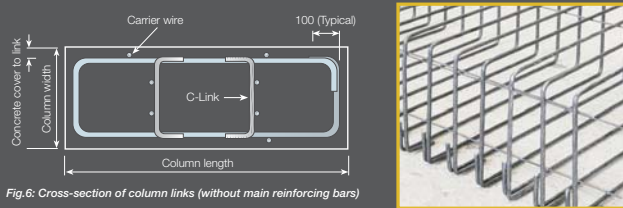


Fig.6: Cross-section of column links (without main reinforcing bars)

Table 8: Product notation for column link cages

'L' for closed link	Material code* ('R' or 'D')	Link diameter	Link spacing
L	R	10	100

* R refers to plain mild steel bar; D refers to cold-reduced ribbed wire

meshFence

NatSteel Holdings' meshFence is a boundary and aesthetic fencing product which is used for enclosing compounds and buildings such as schools, army camps, industrial and private residential areas.

Our meshFence is durable and visually-pleasing. It is produced from welded steel fabric which is hot-dip galvanised to ensure greater durability in tropical climates.

It comes in individual panels, which are joined for continuity of strength and flexibility in installation. The edges of the panels are formed to provide added strength and rigidity.



NatSteel Holdings' meshFence

Table 9: Specifications for meshFence

Mesh spacing	50mm x 150mm
Wire size	ø5mm
Panel height	1200mm, 1500mm, 1800mm and 2100mm
Panel length	2400mm
Profile	Formed top and bottom
Post	48.2mm
Post-to-post centres	2460mm
Finishing	Hot-dip galvanised
Galvanising standard	BS EN ISO 1461:1999

Table 10: Product codes for meshFence panels

Product code	Nominal panel size		Grid (mm)	Wire size (mm)
	Height (mm)	Length (mm)		
MFG1200	1200	2400	50 x 150	5
MFG1500	1500	2400	50 x 150	5
MFG1800	1800	2400	50 x 150	5
MFG2100	2100	2400	50 x 150	5

Table 11: Product codes for meshFence, with accessories

Product code	Post* (mm)	Items per set
PA1200	1700	post with cap; u-clips x 6pcs; bolts and nuts x 3pcs
PA1500	2100	post with cap; u-clips x 6pcs; bolts and nuts x 3pcs
PA1800	2500	post with cap; u-clips x 8pcs; bolts and nuts x 4pcs
PA2100	2900	post with cap; u-clips x 8pcs; bolts and nuts x 4pcs

* Outside diameter 48.2mm

Other products

Cold-reduced wire

Both plain and deformed cold-reduced steel wires are produced from wire rods by the cold-worked process. This process significantly increases the proof stress, tensile strength and elastic limit of the wires. They comply with SS18:1999 and BS 4482:1985 standards.

Our cold-reduced wires are packed in compact coils that ensure easy pay-off.

Bar chairs

Our plastic-tipped bar chairs provide a stable and uniform support for top reinforcement mesh.



Bar chairs



Cold-reduced wire



NatSteel Holdings Plc Ltd makes no representation or warranty regarding the accuracy, quality, suitability or reliability of the information contained herein. NatSteel Holdings Plc Ltd is not responsible for any errors, omissions, or inaccuracies contained in any information provided by such third parties. While efforts have been made to ensure the accuracy of the information set out herein, there may be inadvertent technical or factual inaccuracies and typographical errors. NatSteel Holdings Plc Ltd reserves the right to make changes and corrections at any time, without notice. NatSteel Holdings Plc Ltd does not accept any liability or responsibility for the accuracy, completeness or timeliness of the information contained herein. Neither NatSteel Holdings Plc Ltd nor any of its employees, agents or officers shall be held liable for any improper or incorrect use of the information described in or contained herein and assumes no responsibility for anyone's use of the information. In no event shall NatSteel Holdings Plc Ltd or its employees, agents or officers be liable for any loss or damage of whatever nature (direct, indirect, special, exemplary or consequential damages) howsoever caused whether arising in contract, tort or otherwise, which may arise as a result of your use of or reliance on any content or information contained herein.