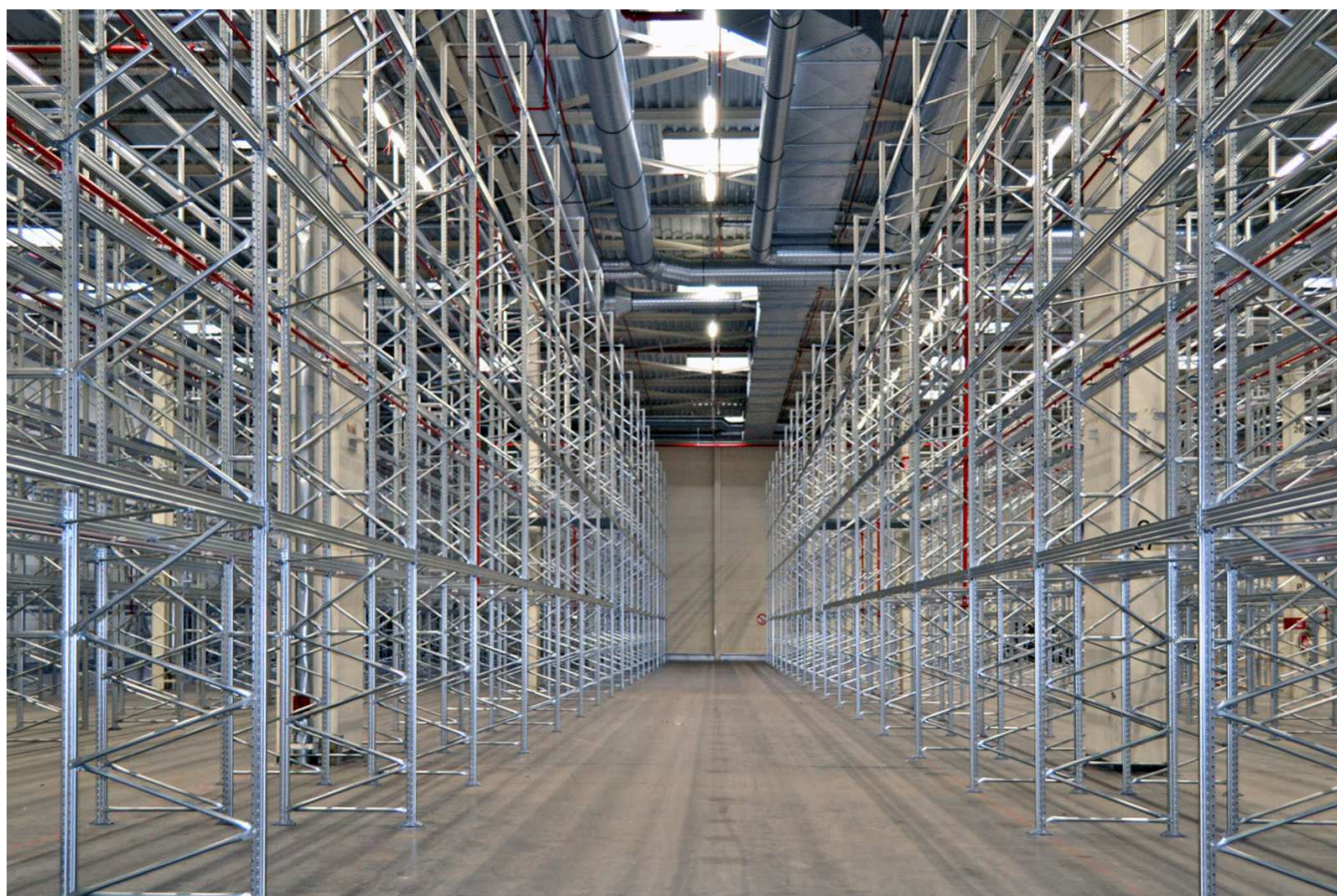


SUPERBO 4-5-6-7

TECHNICAL MANUAL



Revision 12 – 16.11.2020

UNI EN 15512 STANDARD
CE MARKING OF STRUCTURAL COMPONENTS

METALSISTEM[®]

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SUPERBO 4-5-6-7

DIMENSIONS AND UNITS OF MEASUREMENT

This technical manual adopts SI (Sistema Internazionale) standard units of measurement. Metalsistem S.p.A. uses this standard of measurement for all its documents. All dimensions shown in this document are subject to production tolerances.

-	Force	Newton	(N)	(10N=1daN≈1Kg)
-	Length	millimeters	(mm)	

CUSTOMER SATISFACTION

Internet address
www.metalsistem.com

We will be pleased to receive any comments regarding the Metalsistem product described in this document on the Metalsistem portal www.metalsistem.com.

REFERENCE DOCUMENTATION

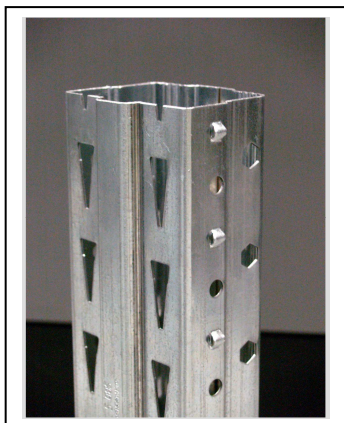
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Code	Document Title
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MT07	Pallet Racking Accessories Technical Manual

REVISION LIST

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1. CALCULATION, SAFETY AND INSTALLATION STANDARDS

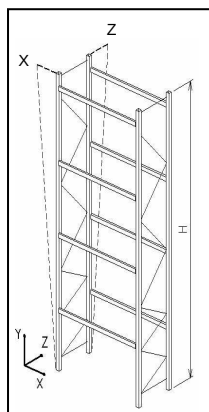


Fig. 1.1

A products' correct technical application and its visual appearance distinguishes both the customer and the manufacturer. METALSISTEM recommends that customers apply the maximum diligence in the application and use of the product in strict conformity with the prescriptions and characteristics shown in this manual. The design and assembly of installations must be carried out by qualified expert personnel. METALSISTEM declines all liability for improper use of the product or use that is not specifically authorized.

a) Scope

This manual applies to class 400 (wide and narrow aisle without automation) and class 300 (very narrow aisle without automation) pallet racking installations as defined by UNI EN 15620 standard. Installations in classes other than those described in this manual require additional engineering conducted by the METALSISTEM technical department.

b) Suitability of floor slabs

Before commencing any installation, the suitability of the floor slab must be checked. The customer must provide the necessary data to perform this assessment.

The flatness of the floor slab: must be checked, taking into account the dimensions, the intended use and the load bearing capacity of the installation.

Unless otherwise expressly mentioned, the floor tolerances shall be in accordance with UNI EN 15620 Standard.

c) Clearances

The minimum installation operating tolerances and clearance of the installation from the building and its fixtures must be agreed with the customer, using UNI EN 15620 standard as reference.

d) Assembly

The rack must be erected by adequately trained and skilled personnel in conformity with national occupational and safety laws and the diagrams and indications in this technical manual and installation instructions. Special attention must be given to the tightening of bolts and the installation of all the safety devices, in compliance with the safety procedures and using suitable tools and PPE equipment commensurate with the activities to be carried out (refer also to "Metalsistem Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual", code MUM01). All activities must be in compliance with working environment, equipment and safety measures imposed by statutory legislation in the place of installation.

e) Rack alignment

The vertical plumb of the pallet racking frames must be checked along both the depth (Z) and length (X) directions. UNI EN 15620 standard states that, unless more restrictive tolerances have been specified, the maximum permissible deviation off both directions must not exceed H/350 for class 400 installations and H/500 for class 300 installations, where H represents the height of the uprights expressed in millimeters (Fig. 1.1). Refer to "Metalsistem Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual", code MUM01, for a more detailed tolerance explanation.

f) Safety signage and load bearing capacity plaques

Refer to the statutory regulations of the installation location for guide lines regarding the application of safety signage to installations. In Europe, the 92/58/EEC directive and its amendments provide the minimum requirements for the provision of safety and/or health signs at work.

It is mandatory to install the following minimum safety signs:

- Generic danger sign (shown for example in annex XXV of Italian legislative decree 81/08, consisting of an exclamation mark);
- Load bearing capacity plaques (required by the aforementioned legislation) in the form of an information sign. The load bearing capacity plates must be affixed in a visible position and must show the year of assembly as well as the frame series, its load bearing capacity, the beam pair load or shelf bearing capacity (uniformly distributed load), the unit load, the height of the first beam from ground and the number of levels (Fig. 1.2). For order codes of the load bearing capacity boards, refer to the "Pallet Racking Accessories Manual" MT07);

It is also advisable to provide:

- Emergency exit signs erected in conformity with the instruction of local authorities or fire consultant;
- Specific prohibitions and danger signs, if required.

g) Standard Safety Considerations for Racking

Frames must always be fastened to the floor slab with a minimum of two (2) M10 anchor bolts per upright.

In applications where the frame height is greater than 5 times the frame depth for single side rows, or 10 times the frame depth in double side rows, the racking must be accessorized with portal ties or wall ties. Note that walls ties are possible only after confirmation of the walls structural adequacy which must be confirmed by the property owner prior to their application. It is strictly prohibited to tie to walls in seismic areas.

Double side frames are defined as a pair of frames placed one behind the other and connected by pairs of adequately dimensioned spacer bars placed at the connection points of the frame diagonal spacer bars or however never more than 2000 mm apart.

The use of portal ties may be avoided in single entry runs if the following instructions are applied.

For frame base to height ratios:

- Up to 1:5 : Standard frame bracing
- Between 1:5 and 1:6 : Frame with 8 short diagonal spacer bars
- Between 1:6 and 1:7 : Frame with 8 short diagonal spacer bars
- : Maximum bay length of 2720mm with

Racking alignment



Fig. 1.2

Order codes for various sign plaques can be found in the "Pallet Racking Accessories Technical Manual", code MT07



Fig. 1.3



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- : 20% reduction in the admissible frame load bearing capacity for unbraced rows.
- : 10% reduction in the admissible frame load bearing capacity for braced rows.

Upright protection must be provided to all frames subjected to the risk of collision by material handling equipment (refer to "Pallet Racking Accessories Manual", code MT07).

METALSISTEM will not be held liable for injuries or losses due to improper installation and/or use.

h) Reference standards

The structural calculation reference standard are:

- UNI EN 15512:2009 "Steel static storage systems - Adjustable pallet racking systems - Principles for structural design";
- UNI EN 15620:2009 "Steel static storage systems - Adjustable pallet racking - Tolerances, deformations and clearances";
- UNI EN 1993-1-1:2015 "Eurocode 3 - Design of steel structures - Part 1-3: General rules and rules for buildings";
- UNI EN 1993-1-3:2007 "Eurocode 3 - Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting";
- UNI EN 1993-1-8:2005 "Eurocode 3 - Design of steel structures - Part 1-8: Design of joints".

Materials reference standards:

- UNI EN 10346:2015 "Continuously hot-dip coated steel flat products - Technical delivery conditions";
- UNI EN 10149-1:2013 "Hot-rolled flat products made of high yield strength steels for cold forming. General delivery conditions.";
- UNI EN 10149-2:2013 "Hot-rolled flat products made of high yield strength steels for cold forming. Delivery conditions for thermomechanically rolled steels";
- UNI EN 10204:2005 "Metallic products - Types of inspection documents (3.1 certificate)".

Other reference standards:

- UNI EN 15635:2009 "Steel static storage systems - Application and maintenance of storage equipment";
- UNI EN 1090-1:2018 "Execution of steel and aluminium structures – Part 1: Requirements for conformity assessment of structural components.";
- UNI EN 1090-2:2018 "Execution of steel and aluminium structures – Part 2: Technical requirements for steel structures";
- ACAI-CISI testo unico del 11/05/2004: "Technical standards for pallet racking";
- ACAI-CISI testo unico del 26/02/2004: "Self certification regulations".

i) Structural component testing

The structural design is based on results derived from laboratory testing conducted by the Department of Mechanical and Structural Engineering at the University of Trento, Italy, and by the laboratories of METALSISTEM Research Centre

j) Structural analysis

The structural design has been conducted using the finite element method with ANSYS, STRAUSS7 and IT.RACKS! software, in compliance with the indications of UNI EN 15512 standard.

k) Beam pair load bearing capacities

The beam pair load bearing capacities have been calculated using the following assumptions:

- Uniformly distributed load;
- resistance and stability checks in accordance with UNI EN 15512 standard, with material factors $\gamma_{M,0} = \gamma_{M,1} = 1,1$; $\gamma_{M,2} = 1,25$;
- beam pair safety coefficient of at least 2 respect to collapse;
- maximum deflection of 1/200 of the beam length;
- mandatory installation of safety pins to beams;
- specific conditions listed under the load bearing capacity tables.

The load bearing capacities of the beams are based on the use of Euro pallets in good conditions.

l) Frame load bearing capacities

The tables contained in Section 9 of this manual are used to find the frame series that match the load demands of a pallet racking installation as a function of the height from ground of the first pair of beams (first loading level), the beam series, the length of the beam and of the height of the frame.

These tables are applicable to pallet racking with:

- A distance between levels equal to or less than the height of the first beam from ground;
- an equal load acting on all levels;
- permissible sway (movement) deformation in accordance with UNI EN 15620 limits for Class 300 and Class 400 pallet racking;
- resistance and stability checks according to UNI EN 15512 standard, with material factors $\gamma_{M,0} = \gamma_{M,1} = 1,05$; $\gamma_{M,2} = 1,25$;
- every upright anchored to ground with a minimum of two (2) anchor bolts;
- compliance with the specific conditions listed under the load bearing capacity tables.

Given that the load bearing capacity of the frame is also dependent from other factors (height of beam from ground equal to or more than the center distance between the bay beams, frame base to height ratio, seismicity of the area, environmental factors such as vibrations, atmospheric conditions, etc) contact Metalsistem Technical Office



Fig. 1.4

METALSISTEM laboratory equipment:
Tensile testing machine
(100000 N capacity)

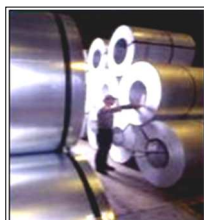


Fig. 1.5

Raw material:
Galvanized
structural
steel coils

regarding doubts concerning non-standard applications, large or complex installations requiring optimization, or structural controls for specific solutions.

The frame load bearing capacities have been determined considering horizontal forces induced by imperfections as defined by UNI EN 15512 standard. Horizontal forces due to wind, vibrations, impact, seismic activity or other have not been considered. If these conditions apply, contact Metalsistem Technical Office.

EN15512 Standard applies material factors which may vary between the European member states with $\gamma_{M,0}$ values ranging from 1.0 to 1.1. Metalsistem frame load bearing capacity tables have been determined using a $\gamma_{M,0}$ value of 1.05. Clients of member states which apply different $\gamma_{M,0}$ values shall contact Metalsistem Technical Office.

m) Installation environment, use and maintenance of the product

The load bearing capacities and the surface finish of the materials are based on use of the racking in indoor non-aggressive environments. Use of the racking outdoors or in environments with high risk of corrosion will automatically invalidate the warranty of surface finishes. If the racking is to be installed outdoors, it is mandatory to consult the METALSISTEM Technical Department.

For guidelines regarding the normal use of the shelving and the periodic checks of its components required by UNI EN 15635 standard, refer to "Metalsistem Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual", code MUM01.

n) Bracing

The bracing system, composed of a bracing tower or by cross bracing, its frame connection accessories and horizontal cross bracing components, is a structural element which limits the movement of the racking and guarantees its global stability. This system is designed to absorb the horizontal forces caused by out of plumb imperfections and by storage and retrieval of goods as defined by UNI EN 15635 standard.

o) Raw material

The mechanical properties of the high tensile structural steel entering METALSISTEM production are guaranteed by accompanying 3.1 certificate (UNI EN 10204).

Depending on the structural relevance of the components, the materials employed have characteristics ranging between S315 and S355 for pickled steels and between S280 and S400 for galvanized steels (in compliance with UNI EN 10149 and with UNI EN 10346 respectively).

The surface treatment of the structural steels may either be hot dip galvanized with "SENDZIMIR" process or powder coated pickled steel.

p) Bolted assemblies

The national standards or local regulations covering the installation may require, depending on the intended use, the application of CE certified bolts. The EN 15048-1 standard is the reference for CE certified bolted joints.

CE marked bolts come in a single package containing both the bolts and nuts. METALSISTEM has, in its price list, a selection of CE certified bolts that can be used in place of the standard bolts.

The full list of bolts available in the METALSISTEM price list is contained in the "Pallet Racking Accessories Technical Manual", code MT07

q) Anchoring

The standard anchoring method which METALSISTEM provides for static conditions, in absence of seismic actions, considers expansion anchor bolts which are CE marked according to ETAG 001 Annex C – Option 7.

Alternative anchor bolts, which may be used for specific load or assembly conditions, are available for order.

Independent of the adopted anchor bolt, METALSISTEM requires that all anchor bolts are set in strict conformity with the anchor bolt manufacturer instructions so that the quality of the connection is not compromised.

Contact METALSISTEM technical office for further indications

r) Fire protection

Consult the "Metalsistem Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual", code MUM01, for information regarding reaction and resistance to fire of components and assemblies for standard pallet racking applications.

It is the responsibility of the racking designer to verify with the customer any possible clearance needs deriving from integration requirements with fire protection systems

s) Controls

The raw material entering production sustains ongoing testing by Metalsistem internal Quality Control Department.

The tests confirm the mechanical properties (elongation, yield, rupture), dimensional characteristics (gauge and width) surface finish (absence of defects, uniformity, resistance of coating). Metalsistem has its own internal testing facilities able to conduct SIT (Servizio di Taratura in Italia) certified tensile tests (approx. 1000 per year), dimensional tests and performance tests (stub column, beam end connector stiffness, shear and deflection) on finished product. Salt spray, scratch resistance and other tests are conducted by external facilities.

Testing of finished products are conducted by the internal Metalsistem Quality Control Office. The system certifying agency RINA guarantees consistent product quality

t) Certifications

Metalsistem production has been certified by the following international standards:

- Structural steel fabrication center
- ISO 14001
- ISO 9001
- BS OHSAS 18001
- CISI
- AEO FULL
- production workshop no. 753/10;
- Environmental management system;
- Quality management system;
- Occupational Health and Safety Management System;
- quality and safety mark;
- Authorized Economic Operator;

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- UNI EN ISO 3834
- EN 1090-1

- Qualified fusion welding process;
- Certificate of conformity assessment of structural components

u) Non Standard applications

For non-standard solutions and/or calculations, contact the METALSISTEM technical department.
METALSISTEM reserves the right to make any changes to the product it deems to be appropriate at any time.

v) Safety apparel

The purchaser is responsible to determine the type, locations, and needs of the safety equipment to be fitted to the installation (e.g.: upright and frame protection, floor guide rails, protections against the falling of stored goods, walkway protection and covers, seismic design) to mitigate the risks connected to the usage conditions of each specific installation. The vendor shall inform the purchaser of the available solutions and products, in order to correctly and knowingly choose the most suitable safety apparel based on their need.
Nevertheless it is the responsibility of the end user to verify the conformity of the installation with the evolution of safety and functional requirements that may occur during the service life of the installation.

2. DIMENSIONING

2.1. PALLET RACKING LOAD BEARING CAPACITY PROCEDURE

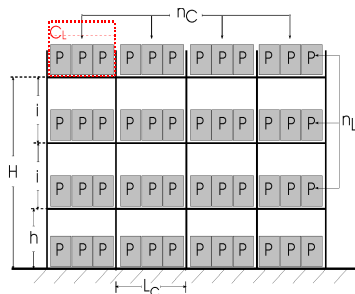


Fig. 2.1

The load bearing capacity of a pallet racking installation is derived from the combined performance of frames and beams and their geometric configuration as well as the loading requirements of the installation. The solution is therefore obtained through a process of iteration during which an optimised bay is obtained.

A) GATHER PROJECT DATA

The designer must have the following information

- P = Unit load
- n_P = number of pallets per pair of beams
- L_C = clear beam span
- n_L = number of levels (excluding ground)
- n_C = number of bays
- h = height of first level
- l = centre distance between beam levels
- H = final beam level height
- P_s = frame depth

Other Definitions

- C_L = Load per level
- S_s = Base to height ratio
- C_s = Frame load

B) PAVEMENT ADEQUACY CHECK

Obtain confirmation from the client that the pavement is suited for the pallet racking installation, its geometry and loads.

C) BEAM SIZING

The following procedure is used for the selection for the beam section:

Calculate the load per pair of beams:

$$C_L (\text{load per level}) = P \times n_P$$

Refer to Section 8:

The beam is selected as a function of L_C , C_L and P , ensuring that the unit load limit is respected.

D) FRAME SIZING

The following procedure is used for the selection of the frame:

Calculate the frame base to height ratio

$$S_s (\text{base : height ratio}) = H / P_s$$

Consult paragraph 4.4 to assess the base to height ratio. If required, act on the frame configuration and apply the load bearing capacity reduction.

Calculate the load acting on the frame

$$C_s (\text{frame load}) = C_L \times n_L$$

Go to the first page of Section 9 "PALLET RACKING FRAME LOAD BEARING CAPACITY TABLES". After considering these notes, proceed to the load bearing capacity tables.

The frame load bearing capacity tables are divided by upright series and height, beam profile section and length as well as unbraced, partially braced or fully braced row configurations.

In the same way that the beam selection is limited by the load unit, some frames are also limited by the maximum load per pair of beams. After checking this limit, select the frame most suited to the beam section and length in an unbraced, partially braced or fully braced row configuration.

Repeat steps C and D with alternative beam sections to assess their impact on the frame selection.

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2.2.

PALLET RACKING DIMENSIONING EXAMPLE

1500	1500	1500
1500	1500	1500
1500	1500	1500
1500	1500	1500
1500	1500	1500
1500	1500	1500
1500	1500	1500

INPUT DATA

$P = 500 \text{ daN}$;
 $n_P = 3$;
 $L_C = 2700 \text{ mm}$;
 $n_L = 6$ (excluding ground);
 $n_C = 3$;
 $h = 600 \text{ mm}$;
 $i = 600 \text{ mm}$;
 $H = 3600 \text{ mm}$;
 $P_s = 1000 \text{ mm}$.

BEAM SIZING

C_L (load per level) = $P \times n_P = 1500 \text{ daN}$

From Tab. 8.2 of paragraph 8.3 – we select the 106/33 riveted beam.

FRAME SIZING

Fig. 2.2

This pallet rack does not have a beam on ground. We choose not to brace.

Calculate the base to height ratio

S_s (base : height ratio) = $H / P_s = 3.6$

As the ratio is less than 1:5, following the notes of paragraph 4.4, we proceed with standard frame considerations.

Calculate the frame load

C_S (frame load) = $C_L \times n_L = 9000 \text{ daN}$

Enter Section 9: PALLET RACKING FRAME LOAD BEARING CAPACITIES:

1. Start by examining the SUPERBO 4 106 RIVETED BEAM, table A-1;
2. Go to the H=6000 frame height group of columns and go to the intersection between the 600mm beam height and the 2700mm length;
3. Here a frame load of 12200 daN is obtained;
4. Therefore the installation requirements are satisfied with the selection of a SUPERBO 4 frame.

Note: If the first approach gave unsatisfactory results alternative solutions would have been examined; such as:

- a) Exploring the partially braced or fully braced portions of the frame load bearing capacity table;
- b) examining the SUPERBO 4-5-6 or 7 tables;
- c) examining all upright series with varying beam sections (106 or 140 riveted or welded connectors).

The dimensioning of the pallet racking system is optimised only after having examined the above 3 steps.

A-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBO 4 - RIVETED 106 BEAM																
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]		H frame = 6000 mm				H frame = 8000 mm				H frame = 10000 mm				PARTIALLY BRACED		FULLY BRACED		
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=1800	Lc=2400	Lc=2700	Lc=3300	daN	BAYS	daN	BAYS	
	500	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	600	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	700	12100	12100	12050	11850	12000	12000	12050	11900	12050	12000	12000	12000	12200	10S / 8D	12200	10S / 8D	
	800	11650	11600	11500	11250	11650	11650	11650	11400	11500	11400	11400	11350	12050	10S / 8D	12050	10S / 8D	
	900	11150	11100	10900	10650	11050	11050	11050	10700	10900	10800	10800	10700	11950	10S / 8D	11950	10S / 8D	
	1000	10700	10550	10300	10100	10450	10400	10350	9950	10350	10150	10150	10000	11800	10S / 8D	11800	10S / 8D	
	1100	10100	9950	9700	9500	9850	9750	9750	9350	9750	9550	9550	9350	11600	10S / 8D	11600	10S / 8D	
	1200	9550	9350	9050	8950	9300	9200	9100	8750	9150	8950	8900	8700	11300	10S / 8D	11300	10S / 8D	
	1300	9050	8850	8600	8500	8750	8600	8500	8150	8550	8350	8300	8100	11000	10S / 9D	11000	10S / 9D	
	1400	8500	8350	8100	8000	8300	8200	8100	7750	8150	7950	7900	7750	10700	10S / 9D	10700	10S / 9D	
	1500	8000	7850	7650	7550	7900	7750	7650	7300	7700	7500	7450	7300	10500	10S / 9D	10500	10S / 9D	
	1600	7650	7450	7300	7250	7450	7300	7250	6900	7300	7100	7050	6900	10300	10S / 9D	10300	10S / 9D	
	1700	7300	7100	6950	6900	7100	6950	6900	6550	7000	6800	6750	6600	10200	10S / 9D	10200	10S / 9D	
	1800	6950	6750	6600	6600	6750	6600	6550	6200	6650	6450	6400	6200	10150	10S / 9D	10150	10S / 9D	
	1900	6600	6400	6250	6250	6400	6250	6200	5850	6300	6150	6050	5800	10050	10S / 9D	10050	10S / 9D	
	2000	6250	6050	5900	5900	6100	5900	5850	5500	5950	5800	5700	5450	9950	10S / 10D	9950	10S / 10D	
	2100	5950	5750	5600	5600	5800	5600	5550	5200	5600	5500	5400	5150	9700	10S / 10D	9700	10S / 10D	
	2200	5650	5450	5300	5300	5500	5300	5250	4950	5300	5200	5100	4850	9450	10S / 10D	9450	10S / 10D	
2300	5350	5150	5050	5050	5200	5000	4950	4700	5000	4900	4750	4600	9200	10S / 10D	9200	10S / 10D		
2400	5050	4850	4750	4750	4850	4700	4650	4400	4650	4600	4450	4300	8950	10S / 10D	8950	10S / 10D		
2500													8700	10S / 10D	8700	10S / 10D		

Fig. 2.3

Frame load bearing capacity table extract.

3.
SUPERBO 4-5-6-7 BEAMS


Fig. 3.1

The beams are box sections of variable thickness with riveted or welded brackets at either end. A channel running along the top face of the beam provides a lip within which a variety of accessories such as shelf panels, secondary beams, drum cradles, and other applications may be inserted (Refer to Pallet Racking Accessories Manual, code MT07).

Metalsistem's unique beam to upright connection has a series of distinctive features, including:

- optimised performance through double faced upright connection;
- beams available in a standard galvanised finish;
- cone shaped connection enables the joint to increase in rigidity as the load is increased.

The tabled load bearing capacities refer to wooden Euro pallets in a good and sufficiently ridged state of repair. The load must be stable and suited to the pallet racking installation. Disposable pallets or pallets of poor quality (not euro pallets) may only be used in conjunction with secondary beams or shelf panels.

3.1.
NOTES ON THE SUPERBO 4-5-6-7 BEAM POWDER COATING
Finish code extensions used by METALSISTEM

Galvanized	.95
Eletrolytically	.20
Galvanized	
Raw material	.00
Painted	.G1
(also .B1, R1 etc)	
Specific material	.98
Finish (plastics, macrocodes etc)	

SUPERBO 4-5-6-7 beams are available in the following colour range:

STANDARD COLOURS:


Fig. 3.2

Two alphanumeric symbols following the decimal point in the Metalsistem article code indicate the finish of the component. Therefore a XXX.G1 code refers to an article that is powder coated yellow RAL1004.

The Metalsistem list price presents all powder coated items with the ".G1" as a default finish. If any of the alternative standard finishes are required (blue RAL5010 or red RAL3000), these may be noted in the product code line of the M.O.R.S. system.

In addition to the standard colour range, other colours of the RAL scale are also available with the application of a one off surcharge.

The powder coating process follows the steps listed below:

- Hot wash degreasing and iron phosphate pre-treatment;
- Application of powder thermal setting paint;
- Curing temperature of approximately 240°C with a force ventilated air circulation oven.

This process and the intrinsic characteristics of the powder coating powders impart excellent adhesion and chemical stability to the painted surface. These surfaces therefore have elevated resistance to knocks and abrasions, and preserve shine and colour if maintained in internal environments.

All colours are ecological, containing only organic pigments. No lead based pigments are used.

Powder coating resistance: In order to select the most appropriate product, consult the Metalsistem Technical offices should there be a necessity to place the pallet racking in an aggressive environment (subject to external environment, acids, refrigerated cells etc).

3.2.

SUPERBO 4-5-6-7 BEAM SAFETY PINS



Fig. 3.3

IMPORTANT: THE USE OF 2 SAFETY PINS PER BEAM IS MANDATORY

In conformity with the indications of the standards, beams with riveted double sided connectors must use only the Riveted Beam Safety Pin (code CP210030.95) while the welded single sided connectors must use the SPACC003.95 safety pins. The correct use of the safety pins guarantee the technical characteristics described in this manual.

The riveted beam safety pins deform when positioned. Their substitution is therefore advisable should beams be relocated.

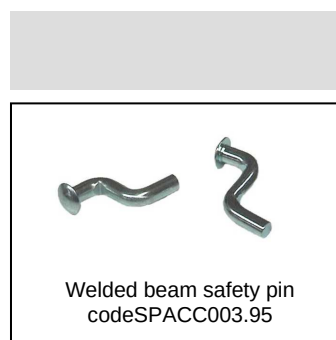


Fig. 3.4

CODE	DESCRIPTION
CP210030.95	RIVETED BEAM SAFETY PIN UB/SB/SBO
SPACC003.95	WELDED BEAM SAFETY PIN UB/SB/SBO

Tab. 3.1

3.3.

HEIGHT OF BEAM FROM GROUND

Tab. 3.2 shows the minimum height from ground for all beam profiles.

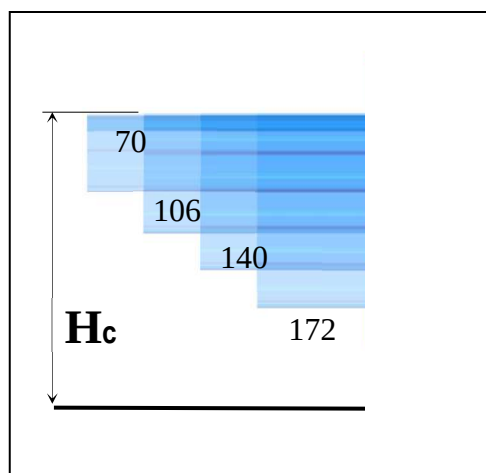


Fig. 3.5

BEAM MINIMUM HEIGHT FROM GROUND		
PROFILE HEIGHT	H _c (mm) Riveted	H _c (mm) Welded
70 BEAM		236
106 BEAM	183	236
140 BEAM	183	236
172 BEAM		286

Tab. 3.2

3.4.

SUPERBO 4-5-6-7 BEAM CODES

Two separate code table categories, differentiated by beam connector, have been developed. These have been colour coded for clarity. The code tables and the load bearing capacity table categories refer to the same colour coding system. ie:

- Orange load tables = riveted galvanised beams (I22, I33, I4, I44, I5, I6);
- Red load tables = welded beams (I4, I44, I5, I6);

SUPERBO 4-5-6-7
3.5.
SUPERBO RIVETED GALVANISED BEAM CODES

	CODE TABLE - TYPE :RIVETED CONNECTOR BEAMS FINISH :GALVANISED - Beams assembled with CP210030.95 code safety pins									 Beam Safety Pin CP210030.95	
Profile Version	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6
Maximum Unit Load	400 daN Unit load	1100 daN Unit load	1200 daN Unit load	1350 daN Unit load	1500 daN Unit load	1800 daN Unit load	1050 daN Unit load	1200 daN Unit load	1350 daN Unit load	1500 daN Unit load	1800 daN Unit load
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
1200	RU150138.95	RU150216.95	RU150014.95	RU150107.95	RU150026.95	RU150038.95	RU150201.95	RU150062.95	RU150118.95	RU150074.95	RU150086.95
1500	RU150139.95	RU150218.95	RU150015.95	RU150108.95	RU150027.95	RU150039.95	RU150202.95	RU150063.95	RU150119.95	RU150075.95	RU150087.95
1800	RU150140.95	RU150219.95	RU150016.95	RU150109.95	RU150028.95	RU150040.95	RU150203.95	RU150064.95	RU150120.95	RU150076.95	RU150088.95
2000	RU150141.95	RU150220.95	RU150017.95	RU150110.95	RU150029.95	RU150041.95	RU150204.95	RU150065.95	RU150121.95	RU150077.95	RU150089.95
2100	RU150142.95	RU150221.95	RU150018.95	RU150111.95	RU150030.95	RU150042.95	RU150205.95	RU150066.95	RU150122.95	RU150078.95	RU150090.95
2200	RU150143.95	RU150222.95	RU150019.95	RU150112.95	RU150031.95	RU150043.95	RU150206.95	RU150067.95	RU150123.95	RU150079.95	RU150091.95
2300	RU150190.95	RU150223.95	RU150192.95	RU150193.95	RU150194.95	RU150195.95	RU150207.95	RU150197.95	RU150198.95	RU150199.95	RU150200.95
2400	RU150144.95	RU150224.95	RU150020.95	RU150113.95	RU150032.95	RU150044.95	RU150208.95	RU150068.95	RU150124.95	RU150080.95	RU150092.95
2700	RU150145.95	RU150225.95	RU150021.95	RU150114.95	RU150033.95	RU150045.95	RU150209.95	RU150069.95	RU150125.95	RU150081.95	RU150093.95
3000	-	-	RU150022.95	RU150115.95	RU150034.95	RU150046.95	RU150210.95	RU150070.95	RU150126.95	RU150082.95	RU150094.95
3300	-	-	RU150180.95	RU150181.95	RU150182.95	RU150183.95	RU150211.95	RU150185.95	RU150186.95	RU150187.95	RU150188.95
3500	-	-	RU150023.95	RU150116.95	RU150035.95	RU150047.95	RU150212.95	RU150071.95	RU150127.95	RU150083.95	RU150095.95
3600	-	-	RU150129.95	RU150130.95	RU150131.95	RU150132.95	-	RU150133.95	RU150134.95	RU150135.95	RU150136.95
4000	-	-	RU150024.95	RU150117.95	RU150036.95	RU150048.95	-	RU150072.95	RU150128.95	RU150084.95	RU150096.95
Special	RU150137.95	RU150215.95	RU150098.95	RU150105.95	RU150099.95	RU150100.95	RU150213.95	RU150102.95	RU150106.95	RU150103.95	RU150104.95

Tab. 3.3

Lc : beam length expressed in millimetres

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SUPERBO 4-5-6-7

3.6.

SUPERBO RIVETED GALVANISED, PAINTED BEAM CODES

		CODE TABLE - TYPE :RIVETED CONNECTOR BEAMS FINISH :GALVANISED + POWDER COATING									
		- Beams assembled with CP210030.95 code safety pins								Beam Safety Pin CP210030.95	
Profile Version	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6
Maximum Unit Load	400 daN Unit load	1100 daN Unit load	1200 daN Unit load	1350 daN Unit load	1500 daN Unit load	1800 daN Unit load	1050 daN Unit load	1200 daN Unit load	1350 daN Unit load	1500 daN Unit load	1800 daN Unit load
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
1200	RU150138.G1	RU150216.G1	RU150014.G1	RU150107.G1	RU150026.G1	RU150038.G1	RU150201.G1	RU150062.G1	RU150118.G1	RU150074.G1	RU150086.G1
1500	RU150139.G1	RU150218.G1	RU150015.G1	RU150108.G1	RU150027.G1	RU150039.G1	RU150202.G1	RU150063.G1	RU150119.G1	RU150075.G1	RU150087.G1
1800	RU150140.G1	RU150219.G1	RU150016.G1	RU150109.G1	RU150028.G1	RU150040.G1	RU150203.G1	RU150064.G1	RU150120.G1	RU150076.G1	RU150088.G1
2000	RU150141.G1	RU150220.G1	RU150017.G1	RU150110.G1	RU150029.G1	RU150041.G1	RU150204.G1	RU150065.G1	RU150121.G1	RU150077.G1	RU150089.G1
2100	RU150142.G1	RU150221.G1	RU150018.G1	RU150111.G1	RU150030.G1	RU150042.G1	RU150205.G1	RU150066.G1	RU150122.G1	RU150078.G1	RU150090.G1
2200	RU150143.G1	RU150222.G1	RU150019.G1	RU150112.G1	RU150031.G1	RU150043.G1	RU150206.G1	RU150067.G1	RU150123.G1	RU150079.G1	RU150091.G1
2300	RU150190.G1	RU150223.G1	RU150192.G1	RU150193.G1	RU150194.G1	RU150195.G1	RU150207.G1	RU150197.G1	RU150198.G1	RU150199.G1	RU150200.G1
2400	RU150144.G1	RU150224.G1	RU150020.G1	RU150113.G1	RU150032.G1	RU150044.G1	RU150208.G1	RU150068.G1	RU150124.G1	RU150080.G1	RU150092.G1
2700	RU150145.G1	RU150225.G1	RU150021.G1	RU150114.G1	RU150033.G1	RU150045.G1	RU150209.G1	RU150069.G1	RU150125.G1	RU150081.G1	RU150093.G1
3000	-	-	RU150022.G1	RU150115.G1	RU150034.G1	RU150046.G1	RU150210.G1	RU150070.G1	RU150126.G1	RU150082.G1	RU150094.G1
3300	-	-	RU150180.G1	RU150181.G1	RU150182.G1	RU150183.G1	RU150211.G1	RU150185.G1	RU150186.G1	RU150187.G1	RU150188.G1
3500	-	-	RU150023.G1	RU150116.G1	RU150035.G1	RU150047.G1	RU150212.G1	RU150071.G1	RU150127.G1	RU150083.G1	RU150095.G1
3600	-	-	RU150129.G1	RU150130.G1	RU150131.G1	RU150132.G1	-	RU150133.G1	RU150134.G1	RU150135.G1	RU150136.G1
4000	-	-	RU150024.G1	RU150117.G1	RU150036.G1	RU150048.G1	-	RU150072.G1	RU150128.G1	RU150084.G1	RU150096.G1
Special	RU150137.G1	RU150215.G1	RU150098.G1	RU150105.G1	RU150099.G1	RU150100.G1	RU150213.G1	RU150102.G1	RU150106.G1	RU150103.G1	RU150104.G1

Tab. 3.4

Lc : beam length expressed in millimetres

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3.7.

WELDED BEAM CODES

	CODE TABLE - TYPE :WELDED CONNECTOR BEAMS FINISH :POWDER COATED											Beam Safety Pin SPACC003.95
Beams assembled with SPACC003.95 code safety pins												
Profile Version	70/4	70/5	106/4	106/44	106/5	106/6	140/4	140/44	140/5	140/6	172/5	172/6
Maximum Unit Load	1200 daN Load Unit	1500 daN Load Unit	1200 daN Load Unit	1350 daN Load Unit	1500 daN Load Unit	1800 daN Load Unit	1200 daN Load Unit	1350 daN Load Unit	1500 daN Load Unit	1800 daN Load Unit	1350 daN Load Unit	1800 daN Load Unit
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
1200	RU160116.G1	RU160125.G1	RU160181.G1	RU160195.G1	RU160209.G1	RU160223.G1	RU160237.G1	RU160251.G1	RU160265.G1	RU160279.G1	RU160391.G1	RU160134.G1
1500	RU160117.G1	RU160126.G1	RU160182.G1	RU160196.G1	RU160210.G1	RU160224.G1	RU160238.G1	RU160252.G1	RU160266.G1	RU160280.G1	RU160392.G1	RU160135.G1
1800	RU160118.G1	RU160127.G1	RU160183.G1	RU160197.G1	RU160211.G1	RU160225.G1	RU160239.G1	RU160253.G1	RU160267.G1	RU160281.G1	RU160393.G1	RU160136.G1
2000	RU160119.G1	RU160128.G1	RU160184.G1	RU160198.G1	RU160212.G1	RU160226.G1	RU160240.G1	RU160254.G1	RU160268.G1	RU160282.G1	RU160394.G1	RU160137.G1
2100	RU160120.G1	RU160129.G1	RU160185.G1	RU160199.G1	RU160213.G1	RU160227.G1	RU160241.G1	RU160255.G1	RU160269.G1	RU160283.G1	RU160395.G1	RU160138.G1
2200	RU160121.G1	RU160130.G1	RU160186.G1	RU160200.G1	RU160214.G1	RU160228.G1	RU160242.G1	RU160256.G1	RU160270.G1	RU160284.G1	RU160396.G1	RU160139.G1
2300	RU160346.G1	RU160347.G1	RU160348.G1	RU160349.G1	RU160350.G1	RU160351.G1	RU160352.G1	RU160353.G1	RU160354.G1	RU160355.G1	RU160397.G1	RU160356.G1
2400	RU160122.G1	RU160131.G1	RU160187.G1	RU160201.G1	RU160215.G1	RU160229.G1	RU160243.G1	RU160257.G1	RU160271.G1	RU160285.G1	RU160398.G1	RU160140.G1
2700	RU160123.G1	RU160132.G1	RU160188.G1	RU160202.G1	RU160216.G1	RU160230.G1	RU160244.G1	RU160258.G1	RU160272.G1	RU160286.G1	RU160399.G1	RU160141.G1
3000	-	-	RU160189.G1	RU160203.G1	RU160217.G1	RU160231.G1	RU160245.G1	RU160259.G1	RU160273.G1	RU160287.G1	RU160400.G1	RU160142.G1
3300	-	-	RU160190.G1	RU160204.G1	RU160218.G1	RU160232.G1	RU160246.G1	RU160260.G1	RU160274.G1	RU160288.G1	RU160401.G1	RU160292.G1
3500	-	-	RU160191.G1	RU160205.G1	RU160219.G1	RU160233.G1	RU160247.G1	RU160261.G1	RU160275.G1	RU160289.G1	RU160402.G1	RU160143.G1
3600	-	-	RU160192.G1	RU160206.G1	RU160220.G1	RU160234.G1	RU160248.G1	RU160262.G1	RU160276.G1	RU160290.G1	RU160403.G1	RU160165.G1
4000	-	-	RU160193.G1	RU160207.G1	RU160221.G1	RU160235.G1	RU160249.G1	RU160263.G1	RU160277.G1	RU160291.G1	RU160404.G1	RU160144.G1
Special	RU160145.G1	RU160146.G1	RU160148.G1	RU160149.G1	RU160150.G1	RU160151.G1	RU160152.G1	RU160153.G1	RU160154.G1	RU160155.G1	RU160376.G1	RU160156.G1

Tab. 3.5

Lc : beam length expressed in millimetres
 : MANDATORY USE OF DIAGONAL STRUTS

4. SUPERBO 4-5-6-7 FRAME CODES

4.1. SUPERBO 600-1400 DEEP FRAME CODES

FRAME BRACING

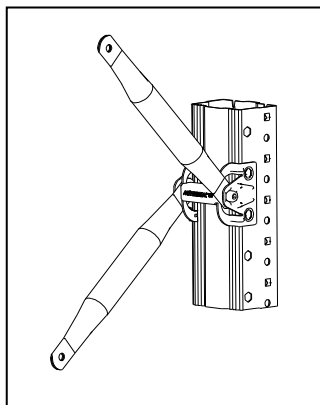


Fig. 4.1

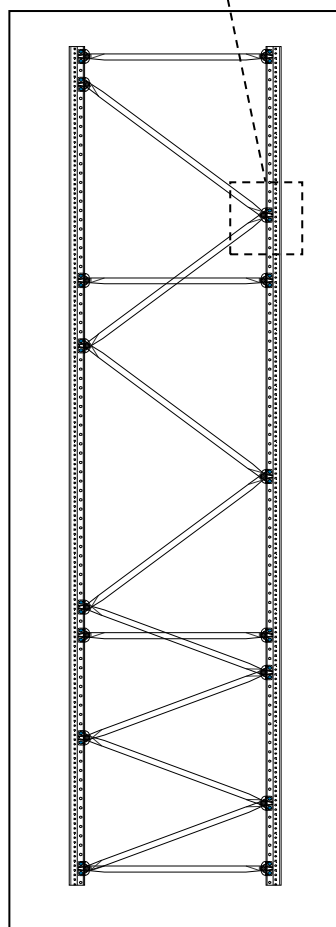


Fig. 4.2

FRAME HEIGHT (mm)	SBO 4 FRAME Art. Code	SBO 5 FRAME Art. Code	SBO 6 FRAME Art. Code	SBO 7 FRAME Art. Code	DEPTH (mm)
2000	SO114S001.95	SO114S171.95	SO114S341.95	SO114S511.95	600
2500	SO114S002.95	SO114S172.95	SO114S342.95	SO114S512.95	
3000	SO114S003.95	SO114S173.95	SO114S343.95	SO114S513.95	
3500	SO114S004.95	SO114S174.95	SO114S344.95	SO114S514.95	
4000	SO114S005.95	SO114S175.95	SO114S345.95	SO114S515.95	
4500	SO114S006.95	SO114S176.95	SO114S346.95	SO114S516.95	
5000	SO114S007.95	SO114S177.95	SO114S347.95	SO114S517.95	
5500	SO114S008.95	SO114S178.95	SO114S348.95	SO114S518.95	
6000	SO114S009.95	SO114S179.95	SO114S349.95	SO114S519.95	
6500	SO114S010.95	SO114S180.95	SO114S350.95	SO114S520.95	
7000	SO114S011.95	SO114S181.95	SO114S351.95	SO114S521.95	
7500	SO114S012.95	SO114S182.95	SO114S352.95	SO114S522.95	
8000	SO114S013.95	SO114S183.95	SO114S353.95	SO114S523.95	
8500	SO114S014.95	SO114S184.95	SO114S354.95	SO114S524.95	
9000	SO114S015.95	SO114S185.95	SO114S355.95	SO114S525.95	
9500	SO114S016.95	SO114S186.95	SO114S356.95	SO114S526.95	
10000	SO114S017.95	SO114S187.95	SO114S357.95	SO114S527.95	
2000	SO114S018.95	SO114S188.95	SO114S358.95	SO114S528.95	700
2500	SO114S019.95	SO114S189.95	SO114S359.95	SO114S529.95	
3000	SO114S020.95	SO114S190.95	SO114S360.95	SO114S530.95	
3500	SO114S021.95	SO114S191.95	SO114S361.95	SO114S531.95	
4000	SO114S022.95	SO114S192.95	SO114S362.95	SO114S532.95	
4500	SO114S023.95	SO114S193.95	SO114S363.95	SO114S533.95	
5000	SO114S024.95	SO114S194.95	SO114S364.95	SO114S534.95	
5500	SO114S025.95	SO114S195.95	SO114S365.95	SO114S535.95	
6000	SO114S026.95	SO114S196.95	SO114S366.95	SO114S536.95	
6500	SO114S027.95	SO114S197.95	SO114S367.95	SO114S537.95	
7000	SO114S028.95	SO114S198.95	SO114S368.95	SO114S538.95	
7500	SO114S029.95	SO114S199.95	SO114S369.95	SO114S539.95	
8000	SO114S030.95	SO114S200.95	SO114S370.95	SO114S540.95	
8500	SO114S031.95	SO114S201.95	SO114S371.95	SO114S541.95	
9000	SO114S032.95	SO114S202.95	SO114S372.95	SO114S542.95	
9500	SO114S033.95	SO114S203.95	SO114S373.95	SO114S543.95	
10000	SO114S034.95	SO114S204.95	SO114S374.95	SO114S544.95	

Tab. 4.1

SUPERBO 4-5-6-7

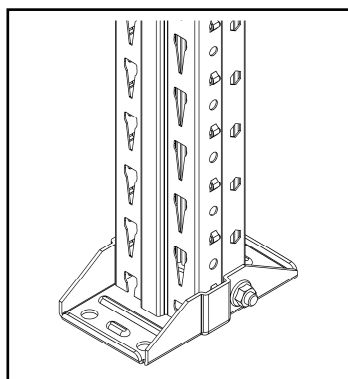


Fig. 4.3

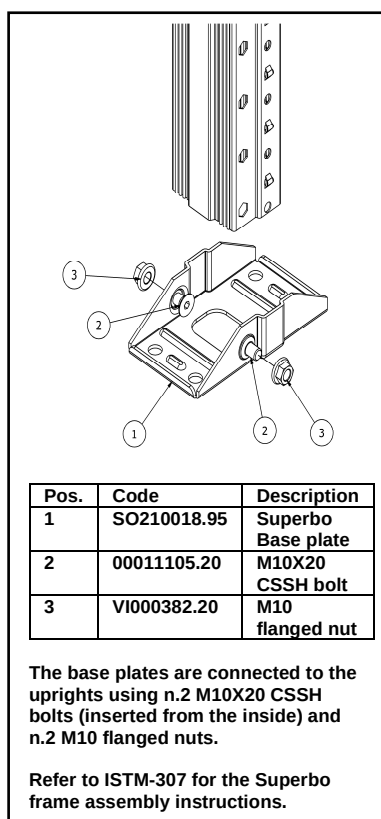


Fig. 4.4

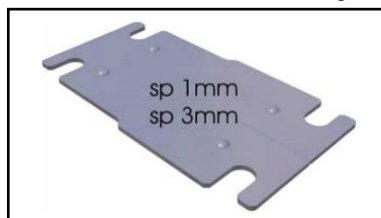


Fig. 4.5

SUPERBO 4-5-6-7 Shim

1 mm gauge
code SBOACC002.95

3 mm gauge
code SBOACC003.95

FRAME HEIGHT (mm)	SBO 4 FRAME Art. Code	SBO 5 FRAME Art. Code	SBO 6 FRAME Art. Code	SBO 7 FRAME Art. Code	DEPTH (mm)
2000	SO114S035.95	SO114S205.95	SO114S375.95	SO114S545.95	800
2500	SO114S036.95	SO114S206.95	SO114S376.95	SO114S546.95	
3000	SO114S037.95	SO114S207.95	SO114S377.95	SO114S547.95	
3500	SO114S038.95	SO114S208.95	SO114S378.95	SO114S548.95	
4000	SO114S039.95	SO114S209.95	SO114S379.95	SO114S549.95	
4500	SO114S040.95	SO114S210.95	SO114S380.95	SO114S550.95	
5000	SO114S041.95	SO114S211.95	SO114S381.95	SO114S551.95	
5500	SO114S042.95	SO114S212.95	SO114S382.95	SO114S552.95	
6000	SO114S043.95	SO114S213.95	SO114S383.95	SO114S553.95	
6500	SO114S044.95	SO114S214.95	SO114S384.95	SO114S554.95	
7000	SO114S045.95	SO114S215.95	SO114S385.95	SO114S555.95	900
7500	SO114S046.95	SO114S216.95	SO114S386.95	SO114S556.95	
8000	SO114S047.95	SO114S217.95	SO114S387.95	SO114S557.95	
8500	SO114S048.95	SO114S218.95	SO114S388.95	SO114S558.95	
9000	SO114S049.95	SO114S219.95	SO114S389.95	SO114S559.95	
9500	SO114S050.95	SO114S220.95	SO114S390.95	SO114S560.95	
10000	SO114S051.95	SO114S221.95	SO114S391.95	SO114S561.95	
2000	SO114S052.95	SO114S222.95	SO114S392.95	SO114S562.95	900
2500	SO114S053.95	SO114S223.95	SO114S393.95	SO114S563.95	
3000	SO114S054.95	SO114S224.95	SO114S394.95	SO114S564.95	
3500	SO114S055.95	SO114S225.95	SO114S395.95	SO114S565.95	
4000	SO114S056.95	SO114S226.95	SO114S396.95	SO114S566.95	
4500	SO114S057.95	SO114S227.95	SO114S397.95	SO114S567.95	
5000	SO114S058.95	SO114S228.95	SO114S398.95	SO114S568.95	
5500	SO114S059.95	SO114S229.95	SO114S399.95	SO114S569.95	
6000	SO114S060.95	SO114S230.95	SO114S400.95	SO114S570.95	
6500	SO114S061.95	SO114S231.95	SO114S401.95	SO114S571.95	
7000	SO114S062.95	SO114S232.95	SO114S402.95	SO114S572.95	900
7500	SO114S063.95	SO114S233.95	SO114S403.95	SO114S573.95	
8000	SO114S064.95	SO114S234.95	SO114S404.95	SO114S574.95	
8500	SO114S065.95	SO114S235.95	SO114S405.95	SO114S575.95	
9000	SO114S066.95	SO114S236.95	SO114S406.95	SO114S576.95	
9500	SO114S067.95	SO114S237.95	SO114S407.95	SO114S577.95	
10000	SO114S068.95	SO114S238.95	SO114S408.95	SO114S578.95	

SUPERBO 4-5-6-7



IMPORTANT:

Frames must be fixed to the floor with no less than 4 code 00041.20 anchor bolts (fig. 4.6)

Use shims (fig 4.5), if necessary, to level the frames to the correct tolerance.

00041.20 – Is the standard anchor bolt. This is a CE certified M10 expansion anchor bolt in accordance with ETAG 001, Annex C – Option 7, fit for a maximum shimming height of 7mm under the base plate.

As an alternative, for needs tied to dynamic actions or for operational preferences, the following anchoring alternatives are also available:

VI000074.20 – CE certified M10 expansion anchor bolt in accordance with ETAG 001 Annex C – option 1 and ETAG 001 Annex E – option C2, fit for a maximum shimming height of 7mm under the base plate.

VI000196.20 – CE certified M8 screw anchor bolt in accordance with ETAG 001 Annex C – option 1 and ETAG 001 Annex E – option C1, fit for a maximum shimming height of 10mm under the base plate.

Fig. 4.6

FRAME HEIGHT (mm)	SBO 4 FRAME Art. Code	SBO 5 FRAME Art. Code	SBO 6 FRAME Art. Code	SBO 7 FRAME Art. Code	DEPTH (mm)
2000	SO114S069.95	SO114S239.95	SO114S409.95	SO114S579.95	1000
2500	SO114S070.95	SO114S240.95	SO114S410.95	SO114S580.95	
3000	SO114S071.95	SO114S241.95	SO114S411.95	SO114S581.95	
3500	SO114S072.95	SO114S242.95	SO114S412.95	SO114S582.95	
4000	SO114S073.95	SO114S243.95	SO114S413.95	SO114S583.95	
4500	SO114S074.95	SO114S244.95	SO114S414.95	SO114S584.95	
5000	SO114S075.95	SO114S245.95	SO114S415.95	SO114S585.95	
5500	SO114S076.95	SO114S246.95	SO114S416.95	SO114S586.95	
6000	SO114S077.95	SO114S247.95	SO114S417.95	SO114S587.95	
6500	SO114S078.95	SO114S248.95	SO114S418.95	SO114S588.95	
7000	SO114S079.95	SO114S249.95	SO114S419.95	SO114S589.95	
7500	SO114S080.95	SO114S250.95	SO114S420.95	SO114S590.95	
8000	SO114S081.95	SO114S251.95	SO114S421.95	SO114S591.95	
8500	SO114S082.95	SO114S252.95	SO114S422.95	SO114S592.95	
9000	SO114S083.95	SO114S253.95	SO114S423.95	SO114S593.95	
9500	SO114S084.95	SO114S254.95	SO114S424.95	SO114S594.95	1100
10000	SO114S085.95	SO114S255.95	SO114S425.95	SO114S595.95	
2000	SO114S086.95	SO114S256.95	SO114S426.95	SO114S596.95	
2500	SO114S087.95	SO114S257.95	SO114S427.95	SO114S597.95	
3000	SO114S088.95	SO114S258.95	SO114S428.95	SO114S598.95	
3500	SO114S089.95	SO114S259.95	SO114S429.95	SO114S599.95	
4000	SO114S090.95	SO114S260.95	SO114S430.95	SO114S600.95	
4500	SO114S091.95	SO114S261.95	SO114S431.95	SO114S601.95	
5000	SO114S092.95	SO114S262.95	SO114S432.95	SO114S602.95	
5500	SO114S093.95	SO114S263.95	SO114S433.95	SO114S603.95	
6000	SO114S094.95	SO114S264.95	SO114S434.95	SO114S604.95	
6500	SO114S095.95	SO114S265.95	SO114S435.95	SO114S605.95	
7000	SO114S096.95	SO114S266.95	SO114S436.95	SO114S606.95	
7500	SO114S097.95	SO114S267.95	SO114S437.95	SO114S607.95	
8000	SO114S098.95	SO114S268.95	SO114S438.95	SO114S608.95	
8500	SO114S099.95	SO114S269.95	SO114S439.95	SO114S609.95	
9000	SO114S100.95	SO114S270.95	SO114S440.95	SO114S610.95	
9500	SO114S101.95	SO114S271.95	SO114S441.95	SO114S611.95	
10000	SO114S102.95	SO114S272.95	SO114S442.95	SO114S612.95	

SUPERBO 4-5-6-7

FRAME HEIGHT (mm)	SBO 4 FRAME Art. Code	SBO 5 FRAME Art. Code	SBO 6 FRAME Art. Code	SBO 7 FRAME Art. Code	DEPTH (mm)
2000	SO114S103.95	SO114S273.95	SO114S443.95	SO114S613.95	1200
2500	SO114S104.95	SO114S274.95	SO114S444.95	SO114S614.95	
3000	SO114S105.95	SO114S275.95	SO114S445.95	SO114S615.95	
3500	SO114S106.95	SO114S276.95	SO114S446.95	SO114S616.95	
4000	SO114S107.95	SO114S277.95	SO114S447.95	SO114S617.95	
4500	SO114S108.95	SO114S278.95	SO114S448.95	SO114S618.95	
5000	SO114S109.95	SO114S279.95	SO114S449.95	SO114S619.95	
5500	SO114S110.95	SO114S280.95	SO114S450.95	SO114S620.95	
6000	SO114S111.95	SO114S281.95	SO114S451.95	SO114S621.95	
6500	SO114S112.95	SO114S282.95	SO114S452.95	SO114S622.95	
7000	SO114S113.95	SO114S283.95	SO114S453.95	SO114S623.95	
7500	SO114S114.95	SO114S284.95	SO114S454.95	SO114S624.95	
8000	SO114S115.95	SO114S285.95	SO114S455.95	SO114S625.95	
8500	SO114S116.95	SO114S286.95	SO114S456.95	SO114S626.95	
9000	SO114S117.95	SO114S287.95	SO114S457.95	SO114S627.95	
9500	SO114S118.95	SO114S288.95	SO114S458.95	SO114S628.95	1300
10000	SO114S119.95	SO114S289.95	SO114S459.95	SO114S629.95	
2000	SO114S120.95	SO114S290.95	SO114S460.95	SO114S630.95	
2500	SO114S121.95	SO114S291.95	SO114S461.95	SO114S631.95	
3000	SO114S122.95	SO114S292.95	SO114S462.95	SO114S632.95	
3500	SO114S123.95	SO114S293.95	SO114S463.95	SO114S633.95	
4000	SO114S124.95	SO114S294.95	SO114S464.95	SO114S634.95	
4500	SO114S125.95	SO114S295.95	SO114S465.95	SO114S635.95	
5000	SO114S126.95	SO114S296.95	SO114S466.95	SO114S636.95	
5500	SO114S127.95	SO114S297.95	SO114S467.95	SO114S637.95	
6000	SO114S128.95	SO114S298.95	SO114S468.95	SO114S638.95	
6500	SO114S129.95	SO114S299.95	SO114S469.95	SO114S639.95	
7000	SO114S130.95	SO114S300.95	SO114S470.95	SO114S640.95	
7500	SO114S131.95	SO114S301.95	SO114S471.95	SO114S641.95	
8000	SO114S132.95	SO114S302.95	SO114S472.95	SO114S642.95	
8500	SO114S133.95	SO114S303.95	SO114S473.95	SO114S643.95	
9000	SO114S134.95	SO114S304.95	SO114S474.95	SO114S644.95	
9500	SO114S135.95	SO114S305.95	SO114S475.95	SO114S645.95	
10000	SO114S136.95	SO114S306.95	SO114S476.95	SO114S646.95	

SUPERBO 4-5-6-7

FRAME HEIGHT (mm)	SBO 4 FRAME Art. Code	SBO 5 FRAME Art. Code	SBO 6 FRAME Art. Code	SBO 7 FRAME Art. Code	DEPTH (mm)
2000	SO114S137.95	SO114S307.95	SO114S477.95	SO114S647.95	1400
2500	SO114S138.95	SO114S308.95	SO114S478.95	SO114S648.95	
3000	SO114S139.95	SO114S309.95	SO114S479.95	SO114S649.95	
3500	SO114S140.95	SO114S310.95	SO114S480.95	SO114S650.95	
4000	SO114S141.95	SO114S311.95	SO114S481.95	SO114S651.95	
4500	SO114S142.95	SO114S312.95	SO114S482.95	SO114S652.95	
5000	SO114S143.95	SO114S313.95	SO114S483.95	SO114S653.95	
5500	SO114S144.95	SO114S314.95	SO114S484.95	SO114S654.95	
6000	SO114S145.95	SO114S315.95	SO114S485.95	SO114S655.95	
6500	SO114S146.95	SO114S316.95	SO114S486.95	SO114S656.95	
7000	SO114S147.95	SO114S317.95	SO114S487.95	SO114S657.95	
7500	SO114S148.95	SO114S318.95	SO114S488.95	SO114S658.95	
8000	SO114S149.95	SO114S319.95	SO114S489.95	SO114S659.95	
8500	SO114S150.95	SO114S320.95	SO114S490.95	SO114S660.95	
9000	SO114S151.95	SO114S321.95	SO114S491.95	SO114S661.95	
9500	SO114S152.95	SO114S322.95	SO114S492.95	SO114S662.95	
10000	SO114S153.95	SO114S323.95	SO114S493.95	SO114S663.95	
2000	SO114S154.95	SO114S324.95	SO114S494.95	SO114S664.95	1500
2500	SO114S155.95	SO114S325.95	SO114S495.95	SO114S665.95	
3000	SO114S156.95	SO114S326.95	SO114S496.95	SO114S666.95	
3500	SO114S157.95	SO114S327.95	SO114S497.95	SO114S667.95	
4000	SO114S158.95	SO114S328.95	SO114S498.95	SO114S668.95	
4500	SO114S159.95	SO114S329.95	SO114S499.95	SO114S669.95	
5000	SO114S160.95	SO114S330.95	SO114S500.95	SO114S670.95	
5500	SO114S161.95	SO114S331.95	SO114S501.95	SO114S671.95	
6000	SO114S162.95	SO114S332.95	SO114S502.95	SO114S672.95	
6500	SO114S163.95	SO114S333.95	SO114S503.95	SO114S673.95	
7000	SO114S164.95	SO114S334.95	SO114S504.95	SO114S674.95	
7500	SO114S165.95	SO114S335.95	SO114S505.95	SO114S675.95	
8000	SO114S166.95	SO114S336.95	SO114S506.95	SO114S676.95	
8500	SO114S167.95	SO114S337.95	SO114S507.95	SO114S677.95	
9000	SO114S168.95	SO114S338.95	SO114S508.95	SO114S678.95	
9500	SO114S169.95	SO114S339.95	SO114S509.95	SO114S679.95	
10000	SO114S170.95	SO114S340.95	SO114S510.95	SO114S680.95	

SUPERBO 4-5-6-7

4.2.

SUPERBO 4-5-6-7 FRAME ASSEMBLY TABLES

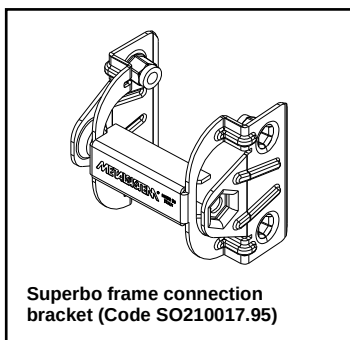


Fig. 4.7

Tab. 4.2 lists the number of frame bracing components required to assemble Superbo frames with depths ranging from 600 to 1500mm.

Tab. 4.3, in addition to providing the frame bracing lengths, shows the real dimensions (external upright) of the frames.

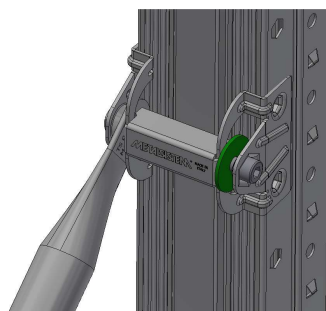
SUPERBO 4-5-6-7 FRAME ASSEMBLY COMPONENT TABLE (FROM 600mm TO 1500mm FRAME DEPTHS)					
HEIGHT (mm)	HORIZONTALS	SHORT DIAGONALS	LONG DIAGONALS	FRAME BRACING BRACKETS	WASHERS
2000	2	4	0	8	4
2500	3	4	1	11	6
3000	3	4	2	11	4
3500	3	4	2	12	6
4000	3	4	3	13	6
4500	4	4	4	16	8
5000	4	4	4	16	8
5500	4	4	5	17	8
6000	4	4	6	18	8
6500	4	4	7	18	6
7000	5	4	7	21	10
7500	5	4	8	22	10
8000	5	4	9	23	10
8500	5	4	9	23	10
9000	6	4	10	26	12
9500	6	4	11	27	12
10000	6	4	12	27	10

Tab. 4.2

Pos.	Code	Description
1	Tab. 4.4	Frame bracing
2	SO210017.95	Frame connection bracket
3	00019563.20	M8x80 CHS bolt
4	00021.20	M8 nut

The frame bracing is connected to the uprights using the Superbo frame connection bracket, locked into position with the M8x80 CHS bolt and M8 nut.

WARNING:
frame connection brackets with only one frame bracing component (for example at the base), an M8X32 washer (code 902.835.20) must be added which functions to compensate the missing frame bracing component:



Refer to ISTM-307 for the Superbo Frame bracing and base assembly instructions.

Fig. 4.8

Fig. 4.9 and Fig. 4.10 show the SUPERBO 4-5-6-7 frame bracing connection locations. All frames must be closed at the base and at the top with a horizontal spacer bar.

All dimensions in these figures refer to the bolt locations of the bracing along the height of the uprights.

SUPERBO 4-5-6-7 COMPONENT DIMENSION TABLE				
NOMINAL FRAME DEPTH (mm)	REAL FRAME DEPTH (mm)	HORIZONTAL SPACER (mm)	SHORT DIAGONAL (mm)	LONG DIAGONAL (mm)
600	585	452	578.5	847.8
700	684	551	657.8	903
800	783	650	742.1	965.4
900	882	749	829.8	1033.8
1000	981	848	919.8	1106.9
1100	1080	947	1011.6	1183.8
1200	1179	1046	1104.7	1264
1300	1278	1145	1198.7	1346.7
1400	1377	1244	1293.5	1431.5
1500	1476	1343	1388.9	1518.1

Tab. 4.3

SUPERBO 4-5-6-7

4.3. 600mm TO 1500mm SUPERBO 4-5-6-7 FRAME ASSEMBLY DIAGRAM

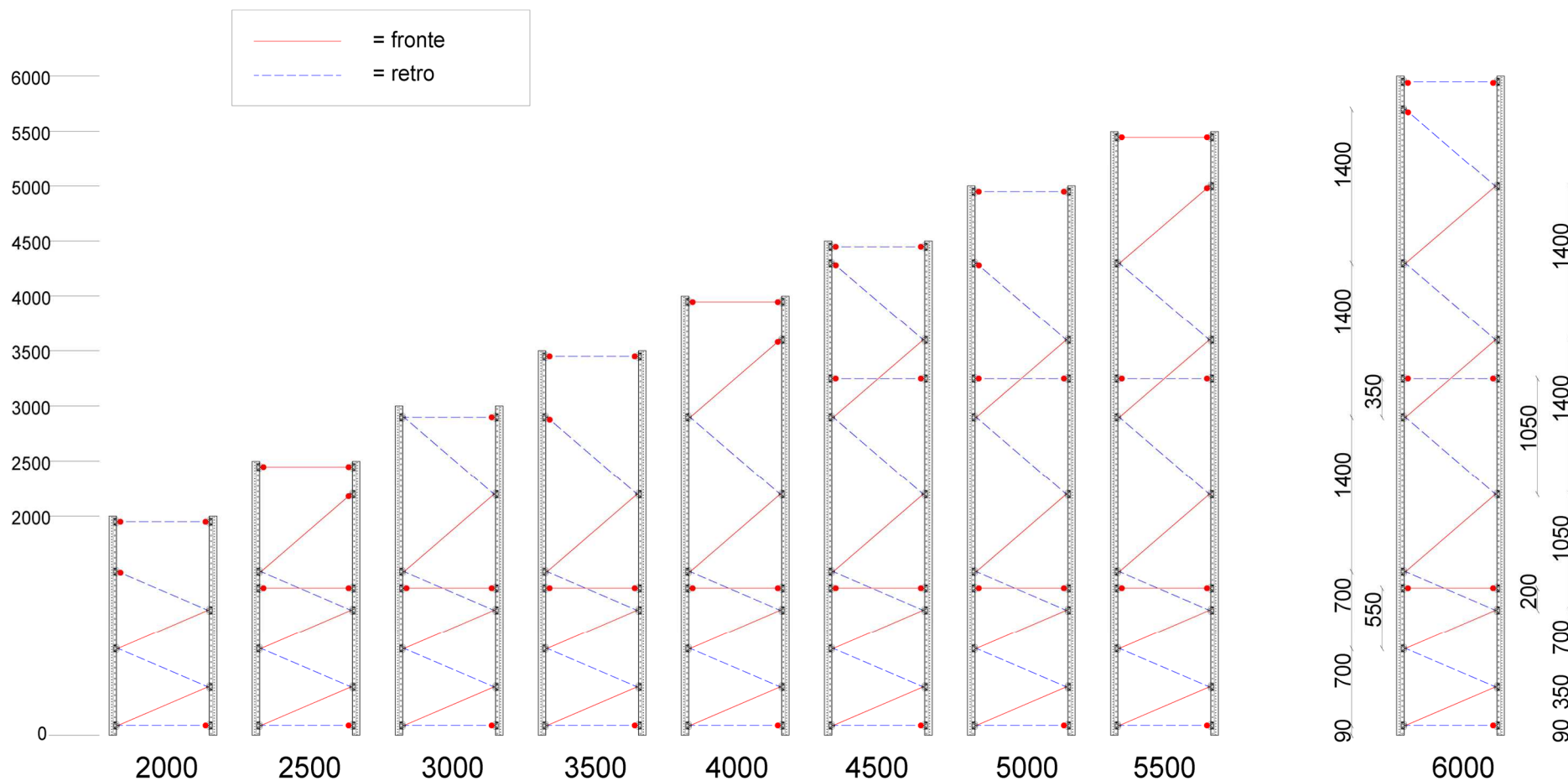


Fig. 4.9

NOTE: Dimensions refer to bolt locations (center of the Superbo 4-5-6-7 frame bracing connection bracket)



INDICATES WASHER PLACED IN THE COUPLING

SUPERBO 4-5-6-7

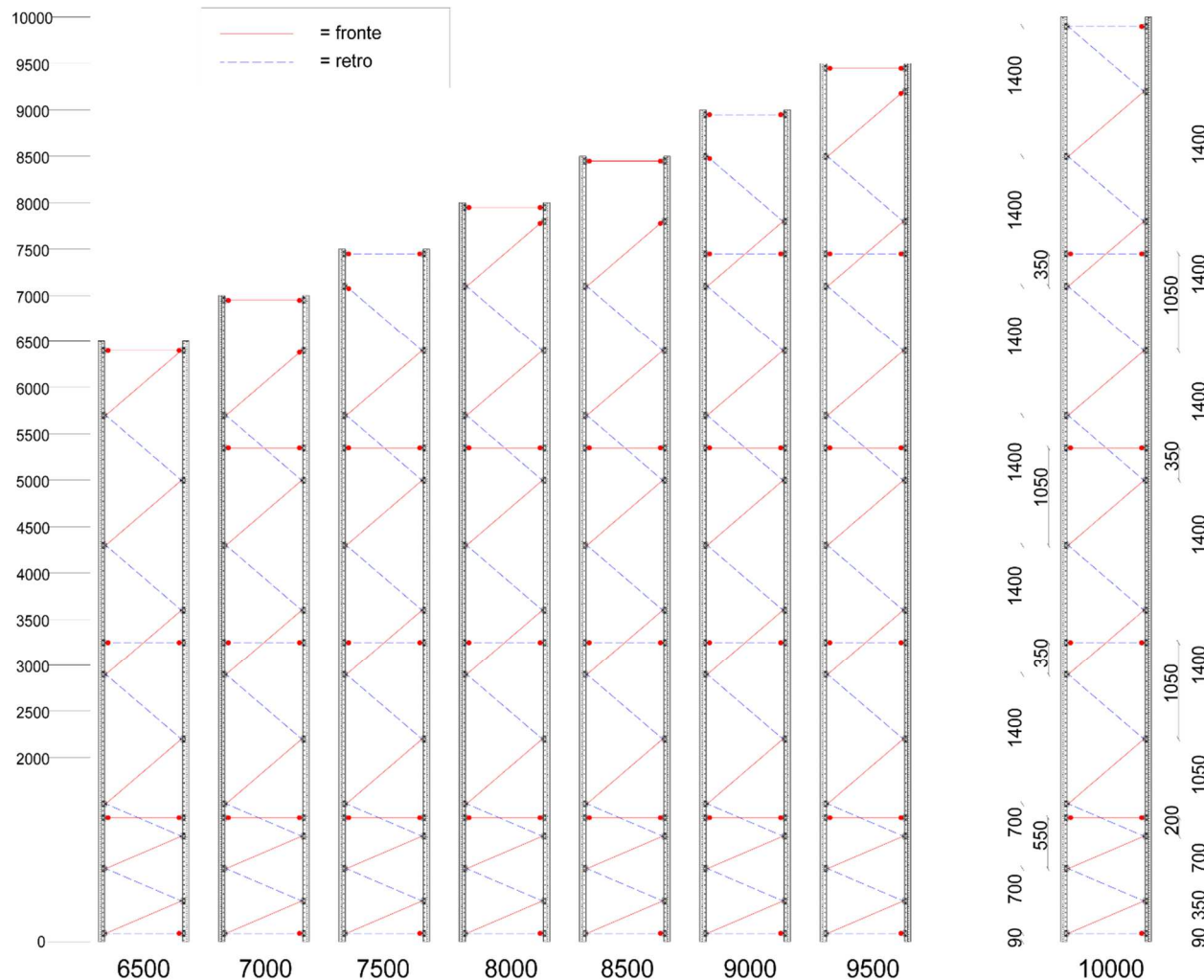


Fig. 4.10

NOTE: Dimensions refer to bolt locations (center of the Superbo 4-5-6-7 frame bracing connection bracket)



INDICATES WASHER PLACED IN THE COUPLING

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4.4.

SPECIAL SUPERBO FRAME BRACING CONFIGURATIONS

Modifications to the frame bracing and limitations to the frame load bearing capacity can allow the frame base to height ratio to be brought from 1:5 to 1:7 without requiring the application of portal beams. The following conditions apply:

- ratios up to **5** - standard frame bracing;
- ratios from **5** to **6** - frame bracing containing 8 short diagonal spacer bars;
- ratios from **6** to **7** - frame bracing containing 8 short diagonal spacer bars with:
 - a maximum bay lengths of 2700mm and;
 - a 20% reduction in the tabled admissible frame load bearing capacity or;
 - a 10% reduction in the admissible frame load bearing capacity for braced rows.

Use the height of the top loading level to calculate the height to depth ratio (see Fig. 4.1).

NOTE:

Restating points "e" and "j" of Section 1, all uprights must be anchor bolted to ground with a minimum of 2, M10x80 anchor bolts per upright and the load bearing capacity of the industrial floor must be checked for structural adequacy.

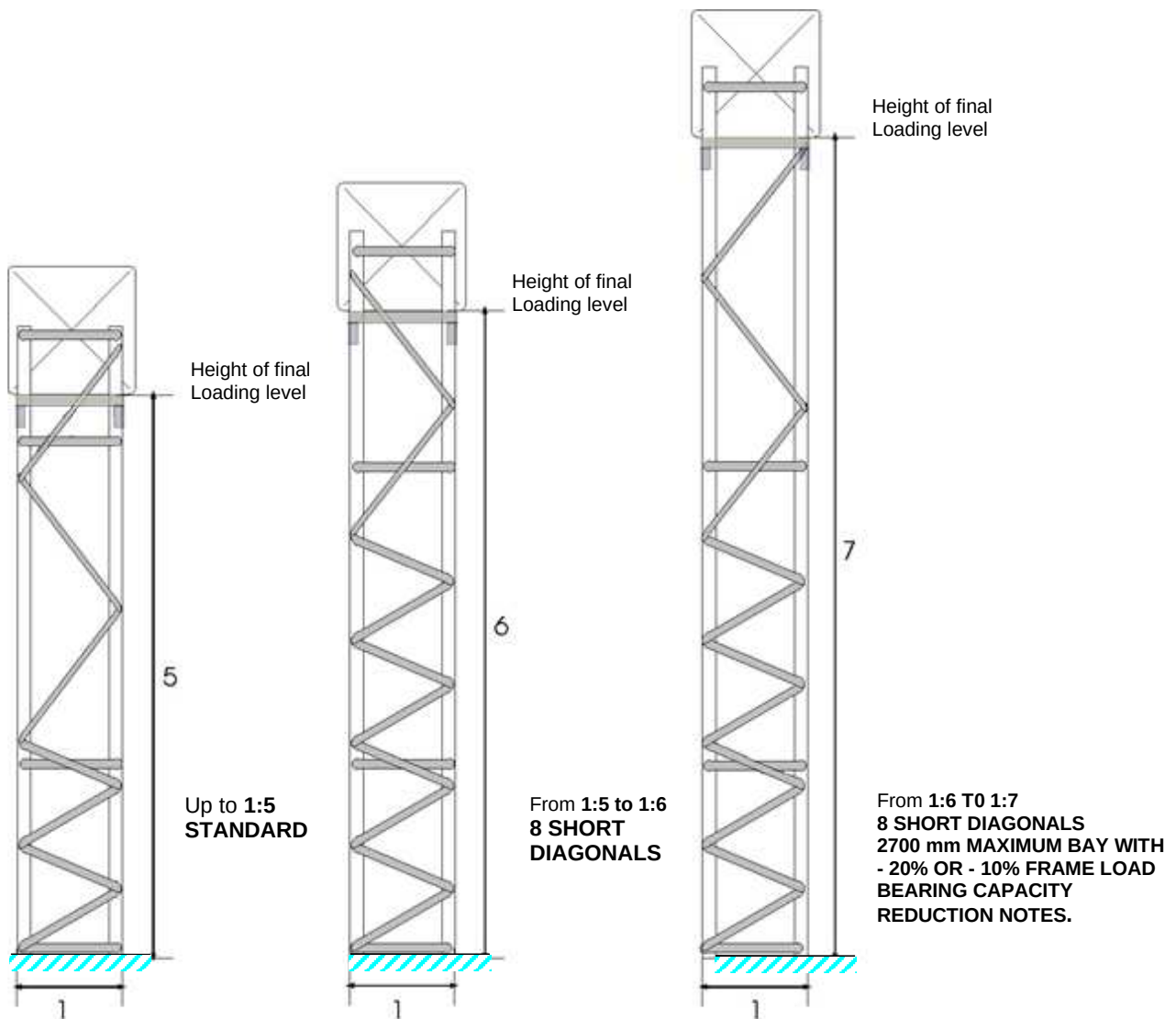


Fig. 4.11

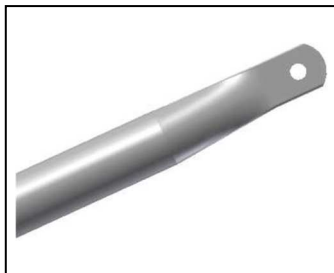
4.5.
SUPERBO 4-5-6-7 FRAME BRACING COMPONENT CODES


Fig. 4.12

NOMINAL FRAME DEPTH (mm)	HORIZONTAL SPACER Article Code	SHORT DIAGONAL Article Code	LONG DIAGONAL Article Code
Special	04200.95	04500.95	04600.95
600	SO140135.95	SO140145.95	SO140155.95
700	SO140136.95	SO140146.95	SO140156.95
800	SO140137.95	SO140147.95	SO140157.95
900	SO140138.95	SO140148.95	SO140158.95
1000	SO140139.95	SO140149.95	SO140159.95
1100	SO140140.95	SO140150.95	SO140160.95
1200	SO140141.95	SO140151.95	SO140161.95
1300	SO140142.95	SO140152.95	SO140162.95
1400	SO140143.95	SO140153.95	SO140163.95
1500	SO140144.95	SO140154.95	SO140167.95

Tab. 4.4

SPECIAL frame bracing components are ordered with their real lengths (**D** real horiz./diag. Fig. 4.13) applying the formula of Tab. 4.5.

Frame bracing components can be ordered for a minimum frame depth of 484mm and a maximum frame depth of 1610mm. Frames with depth over 1500mm are assembled exclusively with short diagonals.

ORDER LENGTH FORMULAE FOR SPECIAL FRAME BRACING			
ARTICLE	FORMULA	ORDER LENGTH RANGE	
		Min. (mm)	Max (mm)
Horizontal	Depth real horiz.= Depth real frame - 133	351	-
Short diagonal	$D_{real\ short\ d.} = \sqrt{(D_{real\ horiz.} - 31)^2 + (350)^2} + 31$	-	1519
Long diagonal	$D_{real\ long\ d.} = \sqrt{(D_{real\ horiz.} - 31)^2 + (700)^2} + 31$	-	1519

Tab. 4.5

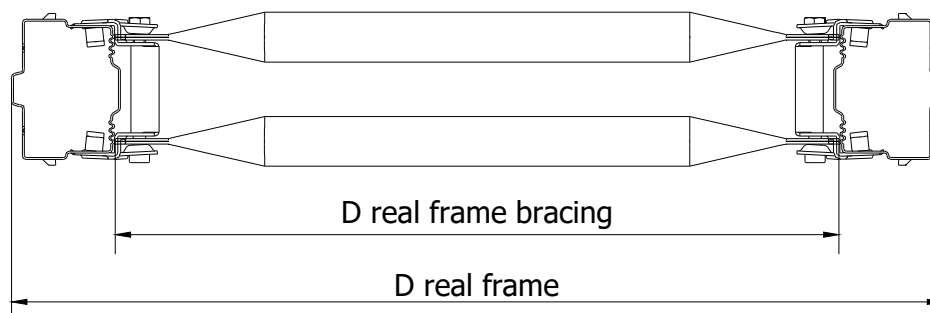


Fig. 4.13

4.6.

SUPERBO 4-5-6-7 FRAME DOUBLE SIDE ROW SPACERS

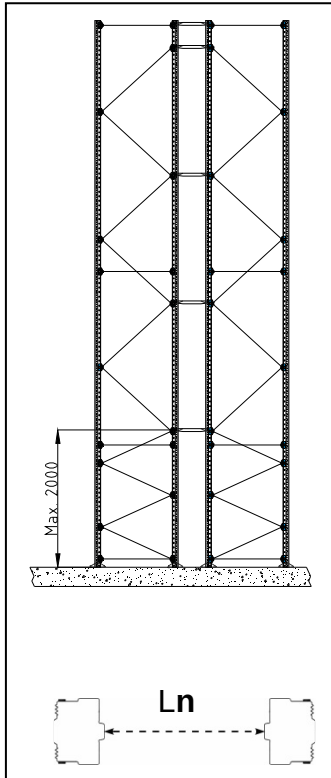


Fig. 4.14

The SUPERBO 4-5-6-7 row spacers, code SO210004.95 are used to tie double entry frames. Row spacers must always be used in pairs and are fixed to the uprights with HEX M8x110 bolts (code 00011.20) and M8 nylon insert nuts (code 00022.20).

The row spacers are assembled to the side of the uprights adjacent to the connection points of the frame bracing, however never at intervals greater than 2000mm.

Fig. 4.14 shows an example of 6 meter frames in a double entry configuration in which 5 pairs of spacer bars are used to tie these frames.

The row spacers can be ordered in lengths (Ln) that range from 280 to 1500mm. Dimensions lower than 280mm can use the Universal Fasteners (Pallet Racking Accessories manual MT07). Contact the Metalsistem technical office for dimensions greater than 1500mm.

The industry standard set out in the UNI EN 15620:2009 suggests that the distance between pallets in a double sided configuration in a CLASS 400 pallet racking installation should be 100mm. Assuming an application with euro pallets on 1000mm deep SUPERBO frames this translates to a net distance between uprights (Ln) of 320mm.

Therefore the following formula is applied when ordering SUPERBO spacer bars (code SO210004.95).

$$L = L_n + 81\text{mm}$$

Therefore in an installation using euro pallets and 1000mm deep SUPERBO frames the spacer bars are ordered using the following formula:

$$L = 320 + 81 = 401\text{mm}$$

Where:

L = Spacer bar order length

Ln = Net span between double entry frames (Fig. 4.).

**SUPERBO 4-5-6-7
Row spacer**

4.7.

WALL TIES

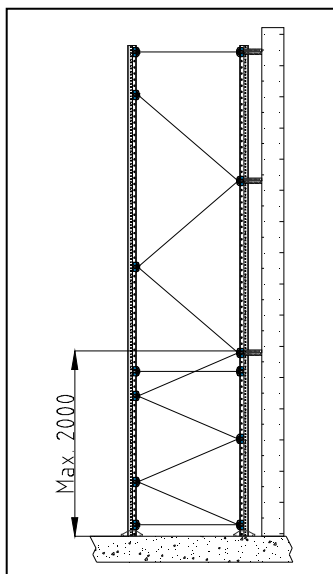


Fig. 4.15

Universal Fasteners are used to tie frames to walls. Information regarding the Universal Fasteners are contained in the "Pallet Racking Accessories Manual" code MT07.

IMPORTANT:

The wall ties are assembled in pairs at the connection points of the frame bracing, however never at intervals greater than 2000mm (Fig. 4.).

A pair of row spacers must always be used to close the top of the frames.

The structural integrity of the wall must be ascertained and proven to be adequate for the intended application and authorised as such by the building supervisor before connecting the pallet racking frame to the wall (refer to Section 1, point e).

SUPERBO 4-5-6-7

4.8.

SUPERBO 4-5-6-7 PORTAL TIE

Portal ties become necessary and wall ties are not permitted or if the frame base to height ratio has exceeded the indications of Paragraph 4.4.

The function of the portal tie is to increase stability by connecting frames across a corridor. It is therefore necessary that all portal tie frames be aligned.

NOTE: If the base to height ratio of double side frames exceed the parameters set in section 1, point e) or paragraph 4.4 refer to the Metalsistem Technical Office.

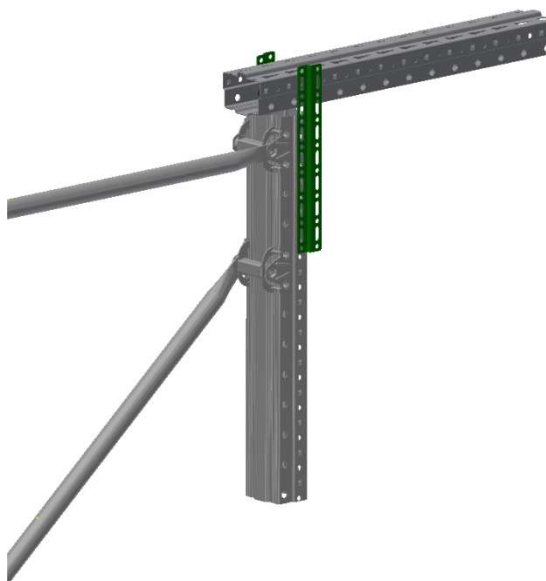


Fig. 4.16

A portal tie is formed by connecting a SUPERBO upright to the top of the corridor facing upright of the bay frames. Universal Fasteners ("pallet racking accessories" MT07), bolted, with M8x110 bolts, to the left and to the right of the aisle facing upright on either side of the corridor provide the connection points for the creation of this component. Table 4.6 shows all the components necessary for the creation of one portal tie.

SUPERBO 4-5-6-7 PORTAL TIE		
Code	Quantity	Description
SO1300XX.95	1	SUPERBO Upright (portal tie 5'000mm max)
08374.95	4	L=310 Universal Fastener
SO210003.95	12	SBO compensation plate
00011.20	6	Hex bolt M8x110 UNI5739 8.8ZB
00022.20	6	M8 nylex nut UNI7473

Tab. 4.6

Note:

1. The upright length needs to be 200mm longer than the corridor width (rounded upwards to the nearest pitch);
2. This solution aligns to the upright holes and is therefore set at an even 50mm pitch. The corridor can be untied from the standard pitch by bolting a pair of Universal Fasteners onto the portal tie.

5. **SUPERBO 4-5-6-7 UPRIGHT CODES**

HEIGHT (H _{nom}) (mm)	SUPERBO 4 UPRIGHTS Code	SUPERBO 5 UPRIGHTS Code	SUPERBO 6 UPRIGHTS Code	SUPERBO 7 UPRIGHTS Code
2000	SO13R001.95	SO13R018.95	SO13R035.95	SO13R055.95
2500	SO13R002.95	SO13R019.95	SO13R036.95	SO13R056.95
3000	SO13R003.95	SO13R020.95	SO13R037.95	SO13R057.95
3500	SO13R004.95	SO13R021.95	SO13R038.95	SO13R058.95
4000	SO13R005.95	SO13R022.95	SO13R039.95	SO13R059.95
4500	SO13R006.95	SO13R023.95	SO13R040.95	SO13R060.95
5000	SO13R007.95	SO13R024.95	SO13R041.95	SO13R061.95
5500	SO13R008.95	SO13R025.95	SO13R042.95	SO13R062.95
6000	SO13R009.95	SO13R026.95	SO13R043.95	SO13R063.95
6500	SO13R010.95	SO13R027.95	SO13R044.95	SO13R064.95
7000	SO13R011.95	SO13R028.95	SO13R045.95	SO13R065.95
7500	SO13R012.95	SO13R029.95	SO13R046.95	SO13R066.95
8000	SO13R013.95	SO13R030.95	SO13R047.95	SO13R067.95
8500	SO13R014.95	SO13R031.95	SO13R048.95	SO13R068.95
9000	SO13R015.95	SO13R032.95	SO13R049.95	SO13R069.95
9500	SO13R016.95	SO13R033.95	SO13R050.95	SO13R070.95
10000	SO13R017.95	SO13R034.95	SO13R051.95	SO13R071.95
Special	SO13R052.95	SO13R053.95	SO13R054.95	SO13R072.95

Tab. 5.1

NOTE:

The real upright dimension is obtained applying the following formula:

$$H_{\text{real}} = H_{\text{nominal}} - 8 \text{ mm}$$

6. **SUPERBO SPINE BRACING**

The partially and fully braced columns of the frame load bearing capacity tables refer to the following standard vertical bracing solutions.

- a. Partially braced bracing tower;
- b. Fully braced bracing tower;
- c. Cross bracing with stirrups (under the conditions of paragraph 9.3).

Points a) and b) refer to the use of a bracing tower. This is an independent structure, made from Super 456 uprights and accessories, that is placed behind a single side pallet rack or between double side pallet racking rows. The bracing tower is connected to the pallet racking row with row spacers and by tensioners attaching the tower uprights to the bays in the locations described in the following paragraphs. The assembly of the bracing tower is completed by placing horizontal bracing under three levels of the braced bay.

As the bracing tower is a standalone structure and is of standardised dimension it can be preassembled and placed in position with ease and at speed.

The cross bracing method uses bracing stirrups which are connected to the frames at every beam level, both vertically and horizontally. Single side applications apply additional struts connecting the bracing connection brackets behind the loading beams while double side applications brace horizontally across the spacer bars as well as between the beams.

6.1. **PARTIALLY BRACED ROW - BRACING TOWER RULES OF APPLICATION**

The rules for the application of the PARTIALLY braced system are:

1. The bracing tower must rise to the first beam level at or above half of the height of the final beam level. The following examples clarify this point:

Case 1: a bay containing 6 beam levels with centre distance 1200mm. Therefore the final beam level is at 7200mm in height. Half this height is 3600mm which coincides with the 3rd beam level. As the bracing tower is ordered in 1000mm multiples we choose a bracing tower height of 4000mm.

Case 2: 5 beam levels with centre distance 1500mm. Therefore the final beam level is at a height of 7500mm. Half this height is 3750mm. The beam directly below is at 3000mm and above is 4500mm. Applying the rule we must adopt a 5000mm high bracing tower as the beam immediately above the half way mark is at 4500mm and we must round this to the nearest 1000mm multiple.

2. The bracing tower must be connected to its adjacent bay with PLAN BRACING in accordance with the indications of Paragraph 6.3.

6.2. **FULLY BRACED ROW - BRACING TOWER RULES OF APPLICATION**

The rules for the application of the FULLY braced system are:

1. The bracing tower must rise at least to the final beam level (rounded in excess to the nearest 1000mm);
2. The bracing tower must be connected to its adjacent bay with PLAN BRACING in accordance with the indications of Paragraph 6.3.

SUPERBO 4-5-6-7

6.3.

BRACING TOWER COMPONENTS

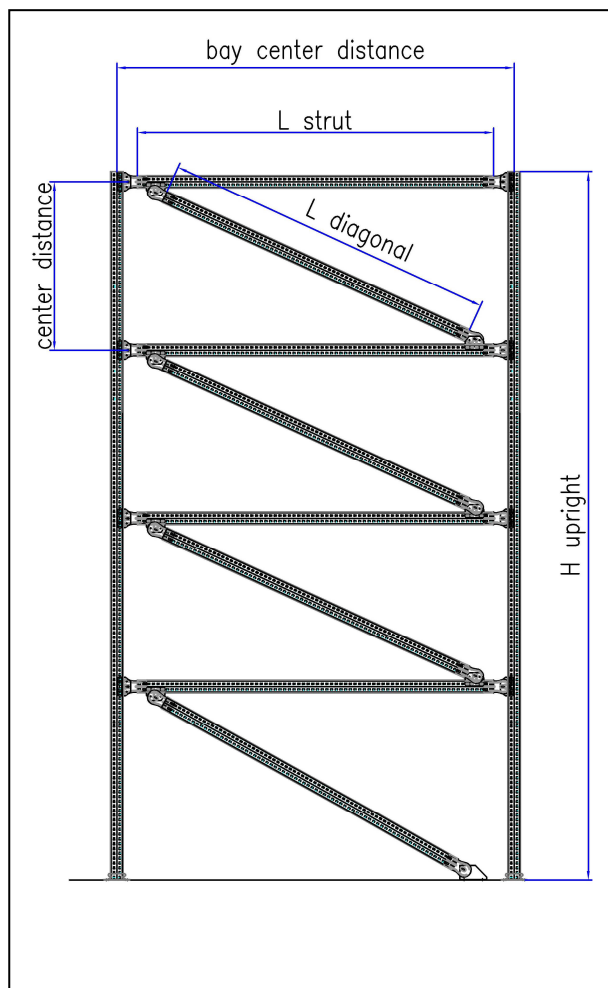


Fig. 6.1

The vertical elements of a bracing tower are made from Super 5 uprights while TS3 sections are used for the horizontal and diagonal components of the assembly.

The bracing towers can be ordered by following 6 simple steps.

Step 1 – Bracing tower upright height and components

Paragraphs 6.1 and 6.2 provide the calculation method to determine the height of partial and full height bracing towers. Tab. 6.1 provides the corresponding upright codes together with the position of the horizontal struts and the quantity of horizontal and diagonal struts of a bracing tower.

BRACING TOWER CONFIGURATION					
H Tower (mm)	H upright (mm)	Upright code	No. Diag. Struts	No. Horiz. Struts	Centre distance (mm)
3000	2970	01504.95	2	2	1421
4000	3995	01508.95	3	3	1289
5000	4986	01512.95	4	4	1190
6000	5978	01516.95	4	4	1454
7000	6969	01520.95	5	5	1355
8000	7994	01524.95	6	6	1289
9000	8985	01528.95	6	6	1454
10000	9976	01532.95	7	7	1388

Tab. 6.1

Step 2 – Determine length of TS3 horizontal struts

Tab. 6.2 shows the horizontal strut length corresponding to the bay beam length.

HORIZONTAL STRUT LENGTHS (code 09008.95)	
Beam Length (mm)	Horizontal strut length (mm)
1800	1615
1900	1714
2000	1814
2100	1913
2200	2012
2300	2111
2400	2210
2500	2309
2600	2408
2700	2508
2800	2607
2900	2706
3000	2805
3100	2904
3200	3003
3300	3103
3400	3202
3500	3301
3600	3400

Tab. 6.2

SUPERBO 4-5-6-7

Step 3 – Determine the length of the TS3 diagonal strut

Tab. 6.3 shows the diagonal strut lengths as a function of bay length and bracing tower height.

DIAGONAL STRUT LENGTH (code 09008.95)								
BAY (mm)	BRACING TOWER HEIGHT (mm)							
	3000	4000	5000	6000	7000	8000	9000	10000
1800	1714	1615	1582	1748	1681	1615	1748	1681
1900	1781	1714	1648	1814	1748	1714	1814	1781
2000	1880	1781	1714	1880	1814	1781	1880	1847
2100	1946	1880	1814	1979	1913	1880	1979	1913
2200	2023	1946	1880	2045	1979	1946	2045	2012
2300	2111	2045	1979	2111	2078	2045	2111	2078
2400	2177	2111	2078	2210	2144	2111	2210	2177
2500	2276	2210	2144	2276	2243	2210	2276	2243
2600	2342	2276	2243	2375	2309	2276	2375	2342
2700	2442	2375	2342	2442	2408	2375	2442	2442
2800	2541	2475	2442	2541	2508	2475	2541	2508
2900	2607	2574	2508	2640	2574	2574	2640	2607
3000	2706	2640	2607	2706	2673	2640	2706	2706
3100	2805	2739	2706	2805	2772	2739	2805	2772
3200	2871	2838	2805	2904	2871	2838	2904	2871
3300	2970	2937	2904	3003	2937	2937	3003	2970
3400	3069	3003	2970	3069	3036	3003	3069	3036
3500	3169	3103	3069	3169	3136	3103	3169	3136
3600	3235	3202	3169	3268	3235	3202	3268	3235

Tab. 6.3

Step 4 – Selection of bracing tower assembly accessory codes

A set a macro codes have been developed to simplify the ordering process of the bracing tower assembly accessories. Tab. 6.4 shows the codes which group together all accessory components required to assemble a single bracing tower.

NOTE: These codes exclude horizontal spacer bars and horizontal bracing components (both length variable codes discussed elsewhere).

BRACING TOWER ACCESSORY KIT CODES		
code	Description	
AI210002.98	H3000	BRACING TOWER ACCESSORIES
AI210003.98	H4000	BRACING TOWER ACCESSORIES
AI210004.98	H5000	BRACING TOWER ACCESSORIES
AI210005.98	H6000	BRACING TOWER ACCESSORIES
AI210006.98	H7000	BRACING TOWER ACCESSORIES
AI210007.98	H8000	BRACING TOWER ACCESSORIES
AI210008.98	H9000	BRACING TOWER ACCESSORIES
AI210009.98	H10000	BRACING TOWER ACCESSORIES

Tab. 6.4

Step 5 – Row spacers

The row spacers are assembled in pairs, closing at the top and placed at intervals of 1000 mm along the height of the tower. Their purpose is to connect the bracing tower to the pallet racking bays.

The row spacer code is **AI210017.95**. These have an order length of:

$$L_{tower} = Ln + 40 \quad (\text{Fig. 6.2})$$

The row spacers are connected to the bracing tower uprights in pairs with Drive-in couplings and bolts. The **SO210014.98** macro code has been developed to simplify the ordering process of the bracing tower connection accessories. Tab. 6.5 provides the row spacer and accessory codes and quantities required for the 8 standard bracing tower heights.

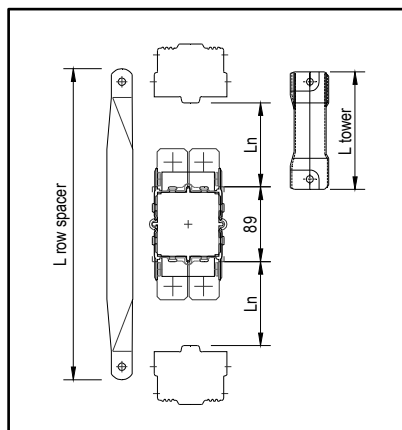


Fig. 6.2

TOWER HEIGHT (mm)	SINGLE SIDED codes/qty		DOUBLE SIDED codes/qty	
	SO210014.98	AI210017.95	SO210014.98	AI210017.95
3000	3	12	6	24
4000	4	16	8	32
5000	5	20	10	40
6000	6	24	12	48
7000	7	28	14	56
8000	8	32	16	64
9000	9	36	18	72
10000	10	40	20	80

Tab. 6.5

The standard row spacers for double side installations (code SO210004.95, paragraph 4.6) require to be produced in a length which is compatible with the bracing tower row spacers. The length is obtained with the following formula.

$$L_{row\ spacer} = 2 \times Ln + 170$$

Step 6 – Horizontal bracing (AI210016.98)

The selection of the height at which the horizontal bracing shall be placed is independent from the adopted bracing tower solution. Three levels of horizontal bracing will be located in the braced bays following the same logic for both partial and fully braced towers. Therefore the following rules apply:

- Level 1:** Placed at the beam closest to one quarter of the height of the final beam level. This level of horizontal bracing must be connected to the uprights of the bracing towers;
- Level 2:** Placed at the beam immediately at or above the half the height of the final beam level. This level of horizontal bracing must be connected to the uprights of the bracing towers;
- Level 3:** Placed at the final beam level. This level of horizontal bracing must be connected to the uprights of the full height bracing tower only.

The horizontal bracing is composed of bracing stirrups (the dimension of which can be obtained in the Metal Excel sheet) and accessories connecting the bracing stirrups to beams. These accessories also include a set of tensioners and Drive-in couplings connecting the rear beams to the uprights of the bracing tower.

The macrocode AI210016.98 includes all accessories required to connect 3 bracing level connections (therefore order 1 accessory for a set of full height single side bracing stirrups).

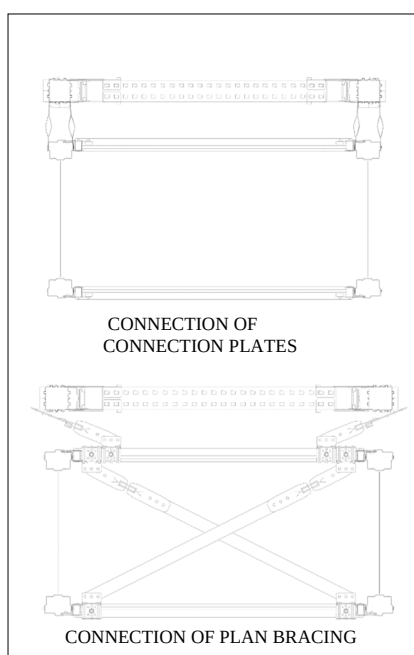


Fig. 6.3

Fig. 6.3 shows the connection of the row spacers and plan bracing between the pallet bracing bay and the bracing tower.

6.4. SINGLE SIDE VERTICAL BRACING WITH STRUT COMPONENTS

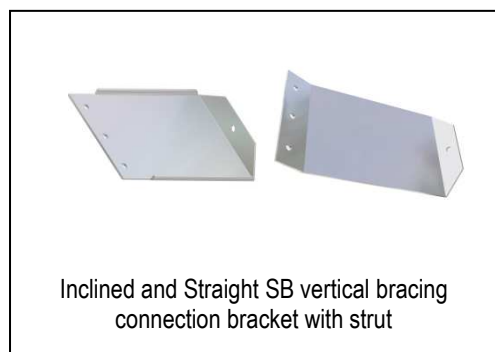


Fig. 6.4



Fig. 6.5

FIG.	COMPONENTS	CODE
Fig. 6.4	Inclined SB vertical bracing connection bracket with strut	SPACC027.95
Fig. 6.4	Straight SB vertical bracing connection bracket with strut	SPACC026.95
	M8 x 110 HEX Bolt 8.8 DIN931 Zp	00011.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
Fig. 6.6	42 x 3 special bracing stirrup	Tab. 6.10
	M8 x 20 HEX Bolt 8.8 DIN933 Zp	00004.20
	M8 High nylon insert nut DIN982 Zp	00022.20
	½ turnbuckle with Ø 10,5 mm hole	08886.95
	M10 x 90 Cyl. Head Sockt conn. Bolt 8.8 DIN931 Z	00076.20
	M10 Nut 6/S DIN934 Zp	00034.20
Fig. 6.5	70x70x1 Raised Pallet Support Beam (bracing strut)	08650.95

Tab. 6.6

Calculation of the bracing strut length (code 08650.95)

$$\text{Strut Length} = L_c - 2\text{mm}$$

Refer to ISTM-033 "Instructions for the correct assembly and use of bracings for pallet racking and mezzanines" for the assembly procedure.

6.5. CALCULATION OF THE SINGLE SIDE BRACING STIRRUP LENGTH

The stirrup length calculations uses the following variables referring to Fig. 6.7:

- L_c = beam length
- H_2 = Ground to top beam height
- H_1 = Ground to bottom beam height
- K = Height between the top of the beam profile and the bracing bracket hole. For :
 - = 106 and 140 riveted beam = 227 mm
 - = 70, 106 and 140 welded beam = 230 mm
 - = 172 welded beam = 280 mm
- D = Height of the first bracing bracket hole from ground = 156 mm

To calculate the lengths:

- $D_h = L_c - 40$ centre distance between bracket holes on opposite sides of the bay.
- $d_{v1} = H_1 - K - D$ centre distance between ground and first level bracket holes.
- $d_v = H_2 - H_1$ centre distance between upper level and lower level brackets

The formula to apply for the calculation of the centre distance between the bracing connection holes from ground to beam level is:

Centre distance between bracing bracket holes at ground level = $\sqrt{dv1^2 + dh^2}$

The formula to apply for the calculation of the centre distance between beam levels is:

Centre distance between bracing bracket holes between beam levels = $\sqrt{dv^2 + dh^2}$

Example:

Input:

bay L = 2700 mm

beam Lc = 2700 mm

H1 = 1533 mm

H2 = 2583 mm

Therefore:

Dh = Lc - 40 = 2660 mm

dv1 = 1533 - 227 - 156 = 1150 mm

dv2 = 2583 - 1533 = 1050 mm

Centre distance between bracing bracket holes at ground level = $\sqrt{1150^2 + 2660^2} = 2898$ mm

Centre distance between bracing bracket holes between beam levels = $\sqrt{1050^2 + 2660^2} = 2860$ mm

Use the "PIATTI SPECIALI / SPEC. BRACING" button of the METAL Excel sheet (available from the reserved area of the Metalsistem internet site) to determine the standard and special bracing stirrup codes corresponding to the dimensions resulting from the above calculation.

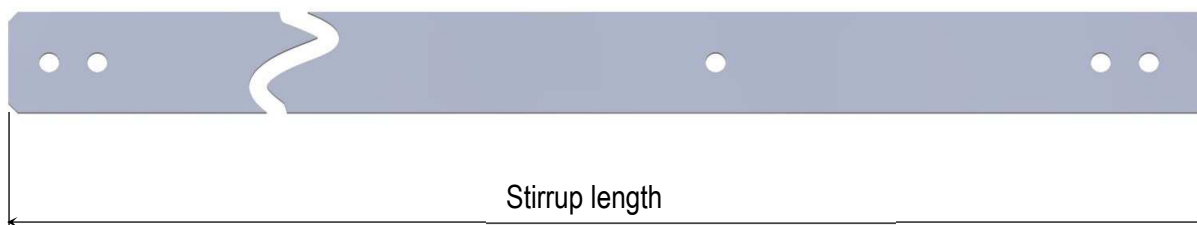


Fig. 6.6

SUPERBO 4-5-6-7

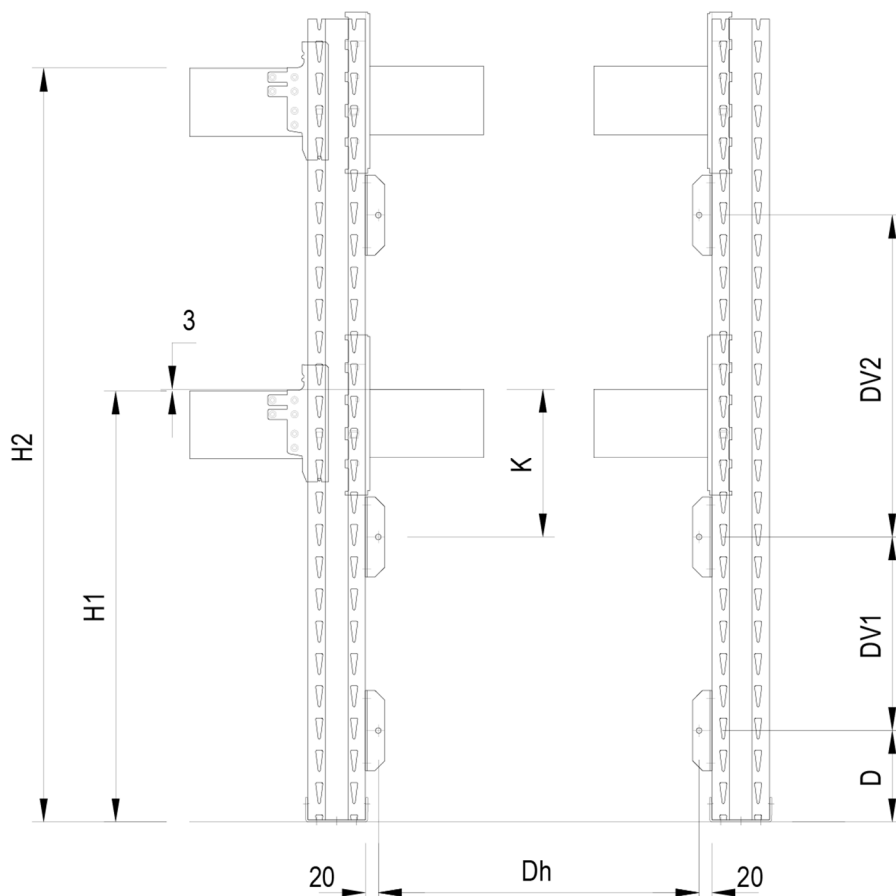


Fig. 6.7

6.6. COMPONENTS FOR DOUBLE SIDE VERTICAL BRACING

Double side bracing is composed of vertical bracing elements that arrive at the beam level and by horizontal bracing placed at every beam level forming a continuous connection through the double side bays.

Beam levels placed on ground do not require the application of plan bracing

Refer to ISTM-033 "Instructions for the correct assembly and use of bracings for pallet racking and mezzanines" for the assembly procedure.

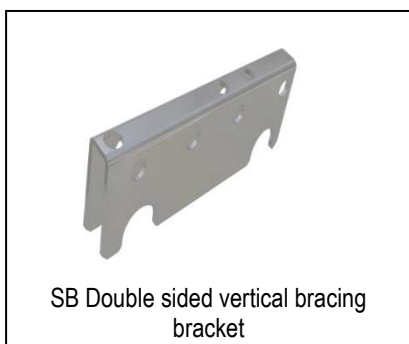


Fig. 6.8

FIG.	COMPONENTS	CODE
Fig. 6.8	SB Double sided vertical bracing bracket	SPACC018.95
Fig. 6.9	Double sided spacer for vertical bracing (L= xxx)	08355.95
Fig. 6.12-6.13	42 x 3 Modular bracing stirrup + Compensator	Tab. 6.9 & 6.10
	M8 x 110 HEX Bolt 8.8 DIN931 Zp	00011.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
	M8 x 30 HEX Bolt 8.8 DIN933 Zp	00008.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
	M8 x 20 HEX Bolt 8.8 DIN933 Zp	00004.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
	½ turnbuckle with Ø 10,5 mm hole	08886.95
	M10 x 90 Cyl. Head Sockt conn. Bolt 8.8 DIN931 Z	00076.20
	M10 Nut 6/S DIN934 Zp	00034.20

Tab. 6.7

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SUPERBO 4-5-6-7



Double sided spacer for vertical bracing

Fig. 6.9

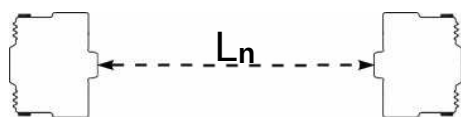


Fig. 6.10

IMPORTANT:

The length of the Double Side Bracing Spacer Bar (Fig. 6.9) is not equal to the length of the row spacer (code SO210004.95). The Double Entry Bracing Spacer Bar is ordered using the resultant of the following formula:

$$L \text{ (Bracing spacer)} = L_n \text{ (Net dist. Between frames)} + 74 \text{ mm}$$

NOTE:

The minimum distance between frames (L_n) is 200 mm

6.7.

HORIZONTAL BRACING COMPONENTS



Bracket for horizontal bracing

Fig. 6.11

FIG.	COMPONENTS	CODE
Fig. 6.11	Bracket for horizontal bracing	08908.95
	5.5x19 HEXSDAP SCR. DIN 7504 /KZp	00058.20
	M8 x 20 HEX Bolt 8.8 DIN933 Zp	00004.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
Fig. 6.12-6.13	42 x 2 Modular bracing stirrup + Compensator (Or, 42 x 3 Modular bracing stirrup + Compensator)	Table 6.9 & 6.10
	½ turnbuckle with Ø 10,5 mm hole	08886.95
	M10 x 90 Cyl. Head Sockt conn. Bolt 8.8 DIN931 Zp	00076.20
	M10 Nut 6/S DIN934 Zp	00034.20

Tab. 6.8

The horizontal bracing brackets are screwed into the beams with a pair of self tapping screws (code 00058.20).

The 3 holes present in the side lip of the bracket provide the connection for the bracing stirrup components within the bay while the hexagonal insert in the centre of the bracket provides a seat for the introduction of the M8 x 20 bolt (code 00004.20) which in turn is used to provide a connection point for the bracing stirrups that are placed between the bays in double entry configurations.

6.8.

BRACING STIRRUPS

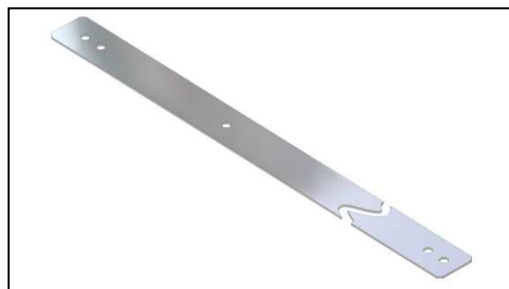


Fig. 6.12

42x2 or 42x3 Modular bracing stirrups
to be coupled with the compensating bracing stirrups
when used as modular lengths.

42x2 MODULAR BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
1200	08746.95	2 mm
2400	08747.95	2 mm
2450	08748.95	2 mm
SPECIAL	08749.95	2 mm

42x3 MODULAR BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
1200	08736.95	3 mm
2400	08737.95	3 mm
SPECIAL	08738.95	3 mm

Tab. 6.9

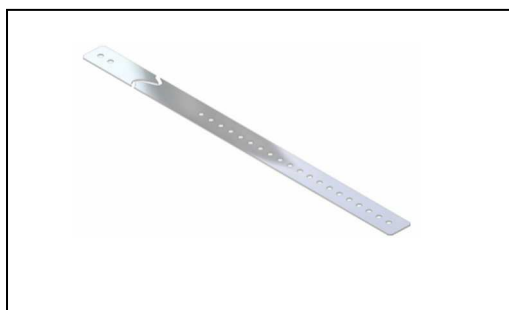


Fig. 6.13

42x2 or 42x3 compensating bracing stirrup
to be paired with the modular bracing stirrups.

42x2 COMPENSATING BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
600	08741.95	2 mm
1000	08742.95	2 mm
1400	08743.95	2 mm
1800	08744.95	2 mm
2200	08745.95	2 mm

42x3 COMPENSATING BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
600	08731.95	3 mm
1000	08732.95	3 mm
1400	08733.95	3 mm
1800	08734.95	3 mm
2200	08735.95	3 mm

Tab. 6.10

Fig. 6.14 shows the "modular bracing stirrup with compensator" assembly cases.

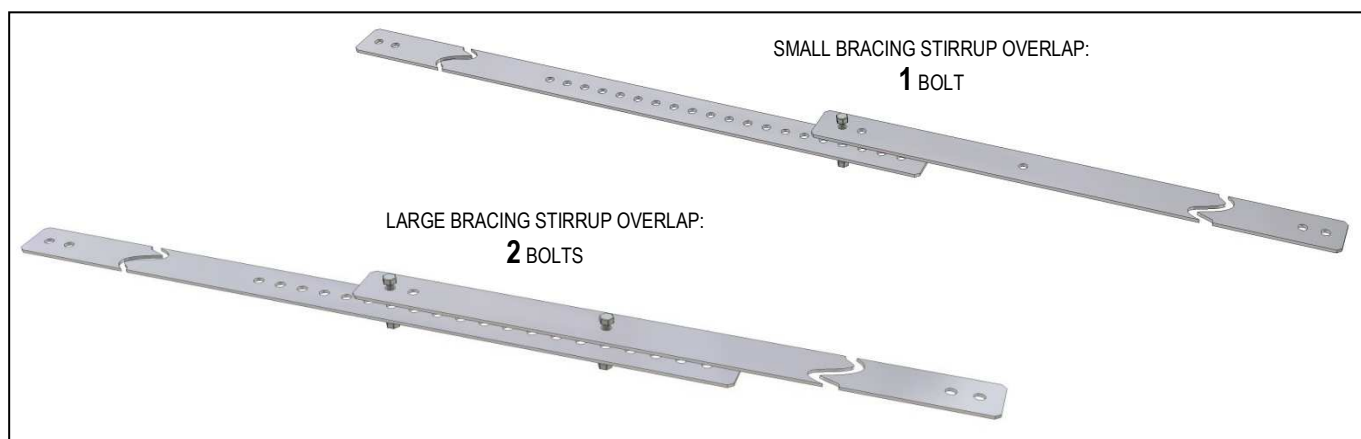


Fig. 6.14

***NOTE:** The Metalsistem Excel Spread Sheet (available from the reserved section of the Metalsistem internet site) must be used to determine the correct combination of modular bracing stirrups to be applied to any one given bay/height combination.

6.9.

BRACING ACCESSORY MACRO CODES

Macrocodes, containing all vertical and horizontal modular bracing stirrup accessories (both for 42x3 and 42x2), have been created to facilitate both the quotation and order of the bracing. Double entry bracing also requires, in addition to the accessory macro codes, Bracing Bay Double Sided Spacer Bars (code 08355.95) to be ordered separately. See Tab. 6.11 and 6.12.

SINGLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.15 Colours
SB SINGLE ENTRY GROUND BRACING ACCESSORIES	SPACC061.98	Brackets and bolts	
+			
SB SINGLE ENTRY BRACING ACCESSORIES	SPACC060.98	Brackets, tensioners and bolts	
+			
HORIZONTAL STRUT	08650.95	Raised pallet support bar	
+			
42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Tab. 6.9 & 6.10	-	

Tab. 6.11

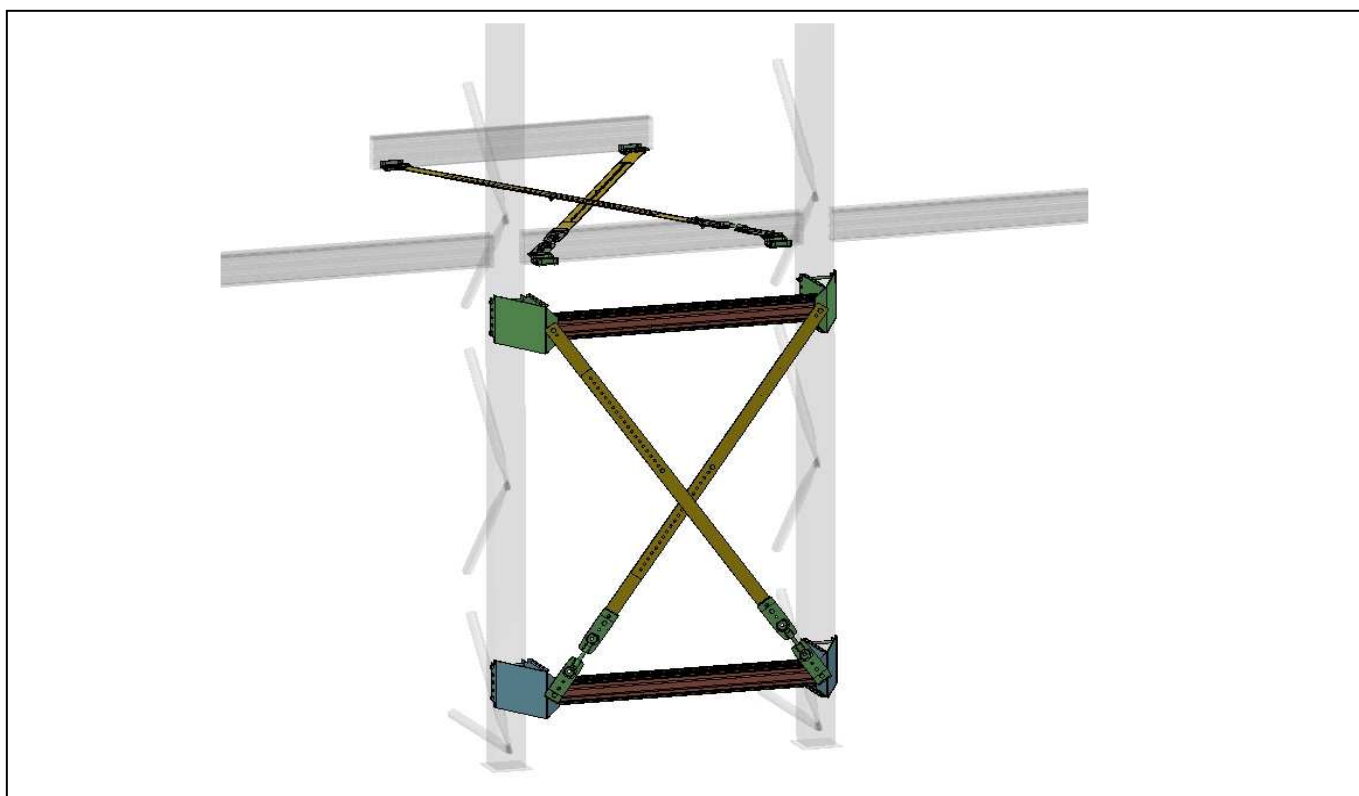


Fig. 6.15

EXAMPLE: the components required to make up the braced bay of Fig. 6.15 are:

N° 2	Tab. 6.9 & 6.10	42x3 modular bracing stirrup + 42x3 compensator (vertical bracing)
N° 2	Tab. 6.9 & 6.10	42x2 modular stirrup + 42x2 compensator (horizontal bracing)
N° 2	08650.95	Raised pallet support bar (Horizontal strut) L= beam length – 2mm
N° 1	SPACC061.98	SINGLE ENTRY GROUND BRACING ACCESSORIES
N° 1	SPACC060.98	SINGLE ENTRY BRACING ACCESSORIES

DOUBLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.16 Colours
SB DOUBLE ENTRY GROUND BRACING ACCESSORIES	SPACC063.98	Brackets and bolts	
+ SB DOUBLE ENTRY BRACING ACCESSORIES	SPACC062.98	Brackets, tensioners and bolts	
+ 42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Tab. 6.9 & 6.10	-	
+ DOUBLE SIDED SPACERS FOR VERTICAL BRACING	08355.95	-	

Tab. 6.12

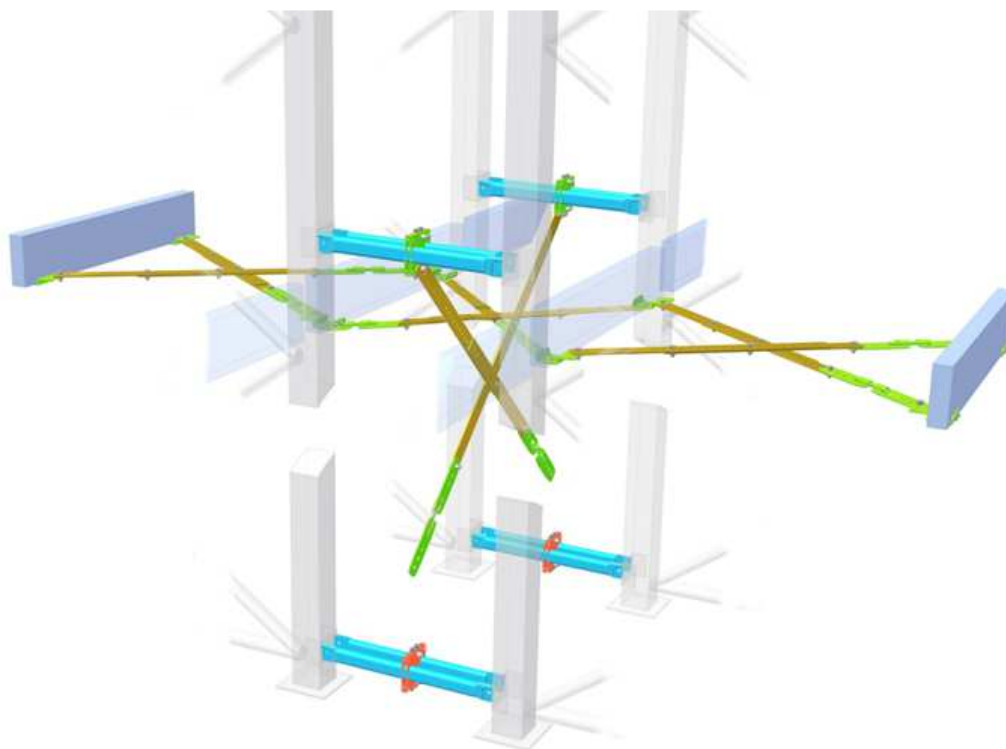


Fig. 6.16

EXAMPLE: the components required to make up the braced bay of Fig. 6.16 are:

N° 2	Tab. 6.9 & 6.10	42x3 modular bracing stirrup + 42x3 compensator (vertical bracing)
N° 6	Tab. 6.9 & 6.10	42x2 modular stirrup + 42x2 compensator horizontal bracing within and between the bays
N° 1	SPACC063.98	SB DOUBLE ENTRY GROUND BRACING ACCESSORIES
N° 1	SPACC062.98	SB DOUBLE ENTRY BRACING ACCESSORIES
N° 8	08355.95	DOUBLE SIDED SPACERS FOR VERTICAL BRACING $L = L_n + 74 \text{ mm}$

7. **SUPERBO DEDICATED ACCESSORIES**

7.1. **SUPERBO 4-5-6-7 SPLICE**

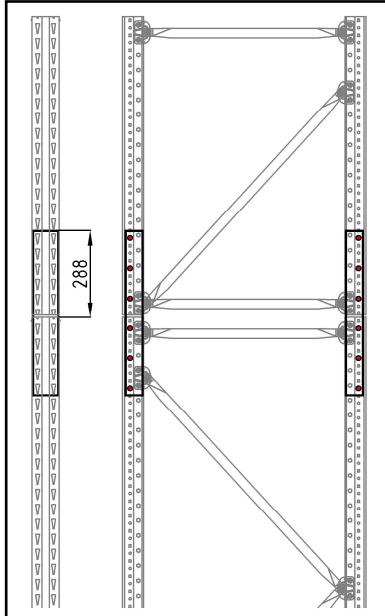


Fig. 7.1

Where necessary the SUPERBO upright profile may be spliced with the SUPERBO 4-5-6-7 Splice (code SO210015.95).

This component is inserted into the upright to the dimension shown in Fig. 7.1 (288mm). The introduction of the splice does not disturb the existing frame bracing which must be closed at the top with a horizontal spacer bar.

Application notes:

1. the splice may be used for the addition of only one loading level with a maximum load of 3000daN per pair of beams;
2. the splice upright may have a length no greater than 1500mm;
3. the splice frame must be of the same SUPERBO series as the frame;
4. every splice must be fastened to the uprights with 6 M8x110 bolts and nylon nuts (codes 00011.20 + 00022.20);
5. the splicing frames must contain frame bracing following the notes of Section 4.2;
6. cross bracing must be placed between the final beam level under the splice and the beam level over the splice. This bracing must connect the 2 levels vertically and be present horizontally at both levels. At least one bay shall be braced for every eight consecutive bays.

8.

PALLET RACKING BEAM LOAD BEARING CAPACITIES

8.1.

SUPERBO 4-5-6-7 BEAM LOAD BEARING CAPACITIES

CHOOSING THE CORRECT SUPERBO 4-5-6-7 BEAM PAIR

1. Check the “**Maximum Permissible Unit Load per Profile**” section of the beam load bearing capacity tables before consulting the beam pair uniformly distributed load bearing capacity section for the applicable length. Both load bearing capacity conditions must be satisfied.
2. Check the maximum beam pair load bearing capacity in the frame load bearing capacity tables.
3. Table cells that are shaded in dark grey are for beam levels that must contain diagonal struts. The application of at least 6 pallet support beams properly fixed to the main beams as detailed in “Pallet Racking Accessories Technical Manual”, code MT07, may substitute diagonal struts for beam lengths up to 3600mm; for longer beams contact Metalsistem Technical Office.

Two separate pallet racking beam load bearing capacity tables, differentiated by beam connector, have been developed. These have been colour coded for clarity. The beam code tables and the load bearing capacity table categories refer to the same colour coding system.

- Orange load tables = riveted beams (I22, I33, I4, I44, I5, I6);
- Red load tables = welded beams (I4, I44, I5, I6);

NOTE: The SUPERBO 4-5-6-7 series uprights have a net span between the uprights equal to the dimension of the beam (L_c), the special beam lengths are ordered with this dimension.

NOTE: Contact the Metalsistem Technical Office for applications with beam lengths (L_c) greater than **4000 mm**.

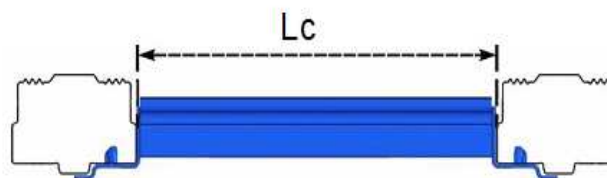


Fig. 8.1

8.2. SUPERBO 4-5-6-7 HAND PICKING BEAM LOAD BEARING CAPACITIES

Picking beams are dedicated beams exclusively for manual picking operations. The load bearing capacities shown in Tab. 8.1 refer to pairs of beams accessorized with Metalsistem H25, H29 or H58 shelving panels.

BEAM PAIR LOAD BEARING CAPACITIES [daN] – RIVETED GALVANIZED		
- Beams assembled with CP210030.95 code safety pins; - uniformly distributed load; - Maximum deflection: 1/200 of "Lc"		
		
Beam Safety Pin CP210030.95		
Beam Length		106/22 daN/pair
	1500	2000
	1800	1950
	2000	1750
	2100	1650
	2200	1600
	2300	1500
	2400	1450
	2700	1250
	2800	1150
	3000	900
	3300	700

Tab. 8.1

Note: These load bearing capacities follow indications of UNI EN 15512

SUPERBO 4-5-6-7

8.3. SUPERBO 4-5-6-7 PALLET RACKING BEAM LOAD BEARING CAPACITIES

		LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS WITH RIVETED CONNECTORS - Beams assembled with CP210030.95 code safety pins; - uniformly distributed load; - maximum deflection: 1/200 of the beam length "Lc"									
Profile Version	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6
Maximum Unit Load	400 daN Unit Load	1100 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load	1050 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load
Lc Beam length [mm]	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair
1500	2000	3500	4000	4500	5000	5500	3500	4000	4500	5000	5500
1800	1950	3500	4000	4500	4950	5500	3500	4000	4500	5000	5500
2000	1750	3500	3650	4100	4500	5350	3500	4000	4500	5000	5500
2100	1700	3300	3500	3900	4250	5100	3500	4000	4500	5000	5500
2200	1600	3000	3350	3750	4100	4850	3500	4000	4500	5000	5500
2300	1550	2800	3200	3550	3900	4600	3500	4000	4500	5000	5500
2400	1500	2600	2950	3300	3650	4250	3500	4000	4500	5000	5500
2700	1250	2100	2400	2700	3000	3400	3400	3800	4200	4700	5500
2800	-	1950	2150	2350	2600	3100	3200	3750	4200	4600	5400
3000	-	1350	1850	2050	2300	2700	2800	3450	3800	4250	5000
3300	-	1150	1550	1700	1900	2250	2250	2850	3150	3500	4200
3500	-	-	1350	1500	1650	1950	2000	2450	2750	3050	3600
3600	-	-	1300	1400	1550	1850	-	2350	2600	2900	3400
4000	-	-	1050	1150	1250	1500	-	1900	2100	2350	2800

Tab. 8.2

Note : These load bearing capacities follow indications of UNI EN 15512

 = MANDATORY USE OF DIAGONAL STRUTS

Maximum load per beam level frame limit:

Superbo 4 = 4 000 daN
Superbo 5 = 5 000 daN

SUPERBO 4-5-6-7



LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS WITH WELDED CONNECTORS

- Beams assembled with **SPACC003.95** code safety pins
 - and uniformly distributed load;
- maximum deflection: 1/200 of the beam length "Lc"



Beam Safety Pin
SPACC003.95

Profile Version	70/4	70/5	106/4	106/44	106/5	106/6	140/4	140/44	140/5	140/6	172/5	172/6
Maximum Unit Load	1200 daN Unit Load	1500 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load	1350 daN Unit Load	1800 daN Unit Load
Lc Beam length [mm]	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair
1500	3000	3650	4000	4500	5000	5500	4000	4500	5000	5500	4500	5500
1800	2150	2600	4000	4500	5000	5500	4000	4500	5000	5500	4500	5500
2000	1750	2150	3750	4150	4550	5400	4000	4500	5000	5500	4500	5500
2100	1600	1950	3600	3950	4350	5150	4000	4500	5000	5500	4500	5500
2200	1500	1800	3450	3800	4150	4950	4000	4500	5000	5500	4500	5500
2300	1350	1650	3300	3650	4000	4650	4000	4500	5000	5500	4500	5500
2400	1250	1500	3050	3350	3700	4300	4000	4500	5000	5500	4500	5500
2700	1000	1200	2400	2700	3000	3400	3950	4400	4850	5500	4500	5500
2800	900	1100	2200	2450	2700	3150	3800	4250	4650	5450	4500	5500
3000	-	-	1950	2150	2350	2800	3450	3850	4300	5000	4500	5500
3300	-	-	1600	1800	1950	2300	2900	3250	3600	4250	4500	5500
3500	-	-	1400	1550	1700	2000	2550	2800	3100	3650	4400	5200
3600	-	-	1350	1450	1600	1900	2400	2650	2950	3450	4200	5000
4000	-	-	1100	1200	1300	1550	1950	2150	2400	2850	3600	4200

Tab. 8.3

Note : These load bearing capacities follow indications of UNI EN 15512

 = MANDATORY USE OF DIAGONAL STRUTS

Maximum load per beam level frame limit:

Superbo 4 = 4 000 daN
Superbo 5 = 5 000 daN

9. PALLET RACKING FRAME LOAD BEARING CAPACITIES

9.1. LOAD BEARING CAPACITY TABLE NOTES FOR USE

A set of 16 tables has been developed for the dimensioning of the frame load bearing capacities. These tables are divided by frame series and beam type as follows:

A-1	SUPERBO 4 / 106 RIVETED BEAM	B-1	SUPERBO 5 / 106 RIVETED BEAM
A-2	SUPERBO 4 / 140 RIVETED BEAM	B-2	SUPERBO 5 / 140 RIVETED BEAM
A-3	SUPERBO 4 / 70-106 WELDED BEAM	B-3	SUPERBO 5 / 70-106 WELDED BEAM
A-4	SUPERBO 4 / 140-172 WELDED BEAM	B-4	SUPERBO 5 / 140-172 WELDED BEAM
C-1	SUPERBO 6 / 106 RIVETED BEAM	D-1	SUPERBO 7 / 106 RIVETED BEAM
C-2	SUPERBO 6 / 140 RIVETED BEAM	D-2	SUPERBO 7 / 140 RIVETED BEAM
C-3	SUPERBO 6 / 70-106 WELDED BEAM	D-3	SUPERBO 7 / 70-106 WELDED BEAM
C-4	SUPERBO 6 / 140-172 WELDED BEAM	D-4	SUPERBO 7 / 140-172 WELDED BEAM

The range of frame load bearing capacity tables enable the user to optimize the pallet racking technical solution to the requirements of the project.

Every table is divided into 5 blocks of columns showing frame load bearing capacities as a function of the first beam level from ground. The first 3 blocks of 4 columns show unbraced bay frame load bearing capacities as a function of 6000mm, 8000mm and 10000mm frame heights each in turn divided into 4 sub-columns based on beam length. The following 2 blocks of 2 sub-columns show the frame load bearing capacities for partially braced and fully braced row configuration using the bracing tower system as defined in Section 6 of this manual. In these columns the symbols S and D correspond to:

S = Singled sided row
D = Double sided row set

The columns referring to partially and fully braced bays show the frame load bearing capacities to the left with the corresponding bracing tower performance to the right. If we take, for example, table C-1 we note a frame load bearing capacity of 11850 daN corresponding to the symbol 10S/8D for a first loading level of 2400mm under the partially braced columns. This means that a Superbo 6 pallet racking frame, in loading conditions as defined in this manual, has the tabled load bearing capacity if 1 bracing tower is included in every 10 consecutive bays for single side rows or every 8 consecutive sets of double side rows.

Note: The bracing tower is considered to be part of the row, not an extension to it. In the single side example above this means that one of the ten bays in the row will have a bracing tower positioned behind it.

SUPERBO 4-5-6-7**9.2.****LOAD BEARING CAPACITY TABLE CONDITIONS OF USE**

A series of assumptions have been made in order to develop the frame load bearing capacity tables. These assumptions must be respected in order to ensure that the tabled frame load bearing capacities are applicable to the pallet racking installation under examination.

The tabled load bearing capacities have been provided with the following assumptions:

1. Unbraced rows: minimum of 2 beam levels with at least 3 bays or minimum of 3 beams levels with at least 2 bays, in conformity with point C (braced rows with only one level and/or one bay are allowed);
2. compliance with all conditions of use noted under the load bearing capacity tables;
3. full compliance with all points of Section 1;
4. all beam levels apply the same beam section;
5. equal load placed on all beam levels;
6. all beam levels above the first, set at a pitch equal to or less than the first beam level height from ground;
7. both frame uprights are loaded equally. If the frame uprights are not equally loaded the frame load bearing capacity will be determined by doubling the highest loaded upright;
8. maximum installation height of 10 meters;
9. Frame base anchored with at least 2 anchor bolts;
10. frame base to height ratio in conformity with the indications of paragraph 4.4;
11. class 300 or 400 pallet racking installation as defined by the UNI EN 15620 standards;
12. absence of forces such as wind, vibration, impact, seismic action and other forces not related to the standard conditions of static storage.

Apply the following modifications to the standard configurations and tables in non standard conditions:

- A. **Unbraced configurations of 2 bays containing only 2 beam levels:**
 - apply a 20% reduction in the tabled frame load bearing capacities.
- B. **Unbraced configurations of only 1 bay:**
 - minimum of 3 levels, apply a 50% reduction in the tabled frame load bearing capacities;
 - maximum ground to first beam height as specified in the footnotes under the load bearing capacity tables;
- C. **Unbraced configurations of less than 4 bays:**
 - apply horizontal bracing to a beam pair at the highest beam level;
- D. **Beam on ground:**
 - refer to paragraph 9.4 for load bearing capacity calculations.

Contact the Metalsistem Technical Office if doubts arise for the application of the frame load bearing capacity tables.

9.3.

PALLET RACKING ROWS USING CROSS BRACING ALTERNATIVE

Paragraph 9.1 describes the application of bracing towers, subject of paragraph 6.3, and their impact of the frame load bearing capacity tables. As an alternative cross bracing, as described in Paragraphs 6.4 to 6.9, with 42x3 vertical bracing stirrups, may also be used however these are less efficient therefore the load bearing capacity tables may be used with cross bracing only if:

1. reference is made only to the partially braced column of the frame load bearing capacity tables;
2. the presence of braced bays in a row are doubled (or in other words, the performance of the bracing system is halved);
3. braced bays, containing both vertical and horizontal cross bracing, arriving at all beam levels.

In the example used to explain the application of the bracing towers in Paragraph 9.1, table C-1 provided a load bearing capacity of 11850daN for a partially braced bay with a frequency of 10S/8D (or 1 bracing tower every 10 consecutive bays for single side rows or ever 8 double side rows). If the cross bracing alternative were to be employed the fully braced columns are immediately excluded from consideration. Therefore to obtain the partially braced load bearing capacity with cross bracing, the 10S/8D combination is halved to obtain 5S/4D, in other words, 1 cross braced bay every 5 consecutive bays for single side rows or ever 4 double side rows.

9.4.

BEAM ON GROUND APPLICATIONS

A beam on ground is defined as a pair of beams of any dimension installed at a height no greater than 500mm ($h \leq 500\text{mm}$) from ground. This is a non standard application that does not comply with the assumptions of paragraph 9.2. This configuration can be adopted providing the following conditions are satisfied.

CALCULATION PROCEDURE:

1. Use the applicable load bearing capacity table considering the sum of loads arriving at level 2 at height "H" from ground (sum of levels 2, 3, 4 and 5 in diagram). All the conditions of use valid for standard configurations must be satisfied in this load case;
2. Apply the same load bearing capacity table a second time with the sum of all loads acting on the frame at height 500mm from ground (levels 1, 2, 3, 4 and 5 in diagram);
3. The table that satisfies both load conditions 1 and 2 may be selected.

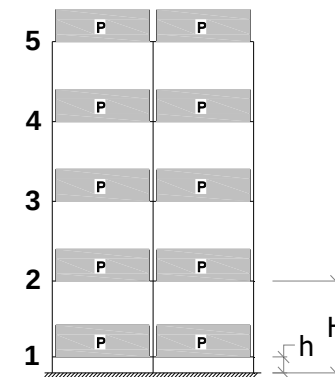


Fig. 9.1

9.5.

BASE PLATE CONSIDERATIONS

A single SUPERBO 4-5-6-7 upright places a load on ground equivalent to half of the frame load over an area of 90mm x 170mm.

SUPERBO 4-5-6-7

9.6. SUPERBO 4-5-6-7 LOAD BEARING CAPACITY TABLES

A-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBO 4 - RIVETED 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	600	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	10S / 8D	12200	10S / 8D
	700	12100	12100	12050	11850	11600	12050	12050	12050	11900	11550	12050	12000	12000	12000	11700	12200	10S / 8D	12200	10S / 8D
	800	11650	11600	11500	11250	10950	11650	11650	11650	11400	10900	11500	11400	11400	11350	10900	12050	10S / 8D	12050	10S / 8D
	900	11150	11100	10900	10650	10350	11050	11000	11000	10700	10100	10900	10800	10800	10700	10100	11950	10S / 8D	11950	10S / 8D
	1000	10700	10550	10300	10050	9700	10450	10350	10350	9950	9350	10350	10150	10150	10000	9350	11800	10S / 8D	11800	10S / 8D
	1100	10100	9950	9700	9500	9100	9850	9800	9750	9350	8800	9750	9550	9550	9350	8650	11600	10S / 8D	11600	10S / 8D
	1200	9550	9350	9050	8900	8550	9300	9200	9100	8750	8300	9200	8950	8900	8700	8050	11300	10S / 8D	11300	10S / 8D
	1300	9050	8850	8600	8500	8050	8750	8600	8500	8150	7750	8650	8450	8400	8200	7600	11000	10S / 9D	11000	10S / 9D
	1400	8500	8350	8100	8000	7600	8300	8200	8100	7700	7350	8100	7950	7900	7750	7200	10700	10S / 9D	10700	10S / 9D
	1500	8000	7850	7650	7550	7150	7900	7750	7650	7300	6950	7750	7600	7500	7350	6800	10500	10S / 9D	10500	10S / 9D
	1600	7650	7450	7300	7250	6800	7450	7300	7250	6900	6600	7350	7200	7100	6900	6400	10300	10S / 9D	10300	10S / 9D
	1700	7300	7100	6950	6900	6500	7100	6950	6900	6550	6250	7000	6850	6750	6550	6050	10200	10S / 9D	10200	10S / 9D
	1800	6950	6750	6600	6600	6150	6750	6600	6550	6200	5900	6650	6500	6400	6200	5700	10150	10S / 9D	10150	10S / 9D
	1900	6600	6400	6250	6250	5800	6400	6250	6200	5850	5600	6300	6150	6050	5800	5400	10050	10S / 9D	10050	10S / 9D
	2000	6250	6050	5900	5900	5500	6100	5900	5850	5500	5250	5950	5800	5700	5450	5050	9950	10S / 10D	9950	10S / 10D
	2100	5950	5750	5600	5600	5250	5800	5600	5550	5200	4950	5600	5500	5400	5150	4750	9700	10S / 10D	9700	10S / 10D
	2200	5650	5450	5300	5300	4950	5500	5300	5250	4950	4750	5300	5200	5100	4850	4500	9450	10S / 10D	9450	10S / 10D
	2300	5350	5150	5050	5050	4700	5200	5000	4950	4700	4450	5000	4900	4750	4600	4250	9200	10S / 10D	9200	10S / 10D
	2400	5050	4850	4750	4750	4400	4850	4700	4650	4400	4150	4650	4600	4450	4300	3950	8950	10S / 10D	8950	10S / 10D
	2500																8700	10S / 10D	8700	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 4 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

A-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 4 - RIVETED 140 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	600	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	10S / 8D	12200	10S / 8D
	700	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	10S / 8D	12200	10S / 8D
	800	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	10S / 8D	12050	10S / 8D
	900	11950	11900	11900	11750	11150	11950	11950	11950	11900	11350	11950	11850	11800	11800	11250	11950	10S / 8D	11950	10S / 8D
	1000	11550	11550	11500	11350	10600	11550	11450	11400	11350	10700	11500	11400	11350	11300	10700	11800	10S / 8D	11800	10S / 8D
	1100	11050	11000	11000	10750	10050	11000	10900	10900	10800	10150	10950	10850	10800	10750	10150	11600	10S / 8D	11600	10S / 8D
	1200	10550	10500	10450	10200	9500	10500	10400	10350	10250	9600	10450	10300	10300	10200	9600	11300	10S / 8D	11300	10S / 8D
	1300	10050	10000	9900	9650	9000	9950	9850	9850	9700	9050	9900	9800	9750	9650	9100	11000	10S / 9D	11000	10S / 9D
	1400	9550	9450	9400	9100	8550	9450	9350	9300	9150	8550	9350	9250	9200	9100	8550	10700	10S / 9D	10700	10S / 9D
	1500	9050	8950	8900	8600	8050	8950	8850	8800	8650	8100	8850	8750	8700	8600	8100	10500	10S / 9D	10500	10S / 9D
	1600	8600	8550	8450	8200	7650	8450	8300	8300	8150	7600	8350	8250	8200	8100	7600	10300	10S / 9D	10300	10S / 9D
	1700	8150	8100	8050	7800	7350	8000	7950	7900	7750	7250	7950	7850	7800	7700	7250	10200	10S / 9D	10200	10S / 9D
	1800	7750	7700	7600	7400	6950	7600	7550	7500	7400	6900	7550	7500	7450	7350	6900	10150	10S / 9D	10150	10S / 9D
	1900	7300	7250	7200	7000	6600	7200	7150	7100	7000	6550	7150	7100	7050	6950	6550	10050	10S / 9D	10050	10S / 9D
	2000	6900	6850	6800	6600	6200	6800	6750	6700	6600	6200	6750	6700	6650	6600	6200	9950	10S / 10D	9950	10S / 10D
	2100	6600	6550	6500	6300	5950	6500	6450	6450	6350	5900	6450	6400	6350	6300	5900	9700	10S / 10D	9700	10S / 10D
	2200	6300	6250	6200	6050	5700	6250	6150	6150	6050	5650	6150	6100	6050	6000	5650	9450	10S / 10D	9450	10S / 10D
	2300	6000	5950	5900	5750	5400	5950	5900	5850	5750	5400	5850	5800	5750	5700	5350	9200	10S / 10D	9200	10S / 10D
	2400	5700	5650	5600	5450	5100	5650	5600	5550	5450	5100	5550	5500	5450	5400	5050	8950	10S / 10D	8950	10S / 10D
	2500																8700	10S / 10D	8700	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 4 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

A-3

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 4 - WELDED 70 and 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	600	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	10S / 8D	12200	10S / 8D
	700	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	10S / 8D	12200	10S / 8D
	800	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	10S / 8D	12050	10S / 8D
	900	11950	11950	11800	11700	11200	11950	11950	11950	11800	11350	11950	11950	11950	11800	11200	11950	10S / 8D	11950	10S / 8D
	1000	11750	11550	11350	11250	10650	11600	11600	11500	11200	10700	11500	11500	11500	11350	10600	11800	10S / 8D	11800	10S / 8D
	1100	11250	11000	10750	10750	10050	11100	11050	10950	10650	10250	11000	11000	10950	10750	10050	11600	10S / 8D	11600	10S / 8D
	1200	10750	10450	10200	10250	9500	10600	10500	10400	10150	9700	10500	10500	10400	10100	9500	11300	10S / 8D	11300	10S / 8D
	1300	10200	9900	9600	9700	8950	10100	10000	9800	9600	9250	9950	9950	9900	9550	8950	11000	10S / 9D	11000	10S / 9D
	1400	9700	9350	9050	9150	8450	9600	9450	9300	9050	8700	9400	9400	9350	9000	8450	10700	10S / 9D	10700	10S / 9D
	1500	9200	8850	8500	8600	7900	9100	8950	8800	8550	8250	8900	8900	8800	8450	8000	10500	10S / 9D	10500	10S / 9D
	1600	8750	8400	8150	8200	7550	8550	8450	8250	8050	7750	8400	8400	8300	7950	7600	10300	10S / 9D	10300	10S / 9D
	1700	8300	8000	7750	7800	7200	8150	8000	7850	7650	7400	8000	8000	7900	7600	7200	10200	10S / 9D	10200	10S / 9D
	1800	7850	7600	7400	7400	6800	7750	7600	7450	7300	7000	7600	7600	7500	7250	6800	10150	10S / 9D	10150	10S / 9D
	1900	7450	7150	7000	7000	6450	7300	7200	7100	6900	6650	7150	7150	7100	6850	6500	10050	10S / 9D	10050	10S / 9D
	2000	7000	6750	6650	6600	6100	6900	6800	6700	6550	6300	6750	6750	6700	6500	6100	9950	10S / 10D	9950	10S / 10D
	2100	6700	6450	6350	6350	5800	6600	6500	6400	6250	6000	6450	6450	6400	6200	5800	9700	10S / 10D	9700	10S / 10D
	2200	6350	6200	6100	6050	5600	6300	6200	6100	5950	5700	6150	6150	6100	5900	5550	9450	10S / 10D	9450	10S / 10D
	2300	6050	5900	5800	5750	5300	6000	5950	5850	5650	5450	5850	5850	5800	5600	5250	9200	10S / 10D	9200	10S / 10D
	2400	5750	5650	5550	5450	5050	5700	5650	5550	5350	5100	5500	5500	5500	5300	5000	8950	10S / 10D	8950	10S / 10D
	2500																8700	10S / 10D	8700	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 4 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

A-4

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 4 - WELDED 140 and 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	10S / 8D	12200	10S / 8D
	600	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	12200	12200	12200	12050	12200	10S / 8D	12200	10S / 8D
	700	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	12200	12200	12200	11950	12200	10S / 8D	12200	10S / 8D
	800	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	12050	12050	12050	11650	12050	10S / 8D	12050	10S / 8D
	900	11950	11950	11950	11950	11450	11900	11900	11900	11900	11450	11700	11700	11700	11700	11450	11950	10S / 8D	11950	10S / 8D
	1000	11650	11650	11650	11650	11000	11400	11400	11400	11400	11150	11250	11250	11250	11250	11200	11800	10S / 8D	11800	10S / 8D
	1100	11150	11150	11150	11150	10450	10900	10900	10900	10900	10650	10750	10750	10750	10750	10650	11600	10S / 8D	11600	10S / 8D
	1200	10700	10700	10700	10650	9850	10400	10400	10400	10400	10150	10250	10250	10250	10250	10200	11300	10S / 8D	11300	10S / 8D
	1300	10200	10200	10200	10100	9400	9950	9950	9950	9950	9600	9750	9750	9750	9750	9700	11000	10S / 9D	11000	10S / 9D
	1400	9750	9750	9750	9550	8900	9450	9450	9450	9450	9150	9200	9200	9200	9200	9200	10700	10S / 9D	10700	10S / 9D
	1500	9250	9250	9250	9050	8500	8950	8950	8950	8950	8600	8750	8750	8750	8750	8700	10500	10S / 9D	10500	10S / 9D
	1600	8800	8800	8800	8600	8050	8450	8450	8450	8450	8150	8250	8250	8250	8250	8250	10300	10S / 9D	10300	10S / 9D
	1700	8350	8350	8350	8150	7650	8050	8050	8050	8050	7700	7850	7850	7850	7850	7800	10200	10S / 9D	10200	10S / 9D
	1800	7900	7900	7900	7750	7250	7600	7600	7600	7600	7350	7450	7450	7450	7450	7400	10150	10S / 9D	10150	10S / 9D
	1900	7450	7450	7450	7300	6850	7200	7200	7200	7200	6900	7100	7100	7100	7100	7000	10050	10S / 9D	10050	10S / 9D
	2000	7000	7000	7000	6900	6450	6800	6800	6800	6800	6550	6700	6700	6700	6700	6600	9950	10S / 10D	9950	10S / 10D
	2100	6700	6700	6700	6600	6200	6550	6550	6550	6550	6250	6400	6400	6400	6400	6300	9700	10S / 10D	9700	10S / 10D
	2200	6400	6400	6400	6350	5900	6250	6250	6250	6250	5950	6100	6100	6100	6100	5950	9450	10S / 10D	9450	10S / 10D
	2300	6050	6050	6050	6050	5700	5950	5950	5950	5950	5700	5750	5750	5750	5750	5700	9200	10S / 10D	9200	10S / 10D
	2400	5750	5750	5750	5750	5450	5650	5650	5650	5650	5450	5450	5450	5450	5450	5400	8950	10S / 10D	8950	10S / 10D
	2500																8700	10S / 10D	8700	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 4 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

B-1

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 5 - RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	10S / 7D	13950	10S / 7D
	600	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	10S / 7D	13950	10S / 7D
	700	13800	13800	13600	13400	13150	13650	13650	13650	13300	12900	13650	13600	13600	13500	13050	13950	10S / 7D	13950	10S / 7D
	800	13200	13050	12800	12650	12250	13150	13100	13050	12600	12050	12950	12800	12800	12600	12000	13800	10S / 7D	13800	10S / 7D
	900	12600	12350	12050	11850	11400	12350	12300	12200	11650	11150	12200	12000	11950	11750	11000	13650	10S / 7D	13650	10S / 7D
	1000	11950	11650	11250	11100	10550	11600	11500	11350	10750	10250	11500	11200	11100	10850	10050	13500	10S / 7D	13500	10S / 7D
	1100	11250	10900	10550	10450	9900	10950	10800	10650	10150	9700	10800	10500	10400	10150	9500	13250	10S / 7D	13250	10S / 7D
	1200	10550	10150	9800	9800	9200	10300	10150	10000	9550	9150	10050	9750	9700	9450	8900	13000	10S / 7D	13000	10S / 7D
	1300	10000	9650	9300	9300	8700	9600	9450	9300	9000	8550	9550	9300	9150	8900	8350	12650	10S / 7D	12650	10S / 7D
	1400	9450	9100	8800	8800	8250	9150	8950	8800	8500	8100	9050	8800	8600	8350	7800	12300	10S / 8D	12300	10S / 8D
	1500	8900	8600	8300	8300	7750	8700	8450	8350	8000	7650	8550	8350	8150	7850	7400	12100	10S / 8D	12100	10S / 8D
	1600	8500	8200	7900	7900	7400	8250	7950	7850	7550	7200	8100	7850	7700	7350	6900	11900	10S / 8D	11900	10S / 8D
	1700	8100	7800	7500	7500	7000	7850	7550	7400	7100	6800	7650	7450	7300	6950	6500	11800	10S / 8D	11800	10S / 8D
	1800	7700	7350	7050	7050	6650	7450	7150	7000	6700	6450	7250	7050	6900	6550	6050	11650	10S / 8D	11650	10S / 8D
	1900	7300	6950	6650	6650	6250	7100	6750	6600	6300	6000	6800	6650	6500	6100	5650	11550	10S / 8D	11550	10S / 8D
	2000	6900	6550	6250	6250	5800	6700	6350	6150	5900	5650	6400	6250	6050	5700	5200	11450	10S / 8D	11450	10S / 8D
	2100	6550	6250	5950	5950	5550	6350	6050	5850	5600	5350	6050	5900	5750	5400	4900	11150	10S / 8D	11150	10S / 8D
	2200	6200	5900	5650	5650	5250	6000	5700	5550	5300	5000	5700	5550	5400	5100	4700	10850	10S / 9D	10850	10S / 9D
	2300	5850	5600	5350	5350	4950	5650	5400	5250	5000	4750	5350	5200	5100	4800	4400	10600	10S / 9D	10600	10S / 9D
	2400	5500	5300	5050	5050	4700	5300	5050	4950	4700	4400	5000	4900	4800	4500	4150	10300	10S / 9D	10300	10S / 9D
	2500	5150	4950	4800	4800	4400	4950	4750	4600	4400	4100	4650	4550	4450	4250	3850	9750	10S / 10D	10000	10S / 10D
	2600																9650	10S / 10D	9800	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 5 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

B-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 5 - RIVETED 140 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	10S / 7D	13950	10S / 7D
	600	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	10S / 7D	13950	10S / 7D
	700	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	10S / 7D	13950	10S / 7D
	800	13800	13800	13800	13800	13250	13800	13800	13800	13800	13350	13800	13800	13800	13800	13350	13800	10S / 7D	13800	10S / 7D
	900	13650	13600	13550	13300	12550	13650	13600	13600	13500	12850	13600	13500	13450	13400	12750	13650	10S / 7D	13650	10S / 7D
	1000	13200	13100	13050	12700	11800	13100	13000	12950	12800	12000	13050	12900	12850	12800	12050	13500	10S / 7D	13500	10S / 7D
	1100	12550	12500	12400	12000	11200	12450	12350	12300	12100	11350	12400	12250	12200	12100	11400	13250	10S / 7D	13250	10S / 7D
	1200	11950	11850	11700	11300	10600	11850	11700	11650	11450	10650	11750	11600	11550	11400	10700	13000	10S / 7D	13000	10S / 7D
	1300	11350	11250	11100	10650	10000	11200	11100	11000	10750	10000	11150	11000	10900	10750	10100	12650	10S / 7D	12650	10S / 7D
	1400	10750	10600	10500	10050	9450	10650	10500	10400	10150	9500	10500	10350	10250	10100	9450	12300	10S / 8D	12300	10S / 8D
	1500	10150	10000	9850	9400	8800	10050	9900	9800	9600	8950	9950	9800	9700	9550	8950	12100	10S / 8D	12100	10S / 8D
	1600	9700	9550	9400	9000	8450	9450	9300	9200	9000	8450	9350	9200	9100	9000	8450	11900	10S / 8D	11900	10S / 8D
	1700	9200	9100	8950	8550	8050	9000	8850	8800	8600	8000	8900	8800	8700	8550	8050	11800	10S / 8D	11800	10S / 8D
	1800	8750	8650	8500	8150	7700	8550	8450	8350	8200	7600	8500	8350	8300	8150	7600	11650	10S / 8D	11650	10S / 8D
	1900	8300	8150	8050	7750	7350	8150	8000	7950	7750	7250	8050	7950	7850	7750	7250	11550	10S / 8D	11550	10S / 8D
	2000	7800	7700	7600	7300	6950	7700	7600	7550	7350	6850	7600	7500	7450	7300	6850	11450	10S / 8D	11450	10S / 8D
	2100	7450	7350	7300	7000	6650	7350	7250	7200	7000	6550	7250	7150	7100	6950	6550	11150	10S / 8D	11150	10S / 8D
	2200	7100	7000	6950	6650	6350	7000	6900	6850	6700	6200	6900	6850	6750	6600	6200	10850	10S / 9D	10850	10S / 9D
	2300	6750	6650	6600	6350	6000	6700	6550	6500	6350	5850	6550	6500	6400	6250	5850	10600	10S / 9D	10600	10S / 9D
	2400	6400	6350	6250	6000	5700	6350	6250	6150	6000	5600	6200	6150	6050	5900	5550	10300	10S / 9D	10300	10S / 9D
	2500	6050	6000	5900	5700	5400	6000	5900	5800	5650	5250	5850	5800	5700	5550	5200	10000	10S / 10D	10000	10S / 10D
	2600																9800	10S / 10D	9800	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 5 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

B-3

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 5 - WELDED 70 and 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	10S / 7D	13950	10S / 7D
	600	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	10S / 7D	13950	10S / 7D
	700	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	10S / 7D	13950	10S / 7D
	800	13800	13800	13800	13800	13250	13800	13800	13800	13800	13350	13800	13800	13800	13800	13350	13800	10S / 7D	13800	10S / 7D
	900	13650	13550	13250	13300	12500	13650	13650	13650	13350	12950	13650	13650	13600	13300	12650	13650	10S / 7D	13650	10S / 7D
	1000	13400	13000	12650	12750	11750	13250	13150	12950	12650	12200	13100	13100	13050	12650	11900	13500	10S / 7D	13500	10S / 7D
	1100	12800	12300	12000	12000	11050	12650	12500	12250	12000	11450	12500	12450	12350	11900	11250	13250	10S / 7D	13250	10S / 7D
	1200	12150	11600	11350	11300	10350	12050	11800	11550	11300	10800	11900	11800	11650	11100	10600	13000	10S / 7D	13000	10S / 7D
	1300	11550	10950	10700	10650	9750	11450	11150	10850	10650	10100	11250	11150	11000	10550	10050	12650	10S / 7D	12650	10S / 7D
	1400	10950	10300	10050	10000	9200	10850	10550	10250	10100	9550	10600	10550	10350	9950	9500	12300	10S / 8D	12300	10S / 8D
	1500	10350	9650	9400	9350	8550	10250	9950	9650	9500	9050	10000	9950	9750	9400	8950	12100	10S / 8D	12100	10S / 8D
	1600	9850	9250	9000	8950	8200	9650	9350	9050	8950	8500	9450	9350	9150	8850	8450	11900	10S / 8D	11900	10S / 8D
	1700	9350	8800	8600	8550	7800	9150	8900	8650	8500	8100	9000	8900	8750	8450	8050	11800	10S / 8D	11800	10S / 8D
	1800	8900	8350	8250	8100	7450	8700	8450	8250	8100	7700	8550	8450	8300	8050	7650	11650	10S / 8D	11650	10S / 8D
	1900	8400	7900	7850	7700	7050	8250	8050	7800	7700	7300	8100	8000	7900	7600	7250	11550	10S / 8D	11550	10S / 8D
	2000	7900	7450	7450	7250	6650	7800	7600	7400	7250	6900	7600	7600	7450	7200	6850	11450	10S / 8D	11450	10S / 8D
	2100	7550	7150	7100	6950	6350	7450	7250	7050	6950	6600	7250	7250	7100	6850	6550	11150	10S / 8D	11150	10S / 8D
	2200	7200	6850	6800	6600	6050	7100	6900	6750	6600	6300	6900	6900	6750	6500	6150	10850	10S / 9D	10850	10S / 9D
	2300	6850	6500	6450	6250	5750	6750	6600	6400	6250	5950	6550	6550	6450	6100	5800	10600	10S / 9D	10600	10S / 9D
	2400	6450	6200	6150	5950	5500	6450	6250	6050	5900	5700	6200	6200	6100	5750	5500	10300	10S / 9D	10300	10S / 9D
	2500	6100	5900	5800	5600	5200	6100	5900	5750	5550	5350	5850	5850	5750	5400	5150	10000	10S / 10D	10000	10S / 10D
	2600																9800	10S / 10D	9800	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 5 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

B-4

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 5 - WELDED 140 and 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	13950	10S / 7D	13950	10S / 7D
	600	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	13950	13950	13950	13800	13950	10S / 7D	13950	10S / 7D
	700	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	13950	13950	13950	13650	13950	10S / 7D	13950	10S / 7D
	800	13800	13800	13800	13800	13350	13800	13800	13800	13800	13350	13800	13800	13800	13800	13350	13800	10S / 7D	13800	10S / 7D
	900	13650	13650	13650	13650	13100	13600	13600	13600	13600	13100	13350	13350	13350	13350	13100	13650	10S / 7D	13650	10S / 7D
	1000	13400	13400	13400	13250	12400	13050	13050	13050	13050	12650	12800	12800	12800	12800	12750	13500	10S / 7D	13500	10S / 7D
	1100	12850	12850	12850	12550	11750	12450	12450	12450	12450	12000	12250	12250	12250	12250	12150	13250	10S / 7D	13250	10S / 7D
	1200	12300	12300	12300	11850	11100	11900	11900	11900	11900	11350	11650	11650	11650	11650	11500	13000	10S / 7D	13000	10S / 7D
	1300	11750	11750	11750	11200	10500	11300	11300	11300	11300	10650	11050	11050	11050	11050	10900	12650	10S / 7D	12650	10S / 7D
	1400	11150	11150	11150	10550	10000	10750	10750	10750	10750	10100	10400	10400	10400	10400	10300	12300	10S / 8D	12300	10S / 8D
	1500	10600	10600	10550	9900	9500	10150	10150	10150	10150	9500	9850	9850	9850	9850	9700	12100	10S / 8D	12100	10S / 8D
	1600	10100	10100	10050	9450	9000	9550	9550	9550	9550	8950	9300	9300	9300	9300	9150	11900	10S / 8D	11900	10S / 8D
	1700	9600	9600	9550	9000	8550	9100	9100	9100	9100	8550	8850	8850	8850	8850	8700	11800	10S / 8D	11800	10S / 8D
	1800	9050	9050	9050	8550	8150	8650	8650	8650	8650	8100	8450	8450	8450	8450	8250	11650	10S / 8D	11650	10S / 8D
	1900	8550	8550	8550	8100	7700	8200	8200	8200	8200	7650	8000	8000	8000	8000	7800	11550	10S / 8D	11550	10S / 8D
	2000	8050	8050	8000	7650	7250	7800	7800	7800	7800	7250	7600	7600	7600	7600	7400	11450	10S / 8D	11450	10S / 8D
	2100	7700	7700	7650	7350	6950	7450	7450	7450	7450	6950	7250	7250	7250	7250	7050	11150	10S / 8D	11150	10S / 8D
	2200	7300	7300	7300	7000	6650	7100	7100	7100	7100	6650	6900	6900	6900	6900	6700	10850	10S / 9D	10850	10S / 9D
	2300	6950	6950	6950	6700	6350	6750	6750	6750	6750	6350	6550	6550	6550	6550	6400	10600	10S / 9D	10600	10S / 9D
	2400	6550	6550	6550	6400	6050	6400	6400	6400	6400	6000	6200	6200	6200	6200	6050	10300	10S / 9D	10300	10S / 9D
	2500	6200	6200	6200	6100	5750	6050	6050	6050	6050	5700	5850	5850	5850	5850	5700	10000	10S / 10D	10000	10S / 10D
	2600																9800	10S / 10D	9800	10S / 10D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum load per pair of beams applicable to Superbo 5 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

C-1

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 6 - RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	10S / 5D	16800	10S / 5D
	600	16750	16750	16750	16650	16550	16750	16750	16750	16500	16200	16750	16750	16750	16600	16150	16750	10S / 5D	16750	10S / 5D
	700	16550	16250	15850	15700	15450	16150	16100	15900	15400	15100	16150	15900	15900	15500	14800	16750	10S / 5D	16750	10S / 5D
	800	15650	15200	14750	14700	14200	15350	15200	14950	14300	14000	15100	14800	14750	14350	13650	16550	10S / 6D	16550	10S / 6D
	900	14750	14150	13650	13650	13000	14300	14050	13750	13250	12800	14100	13650	13600	13200	12450	16350	10S / 6D	16350	10S / 6D
	1000	13850	13100	12500	12500	11750	13300	12950	12600	12150	11600	13050	12550	12450	12050	11350	16150	10S / 6D	16150	10S / 6D
	1100	12950	12300	11900	11900	11100	12550	12200	11900	11500	11050	12300	11900	11700	11250	10550	15950	10S / 6D	15950	10S / 6D
	1200	12050	11500	11300	11300	10400	11850	11450	11150	10800	10450	11550	11200	10950	10450	9750	15700	10S / 6D	15700	10S / 6D
	1300	11450	10900	10650	10650	9750	11150	10700	10450	10100	9800	10900	10550	10250	9750	9150	15350	10S / 6D	15400	10S / 6D
	1400	10850	10250	10050	10050	9200	10600	10100	9800	9500	9250	10200	9900	9600	9050	8500	14950	10S / 6D	15050	10S / 6D
	1500	10250	9650	9400	9400	8550	10000	9500	9200	8900	8650	9650	9300	9050	8500	8050	14700	10S / 6D	14800	10S / 6D
	1600	9750	9150	8900	8900	8150	9450	8900	8600	8300	8100	9100	8750	8500	7950	7600	14500	10S / 6D	14550	10S / 6D
	1700	9300	8650	8450	8450	7650	8950	8400	8150	7850	7650	8600	8300	8000	7500	7100	14450	10S / 6D	14450	10S / 6D
	1800	8800	8150	7950	7950	7200	8450	7950	7650	7350	7200	8100	7800	7550	7050	6650	14300	10S / 6D	14300	10S / 6D
	1900	8300	7650	7450	7450	6700	7950	7500	7200	6900	6750	7600	7300	7100	6600	6150	14150	10S / 7D	14150	10S / 7D
	2000	7800	7150	6950	6950	6300	7450	7050	6750	6450	6350	7100	6800	6650	6150	5700	14050	10S / 7D	14050	10S / 7D
	2100	7400	6800	6650	6650	5950	7050	6650	6400	6150	5950	6700	6450	6250	5850	5400	13700	10S / 7D	13700	10S / 7D
	2200	7000	6500	6300	6300	5700	6700	6300	6050	5800	5650	6350	6050	5900	5550	5050	13350	10S / 7D	13350	10S / 7D
	2300	6650	6150	6000	5950	5350	6300	5950	5750	5450	5300	5950	5700	5550	5200	4750	12750	10S / 7D	13000	10S / 7D
	2400	6250	5800	5650	5600	5050	5900	5600	5400	5150	4900	5550	5350	5200	4900	4450	11850	10S / 8D	12600	10S / 7D
	2500	5850	5450	5350	5250	4750	5550	5250	5050	4800	4600	5200	5000	4850	4550	4150	10950	10S / 9D	12250	10S / 8D
	2600	5450	5150	5000	4900	4450	5150	4900	4700	4450	4250	4900	4750	4600	4350	3950	11000	10S / 9D	11950	10S / 8D
	2700																11050	10S / 9D	11650	10S / 8D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

C-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 6 - RIVETED 140 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	10S / 5D	16800	10S / 5D
	600	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	10S / 5D	16750	10S / 5D
	700	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	10S / 5D	16750	10S / 5D
	800	16550	16550	16550	16400	15850	16550	16550	16550	16550	16050	16550	16550	16550	16550	16050	16550	10S / 6D	16550	10S / 6D
	900	16350	16250	16050	15500	14900	16350	16250	16150	15850	14950	16250	16050	15950	15800	15000	16350	10S / 6D	16350	10S / 6D
	1000	15750	15550	15300	14650	13950	15550	15400	15250	14900	13850	15450	15250	15150	14900	13950	16150	10S / 6D	16150	10S / 6D
	1100	14950	14700	14450	13700	13100	14750	14550	14400	14000	13000	14600	14400	14250	14000	13100	15950	10S / 6D	15950	10S / 6D
	1200	14150	13850	13600	12800	12200	13950	13700	13550	13100	12150	13800	13550	13400	13050	12200	15700	10S / 6D	15700	10S / 6D
	1300	13400	13100	12850	12200	11600	13200	12900	12700	12200	11300	13000	12750	12600	12300	11450	15350	10S / 6D	15400	10S / 6D
	1400	12700	12350	12150	11600	11050	12500	12250	12100	11600	10700	12250	12000	11800	11550	10800	14950	10S / 6D	15050	10S / 6D
	1500	11950	11600	11400	11000	10450	11800	11600	11450	11000	10200	11650	11400	11250	11000	10250	14700	10S / 6D	14800	10S / 6D
	1600	11450	11100	10900	10500	10000	11150	10950	10800	10400	9600	11050	10850	10700	10400	9650	14500	10S / 6D	14550	10S / 6D
	1700	10950	10650	10400	10000	9500	10650	10450	10300	9900	9150	10500	10350	10200	9900	9200	14450	10S / 6D	14450	10S / 6D
	1800	10400	10150	9900	9500	9050	10150	9950	9800	9400	8700	10000	9850	9700	9400	8700	14300	10S / 6D	14300	10S / 6D
	1900	9900	9650	9400	9000	8550	9650	9450	9300	8900	8250	9500	9350	9200	8900	8250	14150	10S / 7D	14150	10S / 7D
	2000	9400	9150	8850	8500	8100	9150	8950	8800	8450	7750	9000	8800	8700	8400	7750	14050	10S / 7D	14050	10S / 7D
	2100	8950	8750	8500	8100	7700	8750	8550	8400	8050	7400	8550	8400	8300	8000	7400	13700	10S / 7D	13700	10S / 7D
	2200	8550	8350	8100	7750	7350	8350	8100	8000	7650	7000	8150	8000	7850	7600	7000	13350	10S / 7D	13350	10S / 7D
	2300	8100	7900	7700	7350	6950	7900	7700	7600	7250	6650	7700	7550	7450	7150	6650	13000	10S / 7D	13000	10S / 7D
	2400	7650	7500	7300	7000	6600	7500	7300	7200	6850	6300	7300	7150	7050	6750	6250	12600	10S / 7D	12600	10S / 7D
	2500	7250	7050	6900	6600	6250	7100	6900	6750	6450	5900	6850	6700	6600	6350	5850	12250	10S / 8D	12250	10S / 8D
	2600	6800	6650	6500	6200	5850	6700	6500	6350	6050	5600	6500	6350	6250	6050	5600	11950	10S / 8D	11950	10S / 8D
	2700																11650	10S / 8D	11650	10S / 8D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

C-3

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 6 - WELDED 70 and 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	10S / 5D	16800	10S / 5D
	600	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	10S / 5D	16750	10S / 5D
	700	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	10S / 5D	16750	10S / 5D
	800	16550	16550	16550	16300	15500	16550	16550	16550	16550	16050	16550	16550	16550	16550	16000	16550	10S / 6D	16550	10S / 6D
	900	16350	15850	15700	15400	14350	16350	16350	16000	15650	15100	16350	16300	16100	15600	14950	16350	10S / 6D	16350	10S / 6D
	1000	15950	15000	14900	14500	13250	15850	15400	14950	14650	13950	15650	15500	15250	14650	14000	16150	10S / 6D	16150	10S / 6D
	1100	15150	14050	13950	13550	12350	15050	14500	14000	13800	13050	14850	14600	14250	13750	13250	15950	10S / 6D	15950	10S / 6D
	1200	14350	13100	13000	12600	11400	14250	13600	13100	12950	12200	14050	13700	13300	12850	12450	15700	10S / 6D	15700	10S / 6D
	1300	13600	12500	12400	11950	10700	13450	12750	12150	12100	11300	13200	12900	12500	12100	11700	15400	10S / 6D	15400	10S / 6D
	1400	12900	11850	11750	11300	10050	12750	12050	11550	11550	10700	12400	12100	11750	11350	11000	15050	10S / 6D	15050	10S / 6D
	1500	12200	11200	11150	10650	9350	12000	11400	10950	10950	10200	11750	11450	11150	10750	10450	14800	10S / 6D	14800	10S / 6D
	1600	11650	10700	10650	10100	8850	11300	10750	10350	10350	9600	11150	10850	10550	10150	9850	14550	10S / 6D	14550	10S / 6D
	1700	11100	10200	10150	9550	8400	10800	10250	9850	9850	9150	10600	10350	10000	9650	9400	14450	10S / 6D	14450	10S / 6D
	1800	10550	9650	9600	9050	7900	10250	9750	9350	9350	8650	10050	9800	9500	9200	8900	14300	10S / 6D	14300	10S / 6D
	1900	10000	9150	9100	8500	7450	9750	9250	8850	8850	8200	9550	9300	9000	8700	8450	14150	10S / 7D	14150	10S / 7D
	2000	9450	8650	8600	8000	6950	9250	8750	8350	8350	7750	9000	8800	8500	8200	7950	14050	10S / 7D	14050	10S / 7D
	2100	9000	8300	8200	7650	6650	8850	8350	8000	8000	7400	8550	8350	8100	7800	7550	13700	10S / 7D	13700	10S / 7D
	2200	8550	7900	7850	7300	6450	8400	7950	7600	7600	7050	8150	7950	7700	7350	7100	13350	10S / 7D	13350	10S / 7D
	2300	8100	7550	7450	6950	6150	8000	7550	7200	7200	6650	7700	7500	7300	6950	6650	13000	10S / 7D	13000	10S / 7D
	2400	7700	7150	7100	6600	5850	7550	7150	6850	6850	6350	7250	7100	6850	6500	6250	12600	10S / 7D	12600	10S / 7D
	2500	7250	6800	6700	6250	5650	7150	6750	6450	6400	5950	6850	6650	6450	6100	5800	12250	10S / 8D	12250	10S / 8D
	2600	6800	6450	6300	5900	5350	6750	6350	6050	6000	5650	6500	6350	6100	5750	5550	11950	10S / 8D	11950	10S / 8D
	2700																11650	10S / 8D	11650	10S / 8D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

C-4

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 6 - WELDED 140 and 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	16800	10S / 5D	16800	10S / 5D
	600	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	16750	16750	16750	16550	16750	10S / 5D	16750	10S / 5D
	700	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	16750	16750	16750	16400	16750	10S / 5D	16750	10S / 5D
	800	16550	16550	16550	16550	16050	16550	16550	16550	16550	16050	16550	16550	16550	16550	16050	16550	10S / 6D	16550	10S / 6D
	900	16350	16350	16350	16150	15500	16350	16350	16350	16350	15650	16050	16050	16050	16050	15650	16350	10S / 6D	16350	10S / 6D
	1000	16150	16150	16150	15300	14600	15750	15750	15750	15750	14700	15350	15350	15350	15350	15100	16150	10S / 6D	16150	10S / 6D
	1100	15650	15650	15350	14500	13850	15000	15000	15000	15000	13900	14600	14600	14600	14600	14200	15950	10S / 6D	15950	10S / 6D
	1200	14900	14900	14500	13750	13150	14300	14300	14300	14100	13150	13850	13850	13850	13850	13300	15700	10S / 6D	15700	10S / 6D
	1300	14200	14200	13800	13050	12350	13600	13600	13600	13200	12350	13100	13100	13100	13100	12500	15400	10S / 6D	15400	10S / 6D
	1400	13450	13450	13100	12400	11650	12850	12850	12850	12500	11700	12350	12350	12350	12350	11750	15050	10S / 6D	15050	10S / 6D
	1500	12750	12750	12400	11650	10950	12150	12150	12150	11800	11050	11750	11750	11750	11750	11100	14800	10S / 6D	14800	10S / 6D
	1600	12150	12150	11850	11200	10500	11400	11400	11400	11100	10450	11150	11150	11150	11150	10450	14550	10S / 6D	14550	10S / 6D
	1700	11550	11550	11250	10650	10100	10900	10900	10900	10600	9950	10650	10650	10650	10650	10000	14450	10S / 6D	14450	10S / 6D
	1800	11000	11000	10700	10150	9650	10400	10400	10400	10100	9450	10100	10100	10100	10100	9500	14300	10S / 6D	14300	10S / 6D
	1900	10400	10400	10150	9650	9250	9900	9900	9900	9600	8950	9600	9600	9600	9600	9000	14150	10S / 7D	14150	10S / 7D
	2000	9800	9800	9550	9150	8800	9400	9400	9400	9100	8500	9100	9100	9100	9100	8550	14050	10S / 7D	14050	10S / 7D
	2100	9350	9350	9150	8750	8450	9000	9000	9000	8700	8100	8650	8650	8650	8650	8150	13700	10S / 7D	13700	10S / 7D
	2200	8900	8900	8750	8350	8000	8550	8550	8550	8300	7700	8250	8250	8250	8250	7750	13350	10S / 7D	13350	10S / 7D
	2300	8450	8450	8300	8000	7600	8150	8150	8150	7900	7350	7800	7800	7800	7800	7350	13000	10S / 7D	13000	10S / 7D
	2400	7950	7950	7900	7600	7250	7700	7700	7700	7500	6900	7400	7400	7400	7400	6950	12600	10S / 7D	12600	10S / 7D
	2500	7500	7500	7500	7200	6850	7300	7300	7300	7100	6550	6950	6950	6950	6950	6550	12250	10S / 8D	12250	10S / 8D
	2600	7050	7050	7050	6850	6450	6850	6850	6850	6700	6150	6600	6600	6600	6600	6200	11950	10S / 8D	11950	10S / 8D
	2700																11650	10S / 8D	11650	10S / 8D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

D-1

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 7 - RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	10S / 5D	18250	10S / 5D
	600	18200	18200	18200	18050	17950	18200	18200	18200	17700	17500	18200	18150	18150	17800	17250	18200	10S / 5D	18200	10S / 5D
	700	18000	17450	17100	16950	16550	17450	17300	17000	16350	16050	17400	17050	16950	16350	15600	18200	10S / 5D	18200	10S / 5D
	800	16900	16250	15900	15800	15150	16450	16100	15750	15000	14650	16200	15850	15700	15100	14350	18000	10S / 5D	18000	10S / 5D
	900	15800	15000	14700	14700	13800	15250	14900	14550	14050	13650	15000	14650	14450	13850	13100	17800	10S / 5D	17800	10S / 5D
	1000	14700	13800	13550	13550	12450	14050	13650	13400	13000	12600	13850	13450	13200	12600	11800	17600	10S / 5D	17600	10S / 5D
	1100	13800	13000	12700	12700	11650	13350	12850	12550	12250	11850	13050	12600	12350	11700	11100	17350	10S / 5D	17350	10S / 5D
	1200	12950	12150	11850	11850	10850	12600	12050	11700	11450	11050	12250	11800	11450	10800	10350	17100	10S / 5D	17100	10S / 5D
	1300	12250	11450	11250	11200	10200	11900	11200	10850	10700	10250	11500	11050	10750	10050	9600	16750	10S / 5D	16750	10S / 5D
	1400	11550	10750	10650	10500	9500	11200	10550	10200	10050	9600	10700	10300	10000	9350	8950	16400	10S / 6D	16450	10S / 6D
	1500	10850	10050	10050	9800	8800	10550	9900	9550	9400	9000	10100	9700	9400	8750	8400	16150	10S / 6D	16250	10S / 6D
	1600	10300	9550	9450	9300	8350	9900	9250	8900	8750	8400	9500	9150	8850	8200	7850	15950	10S / 6D	16050	10S / 6D
	1700	9800	9000	8900	8750	7850	9350	8750	8400	8200	7900	8950	8600	8350	7700	7350	15900	10S / 6D	15900	10S / 6D
	1800	9250	8450	8300	8250	7400	8850	8300	7950	7650	7450	8450	8050	7800	7200	6850	15750	10S / 6D	15750	10S / 6D
	1900	8700	7950	7750	7700	6850	8300	7800	7450	7150	6950	7900	7550	7300	6700	6350	15600	10S / 6D	15600	10S / 6D
	2000	8200	7400	7150	7150	6400	7750	7300	6950	6600	6550	7400	7000	6750	6250	5800	15450	10S / 6D	15450	10S / 6D
	2100	7800	7050	6800	6800	6100	7350	6900	6600	6300	6200	7000	6650	6400	5900	5550	15050	10S / 6D	15050	10S / 6D
	2200	7350	6700	6500	6450	5750	6950	6550	6300	5950	5800	6600	6250	6050	5600	5200	14200	10S / 7D	14650	10S / 6D
	2300	6950	6350	6150	6100	5500	6550	6150	5950	5650	5500	6200	5900	5700	5300	4850	13250	10S / 7D	14250	10S / 7D
	2400	6550	6000	5800	5750	5200	6150	5800	5600	5300	5150	5800	5500	5350	5000	4600	12250	10S / 8D	13850	10S / 7D
	2500	6100	5650	5500	5400	4850	5750	5400	5250	5000	4800	5400	5150	5000	4650	4250	11300	10S / 8D	13450	10S / 7D
	2600	5700	5300	5150	5050	4600	5350	5000	4900	4650	4500	5100	4900	4750	4450	4050	11350	10S / 8D	13150	10S / 7D
	2700																11350	10S / 8D	12800	10S / 7D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

D-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 7 - RIVETED 140 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	10S / 5D	18250	10S / 5D
	600	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	10S / 5D	18200	10S / 5D
	700	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	10S / 5D	18200	10S / 5D
	800	18000	18000	18000	17700	17250	18000	18000	18000	18000	17350	18000	18000	18000	18000	17350	18000	10S / 5D	18000	10S / 5D
	900	17800	17650	17400	16600	16150	17800	17600	17500	17000	15950	17650	17400	17300	17000	16100	17800	10S / 5D	17800	10S / 5D
	1000	17100	16800	16500	15500	15100	16850	16600	16400	15850	14650	16700	16450	16300	15900	14850	17600	10S / 5D	17600	10S / 5D
	1100	16250	15850	15450	14650	14150	15950	15650	15450	14900	13850	15800	15450	15300	14850	13850	17350	10S / 5D	17350	10S / 5D
	1200	15350	14850	14450	13750	13150	15050	14700	14500	13950	13000	14850	14500	14300	13850	12800	17100	10S / 5D	17100	10S / 5D
	1300	14550	14100	13750	13100	12550	14150	13750	13500	13000	12200	13950	13650	13500	13050	12150	16750	10S / 5D	16750	10S / 5D
	1400	13700	13350	13050	12500	12050	13450	13100	12850	12300	11550	13100	12850	12700	12300	11450	16400	10S / 6D	16450	10S / 6D
	1500	12900	12600	12350	11850	11450	12750	12400	12200	11650	10950	12500	12250	12100	11650	10800	16150	10S / 6D	16250	10S / 6D
	1600	12350	12050	11800	11300	10950	12050	11700	11550	11000	10350	11900	11650	11450	11000	10200	15950	10S / 6D	16050	10S / 6D
	1700	11800	11450	11200	10750	10450	11500	11200	11000	10450	9800	11350	11050	10900	10450	9650	15900	10S / 6D	15900	10S / 6D
	1800	11250	10900	10650	10200	9850	10950	10650	10450	9900	9300	10750	10500	10350	9900	9150	15750	10S / 6D	15750	10S / 6D
	1900	10700	10350	10100	9650	9350	10400	10100	9900	9350	8750	10200	9950	9800	9350	8650	15600	10S / 6D	15600	10S / 6D
	2000	10150	9800	9550	9100	8800	9850	9550	9350	8850	8300	9600	9400	9250	8800	8150	15450	10S / 6D	15450	10S / 6D
	2100	9650	9350	9100	8700	8400	9400	9100	8900	8400	7850	9150	8950	8800	8400	7750	15050	10S / 6D	15050	10S / 6D
	2200	9200	8900	8650	8300	7950	8950	8650	8450	8000	7500	8700	8500	8350	7950	7350	14650	10S / 6D	14650	10S / 6D
	2300	8700	8450	8250	7850	7550	8500	8200	8050	7600	7050	8200	8050	7900	7550	6950	14250	10S / 7D	14250	10S / 7D
	2400	8250	8000	7800	7450	7100	8050	7800	7600	7200	6650	7750	7600	7450	7100	6550	13850	10S / 7D	13850	10S / 7D
	2500	7800	7550	7350	7050	6650	7600	7350	7150	6750	6250	7300	7150	7000	6650	6150	13450	10S / 7D	13450	10S / 7D
	2600	7300	7100	6950	6600	6250	7150	6900	6750	6350	5800	6950	6750	6650	6350	5800	13150	10S / 7D	13150	10S / 7D
	2700																12800	10S / 7D	12800	10S / 7D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

D-3

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 7 - WELDED 70 and 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	10S / 5D	18250	10S / 5D
	600	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	10S / 5D	18200	10S / 5D
	700	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	10S / 5D	18200	10S / 5D
	800	18000	18000	17800	17600	16550	18000	18000	18000	18000	17450	18000	18000	18000	17700	17400	18000	10S / 5D	18000	10S / 5D
	900	17800	16950	16800	16450	15200	17800	17600	17050	16900	16100	17800	17650	17300	16550	16300	17800	10S / 5D	17800	10S / 5D
	1000	17300	15900	15800	15250	13850	17250	16450	15850	15800	14700	16950	16650	16250	15400	15200	17600	10S / 5D	17600	10S / 5D
	1100	16400	15000	14900	14250	12800	16300	15450	14850	14850	13800	16050	15600	15150	14450	14200	17350	10S / 5D	17350	10S / 5D
	1200	15550	14100	14000	13250	11750	15350	14400	13850	13850	12850	15100	14550	14050	13450	13100	17100	10S / 5D	17100	10S / 5D
	1300	14700	13450	13250	12450	11000	14450	13400	12850	12850	11950	14200	13700	13250	12850	12350	16750	10S / 5D	16750	10S / 5D
	1400	13850	12800	12550	11650	10200	13700	12700	12250	12250	11350	13250	12850	12450	12250	11650	16450	10S / 6D	16450	10S / 6D
	1500	12950	12150	11800	10850	9450	12950	12050	11700	11700	10700	12600	12150	11750	11550	11000	16250	10S / 6D	16250	10S / 6D
	1600	12400	11550	11300	10300	8950	12150	11400	11100	11050	10100	11950	11500	11100	10850	10350	16000	10S / 6D	16050	10S / 6D
	1700	11800	11000	10850	9750	8500	11600	10850	10550	10500	9550	11350	10950	10550	10300	9800	15900	10S / 6D	15900	10S / 6D
	1800	11250	10450	10350	9200	8000	11000	10300	10000	9950	9050	10750	10350	10000	9750	9350	15750	10S / 6D	15750	10S / 6D
	1900	10650	9900	9900	8650	7550	10450	9750	9450	9450	8550	10150	9800	9450	9250	8800	15600	10S / 6D	15600	10S / 6D
	2000	10100	9300	9400	8100	7050	9900	9200	8900	8900	7950	9600	9250	8900	8700	8300	15450	10S / 6D	15450	10S / 6D
	2100	9600	8900	8950	7750	6800	9400	8750	8500	8500	7600	9100	8800	8450	8250	7900	15050	10S / 6D	15050	10S / 6D
	2200	9150	8500	8500	7450	6600	8950	8350	8050	8050	7250	8650	8300	8000	7800	7500	14650	10S / 6D	14650	10S / 6D
	2300	8650	8100	8100	7100	6350	8500	7900	7600	7600	6900	8200	7850	7600	7350	7100	14250	10S / 7D	14250	10S / 7D
	2400	8200	7650	7650	6800	6100	8050	7500	7200	7150	6550	7700	7400	7150	6900	6650	13850	10S / 7D	13850	10S / 7D
	2500	7750	7250	7200	6450	5850	7600	7050	6750	6750	6200	7250	6950	6700	6400	6300	13100	10S / 7D	13450	10S / 7D
	2600	7250	6850	6750	6100	5650	7100	6650	6350	6300	5800	6850	6600	6350	6100	5950	12900	10S / 7D	13150	10S / 7D
	2700																12700	10S / 7D	12800	10S / 7D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBO 4-5-6-7

D-4

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPERBO 7 - WELDED 140 and 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	18250	10S / 5D	18250	10S / 5D
	600	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	18200	18200	18200	18000	18200	10S / 5D	18200	10S / 5D
	700	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	18200	18200	18200	17800	18200	10S / 5D	18200	10S / 5D
	800	18000	18000	18000	18000	17450	18000	18000	18000	18000	17450	18000	18000	18000	18000	17450	18000	10S / 5D	18000	10S / 5D
	900	17800	17800	17800	17550	16850	17800	17800	17800	17800	16950	17550	17550	17550	17550	17050	17800	10S / 5D	17800	10S / 5D
	1000	17600	17600	17500	16600	15850	17250	17250	17250	17050	15650	16750	16750	16750	16750	16150	17600	10S / 5D	17600	10S / 5D
	1100	17100	17100	16650	15750	15200	16400	16400	16400	16000	14800	15900	15900	15900	15900	15150	17350	10S / 5D	17350	10S / 5D
	1200	16300	16250	15750	14850	14450	15600	15600	15600	14950	13900	15050	15050	15050	15050	14100	17100	10S / 5D	17100	10S / 5D
	1300	15500	15400	14900	14100	13650	14750	14750	14750	13950	13000	14150	14150	14150	14150	13250	16750	10S / 5D	16750	10S / 5D
	1400	14700	14550	14050	13300	12850	14000	14000	14000	13250	12350	13300	13300	13300	13300	12350	16450	10S / 6D	16450	10S / 6D
	1500	13900	13700	13150	12500	12050	13200	13200	13200	12550	11700	12700	12700	12700	12700	11750	16250	10S / 6D	16250	10S / 6D
	1600	13250	13100	12600	11950	11500	12450	12450	12450	11850	11100	12100	12100	12100	12050	11150	16000	10S / 6D	16050	10S / 6D
	1700	12600	12450	12000	11450	11000	11900	11900	11900	11300	10600	11550	11550	11550	11500	10550	15900	10S / 6D	15900	10S / 6D
	1800	12000	11800	11400	10950	10450	11300	11300	11300	10700	10150	10950	10950	10950	10900	10050	15750	10S / 6D	15750	10S / 6D
	1900	11350	11200	10800	10400	9900	10750	10750	10750	10150	9650	10400	10400	10400	10350	9500	15600	10S / 6D	15600	10S / 6D
	2000	10700	10550	10200	9850	9400	10200	10200	10200	9600	9200	9800	9800	9800	9750	9000	15450	10S / 6D	15450	10S / 6D
	2100	10200	10050	9750	9400	8950	9750	9750	9750	9200	8750	9350	9350	9350	9300	8550	15050	10S / 6D	15050	10S / 6D
	2200	9700	9600	9300	9000	8550	9250	9250	9250	8750	8350	8900	8900	8900	8850	8150	14650	10S / 6D	14650	10S / 6D
	2300	9200	9100	8850	8600	8100	8800	8800	8800	8350	7900	8400	8400	8400	8350	7700	14250	10S / 7D	14250	10S / 7D
	2400	8650	8600	8400	8150	7650	8350	8350	8350	7900	7500	7950	7950	7950	7900	7300	13850	10S / 7D	13850	10S / 7D
	2500	8150	8100	7950	7700	7250	7850	7850	7850	7500	7050	7500	7500	7500	7450	6850	13450	10S / 7D	13450	10S / 7D
	2600	7650	7650	7500	7300	6800	7400	7400	7400	7050	6650	7100	7100	7100	7050	6550	13150	10S / 7D	13150	10S / 7D
	2700																12800	10S / 7D	12800	10S / 7D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
3. **1 unbraced bay:** maximum ground to first beam height of 2000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
4. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

10.**SPECIAL CONFIGURATIONS**

As stated in other sections of this manual, the frame load bearing capacity tables consider frames loaded under standard conditions (ie: those which form part of the basic assumptions of Sections 1 and 9). Nevertheless, special conditions may exist, for example when a beam is placed on ground (Section 9.4), for which the tables need to be applied in a manner which respects the basic calculation assumptions.

The following paragraph provides instructions for the correct interpretation of common pallet racking applications which fall outside the tables load bearing capacity assumptions.

10.1.**CROSS AISLE TUNNEL**

The creation of cross aisle tunnels is made possible under the following conditions:

1. Cross aisle tunnels must contain adequate frame protection and occupational health and safety provisions;
2. End cross aisle tunnels are accepted only if the end frame load and first beam level comply with the tabled frame bearing capacities ($H \leq H_{\max}$ of Fig. 10.1);
3. Consecutive cross aisle tunnels are accepted only if the central frame load and first beam level comply with the tabled frame bearing capacities ($H \leq H_{\max}$ of Fig. 10.1);
4. Single or multiple cross aisle tunnels are to be considered as divisions of a row which create multiple blocks. For this reason these blocks must be dimensioned as isolated rows.

SUPERBO 4-5-6-7

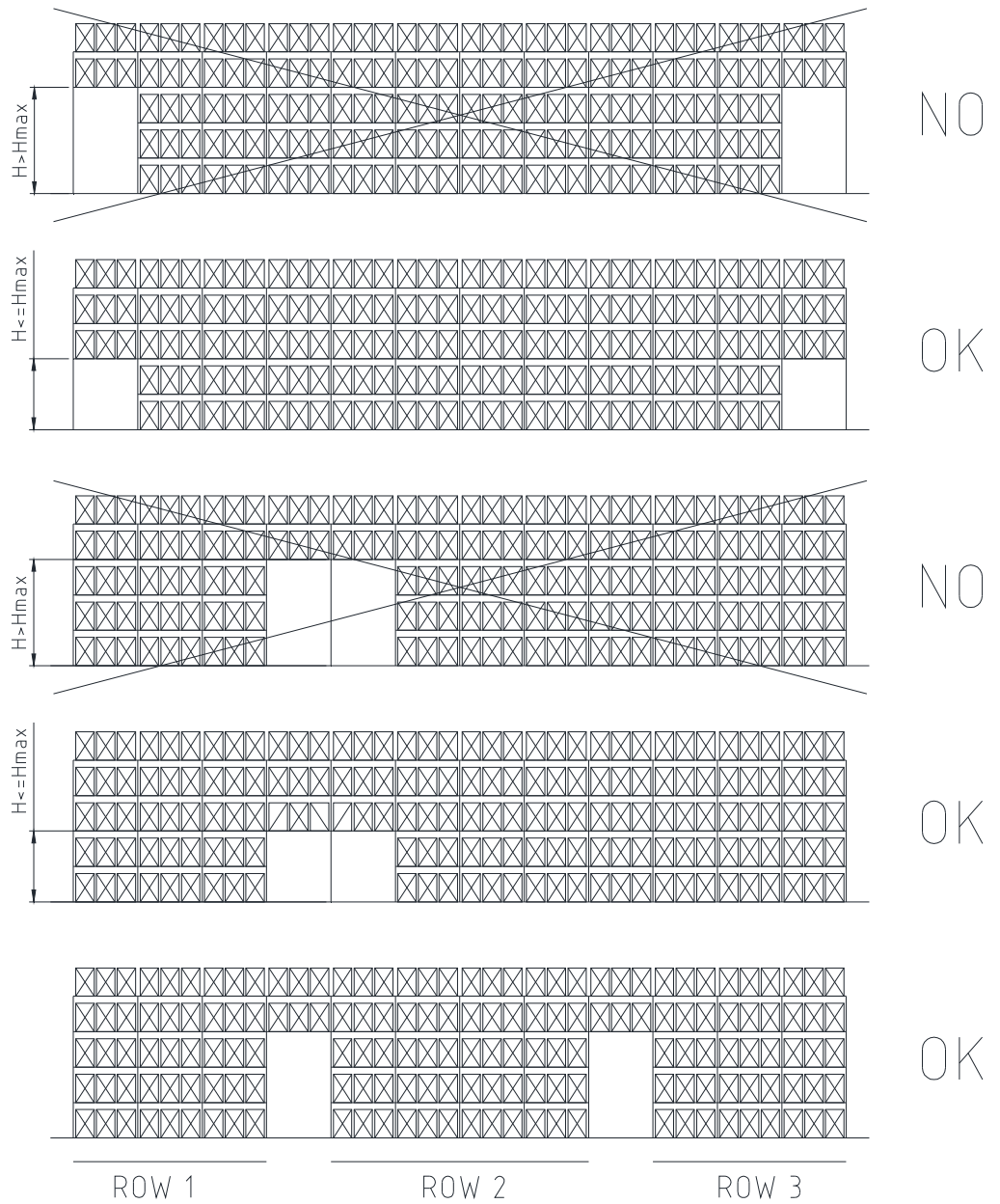


Fig. 10.1

11.

DIMENSIONAL CHARACTERISTICS

CONNECTION PITCH	50mm
UPRIGHT CUT PITCH	50mm
Ln NET SPAN	Free span between uprights (external face of uprights)
Dframe REAL FRAME DEPTH	Real frame depth (external face of uprights)

Tab. 11.1

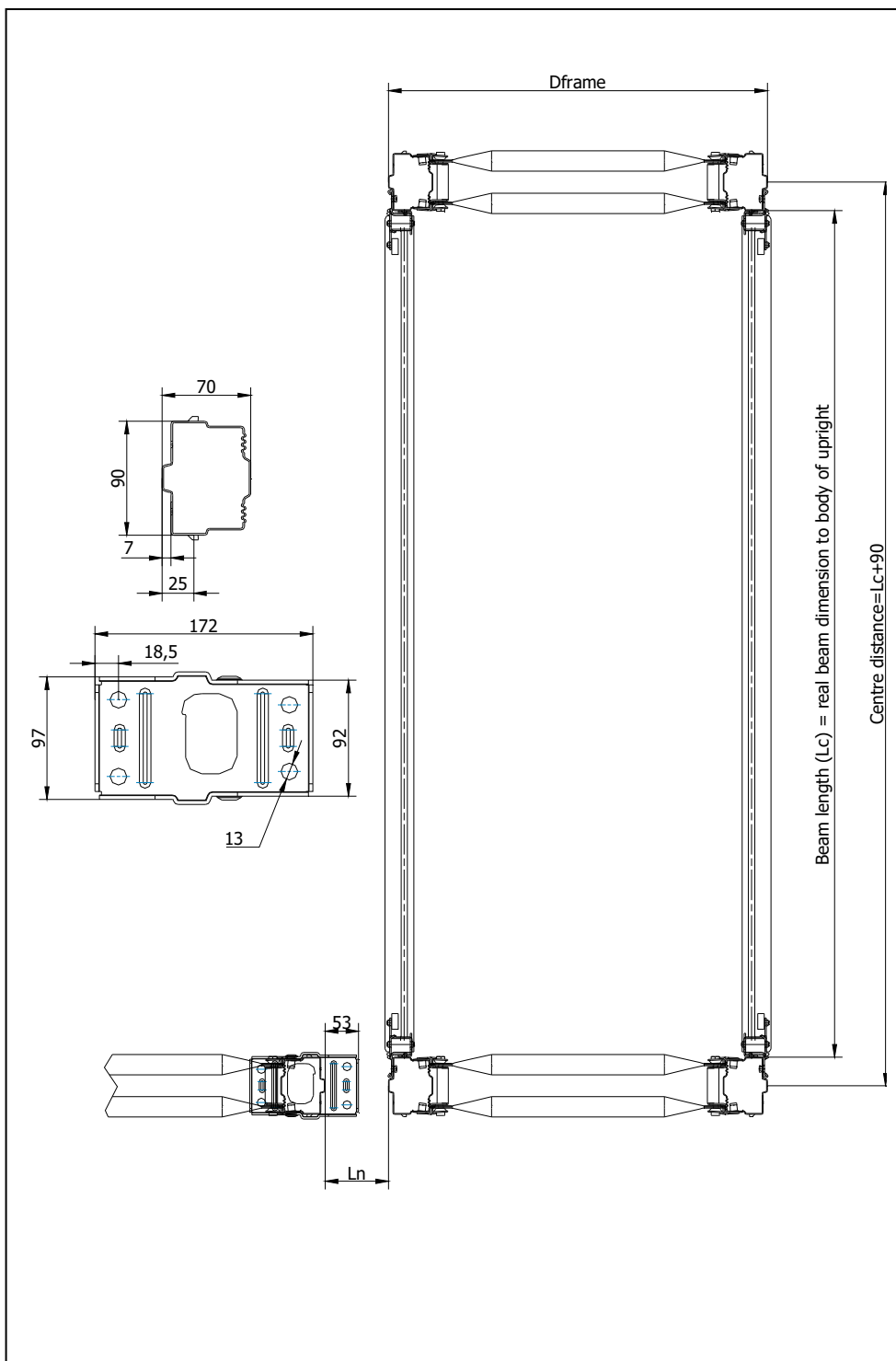


Fig. 11.1

Refer to technical manual MT07 (Pallet Racking Accessories) for other product specific dimensions.

SUPERBO 4-5-6-7

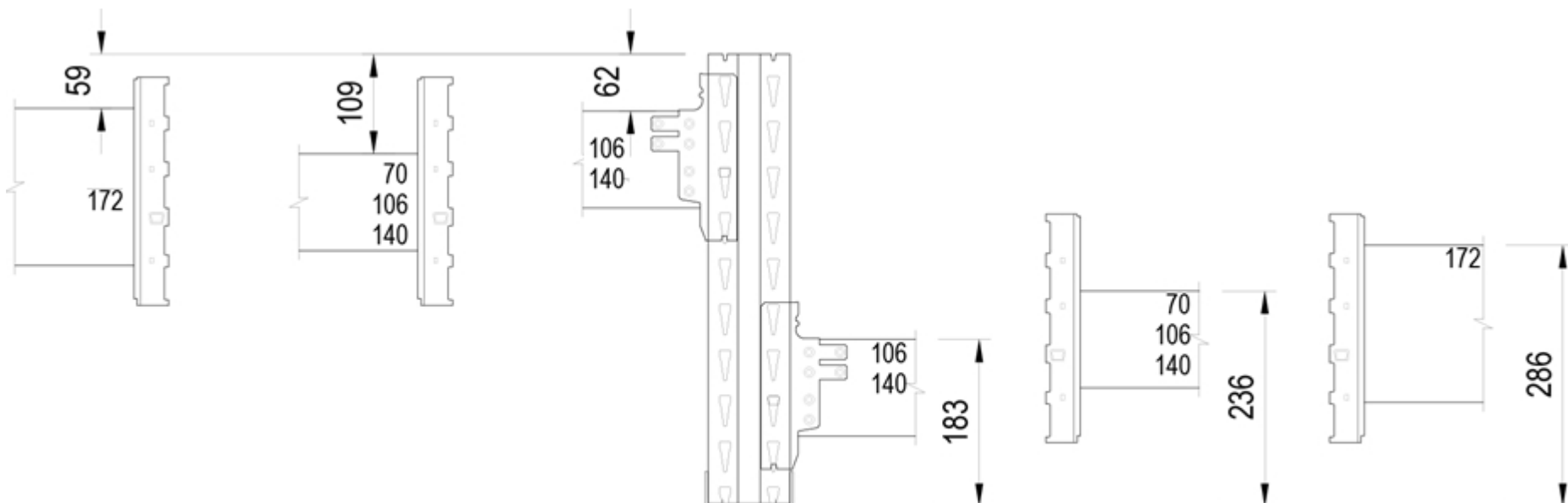


Fig. 11.2

MINIMUM AND MAXIMUM BEAM CONNECTION LEVELS FOR SUPERBO 4-5-6-7 FRAMES

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