

SUPER 4-5-6

TECHNICAL MANUAL



Revision 18 – 16.11.2020

UNI EN 15512 STANDARD
CE MARKING OF STRUCTURAL COMPONENTS

METALSISTEM[®]

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SUPER 4-5-6

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

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REFERENCE DOCUMENTATION

REFERENCE DOCUMENTATION	
Code	Document Title
MUM01	Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual
MT07	Pallet Racking Accessories Technical Manual

REVISION LIST

ISSUED BY:	Ufficio Tecnico Prodotto (U.T.P.)
APPROVED BY:	Area Tecnica - Ufficio Tecnico Prodotto
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REVISIONS

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12	- Corrected TS coupling in table 6.9 - Substituted figure 6.1	David Terzi	12/2018
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1. CALCULATION, SAFETY AND INSTALLATION STANDARDS

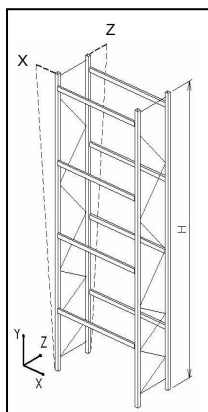


Fig. 1.1

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 the floor

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 good practice to also 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 positioned diagonally across every 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 / connection plates 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

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



- 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
- : 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, STRAUS7 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 $\gamma_{M,0} = \gamma_{M,1} = 1,05$; $\gamma_{M,2} = 1,25$;
- Frames fixed to the floor slab with a minimum of two (2) anchor bolts positioned diagonally across every upright;



Fig. 1.4

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

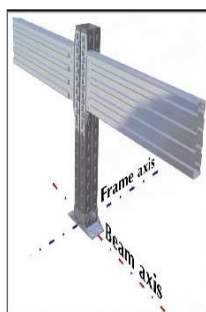


Fig. 1.5



Fig. 1.6

Raw material:
Galvanized
structural
steel coils

- 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 centre distance between the bay beams, frame base to height ratio, seismicity of the area, environmental factors such as vibrations, atmospheric conditions, etc) contact the METALSISTEM Technical Office 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) Direction of Super 456 frame base plate

The tabled frame load bearing capacities are based on the assumption that the frame base plates are aligned with the beams of the pallet racking row (longest face parallel to the pallet racking beams), ref. Fig. 1.5.

It is permissible to change the orientation of the frame base plates (in line with the frame) only when the maximum ground to first beam height and beam length specified in the footnotes of paragraph 9.6 is respected and if the base plates are anchored to the ground with 4 anchor bolts per base plate.

n) 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.

o) 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.

p) 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 using the SENDZIMIR process or powder coated pickled/galvanized steel.

q) 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.

r) 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.

s) 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..

t) 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

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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

u) Certifications

METALSISTEM production has been certified by the following international standards:

- | | |
|--|---|
| -- Structural steel fabrication center | - production workshop no. 753/10; |
| -- ISO 14001 | - Environmental management system; |
| -- ISO 9001 | - Quality management system; |
| -- BS OHSAS 18001 | - Occupational Health and Safety Management System; |
| -- CISI | - quality and safety mark; |
| -- AEO FULL | - Authorized Economic Operator; |
| -- UNI EN ISO 3834 | - Qualified fusion welding process; |
| -- EN 1090-1 | - Certificate of conformity assessment of structural components |

v) 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.

w) Safety equipment

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

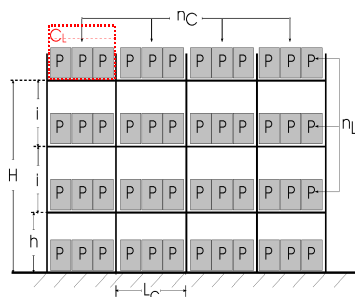


Fig. 2.1

The load bearing capacity of a pallet racking installation is derived from the combined performance of frames and beams and their geometric positioning 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
- i = centre distance between beam levels
- H = final beam level height
- Ps = 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 CAPACITIES". 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.

SUPER 4-5-6
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

Fig. 2.2

INPUT DATA

$P = 500 \text{ daN}$;
 $n_P = 3$;
 $L_C = 2720 \text{ mm}$;
 $n_L = 6$ (excluding ground);
 $n_C = 3$;
 $h = 600 \text{ mm}$;
 $i = 600 \text{ mm}$;
 $H = 3600 \text{ mm}$;
 $P_s = 1000 \text{ mm}$.

BEAM SIZING

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

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

FRAME SIZING

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

Calculate the base to height ratio

$S_s (\text{base : height ratio}) = H / P_s = 3.6$

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

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

Enter Section 9: PALLET RACKING FRAME LOAD BEARING CAPACITIES:

1. Start by examining the SUPER 4 106 DOUBLE SIDED RIVETED BEAM, table A-2;
2. Go to the H=6000 frame height group of columns and go to the intersection between the 600mm beam height and the 2720mm length;
3. Here a frame load of 11600 daN is obtained;
4. Therefore the installation requirements are satisfied with the selection of a SUPER 4 frame.

Note: If the first approach produced an unsatisfactory result alternative solutions would have needed to be examined; such as:

- a) Exploring the partially braced or fully braced portions of the frame load bearing capacity table;
- b) examining the SUPER 5, 6, 5R or 6R tables;
- c) examining all upright series with varying beam sections (106, 140 or 172 riveted connectors).

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

A-2		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPER 4 - D/S RIVETED 106 BEAM															
		H frame = 6000 mm				H frame = 8000 mm				H frame = 10000 mm				PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=1820	Lc=2420	Lc=2720	Lc=3320	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	10S / 8D	11600	10S / 8D
	600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	10S / 8D	11600	10S / 8D
	700	11600	11450	11300	11100	11350	11350	11350	11100	11350	11350	11350	11350	11600	10S / 8D	11600	10S / 8D
	800	11000	10800	10650	10400	10900	10900	10900	10500	10700	10700	10700	10600	11350	10S / 8D	11350	10S / 8D
	900	10400	10150	9950	9650	10200	10200	10200	9750	10000	10000	10000	9850	11050	10S / 9D	11050	10S / 9D
	1000	9800	9500	9300	8950	9500	9500	9500	9000	9250	9250	9250	9100	10800	10S / 9D	10800	10S / 9D
	1100	9150	8850	8650	8350	8850	8850	8850	8400	8600	8600	8600	8400	10500	10S / 9D	10500	10S / 9D
	1200	8500	8200	8000	7700	8250	8250	8250	7800	8000	8000	8000	7750	10200	10S / 9D	10200	10S / 9D
	1300	7950	7700	7550	7250	7600	7600	7600	7250	7450	7450	7450	7250	9800	10S / 10D	9800	10S / 10D
	1400	7400	7200	7050	6850	7150	7150	7150	6750	6900	6900	6900	6800	9350	10S / 10D	9350	10S / 10D
	1500	6850	6700	6550	6450	6700	6700	6600	6350	6500	6500	6500	6400	9100	10S / 10D	9100	10S / 10D
	1600	6500	6350	6200	6100	6250	6200	6150	5950	6100	6100	6100	5950	8850	10S / 10D	8850	10S / 10D
	1700	6150	6000	5900	5750	5900	5900	5850	5600	5800	5750	5750	5600	8750	10S / 10D	8750	10S / 10D
	1800	5800	5650	5550	5400	5550	5550	5500	5250	5450	5400	5350	5200	8650	10S / 10D	8650	10S / 10D
	1900	5400	5300	5200	5100	5200	5200	5150	4950	5100	5050	5000	4950	8550	10S / 10D	8550	10S / 10D
	2000	5050	4950	4850	4750	4850	4850	4800	4600	4750	4700	4650	4600	8400	10S / 10D	8400	10S / 10D
	2100	4800	4700	4600	4500	4600	4600	4550	4400	4500	4450	4400	4350	8300	10S / 10D	8300	10S / 10D
2200	4550	4450	4400	4300	4350	4350	4300	4150	4200	4200	4150	4100	8100	10S / 10D	8100	10S / 10D	
2300													7800	10S / 10D	7800	10S / 10D	
														7500	10S / 10D	7500	10S / 10D

Frame load bearing capacity table extract.

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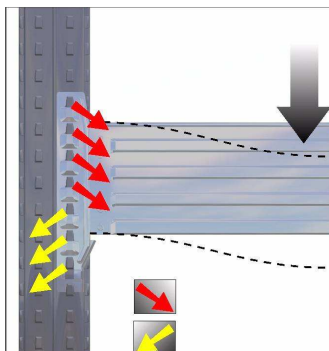
3.
SUPER 4-5-6 BEAMS
**ADVANTAGES OF THE
DOUBLE CONNECTOR**


Fig. 3.1

The SUPER 4-5-6 beams **MUST** always be connected to the upright with the top channel facing the centre of the frame.

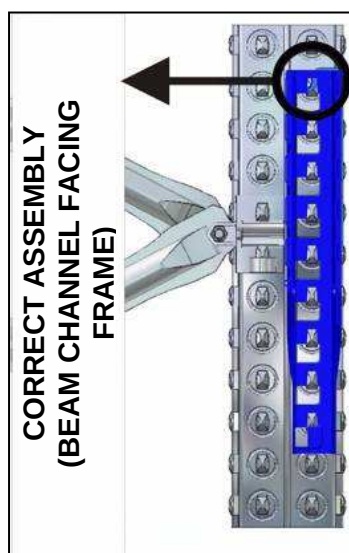


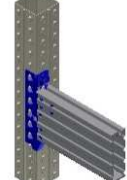
Fig. 3.2

The beams are box sections of variable thickness with single or double sided riveted brackets at either end. A channel running along the top face of the beam provides a lip within which a variety of components such as shelf panels, secondary beams, drum cradles, and other accessories may be inserted (Refer to Pallet Racking Accessories Manual, code MT07). METALSISTEM's unique beam to upright connection for 106 and 140 beams has a series of distinctive features, including:

- optimised performance through double faced upright connection;
- The inclined faces of the connection lugs ensure that the degree of connection between the upright and the beam increases as the beam load increases.

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.

Tab. 3.1 lists the available Super 4-5-6 beams and their dimensional range

SUPER 4-5-6 DIMENSIONAL RANGE					
BEAMS		STANDARD DIMENSIONS		PRODUCIBLE DIMENSIONS	
		MIN [mm]	MAX [mm]	MIN [mm]	MAX [mm]
 70	MOULDED CONNECTOR	920	2720	920	2720
 70	RIVETED CONNECTOR	920	2720	920	3020
 106	DOUBLE SIDE RIVETED CONNECTOR	920	4020	920	4020
 140	DOUBLE SIDE RIVETED CONNECTOR	920	4020	920	4020
 172	RIVETED CONNECTOR	920	4020	920	4020

Tab. 3.1

3.1. NOTES ON THE SUPER 4-5-6 BEAM POWDER COATING

Finish code extensions used by METALSISTEM

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

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

STANDARD COLOURS:



Fig. 3.3

The two figures following the decimal point in the METALSISTEM article codes indicate the codes finish. 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.

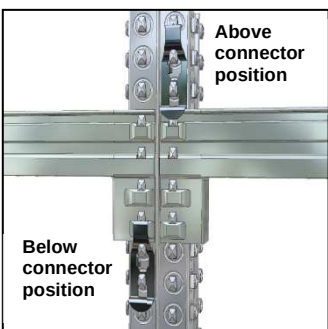
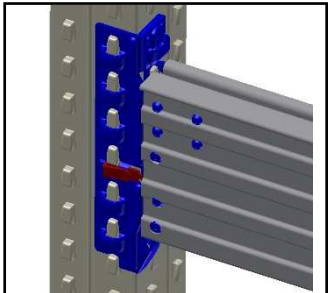
Powder coating resistance: In order to select the most appropriate product, consult the METALSISTEM Technical offices should there be a necessity to place the pallet racking in an aggressive environment (subject to external environment, acids, refrigerated cells etc.).

3.2.

SUPER 4-5-6 BEAM SAFETY PINS

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

In conformity with the indications of the standards, beams with riveted double sided connectors must use only the Riveted Double Sided Connector Beam Safety Pin (code 08195.95). Beams with riveted single sided connectors must use only the Riveted Single Sided Connector Beam Safety Brackets (08028.95 + 08029.95) while the moulded single sided connectors must use either the 08082.95 or the TS210005.95 safety brackets. The correct use of the safety brackets guarantee the technical characteristics described in this manual.

		CODE	DESCRIPTION
	 Moulded connector beam safety bracket	08082.95	SECUR. CLIP TS/BAM-NO WELD. CON
	 Moulded connector beam safety bracket	TS210005.95	SECUR.CLIP TS/BAM-MOULD. CONN
	 Riveted single sided connector beam safety bracket	08028.95	SECUR.CLIP CONN."ABOVE"-RIGHT
		08029.95	SECUR.CLIP CONN."ABOVE"-LEFT
	 Riveted double sided connector beam safety pin	08195.95	SAFETY CLIP BEAM TS 2-SID.CONN

Tab. 3.2

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SUPER 4-5-6
3.3.
HEIGHT OF BEAM FROM GROUND

Tab. 3.3 shows the minimum height from ground for all beam profiles.

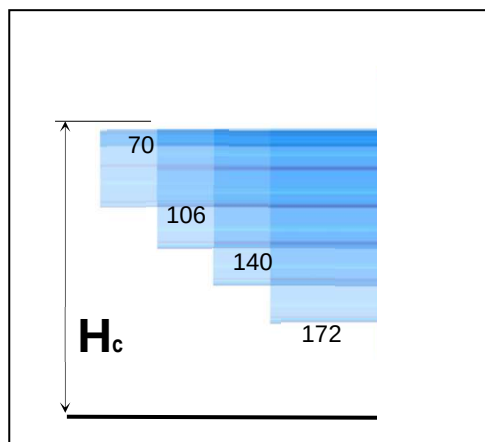


Fig. 3.4

PROFILE HEIGHT	H _c (mm)
70 BEAM (MOULDED)	197
70 BEAM (RIVETED)	263
106 BEAM (D/S RIVETED)	187
140 BEAM (D/S RIVETED)	220
172 BEAM (RIVETED)	362

Tab. 3.3

3.4.
SUPER 4-5-6 BEAM CODES

Two separate code table categories have been developed, that reflect the load bearing capacity tables divided by manual loading (picking) or mechanical loading. 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:

- Blue load tables = manual picking beams;
- Orange load tables = pallet racking beams;

3.5.
SUPER 4-5-6 LOWERED CONNECTOR BEAM CODES

The lowered connector beams allow the installation at a lower height from ground or the reduction of the distance between beams compared to the use of standard beams, although with a reduced load bearing capacity.

Lowered connector beams can be used in unbraced racks only as beams on ground (up to 500mm from ground) or as manual picking levels on an otherwise verified configuration (refer to paragraph 10.1).

Provided that the lowered connector beam load bearing capacity is satisfied, no additional restrictions apply to braced racks.

Lowered connector beams are available for a selected list of beam profiles.

REDUCED CONNECTOR BEAM CODES		
Profile version	Galvanised	Galvanised and painted
TS 70/22 beam with lowered connector	TS150158.95	TS150158.G1
TS 70/3 beam with lowered connector	TS150156.95	TS150156.G1
TS 70/4 beam with lowered connector	TS150155.95	TS150155.G1
TS 70/5 beam with lowered connector	TS150157.95	TS150157.G1
TS 106/33 beam with lowered connector	TS150219.95	TS150219.G1
TS 106/4 beam with lowered connector	054016T.95	054016T.G1
TS 140/33 beam with lowered connector	TS150186.95	TS150186.G1
TS 140/4 beam with lowered connector	05690T.95	05690T.G1
TS 140/5 beam with lowered connector	05710T.95	05710T.G1

Left (code **08028.95**) and right (code **08029.95**) "Above" connector safety brackets must be used with lowered connector beams.

SUPER 4-5-6

3.6.

SUPER 4-5-6 MANUAL PICKING GALVANISED BEAM CODES

**CODE TABLE - TYPE :MANUAL PICKING BEAMS
FINISH :GALVANISED**

- Beams assembled with safety brackets

Profile Version	70/22	70/3	70/4	70/2	70/22	70/3	70/4	70/5	106/22
	MOULDED CONNECTOR (Safety bracket 08082.95 or TS210005.95)			RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)					DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.95)
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code
920	04940.95	05000.95	05050.95	TS150160.95	TS150044.95	TS150057.95	TS150070.95	TS150139.95	TS150029.95
1220	04942.95	05002.95	05052.95	TS150161.95	TS150045.95	TS150058.95	TS150071.95	TS150140.95	TS150030.95
1520	04944.95	05004.95	05054.95	TS150162.95	TS150046.95	TS150059.95	TS150072.95	TS150141.95	TS150031.95
1820	04946.95	05006.95	05056.95	TS150163.95	TS150047.95	TS150060.95	TS150073.95	TS150142.95	TS150032.95
2020	04948.95	05008.95	05058.95	TS150164.95	TS150048.95	TS150061.95	TS150074.95	TS150143.95	TS150033.95
2120	04950.95	05009.95	05059.95	TS150165.95	TS150049.95	TS150062.95	TS150075.95	TS150144.95	TS150034.95
2220	04952.95	05010.95	05060.95	TS150166.95	TS150050.95	TS150063.95	TS150076.95	TS150145.95	TS150035.95
2420	04954.95	05012.95	05062.95	TS150167.95	TS150051.95	TS150064.95	TS150077.95	TS150146.95	TS150036.95
2720	04956.95	05014.95	05064.95	TS150168.95	TS150052.95	TS150065.95	TS150078.95	TS150147.95	TS150037.95
3020	-	-	-	TS150169.95	TS150053.95	TS150066.95	TS150079.95	TS150148.95	-
3320	-	-	-	-	-	-	TS150080.95	TS150149.95	-
Special	09180.95	09200.95	09250.95	TS150172.95	TS150056.95	TS150069.95	TS150082.95	TS150154.95	TS150042.95

Lc : beam length expressed in millimetres

Tab. 3.4

MANDATORY USE OF SHELF PANELS

SUPER 4-5-6

3.7.

SUPER 4-5-6 MANUAL PICKING GALVANISED, PAINTED BEAM CODES

CODE TABLE - TYPE :MANUAL PICKING BEAMS
FINISH :GALVANISED + POWDER COATING

- Beams assembled with safety brackets

Profile Version	70/22	70/3	70/4	70/2	70/22	70/3	70/4	70/5	106/22
	MOULDED CONNECTOR (Safety bracket 08082.95 or TS210005.95)			RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)					DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.95)
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code
920	04940.G1	05000.G1	05050.G1	TS150160.G1	TS150044.G1	TS150057.G1	TS150070.G1	TS150139.G1	TS150029.G1
1220	04942.G1	05002.G1	05052.G1	TS150161.G1	TS150045.G1	TS150058.G1	TS150071.G1	TS150140.G1	TS150030.G1
1520	04944.G1	05004.G1	05054.G1	TS150162.G1	TS150046.G1	TS150059.G1	TS150072.G1	TS150141.G1	TS150031.G1
1820	04946.G1	05006.G1	05056.G1	TS150163.G1	TS150047.G1	TS150060.G1	TS150073.G1	TS150142.G1	TS150032.G1
2020	04948.G1	05008.G1	05058.G1	TS150164.G1	TS150048.G1	TS150061.G1	TS150074.G1	TS150143.G1	TS150033.G1
2120	04950.G1	05009.G1	05059.G1	TS150165.G1	TS150049.G1	TS150062.G1	TS150075.G1	TS150144.G1	TS150034.G1
2220	04952.G1	05010.G1	05060.G1	TS150166.G1	TS150050.G1	TS150063.G1	TS150076.G1	TS150145.G1	TS150035.G1
2420	04954.G1	05012.G1	05062.G1	TS150167.G1	TS150051.G1	TS150064.G1	TS150077.G1	TS150146.G1	TS150036.G1
2720	04956.G1	05014.G1	05064.G1	TS150168.G1	TS150052.G1	TS150065.G1	TS150078.G1	TS150147.G1	TS150037.G1
3020	-	-	-	TS150169.G1	TS150053.G1	TS150066.G1	TS150079.G1	TS150148.G1	-
3320	-	-	-	-	-	-	TS150080.G1	TS150149.G1	-
Special	09180.G1	09200.G1	09250.G1	TS150172.G1	TS150056.G1	TS150069.G1	TS150082.G1	TS150154.G1	TS150042.G1

Lc : beam length expressed in millimetres

Tab. 3.5

MANDATORY USE OF SHELF PANELS

SUPER 4-5-6

3.8.

SUPER 4-5-6 PALLET RACKING GALVANISED BEAM CODES

CODE TABLE - TYPE :PALLET RACKING BEAMS FINISH :GALVANISED													Beams assembled with safety brackets			
Profile Version	70/3	70/4	70/5	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6	172/5	172/6
	RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)			DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.95)											RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)	
Maximum Unit Load	900 daN Unit load	1200 daN Unit load	1500 daN 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	daN Unit load	1800 daN Unit load
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
920	TS150057.95	TS150070.95	TS150139.95	TS150029.95	TS150206.95	02231.95	TS150001.95	02261.95	02291.95	TS150173.95	02531.95	TS150013.95	02561.95	02591.95	TS150187.95	TS150084.95
1220	TS150058.95	TS150071.95	TS150140.95	TS150030.95	TS150207.95	02233.95	TS150002.95	02263.95	02293.95	TS150174.95	02533.95	TS150014.95	02563.95	02593.95	TS150188.95	TS150085.95
1520	TS150059.95	TS150072.95	TS150141.95	TS150031.95	TS150208.95	02237.95	TS150003.95	02267.95	02297.95	TS150175.95	02537.95	TS150015.95	02567.95	02597.95	TS150189.95	TS150086.95
1820	TS150060.95	TS150073.95	TS150142.95	TS150032.95	TS150209.95	02239.95	TS150004.95	02269.95	02299.95	TS150176.95	02539.95	TS150016.95	02569.95	02599.95	TS150190.95	TS150087.95
2020	TS150061.95	TS150074.95	TS150143.95	TS150033.95	TS150210.95	02241.95	TS150005.95	02271.95	02301.95	TS150177.95	02541.95	TS150017.95	02571.95	02601.95	TS150191.95	TS150088.95
2120	TS150062.95	TS150075.95	TS150144.95	TS150034.95	TS150211.95	02243.95	TS150006.95	02273.95	02303.95	TS150178.95	02543.95	TS150018.95	02573.95	02603.95	TS150192.95	TS150089.95
2220	TS150063.95	TS150076.95	TS150145.95	TS150035.95	TS150212.95	02245.95	TS150007.95	02275.95	02305.95	TS150179.95	02545.95	TS150019.95	02575.95	02605.95	TS150193.95	TS150090.95
2420	TS150064.95	TS150077.95	TS150146.95	TS150036.95	TS150213.95	02247.95	TS150008.95	02277.95	02307.95	TS150180.95	02547.95	TS150020.95	02577.95	02607.95	TS150194.95	TS150091.95
2720	TS150065.95	TS150078.95	TS150147.95	TS150037.95	TS150215.95	02251.95	TS150009.95	02281.95	02311.95	TS150181.95	02551.95	TS150021.95	02581.95	02611.95	TS150195.95	TS150092.95
3020	TS150066.95	TS150079.95	TS150148.95	-	-	02253.95	TS150010.95	02283.95	02313.95	TS150182.95	02553.95	TS150022.95	02583.95	02613.95	TS150196.95	TS150093.95
3320	-	TS150080.95	TS150149.95	-	-	02254.95	TS150136.95	02284.95	02314.95	TS150183.95	02554.95	TS150137.95	02584.95	02614.95	TS150197.95	TS150094.95
3520	-	-	-	-	-	02255.95	TS150011.95	02285.95	02315.95	TS150184.95	02555.95	TS150023.95	02585.95	02615.95	TS150198.95	TS150095.95
3620	-	-	-	-	-	02256.95	TS150027.95	02286.95	02316.95	-	02556.95	TS150028.95	02586.95	02616.95	TS150199.95	TS150096.95
4020	-	-	-	-	-	02257.95	TS150012.95	02287.95	02317.95	-	02557.95	TS150024.95	02587.95	02617.95	TS150200.95	TS150097.95
Special	TS150069.95	TS150082.95	TS150154.95	TS150042.95	TS150205.95	02230.95	TS150025.95	02260.95	02290.95	TS150185.95	02530.95	TS150026.95	02560.95	02590.95	TS150202.95	TS150099.95

Tab. 3.6

Lc : beam length expressed in millimetres

 : MANDATORY USE OF DIAGONAL STRUTS

3.9.

SUPER 4-5-6 PALLET RACKING GALVANISED, PAINTED BEAM CODES

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SUPER 4-5-6

CODE TABLE - TYPE :PALLET RACKING BEAMS FINISH :GALVANISED													Beams assembled with safety brackets			
Profile Version	70/3	70/4	70/5	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6	172/5	172/6
RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)				DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.95)										RIVETED CONNECTOR (Safety bracket 08028.95 + 08029.95)		
Maximum Unit Load	900 daN Unit load	1200 daN Unit load	1500 daN 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	daN Unit load	1800 daN Unit load
Lc Beam Length	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
920	TS150057.G1	TS150070.G1	TS150139.G1	TS150029.G1	TS150206.G1	02231.G1	TS150001.G1	02261.G1	02291.G1	TS150173.G1	02531.G1	TS150013.G1	02561.G1	02591.G1	TS150187.G1	TS150084.G1
1220	TS150058.G1	TS150071.G1	TS150140.G1	TS150030.G1	TS150207.G1	02233.G1	TS150002.G1	02263.G1	02293.G1	TS150174.G1	02533.G1	TS150014.G1	02563.G1	02593.G1	TS150188.G1	TS150085.G1
1520	TS150059.G1	TS150072.G1	TS150141.G1	TS150031.G1	TS150208.G1	02237.G1	TS150003.G1	02267.G1	02297.G1	TS150175.G1	02537.G1	TS150015.G1	02567.G1	02597.G1	TS150189.G1	TS150086.G1
1820	TS150060.G1	TS150073.G1	TS150142.G1	TS150032.G1	TS150209.G1	02239.G1	TS150004.G1	02269.G1	02299.G1	TS150176.G1	02539.G1	TS150016.G1	02569.G1	02599.G1	TS150190.G1	TS150087.G1
2020	TS150061.G1	TS150074.G1	TS150143.G1	TS150033.G1	TS150210.G1	02241.G1	TS150005.G1	02271.G1	02301.G1	TS150177.G1	02541.G1	TS150017.G1	02571.G1	02601.G1	TS150191.G1	TS150088.G1
2120	TS150062.G1	TS150075.G1	TS150144.G1	TS150034.G1	TS150211.G1	02243.G1	TS150006.G1	02273.G1	02303.G1	TS150178.G1	02543.G1	TS150018.G1	02573.G1	02603.G1	TS150192.G1	TS150089.G1
2220	TS150063.G1	TS150076.G1	TS150145.G1	TS150035.G1	TS150212.G1	02245.G1	TS150007.G1	02275.G1	02305.G1	TS150179.G1	02545.G1	TS150019.G1	02575.G1	02605.G1	TS150193.G1	TS150090.G1
2420	TS150064.G1	TS150077.G1	TS150146.G1	TS150036.G1	TS150213.G1	02247.G1	TS150008.G1	02277.G1	02307.G1	TS150180.G1	02547.G1	TS150020.G1	02577.G1	02607.G1	TS150194.G1	TS150091.G1
2720	TS150065.G1	TS150078.G1	TS150147.G1	TS150037.G1	TS150215.G1	02251.G1	TS150009.G1	02281.G1	02311.G1	TS150181.G1	02551.G1	TS150021.G1	02581.G1	02611.G1	TS150195.G1	TS150092.G1
3020	TS150066.G1	TS150079.G1	TS150148.G1	-	-	02253.G1	TS150010.G1	02283.G1	02313.G1	TS150182.G1	02553.G1	TS150022.G1	02583.G1	02613.G1	TS150196.G1	TS150093.G1
3320	-	TS150080.G1	TS150149.G1	-	-	02254.G1	TS150136.G1	02284.G1	02314.G1	TS150183.G1	02554.G1	TS150137.G1	02584.G1	02614.G1	TS150197.G1	TS150094.G1
3520	-	-	-	-	-	02255.G1	TS150011.G1	02285.G1	02315.G1	TS150184.G1	02555.G1	TS150023.G1	02585.G1	02615.G1	TS150198.G1	TS150095.G1
3620	-	-	-	-	-	02256.G1	TS150027.G1	02286.G1	02316.G1	-	02556.G1	TS150028.G1	02586.G1	02616.G1	TS150199.G1	TS150096.G1
4020	-	-	-	-	-	02257.G1	TS150012.G1	02287.G1	02317.G1	-	02557.G1	TS150024.G1	02587.G1	02617.G1	TS150200.G1	TS150097.G1
Special	TS150069.G1	TS150082.G1	TS150154.G1	TS150042.G1	TS150205.G1	02230.G1	TS150025.G1	02260.G1	02290.G1	TS150185.G1	02530.G1	TS150026.G1	02560.G1	02590.G1	TS150202.G1	TS150099.G1

Tab. 3.7

Lc : beam length expressed in millimetres



: MANDATORY USE OF DIAGONAL STRUTS

SUPER 4-5-6

4.

SUPER 4-5-6 FRAMES

4.1.

SUPER 4-5-6 600-1500 DEEP FRAME CODES

FRAME BRACING



Fig. 4.1

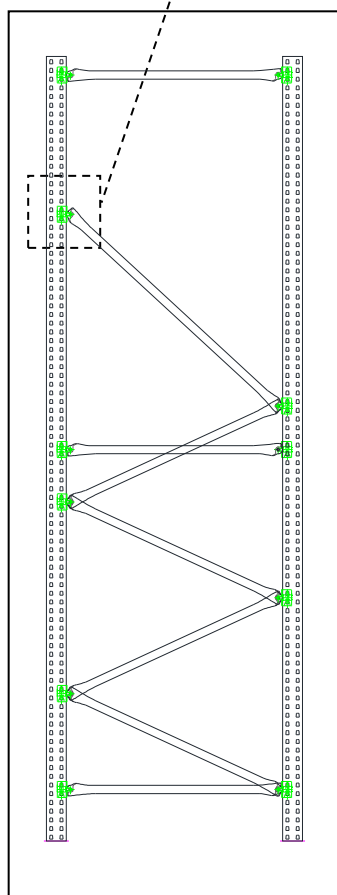


Fig. 4.2

IMPORTANT:

Refer to the "PALLET RACKING AND DRIVE-IN OPERATING AND MAINTENANCE MANUAL" (code MUM/01) for all information regarding assembly of Super 456 frames.

FRAME HEIGHT	SUPER 4 FRAME	SUPER 5 FRAME	SUPER 6 FRAME	DEPTH
(mm)	Art. Code	Art. Code	Art. Code	(mm)
1979	MPE106X20.G1	MPE206X20.G1	MPE306X20.G1	600
2475	MPE106X25.G1	MPE206X25.G1	MPE306X25.G1	
2970	MPE106X30.G1	MPE206X30.G1	MPE306X30.G1	
3499	MPE106X35.G1	MPE206X35.G1	MPE306X35.G1	
3995	MPE106X40.G1	MPE206X40.G1	MPE306X40.G1	
4491	MPE106X45.G1	MPE206X45.G1	MPE306X45.G1	
4986	MPE106X50.G1	MPE206X50.G1	MPE306X50.G1	
5482	MPE106X55.G1	MPE206X55.G1	MPE306X55.G1	
5978	MPE106X60.G1	MPE206X60.G1	MPE306X60.G1	
6473	MPE106X65.G1	MPE206X65.G1	MPE306X65.G1	
6969	MPE106X70.G1	MPE206X70.G1	MPE306X70.G1	
7498	-	MPE206X75.G1	MPE306X75.G1	
7994	-	MPE206X80.G1	MPE306X80.G1	
8489	-	MPE206X85.G1	MPE306X85.G1	
8985	-	MPE206X90.G1	MPE306X90.G1	
9481	-	MPE206X95.G1	MPE306X95.G1	700
9976	-	MPE206XA0.G1	MPE306XA0.G1	
1979	MPE107X20.G1	MPE207X20.G1	MPE307X20.G1	
2475	MPE107X25.G1	MPE207X25.G1	MPE307X25.G1	
2970	MPE107X30.G1	MPE207X30.G1	MPE307X30.G1	
3499	MPE107X35.G1	MPE207X35.G1	MPE307X35.G1	
3995	MPE107X40.G1	MPE207X40.G1	MPE307X40.G1	
4491	MPE107X45.G1	MPE207X45.G1	MPE307X45.G1	
4986	MPE107X50.G1	MPE207X50.G1	MPE307X50.G1	
5482	MPE107X55.G1	MPE207X55.G1	MPE307X55.G1	
5978	MPE107X60.G1	MPE207X60.G1	MPE307X60.G1	
6473	MPE107X65.G1	MPE207X65.G1	MPE307X65.G1	
6969	MPE107X70.G1	MPE207X70.G1	MPE307X70.G1	
7498	-	MPE207X75.G1	MPE307X75.G1	
7994	-	MPE207X80.G1	MPE307X80.G1	
8489	-	MPE207X85.G1	MPE307X85.G1	
8985	-	MPE207X90.G1	MPE307X90.G1	
9481	-	MPE207X95.G1	MPE307X95.G1	
9976	-	MPE207XA0.G1	MPE307XA0.G1	

Tab. 4.1

SUPER 4-5-6

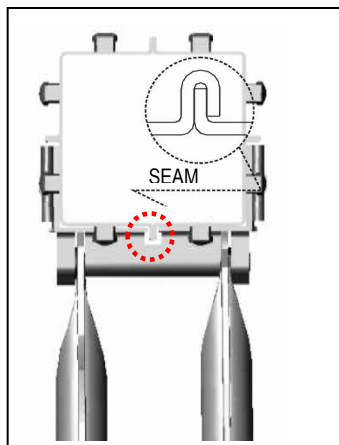


Fig. 4.3

SUPER 4-5-6 FRAME
Bracing and base plate
assembly (Fig. 4.3, 4.4)

Use:

Base plate Macro code 08000.95
2mm shim 08022.95
M10x80 anchor bolt 00041.20

The base plates are fastened to the uprights with 2 of the following codes per component, which are included in the Super 456 base plate Macro code:

M8 nuts 00021.20
M8x20 bolt 00002.20

The frame bracing is connected to the uprights with the Super 456 frame connection bracket and secured by bolt:

S456 frame bracket TS210017.95
M8 x 80 bolt 00019563.20
M8 nut 00021.20

IMPORTANT: The upright seam must always be placed towards the center of the frame as shown in Fig. 4.3



Fig. 4.4

FRAME HEIGHT (mm)	SUPER 4 FRAME Art. Code	SUPER 5 FRAME Art. Code	SUPER 6 FRAME Art. Code	DEPTH (mm)
1979	MPE108X20.G1	MPE208X20.G1	MPE308X20.G1	800
2475	MPE108X25.G1	MPE208X25.G1	MPE308X25.G1	
2970	MPE108X30.G1	MPE208X30.G1	MPE308X30.G1	
3499	MPE108X35.G1	MPE208X35.G1	MPE308X35.G1	
3995	MPE108X40.G1	MPE208X40.G1	MPE308X40.G1	
4491	MPE108X45.G1	MPE208X45.G1	MPE308X45.G1	
4986	MPE108X50.G1	MPE208X50.G1	MPE308X50.G1	
5482	MPE108X55.G1	MPE208X55.G1	MPE308X55.G1	
5978	MPE108X60.G1	MPE208X60.G1	MPE308X60.G1	
6473	MPE108X65.G1	MPE208X65.G1	MPE308X65.G1	
6969	MPE108X70.G1	MPE208X70.G1	MPE308X70.G1	
7498	-	MPE208X75.G1	MPE308X75.G1	
7994	-	MPE208X80.G1	MPE308X80.G1	
8489	-	MPE208X85.G1	MPE308X85.G1	
8985	-	MPE208X90.G1	MPE308X90.G1	
9481	-	MPE208X95.G1	MPE308X95.G1	900
9976	-	MPE208XA0.G1	MPE308XA0.G1	
1979	MPE109X20.G1	MPE209X20.G1	MPE309X20.G1	
2475	MPE109X25.G1	MPE209X25.G1	MPE309X25.G1	
2970	MPE109X30.G1	MPE209X30.G1	MPE309X30.G1	
3499	MPE109X35.G1	MPE209X35.G1	MPE309X35.G1	
3995	MPE109X40.G1	MPE209X40.G1	MPE309X40.G1	
4491	MPE109X45.G1	MPE209X45.G1	MPE309X45.G1	
4986	MPE109X50.G1	MPE209X50.G1	MPE309X50.G1	
5482	MPE109X55.G1	MPE209X55.G1	MPE309X55.G1	
5978	MPE109X60.G1	MPE209X60.G1	MPE309X60.G1	
6473	MPE109X65.G1	MPE209X65.G1	MPE309X65.G1	
6969	MPE109X70.G1	MPE209X70.G1	MPE309X70.G1	
7498	-	MPE209X75.G1	MPE309X75.G1	
7994	-	MPE209X80.G1	MPE309X80.G1	
8489	-	MPE209X85.G1	MPE309X85.G1	
8985	-	MPE209X90.G1	MPE309X90.G1	
9481	-	MPE209X95.G1	MPE309X95.G1	
9976	-	MPE209XA0.G1	MPE309XA0.G1	

SUPER 4-5-6

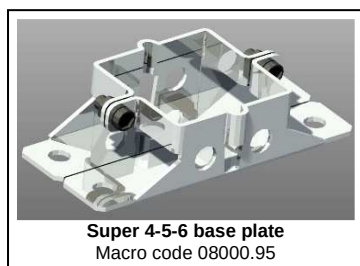


Fig. 4.5

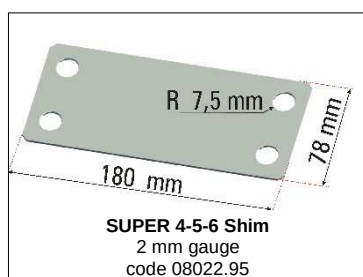


Fig. 4.6

FRAME HEIGHT (mm)	SUPER 4 FRAME Art. Code	SUPER 5 FRAME Art. Code	SUPER 6 FRAME Art. Code	DEPTH (mm)
1979	MPE110X20.G1	MPE210X20.G1	MPE310X20.G1	1000
2475	MPE110X25.G1	MPE210X25.G1	MPE310X25.G1	
2970	MPE110X30.G1	MPE210X30.G1	MPE310X30.G1	
3499	MPE110X35.G1	MPE210X35.G1	MPE310X35.G1	
3995	MPE110X40.G1	MPE210X40.G1	MPE310X40.G1	
4491	MPE110X45.G1	MPE210X45.G1	MPE310X45.G1	
4986	MPE110X50.G1	MPE210X50.G1	MPE310X50.G1	
5482	MPE110X55.G1	MPE210X55.G1	MPE310X55.G1	
5978	MPE110X60.G1	MPE210X60.G1	MPE310X60.G1	
6473	MPE110X65.G1	MPE210X65.G1	MPE310X65.G1	
6969	MPE110X70.G1	MPE210X70.G1	MPE310X70.G1	
7498	-	MPE210X75.G1	MPE310X75.G1	
7994	-	MPE210X80.G1	MPE310X80.G1	
8489	-	MPE210X85.G1	MPE310X85.G1	
8985	-	MPE210X90.G1	MPE310X90.G1	
9481	-	MPE210X95.G1	MPE310X95.G1	
9976	-	MPE210XA0.G1	MPE310XA0.G1	

1979	MPE111X20.G1	MPE211X20.G1	MPE311X20.G1	1100
2475	MPE111X25.G1	MPE211X25.G1	MPE311X25.G1	
2970	MPE111X30.G1	MPE211X30.G1	MPE311X30.G1	
3499	MPE111X35.G1	MPE211X35.G1	MPE311X35.G1	
3995	MPE111X40.G1	MPE211X40.G1	MPE311X40.G1	
4491	MPE111X45.G1	MPE211X45.G1	MPE311X45.G1	
4986	MPE111X50.G1	MPE211X50.G1	MPE311X50.G1	
5482	MPE111X55.G1	MPE211X55.G1	MPE311X55.G1	
5978	MPE111X60.G1	MPE211X60.G1	MPE311X60.G1	
6473	MPE111X65.G1	MPE211X65.G1	MPE311X65.G1	
6969	MPE111X70.G1	MPE211X70.G1	MPE311X70.G1	
7498	-	MPE211X75.G1	MPE311X75.G1	
7994	-	MPE211X80.G1	MPE311X80.G1	
8489	-	MPE211X85.G1	MPE311X85.G1	
8985	-	MPE211X90.G1	MPE311X90.G1	
9481	-	MPE211X95.G1	MPE311X95.G1	
9976	-	MPE211XA0.G1	MPE311XA0.G1	

SUPER 4-5-6



M10 anchor bolt 00041.20
(2 or 4 anchor bolts per upright)

Fig. 4.7

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.

FRAME HEIGHT (mm)	SUPER 4 FRAME Art. Code	SUPER 5 FRAME Art. Code	SUPER 6 FRAME Art. Code	DEPTH (mm)
1979	MPE112X20.G1	MPE212X20.G1	MPE312X20.G1	1200
2475	MPE112X25.G1	MPE212X25.G1	MPE312X25.G1	
2970	MPE112X30.G1	MPE212X30.G1	MPE312X30.G1	
3499	MPE112X35.G1	MPE212X35.G1	MPE312X35.G1	
3995	MPE112X40.G1	MPE212X40.G1	MPE312X40.G1	
4491	MPE112X45.G1	MPE212X45.G1	MPE312X45.G1	
4986	MPE112X50.G1	MPE212X50.G1	MPE312X50.G1	
5482	MPE112X55.G1	MPE212X55.G1	MPE312X55.G1	
5978	MPE112X60.G1	MPE212X60.G1	MPE312X60.G1	
6473	MPE112X65.G1	MPE212X65.G1	MPE312X65.G1	
6969	MPE112X70.G1	MPE212X70.G1	MPE312X70.G1	
7498	-	MPE212X75.G1	MPE312X75.G1	1300
7994	-	MPE212X80.G1	MPE312X80.G1	
8489	-	MPE212X85.G1	MPE312X85.G1	
8985	-	MPE212X90.G1	MPE312X90.G1	
9481	-	MPE212X95.G1	MPE312X95.G1	
9976	-	MPE212XA0.G1	MPE312XA0.G1	
1979	MPE113X20.G1	MPE213X20.G1	MPE313X20.G1	
2475	MPE113X25.G1	MPE213X25.G1	MPE313X25.G1	
2970	MPE113X30.G1	MPE213X30.G1	MPE313X30.G1	
3499	MPE113X35.G1	MPE213X35.G1	MPE313X35.G1	
3995	MPE113X40.G1	MPE213X40.G1	MPE313X40.G1	
4491	MPE113X45.G1	MPE213X45.G1	MPE313X45.G1	
4986	MPE113X50.G1	MPE213X50.G1	MPE313X50.G1	
5482	MPE113X55.G1	MPE213X55.G1	MPE313X55.G1	
5978	MPE113X60.G1	MPE213X60.G1	MPE313X60.G1	
6473	MPE113X65.G1	MPE213X65.G1	MPE313X65.G1	
6969	MPE113X70.G1	MPE213X70.G1	MPE313X70.G1	
7498	-	MPE213X75.G1	MPE313X75.G1	
7994	-	MPE213X80.G1	MPE313X80.G1	
8489	-	MPE213X85.G1	MPE313X85.G1	
8985	-	MPE213X90.G1	MPE313X90.G1	
9481	-	MPE213X95.G1	MPE313X95.G1	
9976	-	MPE213XA0.G1	MPE313XA0.G1	

SUPER 4-5-6

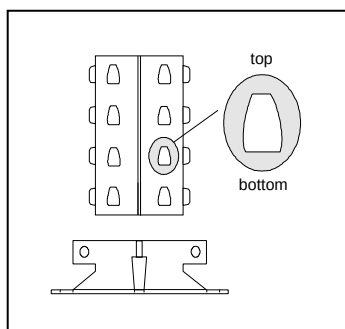
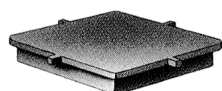


Fig. 4.8

Important:

The Super 456 upright has a direction from top to bottom that must be respected; After examining the connection place the narrow end on top as shown in Fig. 4.8



Super 4-5-6 PVC upright cap

Code 08021.98

Fig. 4.9

FRAME HEIGHT (mm)	SUPER 4 FRAME Art. Code	SUPER 5 FRAME Art. Code	SUPER 6 FRAME Art. Code	DEPTH (mm)
1979	MPE114X20.G1	MPE214X20.G1	MPE314X20.G1	1400
2475	MPE114X25.G1	MPE214X25.G1	MPE314X25.G1	
2970	MPE114X30.G1	MPE214X30.G1	MPE314X30.G1	
3499	MPE114X35.G1	MPE214X35.G1	MPE314X35.G1	
3995	MPE114X40.G1	MPE214X40.G1	MPE314X40.G1	
4491	MPE114X45.G1	MPE214X45.G1	MPE314X45.G1	
4986	MPE114X50.G1	MPE214X50.G1	MPE314X50.G1	
5482	MPE114X55.G1	MPE214X55.G1	MPE314X55.G1	
5978	MPE114X60.G1	MPE214X60.G1	MPE314X60.G1	
6473	MPE114X65.G1	MPE214X65.G1	MPE314X65.G1	
6969	MPE114X70.G1	MPE214X70.G1	MPE314X70.G1	
7498	-	MPE214X75.G1	MPE314X75.G1	
7994	-	MPE214X80.G1	MPE314X80.G1	
8489	-	MPE214X85.G1	MPE314X85.G1	
8985	-	MPE214X90.G1	MPE314X90.G1	
9481	-	MPE214X95.G1	MPE314X95.G1	1500
9976	-	MPE214XA0.G1	MPE314XA0.G1	
1979	MPE115X20.G1	MPE215X20.G1	MPE315X20.G1	
2475	MPE115X25.G1	MPE215X25.G1	MPE315X25.G1	
2970	MPE115X30.G1	MPE215X30.G1	MPE315X30.G1	
3499	MPE115X35.G1	MPE215X35.G1	MPE315X35.G1	
3995	MPE115X40.G1	MPE215X40.G1	MPE315X40.G1	
4491	MPE115X45.G1	MPE215X45.G1	MPE315X45.G1	
4986	MPE115X50.G1	MPE215X50.G1	MPE315X50.G1	
5482	MPE115X55.G1	MPE215X55.G1	MPE315X55.G1	
5978	MPE115X60.G1	MPE215X60.G1	MPE315X60.G1	
6473	MPE115X65.G1	MPE215X65.G1	MPE315X65.G1	
6969	MPE115X70.G1	MPE215X70.G1	MPE315X70.G1	
7498	-	MPE215X75.G1	MPE315X75.G1	
7994	-	MPE215X80.G1	MPE315X80.G1	
8489	-	MPE215X85.G1	MPE315X85.G1	
8985	-	MPE215X90.G1	MPE315X90.G1	
9481	-	MPE215X95.G1	MPE315X95.G1	
9976	-	MPE215XA0.G1	MPE315XA0.G1	

4.2.

SUPER 4-5-6 FRAME ASSEMBLY TABLES

Tab. 4.2 lists the number of frame bracing components required to assemble Super 4-5-6 frames.

Tab. 4.3, in addition to providing the frame bracing lengths, shows the real dimensions (89 x 89 upright dimension) of the frames.



The frame bracing is connected to the uprights with the Super 456 frame connection bracket (Code TS210017.95), locked into position with the M8x80 (code 00019563.20 + 00021.20) bolts.

An M8 washer [code 902.835.20] is used as compensator when this bracket accommodates only one frame bracing component.

Refer to ISTM-309 for the Super 4-5-6 Frame Bracing Bracket assembly instructions

Note: The bracket cannot be reutilized.

Fig. 4.10

SUPER 4-5-6 FRAME ASSEMBLY COMPONENT TABLE

HEIGHT (mm)	HORIZONTAL	SHORT DIAGONAL	LONG DIAGONAL	FRAME BRACKETS	WASHERS
2000	2	4	0	8	4
2500	3	4	1	10	4
3000	3	4	1	11	6
3500	3	4	2	12	6
4000	3	4	3	13	6
4500	4	4	3	15	8
5000	4	4	4	16	8
5500	4	4	5	17	8
6000	4	4	5	17	8
6500	4	4	6	18	8
7000	5	4	7	21	10
7500	5	4	8	21	9
8000	5	4	8	22	10
8500	5	4	9	23	10
9000	6	4	10	25	10
9500	6	4	10	26	12
10000	6	4	11	27	12

Tab. 4.2

Figure 4.11 and figure 4.12 show the location of the Super 456 frame bracing. The frame must **always** be closed at the top and at the base with a horizontal spacer bar. The dimensions refer to the bolt locations (center distance between the SUPER 456 frame bracing connection bracket).

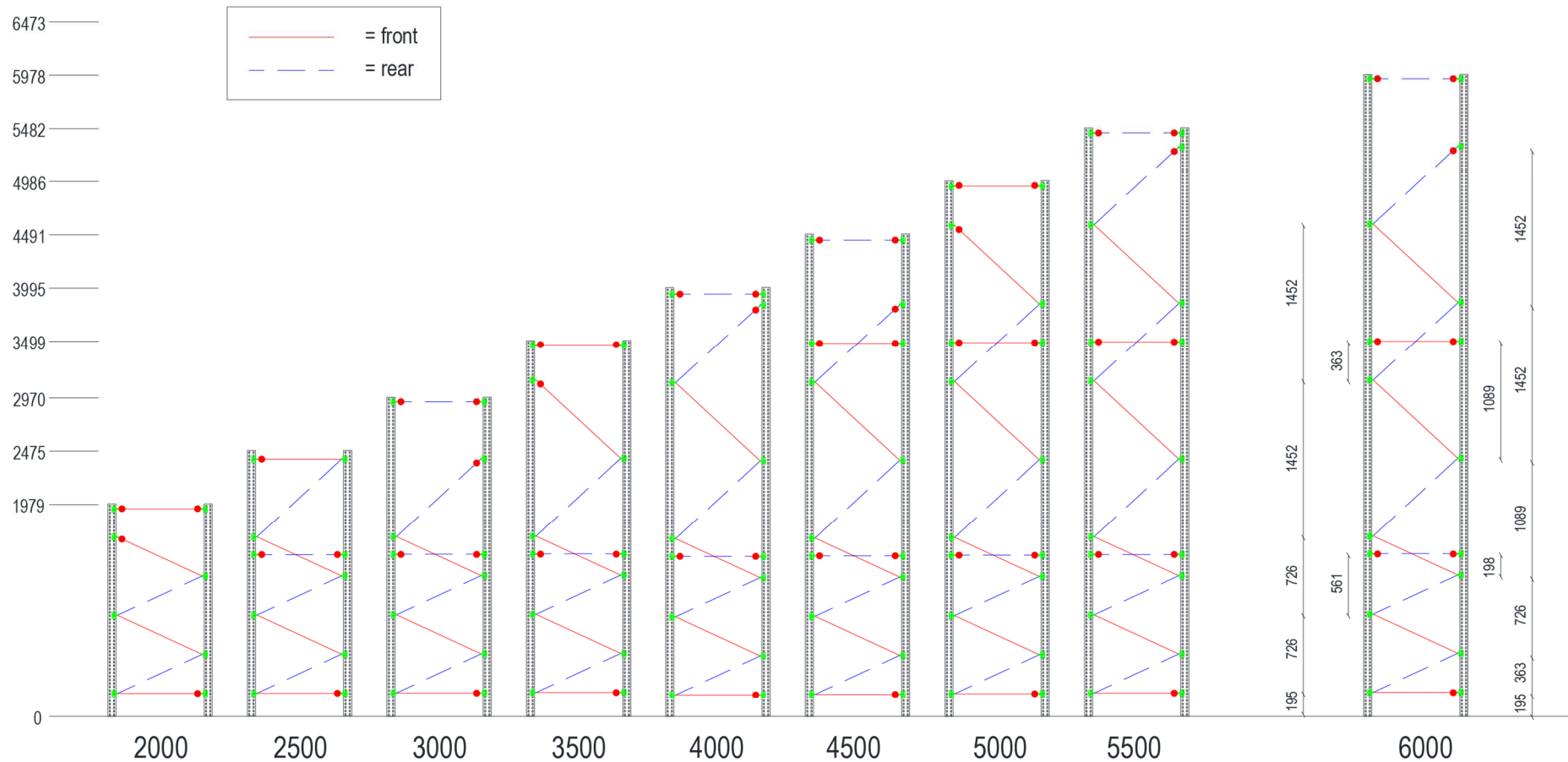
SUPER 4-5-6 COMPONENT DIMENSION TABLE

NOMINAL FRAME DEPTH (mm)	REAL FRAME DEPTH (mm)	HORIZONTAL SPACER (mm)	SHORT DIAGONAL (mm)	LONG DIAGONAL (mm)
600	590	424,0	566,0	856,5
700	689	523,0	642,4	908,0
800	788	622,0	724,6	967,1
900	887	721,0	810,7	1032,6
1000	986	820,0	899,5	1103,2
1100	1085	919,0	990,3	1178,0
1200	1184	1018,0	1082,6	1256,3
1300	1283	1117,0	1176,1	1337,3
1400	1382	1216,0	1270,4	1420,7
1500	1481	1315,0	1365,3	1506,0

Tab. 4.3

4.3.

SUPER 4-5-6 FRAME ASSEMBLY DIAGRAM

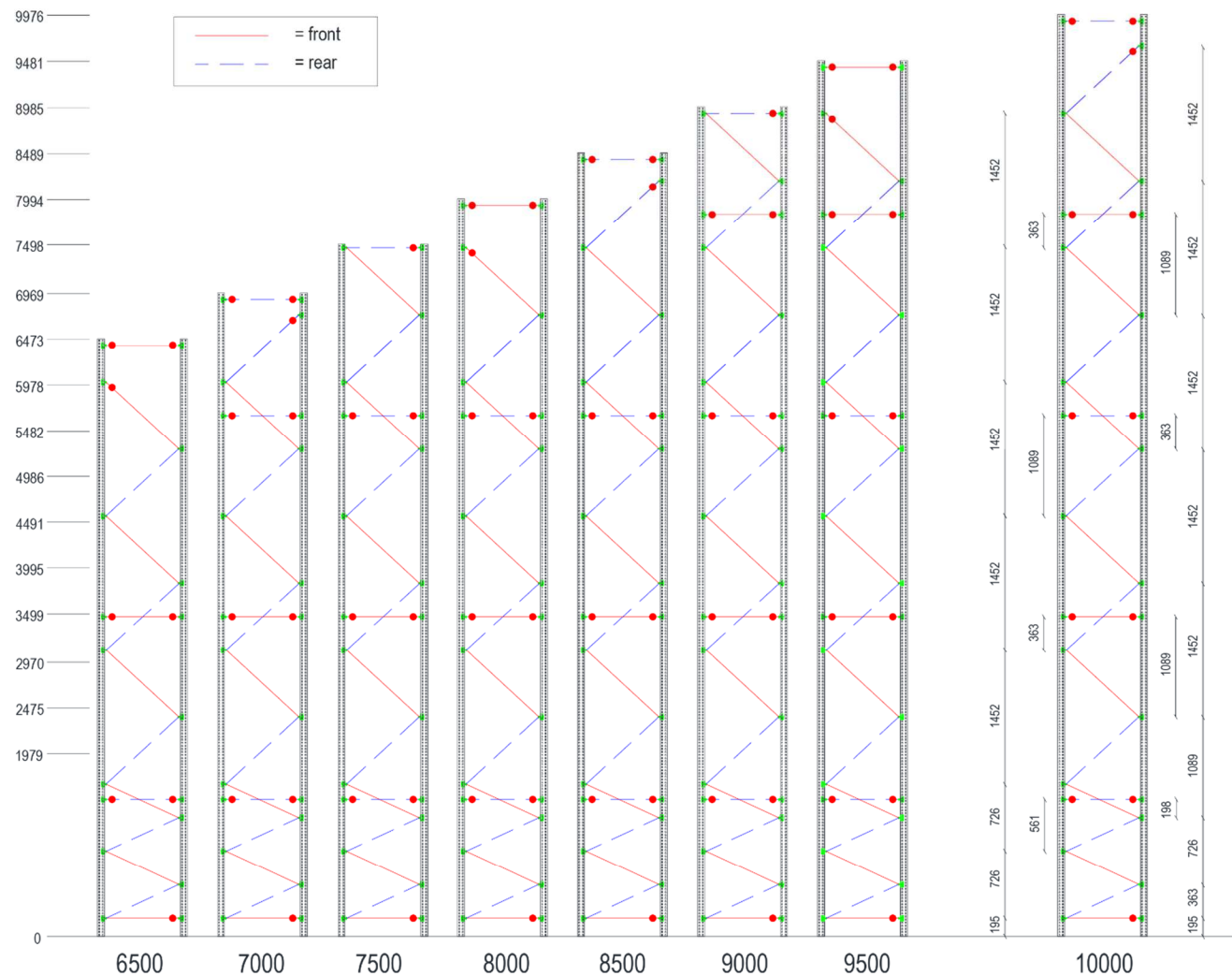


NOTE: dimensions refer to the bolt locations (center of the Super 4-5-6 frame bracing connection bracket)

● Indicates a washer placed in the coupling

Fig. 4.11

SUPER 4-5-6



NOTE: dimensions refer to the bolt locations (center of the Super 4-5-6 frame bracing connection bracket)

● Indicates a washer placed in the coupling

Fig. 4.12

4.4.

SPECIAL SUPER 4-5-6 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 **1:5** - standard frame bracing;
- ratios from **1:5** to **1:6** - frame bracing containing 8 short diagonal spacer bars;
- ratios from **1:6** to **1:7** - frame bracing containing 8 short diagonal spacer bars with:
 - a maximum bay lengths of 2720mm and;
 - a 20% reduction in the tabled admissible frame load bearing capacity for non-braced rows;
 - a 10% reduction in the tabled 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. 4.11)

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 (with base plate in line with the beams) and the load bearing capacity of the industrial floor must be checked for structural adequacy.

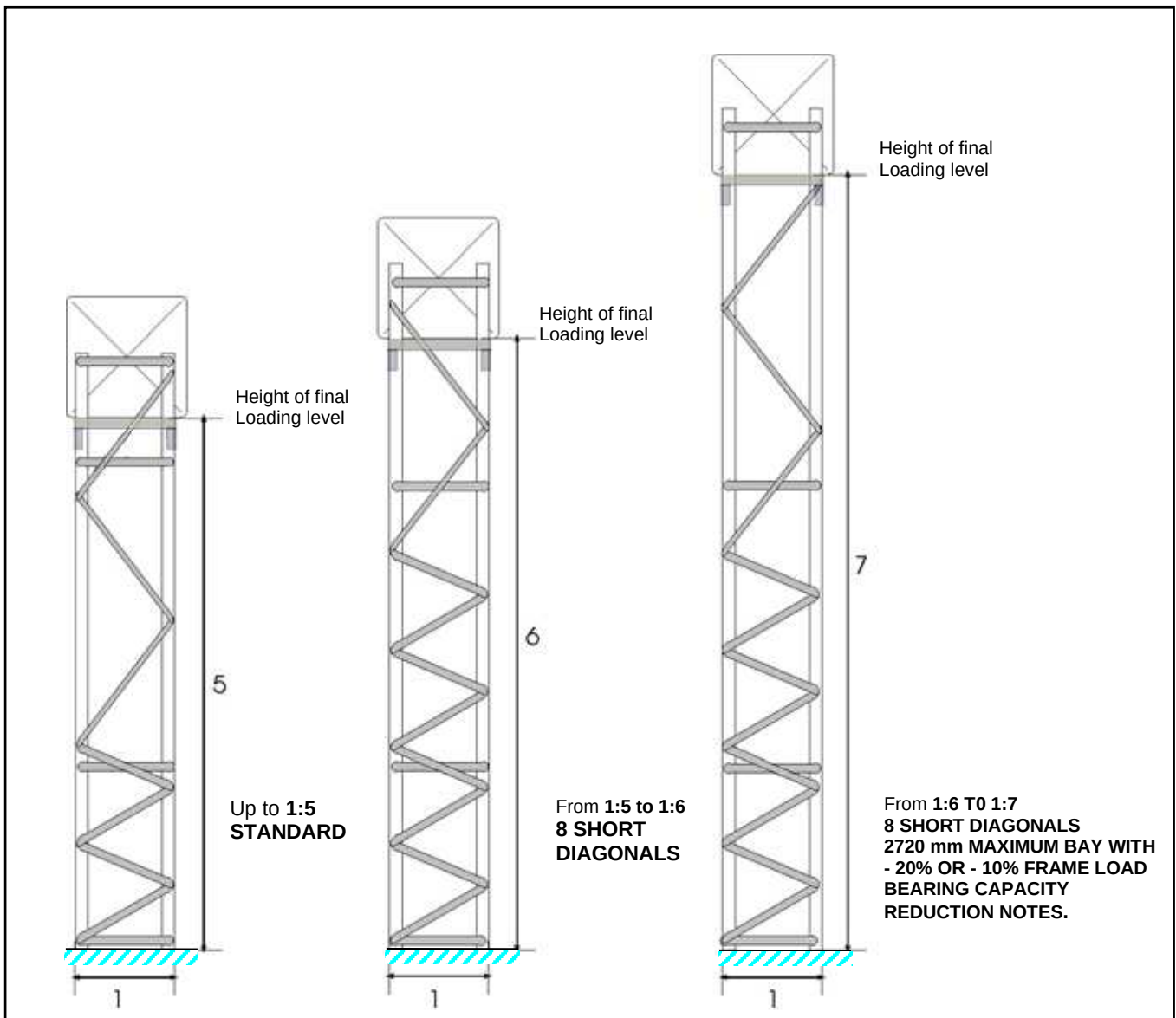


Fig. 4.11

4.5.

SUPER 4-5-6 FRAME BRACING COMPONENT CODES

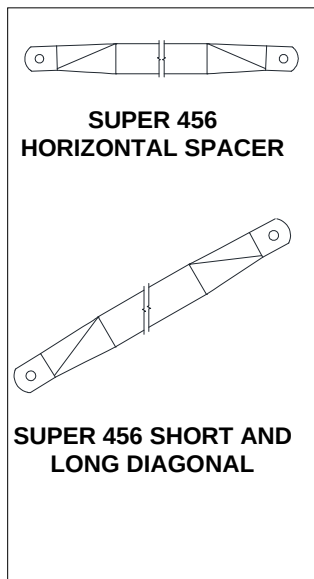


Fig. 4.12



Fig. 4.13

NOMINAL FRAME DEPTH (mm)	HORIZONTAL SPACER Article Code	SHORT DIAGONAL Article Code	LONG DIAGONAL Article Code
600	04206.G1	04506.G1	04606.G1
700	04208.G1	04508.G1	04608.G1
800	04210.G1	04510.G1	04610.G1
900	04212.G1	04512.G1	04612.G1
1000	04214.G1	04514.G1	04614.G1
1100	04216.G1	04516.G1	04616.G1
1200	04218.G1	04518.G1	04618.G1
1300	04220.G1	04520.G1	04620.G1
1400	04222.G1	04522.G1	04622.G1
1500	04224.G1	04524.G1	04624.G1
Special	04200.G1	04500.G1	04600.G1

Tab. 4.4

SPECIAL frame bracing components are ordered with their real lengths (**L** real horiz./diag. Fig. 4.14) applying the formula of Tab. 4.5. Contact METALSISTEM Technical Office for nominal frame dimensions greater than 1500m.

ORDER LENGTH FORMULAE FOR SPECIAL FRAME BRACING			
ARTICLE	FORMULA	ORDER LENGTH RANGE	
		Min. (mm)	Max (mm)
Horizontal	Length real horiz.= Length real frame - 166	280	-
Short diagonal	$L_{\text{real short d.}} = \sqrt{(L_{\text{real horiz.}} - 31)^2 + (363)^2} + 31$	535	1516
Long diagonal	$L_{\text{real long d.}} = \sqrt{(L_{\text{real horiz.}} - 31)^2 + (726)^2} + 31$	837	1516

Tab. 4.5

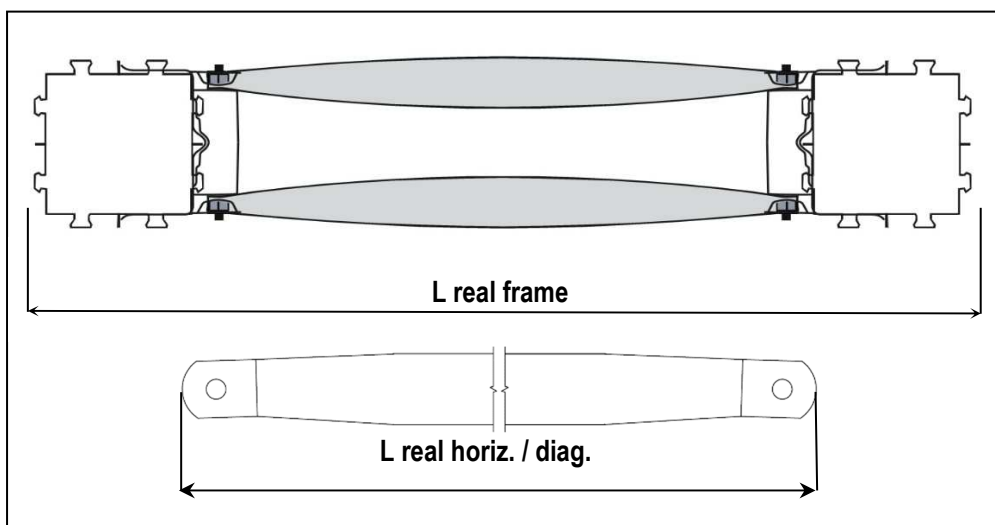


Fig. 4.14

4.6.

SUPER 4-5-6 FRAME DOUBLE SIDE ROW SPACERS

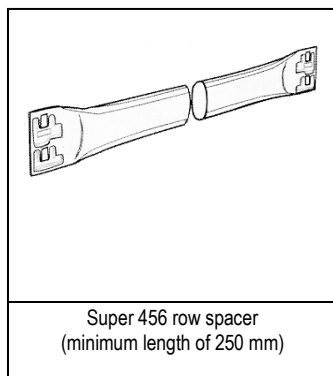


Fig. 4.15

The SUPER 4-5-6 row spacers (Fig. 4.15) are used to tie double side frames. Row spacers must always be used in pairs and are placed at the connection points of the diagonal spacer bars with the uprights starting from the arrival point of the last short diagonal spacer bar (however never more than 2000mm).

Integrated safety clips located immediately under the top connection lug on either side of the component are activated by pressing them flat against the upright with a pin punch or similar. The assembly is completed only when both safety clips are activated.

Row spacer dimensions and codes are shown on Tab. 4.6

The following formula is applied when ordering SUPER 4-5-6 spacer bars with special length (code 09100.G1).

$$L = L_n + 50\text{mm}$$

Where:

L = Spacer bar order length

L_n = Net span between double entry frames (Fig. 4.16).

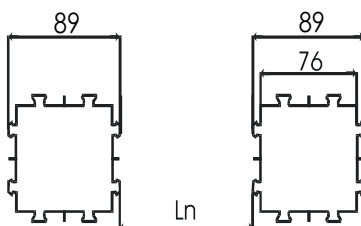


Fig. 4.16

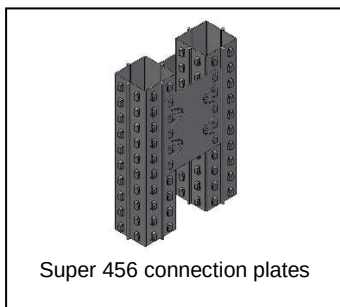
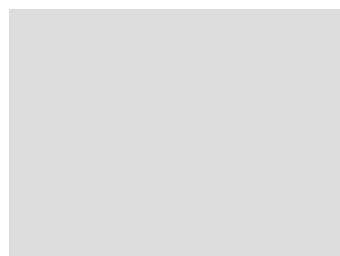
The row spacers can be ordered in lengths ranging from a minimum of 300mm (L_n = 250mm) up to 1000mm.

SUPER 4-5-6 ROW SPACER DIMENSIONS AND CODES		
NET LENGTH (L _n)	CODE	DESCRIPTION
mm		
Special	09100.G1	Super 4-5-6 row spacer special depth
250	08336.G1	Super 4-5-6 row spacer tie span 250
300	08338.G1	Super 4-5-6 row spacer tie span 300
350	08340.G1	Super 4-5-6 row spacer tie span 350
400	08342.G1	Super 4-5-6 row spacer tie span 400
450	08344.G1	Super 4-5-6 row spacer tie span 450
500	08346.G1	Super 4-5-6 row spacer tie span 500
550	08348.G1	Super 4-5-6 row spacer tie span 550
600	08350.G1	Super 4-5-6 row spacer tie span 600

Tab. 4.6

SUPER 4-5-6

Standard row spacers cannot be used for net distances between frames of less than 250mm. SUPER 4-5-6 Connection Plates (Fig. 4.17) are used in these applications. The net lengths of these components are shown in Tab. 4.7.



Super 456 connection plates

Fig. 4.17

SUPER 4-5-6 CONNECTION PLATES		
NET LENGTH (Ln)	CODE	DESCRIPTION
mm		
14	MP210070.G1	Super 4-5-6 quick lock connection plate H = 64
30	MP210071.G1	Super 4-5-6 quick lock connection plate H = 80
60	MP210072.G1	Super 4-5-6 quick lock connection plate H=110
100	MP210073.G1	Super 4-5-6 quick lock connection plate H=150
140	MP210074.G1	Super 4-5-6 quick lock connection plate H=190
190	MP210075.G1	Super 4-5-6 quick lock connection plate H=240
214	MP210076.G1	Super 4-5-6 quick lock connection plate H=264
270	MP210077.G1	Super 4-5-6 quick lock connection plate H=320

Tab. 4.7

4.7.

WALL TIES

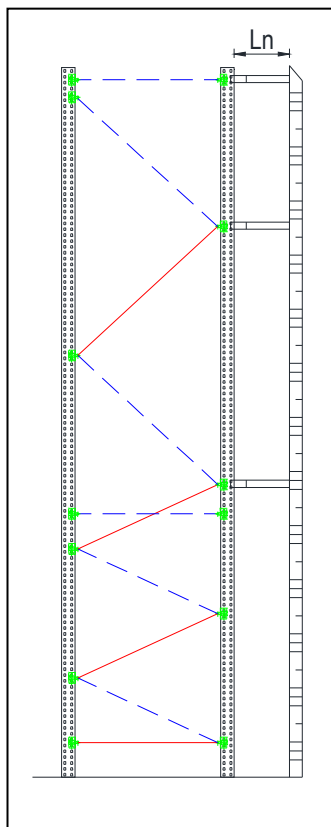


Fig. 4.18

Universal Fasteners are used to tie frames to walls. Information regarding the application of the Universal Fasteners to the SUPER 456 product is 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 more than 2000 mm apart. (Fig. 4.18).

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 owner before connecting the pallet racking frame to the wall (refer to Section 1, point g).

4.8.

SUPER 4-5-6 PORTAL TIE

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

The function of the portal tie is to increase the stability of the frame by connecting frame of a single side row to the adjacent double side row frames. 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.

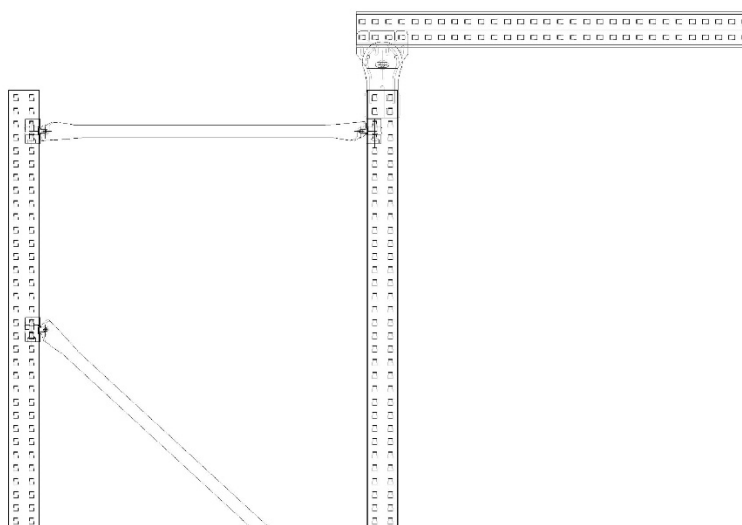


Fig. 4.19

The portal tie is formed by a Super 456 upright placed across the corridor resting on 2 corridor facing uprights. The portal tie is accessorised with slotted hinge bases (code 00019743.G1) fitted at either extremity and bolted to hinge head brackets (code AI210083.G1), which have been fitted, in pairs, to the top of the corridor facing frame uprights, and bolted with M12x100 bolts. Tab. 4.8 shows all the components necessary for the creation of one portal tie.

SUPER 4-5-6 PORTAL TIE		
Code	Quantity	Description
XXXXX.G1	1	SUPER 4-5-6 Upright (portal tie 5'000mm max)
AI210083.G1	4	TS hinge head central hole
00019743.G1	2	TS slotted hinge base
00008518.20	2	Hex bolt M12x100 UNI5737 8.8ZB
00008023.20	2	M12 nylex nut UNI7474
00008025.20	4	M12 washer UNI6592 ZP

Tab. 4.8

NOTE: The upright length needs to be 218mm longer than the corridor width (rounded upwards to the nearest pitch).

5.
SUPER 4-5-6 UPRIGHTS
5.1.
SUPER 4-5-6 UPRIGHT CODES


Fig. 5.1

HEIGHT (H _{nom})	SUPER 4 UPRIGHTS	SUPER 5 UPRIGHTS	SUPER 6 UPRIGHTS
(mm)	Code	Code	Code
1979	01000.G1	01500.G1	01600.G1
2475	01002.G1	01502.G1	01602.G1
2970	01004.G1	01504.G1	01604.G1
3499	01006.G1	01506.G1	01606.G1
3995	01008.G1	01508.G1	01608.G1
4491	01010.G1	01510.G1	01610.G1
4986	01012.G1	01512.G1	01612.G1
5482	01014.G1	01514.G1	01614.G1
5978	01016.G1	01516.G1	01616.G1
6473	01018.G1	01518.G1	01618.G1
6969	01020.G1	01520.G1	01620.G1
7498	-	01522.G1	01622.G1
7994	-	01524.G1	01624.G1
8489	-	01526.G1	01626.G1
8985	-	01528.G1	01628.G1
9481	-	01530.G1	01630.G1
9976	-	01532.G1	01632.G1
Special	09010.G1	09012.G1	09014.G1

Tab. 5.1

NOTE:

Order the SUPER 4-5-6 uprights in the special heights shown in Tab. 5.3.

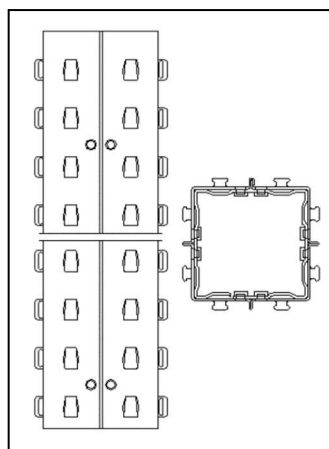
5.2.
SUPER 5-6 RIVETED REINFORCED UPRIGHT CODES


Fig. 5.2

DESCRIPTION	CODE
Upright TS5 Reinf. Riv. Special	09012R.G1
Upright TS6 Reinf. Riv. Special	09014R.G1

Tab. 5.2

NOTE 1: The codes of table 5.2 are used to order Super 5 and Super 6 reinforced uprights. The reinforcement profile inserted within these uprights has a fixed height of 3117mm and is riveted to the outside skin of the upright at a pitch of 165mm. Given the fixed height of the internal profile, the reinforced uprights cannot be ordered at heights of less than 3136mm

NOTE 2: The load bearing capacities of the reinforced upright frames are listed in the D-1, D-2, E1 and E2 tables of chapter 9.

SUPER 4-5-6

Tab. 5.3 indicates the cut lengths of the Super 456 uprights up to a height of 9.976mm. The shaded cells show the standard cut heights

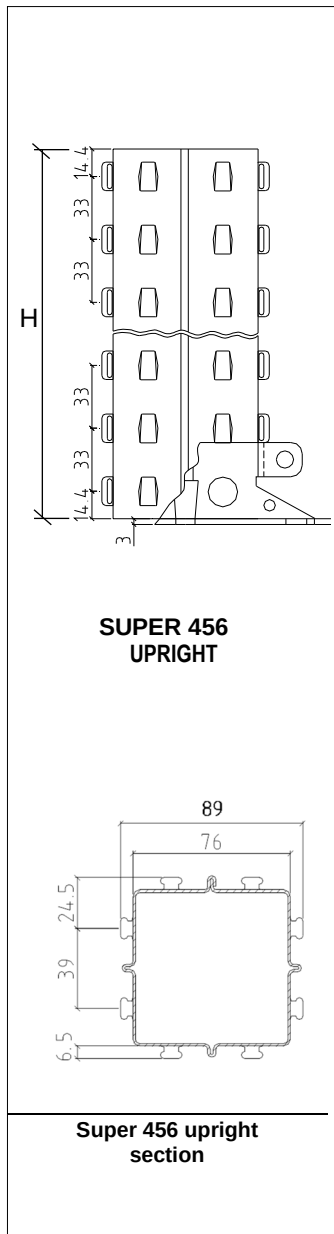


Fig. 5.3

SUPER 456 CUT LENGTH TABLE								
H [mm]								
-	1.153	2.276	3.400	4.524	5.647	6.771	7.894	9.018
-	1.186	2.309	3.433	4.557	5.680	6.804	7.928	9.051
-	1.219	2.342	3.466	4.590	5.713	6.837	7.961	9.084
-	1.252	2.375	3.499	4.623	5.746	6.870	7.994	9.117
-	1.285	2.408	3.532	4.656	5.779	6.903	8.027	9.150
-	1.318	2.442	3.565	4.689	5.812	6.936	8.060	9.183
-	1.351	2.475	3.598	4.722	5.845	6.969	8.093	9.216
260	1.384	2.508	3.631	4.755	5.879	7.002	8.126	9.249
293	1.417	2.541	3.664	4.788	5.912	7.035	8.159	9.282
326	1.450	2.574	3.697	4.821	5.945	7.068	8.192	9.316
360	1.483	2.607	3.730	4.854	5.978	7.101	8.225	9.349
393	1.516	2.640	3.763	4.887	6.011	7.134	8.258	9.382
426	1.549	2.673	3.797	4.920	6.044	7.167	8.291	9.415
459	1.582	2.706	3.830	4.953	6.077	7.200	8.324	9.448
492	1.615	2.739	3.863	4.986	6.110	7.234	8.357	9.481
525	1.648	2.772	3.896	5.019	6.143	7.267	8.390	9.514
558	1.681	2.805	3.929	5.052	6.176	7.300	8.423	9.547
591	1.714	2.838	3.962	5.085	6.209	7.333	8.456	9.580
624	1.748	2.871	3.995	5.118	6.242	7.366	8.489	9.613
657	1.781	2.904	4.028	5.151	6.275	7.399	8.522	9.646
690	1.814	2.937	4.061	5.185	6.308	7.432	8.555	9.679
723	1.847	2.970	4.094	5.218	6.341	7.465	8.588	9.712
756	1.880	3.003	4.127	5.251	6.374	7.498	8.622	9.745
789	1.913	3.036	4.160	5.284	6.407	7.531	8.655	9.778
822	1.946	3.069	4.193	5.317	6.440	7.564	8.688	9.811
855	1.979	3.103	4.226	5.350	6.473	7.597	8.721	9.844
888	2.012	3.136	4.259	5.383	6.506	7.630	8.754	9.877
921	2.045	3.169	4.292	5.416	6.539	7.663	8.787	9.910
954	2.078	3.202	4.325	5.449	6.573	7.696	8.820	9.943
987	2.111	3.235	4.358	5.482	6.606	7.729	8.853	9.976
1.020	2.144	3.268	4.391	5.515	6.639	7.762	8.886	
1.054	2.177	3.301	4.424	5.548	6.672	7.795	8.919	
1.087	2.210	3.334	4.457	5.581	6.705	7.828	8.952	
1.120	2.243	3.367	4.491	5.614	6.738	7.861	8.985	

Tab. 5.3

6.

SUPER 4-5-6 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 connection plates 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.

6.3.

BRACING TOWER COMPONENTS

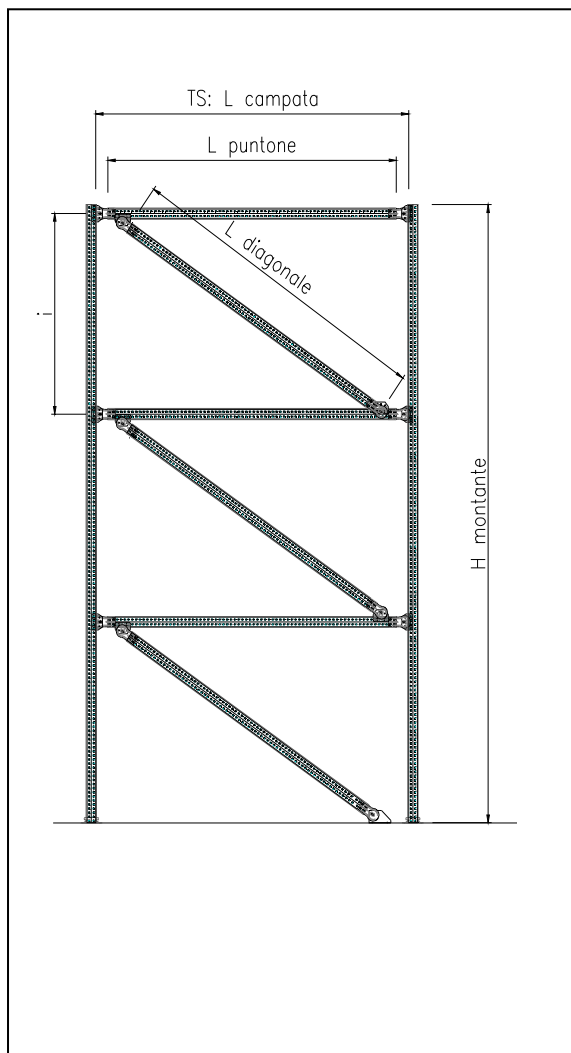


Fig. 6.1

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.G1	2	2	1421
4000	3995	01508.G1	3	3	1289
5000	4986	01512.G1	4	4	1190
6000	5978	01516.G1	4	4	1454
7000	6969	01520.G1	5	5	1355
8000	7994	01524.G1	6	6	1289
9000	8985	01528.G1	6	6	1454
10000	9976	01532.G1	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.G1)	
BAY (mm)	Horizontal strut length (mm)
1820	1615
1920	1714
2020	1814
2120	1913
2220	2012
2320	2111
2420	2210
2520	2309
2620	2408
2720	2508
2820	2607
2920	2706
3020	2805
3120	2904
3220	3003
3320	3103
3420	3202
3520	3301
3620	3400

Tab. 6.2

SUPER 4-5-6

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.G1)								
BAY (mm)	BRACING TOWER HEIGHT (mm)							
	3000	4000	5000	6000	7000	8000	9000	10000
1820	1714	1615	1582	1748	1681	1615	1748	1681
1920	1781	1714	1648	1814	1748	1714	1814	1781
2020	1880	1781	1714	1880	1814	1781	1880	1847
2120	1946	1880	1814	1979	1913	1880	1979	1913
2220	2023	1946	1880	2045	1979	1946	2045	2012
2320	2111	2045	1979	2111	2078	2045	2111	2078
2420	2177	2111	2078	2210	2144	2111	2210	2177
2520	2276	2210	2144	2276	2243	2210	2276	2243
2620	2342	2276	2243	2375	2309	2276	2375	2342
2720	2442	2375	2342	2442	2408	2375	2442	2442
2820	2541	2475	2442	2541	2508	2475	2541	2508
2920	2607	2574	2508	2640	2574	2574	2640	2607
3020	2706	2640	2607	2706	2673	2640	2706	2706
3120	2805	2739	2706	2805	2772	2739	2805	2772
3220	2871	2838	2805	2904	2871	2838	2904	2871
3320	2970	2937	2904	3003	2937	2937	3003	2970
3420	3069	3003	2970	3069	3036	3003	3069	3036
3520	3169	3103	3069	3169	3136	3103	3169	3136
3620	3235	3202	3169	3268	3235	3202	3268	3235

Tab. 6.3

Step 4 – Selection of bracing tower assembly accessory codes

A set of 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 – Connection plates and row spacers

The Super 4-5-6 connection plates 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.

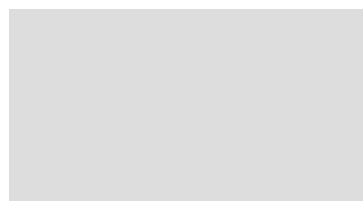


Fig. 6.2

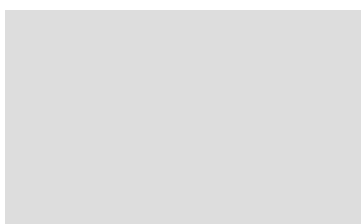


Fig. 6.3

Tab. 6.5 provides the quantities of connection plates required for the 8 standard bracing tower heights.

TOWER HEIGHT (mm)	SINGLE SIDED quantity	DOUBLE SIDED Quantity
3000	12	24
4000	16	32
5000	20	40
6000	24	48
7000	28	56
8000	32	64
9000	36	72
10000	40	80

Tab. 6.5

Double side installations require special row spacer (code 09100.G1, paragraph 4.6) lengths to adapt these to the standard connection plate dimensions. Tab. 6.6 provides the connection plate codes with their corresponding row spacer order lengths.

Connection plates		Row spacer 09100.G1	
CODE	DESCRIPTION	NET LENGTH (Ln)	ORDER LENGTH
		mm	mm
08917.G1	Super 4-5-6 connection plates H = 150	100	340
08921.G1	Super 4-5-6 connection plates H = 190	140	420
08922.G1	Super 4-5-6 connection plates H = 240	190	520
08923.G1	Super 4-5-6 connection plates H = 320	270	680

Tab. 6.6

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 shows the connection of the connection plates and plan bracing between the pallet bracing bay and the bracing tower.

6.4. SINGLE SIDE VERTICAL BRACING WITH STRUT COMPONENTS

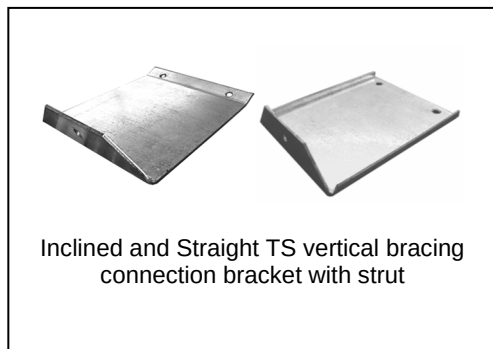


Fig. 6.4

The order codes of the accessories necessary to create a single side vertically braced bay are summarized in Tab. 6.7. A set of macro codes have been developed to simplify the ordering process of the various components. For these codes, refer to paragraph 6.10.

FIG.	COMPONENTS	CODE
Fig. 6.4	Inclined TS vertical bracing connection bracket with strut	08364.G1
Fig. 6.4	Straight TS vertical bracing connection bracket with strut	08363.G1
	SUPER 456 Frame connection bracket	TS210017.G1
	M8 x 80 CHS bolt 8.8 DIN 912 Zp	00019563.20
	M8 nut 8 DIN 934 Zp	00021.20
Fig. 6.6	42 x 3 special bracing stirrup	Tab. 6.12
	M8 x 20 HEX Bolt 8.8 DIN933 Zp	00004.20
	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
	½ turnbuckle with Ø 10,5 mm hole	08886.G1
	M10 x 90 Cyl. Head Socket 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.G1

Tab. 6.7



Fig. 6.5

The bracing strut (code 08650.G1) length is ordered using the following formula:

$$\text{Strut Length} = L_c + 14\text{mm}$$

Refer to ISTM-030 "Single entry bracing systems for bays containing back stop beams" 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
- D = Height of the connection hole of the first bracing bracket from ground
- H_1 = Ground to lower beam height (start bracing position)
- H_2 = Ground to top beam height (arriving bracing position)
- k_1 = Height between the top of the beam profile and the bracing bracket hole for the **first beam level** (start bracing position)
- k_2 = Height between the top of the beam profile and the bracing bracket hole for the **upper beam level** (arriving bracing position)

Profile height	D	k_1	k_2
NO BEAM ON GROUND	150	-	-
70 BEAM (MOULDED)	349	245	245
70 BEAM (RIVETED)	349	311	311
106 BEAM (D/S RIVETED)	316	235	235
140 BEAM (D/S RIVETED)	349	268	268
172 BEAM (RIVETED)	448	411	411

Tab. 6.8

To calculate the lengths:

- $d_h = L_c - 14$ centre distance between bracket holes on opposite sides of the bay
- $d_{v1} = H_1 - k_1 - D$ centre distance between ground and first level bracket holes
- $d_{v2} = H_2 - H_1 + k_1 - k_2$ 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 $= \sqrt{d_{v1}^2 + d_h^2}$

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

Centre distance between bracing bracket holes between beam levels $= \sqrt{d_{v2}^2 + d_h^2}$

Example:

Input:

- bay L = 2720 mm
 beam Lc = 2720 mm
 H1 = 1542 mm
 H2 = 2534 mm
 D = No beam on ground = 150
 k₁ = 140/4 double sided beam = 268
 k₂ = 106/4 double sided beam = 235

Therefore:

- Dh = Lc - 14 = 2706 mm
 d_{v1} = 1542 - 268 - 150 = 1124 mm
 d_{v2} = 2534 - 1542 + 268 - 235 = 1025 mm

Centre distance between bracing bracket holes at ground level $= \sqrt{1124^2 + 2706^2} = 2930 \text{ mm}$

Centre distance between bracing bracket holes between beam levels $= \sqrt{1025^2 + 2706^2} = 2894 \text{ mm}$

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.

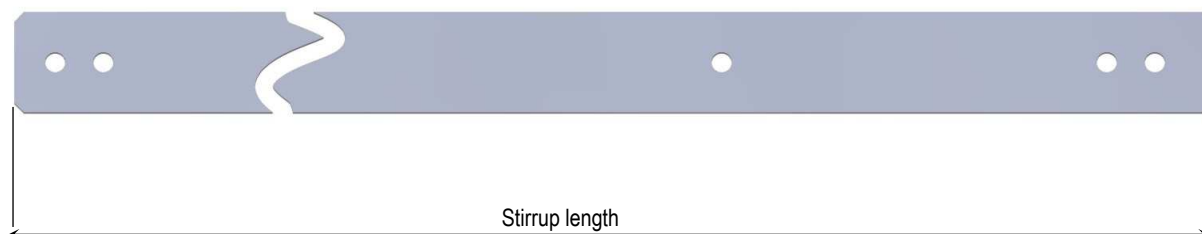


Fig. 6.6

SUPER 4-5-6

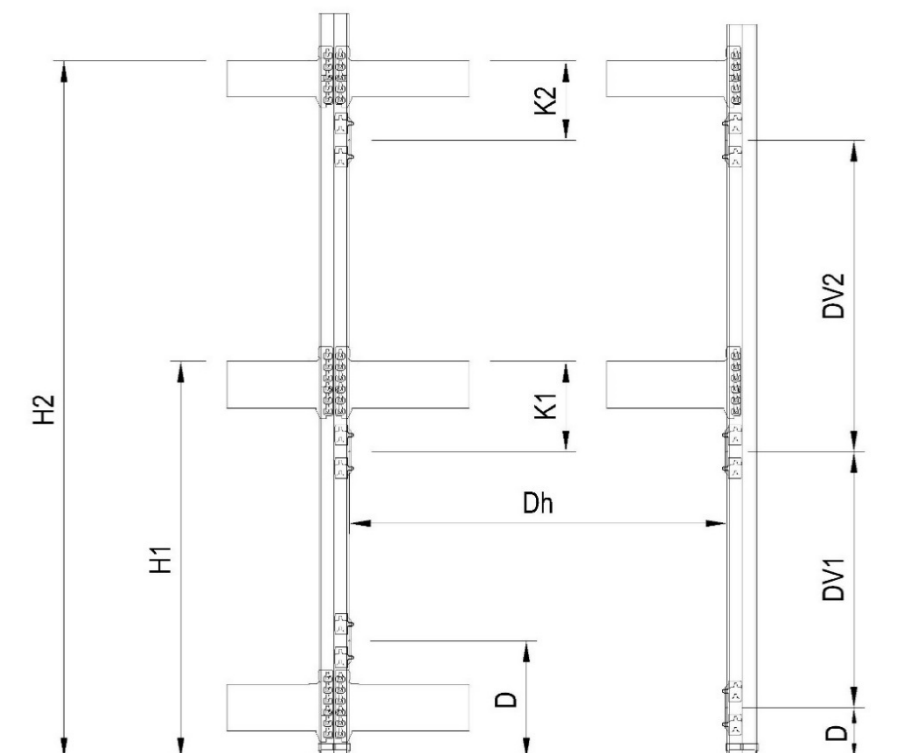


Fig. 6.7

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 from one side to the other through the double side bays.

The order codes of the accessories that are necessary to create a double side vertical bracing bay are summarized in Tab. 6.9. A set of macro codes have been developed to simplify the ordering process of the various components. For these codes, refer to paragraph 6.10.

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



TS Double sided vertical bracing bracket

Fig. 6.8

FIG.	COMPONENTS	CODE
Fig. 6.8	TS Double sided vertical bracing bracket	08360.G1
Fig. 6.9	Double sided spacer for vertical bracing (L= xxx)	08355.G1
	SUPER 456 Frame connection bracket	08004.G1
	M8 x 80 CHS bolt 8.8 DIN 912 Zp	00032.20
	M8 nut 8 DIN 934 Zp	00021.20
Fig. 6.15 - 6.16	42 x 3 Modular bracing stirrup + Compensator	Tab. 6.12 & 6.13
	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.G1
	M10 x 90 Cyl. Head Sockt conn. Bolt 8.8 DIN931 Z	00076.20
	M10 Nut 6/S DIN934 Zp	00034.20

Tab. 6.9

IMPORTANT:

The Double Entry Bracing Spacer Bar 08355.G1 is ordered using the resultant of the following formula:



Double sided spacer for vertical bracing

Fig. 6.9

$$L \text{ (Bracing spacer)} = L_n \text{ (Net dist. Between frames)} + 5 \text{ mm}$$

NOTE:

The minimum distance between frames (L_n) is **250 mm**

6.7. CALCULATION OF THE DOUBLE SIDE BRACING STIRRUP LENGTH

The stirrup length calculations uses the following variables referring to Fig. 6.11

- L_c = beam length
- D = Height of the first bracing bracket hole from ground
- H_1 = Ground to bottom beam height (start bracing position)
- H_2 = Ground to top beam height (arriving bracing position)
- k_1 = Height between the top of the beam profile and the double sided bracing bracket hole for the **first beam level** (start bracing position)
- k_2 = Height between the top of the beam profile and the double sided bracing bracket hole for the **upper beam level** (arriving bracing position)

Profile height	D	k_1	k_2
NO BEAM ON GROUND	136	-	-
70 BEAM (MOULDED)	268	-5	71
70 BEAM (RIVETED)	334	-5	71
106 BEAM (D/S RIVETED)	301	38	114
140 BEAM (D/S RIVETED)	334	38	114
172 BEAM (RIVETED)	433	-5	71

To calculate the lengths:

Tab. 6.10

- $d_h = L_c + 76$ centre distance between bracket holes on opposite sides of the bay
- $d_{v1} = H_1 + k_1 - D$ centre distance between ground and first level bracket holes
- $d_{v2} = H_2 - H_1 + k_2 - k_1$ 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 = $\sqrt{dv_1^2 + dh^2}$

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

Centre distance between bracing bracket holes between beam levels = $\sqrt{dv_2^2 + dh^2}$

Example:

Input:

bay L = 2720 mm

beam Lc = 2720 mm

H1 = 1542 mm

H2 = 2544 mm

D = no beam on ground = 139

k₁ = 106 or 140 beam = 117

k₂ = 172/6 beam = 74

Therefore:

Dh = Lc + 76 = 2796 mm

dv₁ = 1542 + 117 – 139 = 1520 mm

dv₂ = 2544 – 1542 + 74 - 117 = 959 mm

Centre distance between bracing bracket holes at ground level = $\sqrt{1520^2 + 2796^2} = 3182 \text{ mm}$

Centre distance between bracing bracket holes between beam levels = $\sqrt{959^2 + 2796^2} = 2956 \text{ mm}$

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.

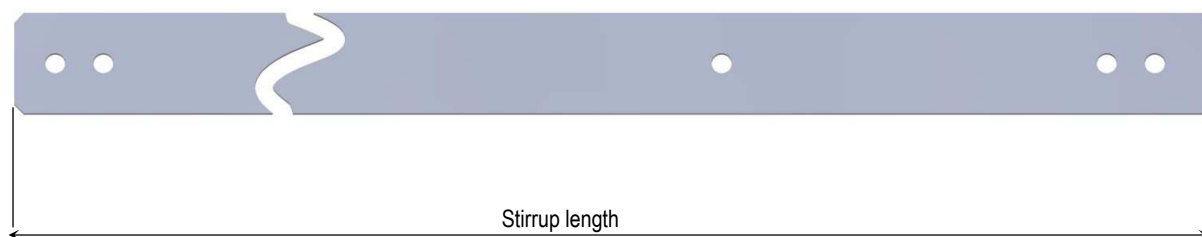


Fig. 6.10

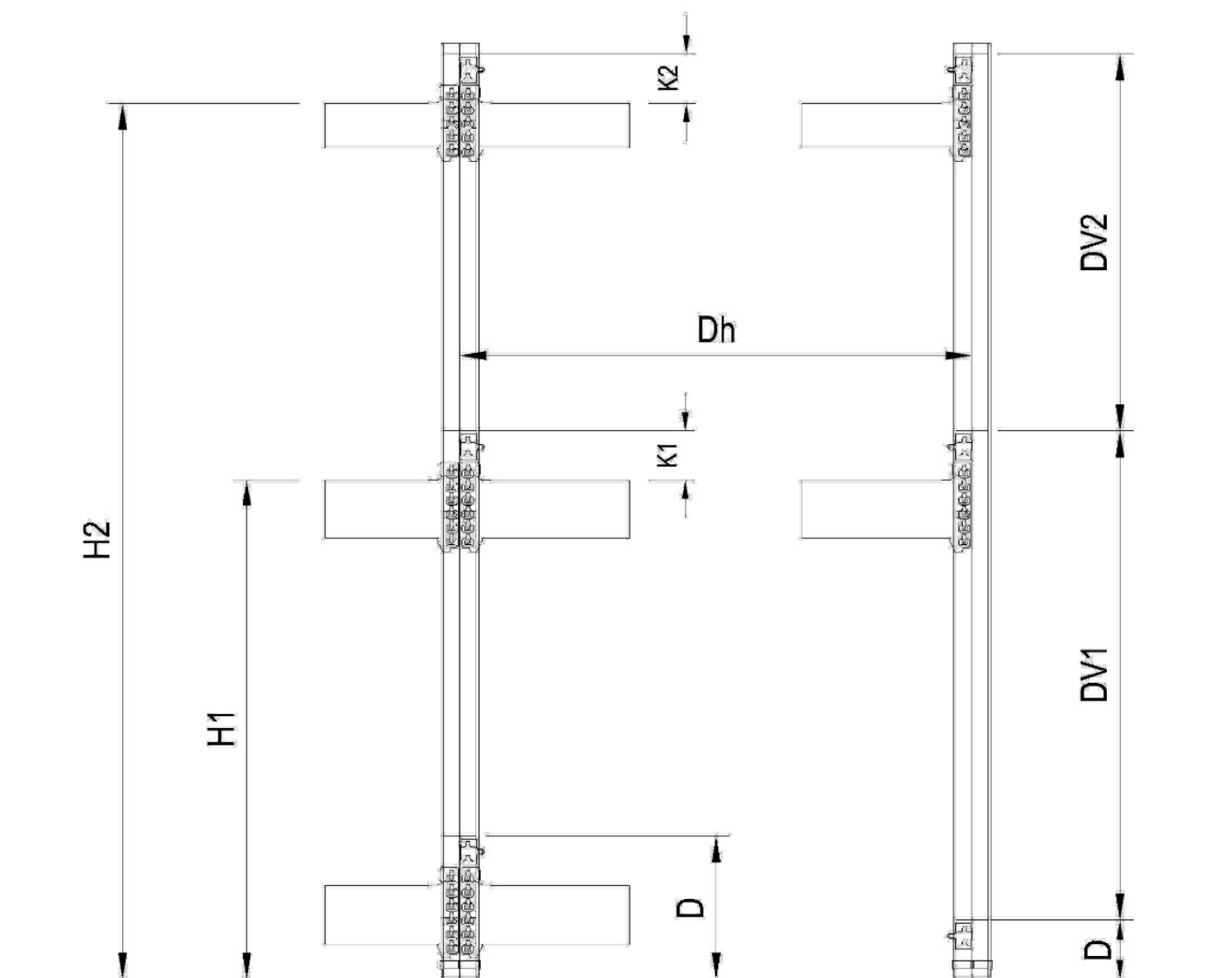


Fig. 6.11

6.8.

HORIZONTAL BRACING COMPONENTS

The order codes of the accessories that are necessary to create horizontal bracing are summarized in Tab. 6.11. The macro codes created for the single and double side bracing accessories include all the accessories required to create the horizontal bracing elements of these bays. For these codes, refer to paragraph 6.10.

Fig. 6.14	COMPONENTS	CODE
1	Bracket for horizontal bracing	08908.G1
2	5.5x19 HEXSDAP SCR. DIN 7504 /KZp	00058.20
3	M8 x 20 HEX Bolt 8.8 DIN933 Zp	00004.20
	M8 High nylon insert Nut DIN982 Zp	00022.20
4	42 x 2 Modular bracing stirrup + Compensator (Or, 42 x 3 Modular bracing stirrup + Compensator)	Tab. 6.12 & 6.13
5	½ turnbuckle with Ø 10,5 mm hole	08886.G1
6	M10 x 90 Cyl. Head Sockt conn. Bolt 8.8 DIN931 Zp	00076.20
	M10 Nut 6/S DIN934 Zp	00034.20

Tab. 6.11

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.

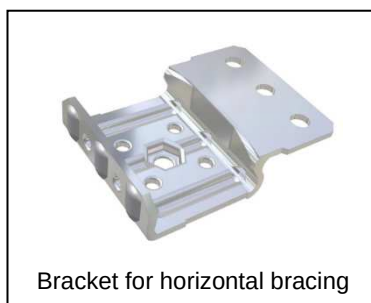


Fig. 6.12

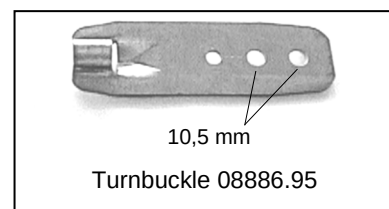


Fig. 6.13

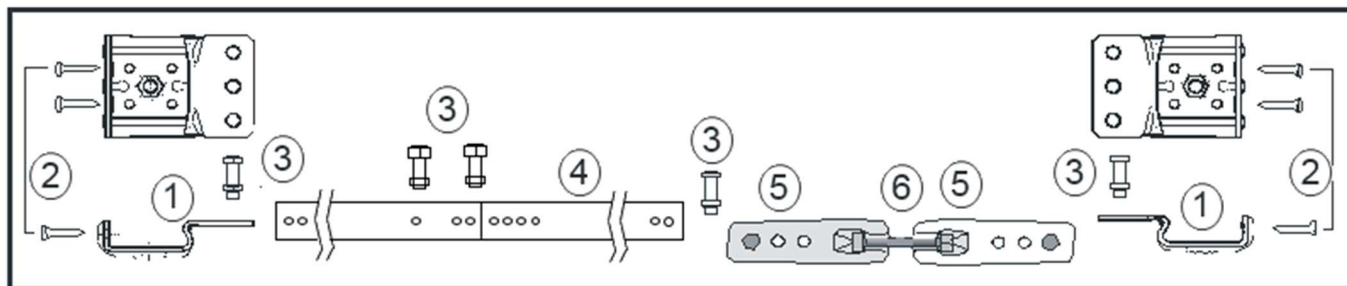


Fig. 6.14

6.9.

BRACING STIRRUPS

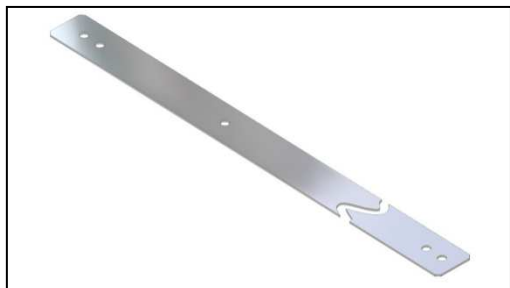


Fig. 6.15

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.G1	2 mm
2400	08747.G1	2 mm
2450	08748.G1	2 mm
SPECIAL	08749.G1	2 mm

42x3 MODULAR BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
1200	08736.G1	3 mm
2400	08737.G1	3 mm
SPECIAL	08738.G1	3 mm

Tab. 6.12

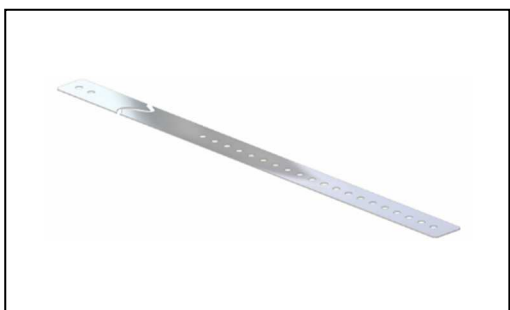


Fig. 6.16

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

42x2 COMPENSATING BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
600	08741.G1	2 mm
1000	08742.G1	2 mm
1400	08743.G1	2 mm
1800	08744.G1	2 mm
2200	08745.G1	2 mm

42x3 COMPENSATING BRACING STIRRUPS		
LENGTH* (mm)	CODE	GAUGE
600	08731.G1	3 mm
1000	08732.G1	3 mm
1400	08733.G1	3 mm
1800	08734.G1	3 mm
2200	08735.G1	3 mm

Tab. 6.13

Fig. 6.17 shows the "modular bracing stirrup with compensator" assembly cases.

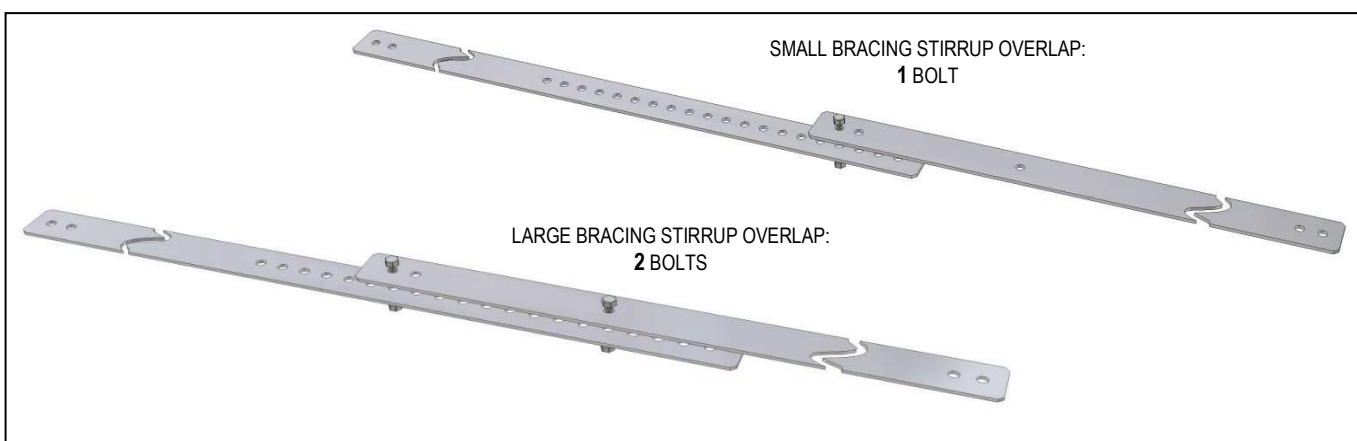


Fig. 6.17

***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.

6.10.

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.G1) to be ordered separately. See Tab. 6.14 and Tab. 6.15.

SINGLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.18 Colours
TS SINGLE ENTRY GROUND BRACING ACCESSORIES	08891.98	Brackets and bolts	
+			
TS SINGLE ENTRY BRACING ACCESSORIES	08890.98	Brackets, tensioners and bolts	
+			
HORIZONTAL STRUT	08650.G1	Raised pallet support bar	
+			
42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Tab. 6.12 & 6.13	-	

Tab. 6.14

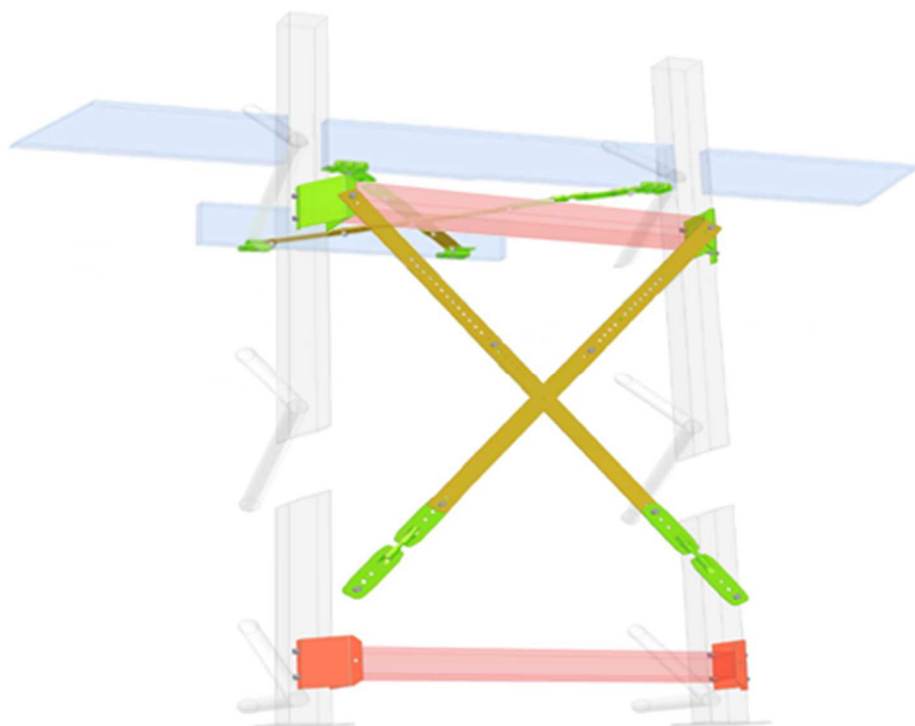


Fig. 6.18

EXAMPLE: the components required to make up the braced bay of Fig. 6.18 are:

N° 2	Tab. 6.12 & 6.13	42x3 modular bracing stirrup + 42x3 compensator (vertical bracing)
N° 2	Tab. 6.12 & 6.13	42x2 modular bracing stirrup + 42x2 compensator (horizontal bracing)
N° 2	08650.G1	Raised pallet support bar (Horizontal strut) L= beam length +14mm
N° 1	08891.98	TS SINGLE ENTRY GROUND BRACING ACCESSORIES
N° 1	08890.98	TS SINGLE ENTRY BRACING ACCESSORIES

DOUBLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.19 Colours
TS DOUBLE ENTRY GROUND BRACING ACCESSORIES	08893.98	Brackets and bolts	
+			
TS DOUBLE ENTRY BRACING ACCESSORIES	08892.98	Brackets, tensioners and bolts	
+			
42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Tab. 6.12 & 6.13	-	
+			
DOUBLE SIDED SPACERS FOR VERTICAL BRACING	08355.G1	-	

Tab. 6.15

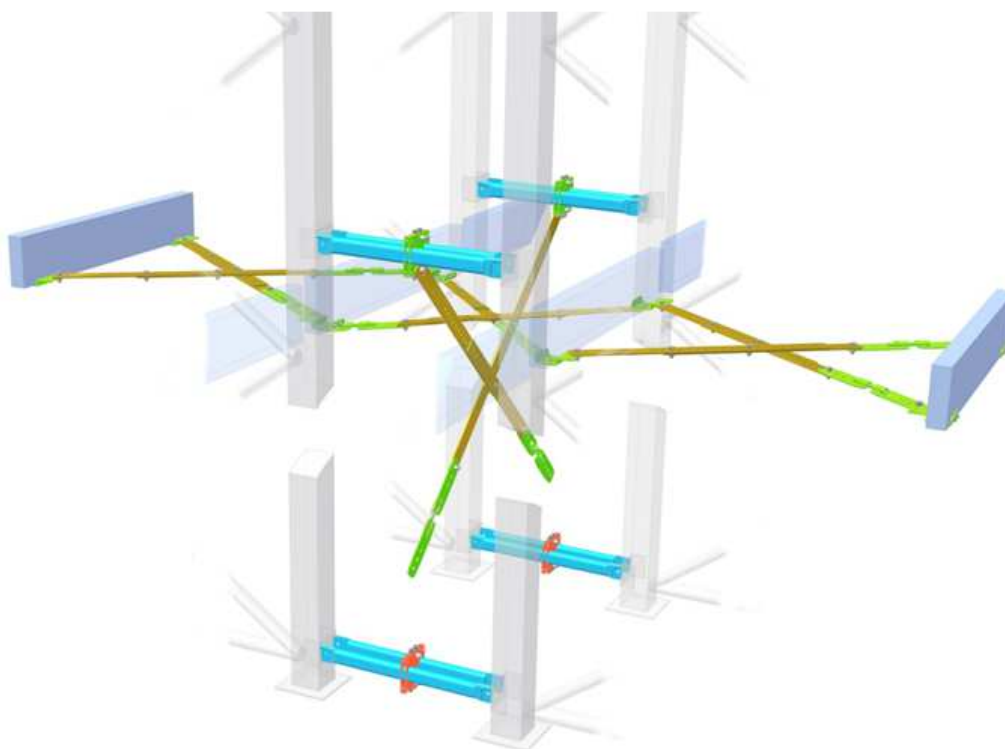


Fig. 6.19

EXAMPLE: the components required to make up the braced bay of Fig. 6.19 are:

N° 2	Tab. 6.12 & 6.13	42x3 modular bracing stirrup + 42x3 compensator (vertical bracing)
N° 6	Tab. 6.12 & 6.13	42x2 modular bracing stirrup + 42x2 compensator horizontal bracing within and between the bays
N° 1	08893.98	TS DOUBLE ENTRY GROUND BRACING ACCESSORIES
N° 1	08892.98	TS DOUBLE ENTRY BRACING ACCESSORIES
N° 8	08355.G1	DOUBLE SIDED SPACERS FOR VERTICAL BRACING $L = L_n + 5 \text{ mm}$

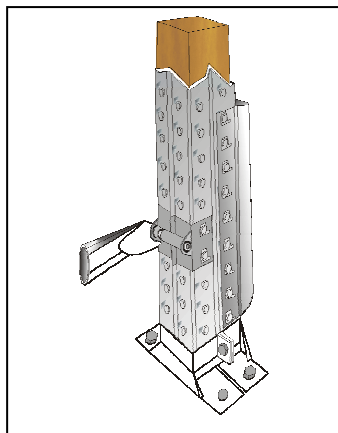
7.
SUPER 4-5-6 DEDICATED ACCESSORIES
7.1.
SUPER 4-5-6 WOODEN PROFILE / UPRIGHT PROTECTOR


Fig. 7.1

The Super 4-5-6 wooden profile and the upright protector have been designed to protect the upright from accidental knocks caused by maneuvering errors with manually operated trolleys. It is advised to insert the Super 456 wooden profile in corridor facing uprights only.

IMPORTANT:

The wooden profile must be inserted through the base of the upright before bolting the base plate.

CODE	DESCRIPTION
08018.98	WOODEN PROFILE FOR UPRIGHT
08013.98	UPRIGHT PROTECTOR SUPER 4/5/6

Tab. 7.1

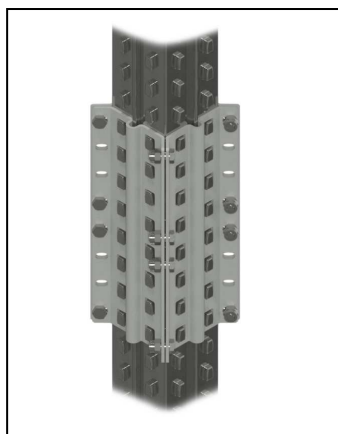
7.2.
UPRIGHT SPLICING SYSTEM


Fig. 7.2

The upright splicing system allows the connection of a splice upright onto an existing upright profile to extend the height of an existing installation.

Splices are available in two versions (4 or 8 button variants). Depending on the splice used and the eventual application of additional bracing to the extension, the performance changes. The table indicates the requirements to be met and the performance of various configurations.

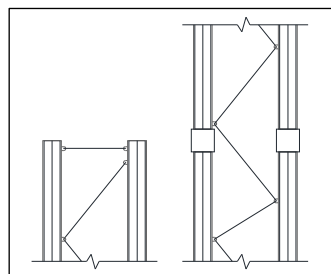


Fig. 7.3

	Splice without additional bracing	Splice with additional bracing
Geometrical requirements	The splice upright must have the same section as the existing upright; The splice must be installed in proximity of a load level; The interruption of the uprights must be at the center of the splice; All the pitches of the splice must be connected onto the upright buttons; Frame bracing must be modified in case of interference between the splice and the frame bracing (ref. Fig. 7.3).	
Additional geometrical requirements	H106, H140 or H172 beams; Contact METALSISTEM for applications with H70 beams.	Vertical and horizontal bracing (using stirrups) must be included in one bay of every 8 consecutive bays. Bracing to be installed from the upper beam level of the existing installation up to the upper level of the extension.
4 button splice	Max. splice upright length: 1500mm Max. distance between levels: 1500mm Maximum load on the extension: Super 4 – 1000 daN/frame Super 5 – 1500 daN/frame Super 6 – 2000 daN/frame	Max. splice upright length : 2500mm Max. distance between levels: 2000mm Maximum load on the extension: Super 4 – 2000 daN/frame Super 5 – 3000 daN/frame Super 6 – 4000 daN/frame
8 button splice	Max. splice upright length: 2000mm Max. distance between levels: 1500mm Maximum load on the extension : Super 4 – 1500 daN/frame Super 5 – 2200 daN/frame Super 6 – 3000 daN/frame	Max. splice upright length : 3000mm Max. distance between levels: 2300mm Maximum load on the extension : Super 4 – 2000 daN/frame Super 5 – 3000 daN/frame Super 6 – 4000 daN/frame

Tab. 7.2

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The change in configuration requires a verification of the load bearing capacity. If the extension is created without additional bracing, apply a 50% increase to the load on the extension when verifying the frame load bearing capacity.

Example:

An existing Super 6 frame is extended without additional bracing. The existing frame has a load of 6000 daN, the extension has an additional 1500 daN. Hence, the total frame load bearing capacity to be declared is 7500 daN. The frame load bearing capacity of the modified configuration must however be verified considering an increased load of $6000 + 1,5 \times 1500 = 8250$ daN/frame.

The splices may be ordered using the following macrocodes, which include the connection plates and the required bolts and nuts.

CODE	DESCRIPTION
TS210021.G1	External reinforcement TS upright – 4 button
TS210022.G1	External reinforcement TS upright – 8 button

Tab. 7.3

Fig. 7.4	CODE	DESCRIPTION	Q.TY
A	00020420.G1	¼ external reinforcement TS upright – 4 button	4
B	00004.20	M8 x 20 HEX Bolt 8.8 UNI 5739 8.8 ZB	16
C	00022.20	High nylon insert nut UNI 7473 M8 ZB	16

Tab. 7.4

Fig. 7.5	CODE	DESCRIPTION	Q.TY
A	00020421.G1	¼ external reinforcement TS upright – 8 button	4
B	00004.20	M8 x 20 HEX Bolt 8.8 UNI 5739 8.8 ZB	16
C	00022.20	High nylon insert nut UNI 7473 M8 ZB	16

Tab. 7.5

Note:

The load bearing capacity tables refer to new, undamaged components, and are not valid for installations with damaged and/or obsolete components. We recommend extreme caution during the design phase of a modification to an existing installation. In case of doubts please contact METALSISTEM Technical Office.

8. PALLET RACKING BEAM LOAD BEARING CAPACITIES

8.1. SUPER 4-5-6 BEAM LOAD BEARING CAPACITIES

CHOOSING THE CORRECT SUPER 4-5-6 BEAM PAIR

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

- Blue load tables = manual picking beams;
- Orange load tables = pallet racking beams);

In case of pallet racking beams:

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 3620mm; for longer beams contact METALSISTEM Technical Office).

NOTE: The SUPER 4-5-6 series uprights have a net span between the body of the (76 x 76mm) 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 **4020 mm**.

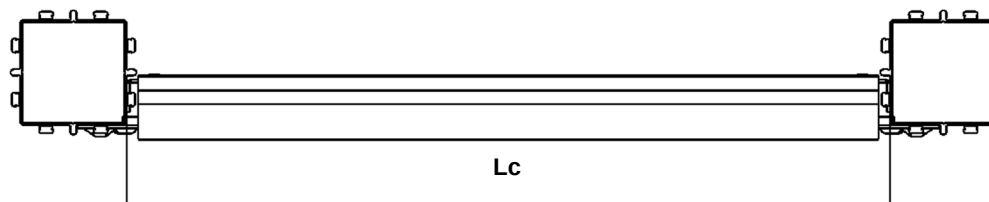


Fig. 8.1

8.2.

SUPER 4-5-6 MANUAL PICKING BEAM LOAD BEARING CAPACITIES

Picking beams are beams dedicated exclusively to manual picking operations. The load bearing capacities shown in Tab. 8.1 refer to pairs of beams connected by METALSISTEM H25, H29 moulded shelving panels.

The manual picking beams are applied when one or more manual picking levels are inserted below a pallet racking bay. Refer to paragraph 10.1 when applying these tables for instructions on the proper application conditions of the standard frame load bearing capacities.

LOAD BEARING CAPACITY TABLE PER PAIR OF MANUAL PICKING BEAMS WITHIN PALLET RACKING INSTALLATIONS									
- Beams assembled with safety brackets - uniformly distributed load - Maximum deflection: 1/200 of the beam length "Lc"									
Profile Version	70/22	70/3	70/4	70/2	70/22	70/3	70/4	70/5	106/22
	MOULDED CONNECTOR (Safety bracket 08082.G1 or TS210005.G1)			RIVETED CONNECTOR (Safety bracket 08028.G1 + 08029.G1)				DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.G1)	
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
920	700	800	900	900	1300	1500	1900	2100	2000
1220	700	800	900	900	1300	1500	1900	2100	2000
1520	700	800	900	900	1300	1500	1900	2100	2000
1820	700	800	900	900	1300	1500	1900	2100	1950
2020	700	800	900	900	1150	1300	1600	1950	1750
2120	700	800	900	850	1050	1150	1450	1800	1700
2220	700	800	900	750	950	1050	1300	1650	1600
2320	700	800	900	700	850	1000	1200	1500	1550
2420	600	800	900	650	800	900	1100	1400	1500
2720	500	600	800	500	650	700	900	1100	1250
2820	-	-	-	450	600	650	850	1000	1100
3020	-	-	-	350	400	450	550	700	900
3320	-	-	-	-	-	-	450	550	700

MANDATORY USE OF SHELF PANELS

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

Tab. 8.1

SUPER 4-5-6

8.3.

SUPER 4-5-6 PALLET RACKING BEAM LOAD BEARING CAPACITIES

LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS

- Beams assembled with safety brackets
- uniformly distributed load
- Maximum deflection: 1/200 of the beam length "Lc"

Profile Version	70/3	70/4	70/5	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6	172/5	172/6
RIVETED CONNECTOR (Safety bracket 08028.G1 + 08029.G1)				DOUBLE SIDE RIVETED CONNECTOR (Safety pin 08195.G1)											RIVETED CONNECTOR (Safety bracket 08028.G1 + 08029.G1)	
Maximum Unit Load	900 daN Unit load	1200 daN Unit load	1500 daN 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	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	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair
920	1500	1900	2100	2000	3500	4000	4500	5000	5500	3500	4000	4500	5000	5500	4500	5500
1220	1500	1900	2100	2000	3500	4000	4500	5000	5500	3500	4000	4500	5000	5500	4500	5500
1520	1500	1900	2100	2000	3500	4000	4500	5000	5500	3500	4000	4500	5000	5500	4500	5500
1820	1500	1900	2100	1950	3500	4000	4500	4950	5500	3500	4000	4500	5000	5500	4500	5500
2020	1300	1600	1950	1750	3500	3650	4100	4500	5350	3500	4000	4500	5000	5500	4500	5500
2120	1150	1450	1800	1700	3300	3500	3900	4250	5100	3500	4000	4500	5000	5500	4500	5500
2220	1050	1300	1650	1600	3000	3350	3750	4100	4850	3500	4000	4500	5000	5500	4500	5500
2320	1000	1200	1500	1550	2800	3200	3550	3900	4600	3500	4000	4500	5000	5500	4500	5500
2420	900	1100	1400	1500	2600	2950	3300	3650	4250	3500	4000	4500	5000	5500	4500	5500
2720	700	900	1100	1250	2100	2400	2700	3000	3400	3400	3800	4200	4700	5500	4500	5500
2820	650	850	1000	1100	1950	2150	2350	2600	3100	3200	3750	4200	4600	5400	4500	5500
3020	450	550	700	900	1350	1850	2050	2300	2700	2800	3450	3800	4250	5000	4500	5500
3320	-	450	550	700	1150	1550	1700	1900	2250	2250	2850	3150	3500	4200	4500	5500
3520	-	-	-	-	-	1350	1500	1650	1950	2000	2450	2750	3050	3600	4400	5200
3620	-	-	-	-	-	1300	1400	1550	1850	-	2350	2600	2900	3400	4200	5000
4020	-	-	-	-	-	1050	1150	1250	1500	-	1900	2100	2350	2800	3600	4200

Tab. 8.2

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

 = MANDATORY USE OF DIAGONAL STRUTS

8.4. SUPER 4-5-6 REDUCED CONNECTOR BEAM LOAD BEARING CAPACITY

LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS

- *Tabled values to be used exclusively for beams on ground*
- *Beams assembled with safety brackets (code 08028.G1 + code 08029.G1)*
- *Uniformly distributed load*
- *Maximum deflection: 1/200 of the beam length "Lc"*

Profile version	70/22	70/3	70/4	70/5	106/33	106/4	140/33	140/4	140/5
Maximum Unit Load	Manual picking only	900 daN Unit load	1200 daN Unit load	1500 daN Unit load	1100 daN Unit load	1200 daN Unit load	1050 daN Unit load	1200 daN Unit load	1500 daN Unit load
Lc [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
920	1300	1500	1900	2000	2800	2800	3500	3500	3500
1220	1300	1500	1900	2000	2800	2800	3500	3500	3500
1520	1300	1500	1900	2000	2800	2800	3500	3500	3500
1820	1250	1450	1800	2000	2800	2800	3500	3500	3500
2020	1000	1150	1450	1850	2800	2800	3500	3500	3500
2120	900	1050	1300	1650	2650	2800	3500	3500	3500
2220	850	950	1200	1500	2550	2800	3500	3500	3500
2320	750	900	1100	1400	2400	2700	3500	3500	3500
2420	700	800	1000	1250	2200	2600	3500	3500	3500
2720	550	650	800	1000	1700	2100	3250	3350	3500
2820	500	600	750	950	1600	1950	3000	3200	3500
3020	450	500	650	800	1400	1700	2600	3000	3500
3320	-	-	500	650	1150	1400	2150	2650	3350

Tab. 8.3

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

The reduced connector beam load bearing capacity tables (table 8.3) is to be applied exclusively for either picking beams (following the instructions of paragraph 10.1) or at beam on ground applications or as beams within a fully braced pallet racking row.

9. **PALLET RACKING FRAME LOAD BEARING CAPACITIES**

9.1. **LOAD BEARING CAPACITY TABLE NOTES FOR USE**

A set of 13 tables have been developed for the design of the frame load bearing capacities. These tables are divided by frame series and beam type as follows:

A-1	SUPER 4 / 70 RIVETED BEAM	B-1	SUPER 5 / 70 RIVETED BEAM
A-2	SUPER 4 / 106 D/S RIVETED BEAM	B-2	SUPER 5 / 106 D/S RIVETED BEAM
A-3	SUPER 4 / 140 D/S RIVETED BEAM	B-3	SUPER 5 / 140 D/S RIVETED BEAM
A-3	SUPER 4 / 172 RIVETED BEAM	B-3	SUPER 5 / 172 RIVETED BEAM
C-1	SUPER 6 / 70 RIVETED BEAM	D-1	SUPER 5R / 106 D/S RIVETED BEAM
C-2	SUPER 6 / 106 D/S RIVETED BEAM	D-2	SUPER 5R / 140 D/S RIVETED BEAM
C-3	SUPER 6 / 140 D/S RIVETED BEAM	D-2	SUPER 5R / 172 RIVETED BEAM
C-3	SUPER 6 / 172 RIVETED BEAM		
E-1	SUPER 6R / 106 D/S RIVETED BEAM		
E-2	SUPER 6R / 140 D/S RIVETED BEAM		
E-2	SUPER 6R / 172 RIVETED BEAM		

The array of frame load bearing capacity tables offered for the individual series enable the user to optimize the pallet racking technical solution to the requirements of the project.

Tables for 70 beams apply a maximum frame height of 6000mm and are divided into 5 columns. Three according to beam type and two according to bracing configuration. The tables applying 106, 140 and 172 beams are 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 side row
D = Double side row

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 B-2 we note a frame load bearing capacity of 11250 daN corresponding to the symbol 10S/8D for a first loading level of 1900mm under the partially braced columns. This means that a SUPER 5 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 of 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.

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. 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;
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 6 meters for installations using exclusively 70mm high beams;
9. maximum installation height of 10 meters for all other installations;
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 B-2 provided a load bearing capacity of 11250daN for a partially braced bay with a frequency of 10S/8D (or 1 bracing tower every 10 consecutive bays for single side rows and every 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 and 1 cross braced bay every 4 consecutive bays for 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.

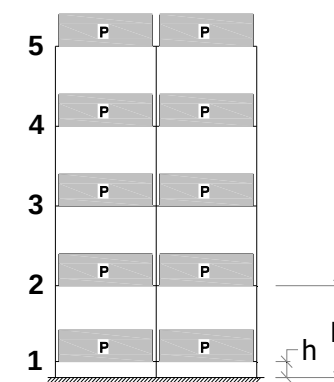


Fig. 9.1

9.5.

BASE PLATE CONSIDERATIONS

A single SUPER 4-5-6 upright places a load on ground equivalent to half of the frame load over an area of 80mm x 100mm.

9.6.

SUPER 4-5-6 LOAD BEARING CAPACITY TABLES

A-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPER 4 - RIVETED 70 BEAM															
		70/3			70/4				70/5				PARTIALLY BRACED			FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=1820	Lc=2420	Lc=2720	Lc=3320	70/3	70/4	70/5	BAYS	
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	7950	7750	5400	10550	10450	10450	5400	10600	10550	10500	6600	11600	11600	11600	11600	10S / 8D
	600	7350	7000	4850	9800	9600	9400	4850	9850	9800	9700	5900	10850	11600	11600	11600	10S / 8D
	700	6750	6250	4300	9050	8700	8400	4300	9100	9050	8950	5250	9100	11600	11600	11600	10S / 8D
	800	6150	5500	3750	8250	7850	7400	3750	8350	8300	8150	4600	8250	11350	11350	11350	10S / 8D
	900	5550	4750	3200	7500	6950	6400	3200	7600	7550	7350	3950	7400	10750	11050	11050	10S / 9D
	1000	4900	4000	2700	6750	6050	5400	2700	6850	6800	6600	3300	6550	9700	10800	10800	10S / 9D
	1100	4650	3800	2500	6350	5700	5000	2500	6400	6350	6150	3050	5950	8850	10500	10500	10S / 9D
	1200	4350	3600	2300	5950	5300	4650	2300	6000	5950	5700	2850	5300	8000	10200	10200	10S / 9D
	1300	4050	3400	2150	5550	4950	4300	2150	5550	5500	5250	2600	5100	7800	9800	9800	10S / 10D
	1400	3750	3200	1950	5100	4550	3950	1950	5150	5100	4800	2400	4850	7600	9350	9350	10S / 10D
	1500	3500	3000	1800	4700	4200	3600	1800	4700	4650	4400	2200	4400	6850	9050	9100	10S / 10D
	1600	3300	2850	1700	4400	3950	3400	1700	4450	4400	3750	2050	4000	6050	7850	8850	10S / 10D
	1700	3100	2700	1600	4150	3750	3200	1600	4200	4150	3150	1950	3900	5950	7850	8750	10S / 10D
	1800	2850	2550	1500	3850	3550	3050	1500	3900	3900	2550	1850	3750	5850	7850	8650	10S / 10D
	1900	2650	2400	1400	3550	3300	2850	1400	3650	3600	1950	1750	3650	5750	7850	8550	10S / 10D
	2000	2450	2250	1350	3250	3100	2700	1350	3400	3350	1300	1650	3500	5650	7850	8400	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 frame height 6000mm;
3. Unbraced configuration contains a minimum of 3 suspended levels;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, apply a 50% reduction in the tabled frame load bearing capacities;
5. Frame base plates may only be aligned with the beams of the bay and anchored with 2 anchor bolts;
6. 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.

SUPER 4-5-6

A-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 4 - D/S RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	10S / 8D	11600	10S / 8D
	600	11600	11600	11600	11600	11450	11600	11600	11600	11600	11450	11600	11600	11600	11600	11450	11600	10S / 8D	11600	10S / 8D
	700	11600	11450	11300	11100	10800	11350	11350	11350	11100	10750	11350	11350	11350	11350	11000	11600	10S / 8D	11600	10S / 8D
	800	11000	10800	10650	10400	10050	10900	10900	10800	10500	10000	10700	10700	10700	10600	10150	11350	10S / 8D	11350	10S / 8D
	900	10400	10150	9950	9650	9300	10200	10200	10100	9750	9150	10000	10000	10000	9850	9300	11050	10S / 9D	11050	10S / 9D
	1000	9800	9500	9300	8950	8550	9500	9500	9350	9000	8350	9250	9250	9250	9100	8450	10800	10S / 9D	10800	10S / 9D
	1100	9150	8850	8650	8350	8050	8850	8850	8750	8400	7800	8600	8600	8600	8400	7800	10500	10S / 9D	10500	10S / 9D
	1200	8500	8200	8000	7700	7550	8250	8250	8100	7800	7300	8000	8000	8000	7750	7200	10200	10S / 9D	10200	10S / 9D
	1300	7950	7700	7550	7250	7100	7600	7600	7450	7200	6700	7450	7450	7450	7250	6700	9800	10S / 10D	9800	10S / 10D
	1400	7400	7200	7050	6850	6650	7150	7150	7050	6750	6350	6900	6900	6900	6800	6300	9350	10S / 10D	9350	10S / 10D
	1500	6850	6700	6550	6400	6200	6700	6700	6600	6350	5950	6500	6500	6500	6400	5900	9100	10S / 10D	9100	10S / 10D
	1600	6500	6350	6200	6100	5850	6250	6200	6150	5950	5600	6100	6100	6050	5950	5550	8850	10S / 10D	8850	10S / 10D
	1700	6150	6000	5900	5750	5550	5900	5900	5850	5600	5250	5800	5750	5700	5600	5200	8750	10S / 10D	8750	10S / 10D
	1800	5800	5650	5550	5400	5200	5550	5550	5500	5250	4900	5450	5400	5350	5300	4900	8650	10S / 10D	8650	10S / 10D
	1900	5400	5300	5200	5050	4850	5200	5200	5150	4950	4600	5100	5050	5000	4950	4600	8550	10S / 10D	8550	10S / 10D
	2000	5050	4950	4850	4700	4550	4850	4850	4800	4600	4250	4750	4700	4650	4600	4250	8400	10S / 10D	8400	10S / 10D
	2100	4800	4700	4600	4500	4350	4600	4600	4550	4400	4000	4500	4450	4400	4350	4050	8100	10S / 10D	8100	10S / 10D
	2200	4550	4450	4400	4300	4100	4350	4350	4300	4150	3800	4200	4200	4150	4100	3800	7800	10S / 10D	7800	10S / 10D
	2300																7500	10S / 10D	7500	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 Super 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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1500mm and has a maximum length of 2720mm;
6. 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.

SUPER 4-5-6

A-3

FRAME LOAD BEARING CAPACITY TABLE [daN]

SUPER 4 - D/S RIVETED 140 BEAM

SUPER 4 - RIVETED 172 BEAM

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	11600	10S / 8D	11600	10S / 8D
	600	11600	11600	11600	11600	11450	11600	11600	11600	11600	11450	11600	11600	11600	11600	11450	11600	10S / 8D	11600	10S / 8D
	700	11600	11600	11600	11600	11350	11600	11600	11600	11600	11350	11600	11600	11600	11600	11350	11600	10S / 8D	11600	10S / 8D
	800	11350	11350	11350	11350	11000	11350	11350	11350	11350	11000	11350	11350	11350	11350	11000	11350	10S / 8D	11350	10S / 8D
	900	11050	11050	11000	10850	10350	11050	11050	11050	11000	10450	11000	11000	11000	11000	10500	11050	10S / 9D	11050	10S / 9D
	1000	10600	10550	10500	10350	9700	10500	10500	10500	10400	9750	10400	10400	10400	10400	9800	10800	10S / 9D	10800	10S / 9D
	1100	10050	10000	9900	9700	9150	9900	9900	9900	9750	9200	9850	9850	9850	9800	9250	10500	10S / 9D	10500	10S / 9D
	1200	9450	9400	9300	9100	8550	9300	9300	9300	9150	8600	9250	9250	9250	9200	8600	10200	10S / 9D	10200	10S / 9D
	1300	8900	8800	8700	8550	8000	8750	8750	8750	8550	8000	8650	8650	8650	8600	8050	9800	10S / 10D	9800	10S / 10D
	1400	8300	8250	8150	8000	7500	8200	8200	8200	8000	7550	8050	8050	8050	8000	7550	9350	10S / 10D	9350	10S / 10D
	1500	7750	7700	7600	7400	6950	7600	7600	7600	7450	7000	7500	7500	7500	7500	7000	9100	10S / 10D	9100	10S / 10D
	1600	7300	7250	7150	7000	6600	7050	7050	7050	6950	6500	7000	7000	7000	6950	6550	8850	10S / 10D	8850	10S / 10D
	1700	6850	6800	6750	6600	6200	6650	6650	6650	6550	6100	6600	6600	6600	6550	6150	8750	10S / 10D	8750	10S / 10D
	1800	6400	6400	6300	6200	5800	6250	6250	6250	6150	5750	6200	6200	6200	6150	5750	8650	10S / 10D	8650	10S / 10D
	1900	5950	5950	5900	5800	5450	5850	5850	5850	5750	5400	5800	5800	5800	5800	5450	8550	10S / 10D	8550	10S / 10D
	2000	5550	5500	5450	5400	5050	5450	5450	5450	5400	5050	5400	5400	5400	5400	5050	8400	10S / 10D	8400	10S / 10D
	2100	5250	5250	5200	5150	4800	5150	5150	5150	5100	4750	5100	5100	5100	5100	4750	8100	10S / 10D	8100	10S / 10D
	2200	5000	5000	4950	4900	4600	4900	4900	4900	4850	4550	4800	4800	4800	4800	4550	7800	10S / 10D	7800	10S / 10D
	2300																7500	10S / 10D	7500	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 Super 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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 2000mm and has a maximum length of 2720mm;
6. 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.

SUPER 4-5-6
B-1
**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 5 - RIVETED 70 BEAM**

		70/3			70/4				70/5				PARTIALLY BRACED			FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=1820	Lc=2420	Lc=2720	Lc=3320	70/3	70/4	70/5		BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	9000	7900	5400	12600	11950	10800	5400	12650	12550	12500	6600	12900	15150	15150	15150	10S / 6D
	600	8200	7200	4850	11500	10850	9700	4850	11700	11600	11300	5900	11050	15150	15150	15150	10S / 6D
	700	7400	6550	4300	10450	9700	8600	4300	10700	10600	10150	5250	9200	13750	15100	15100	10S / 6D
	800	6600	5850	3750	9350	8600	7550	3750	9750	9650	8950	4600	8350	12550	14800	14800	10S / 6D
	900	5800	5200	3200	8300	7500	6450	3200	8750	8650	7750	3950	7500	11300	14500	14500	10S / 6D
	1000	5050	4500	2700	7200	6400	5400	2700	7750	7700	6600	3300	6650	10050	13050	14150	10S / 7D
	1100	4750	4200	2500	6800	6000	5000	2500	7250	7200	6150	3050	6000	9150	12000	13800	10S / 7D
	1200	4450	3950	2300	6400	5600	4650	2300	6750	6650	5700	2850	5400	8250	10950	13450	10S / 7D
	1300	4200	3650	2150	6000	5200	4300	2150	6250	6150	5250	2600	5150	8050	10950	12950	10S / 7D
	1400	3900	3350	1950	5600	4800	3950	1950	5750	5650	4800	2400	4900	7800	10900	12450	10S / 8D
	1500	3600	3100	1800	5200	4400	3600	1800	5200	5100	4400	2200	4500	7050	9650	12100	10S / 8D
	1600	3400	2950	1700	4900	4150	3400	1700	4950	4800	4150	2050	4050	6300	8350	11750	10S / 8D
	1700	3200	2800	1600	4550	3950	3200	1600	4650	4550	3950	1950	3950	6150	8350	11600	10S / 8D
	1800	2950	2600	1500	4200	3700	3050	1500	4350	4250	3700	1850	3800	6000	8350	11400	10S / 8D
	1900	2750	2450	1400	3900	3500	2850	1400	4050	3950	3500	1750	3650	5900	8350	11250	10S / 8D
	2000	2550	2300	1350	3550	3300	2700	1350	3750	3650	3300	1650	3550	5750	8350	11050	10S / 9D

SPECIFIC LOAD CONDITIONS:

1. Refer to Paragraph 9.2 for the general limitations of the application of these load bearing capacity tables;
2. Maximum frame height 6000mm
3. Unbraced configuration contains a minimum of 3 suspended levels;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, apply a 50% reduction in the tabled frame load bearing capacities;
5. Frame base plates may only be aligned with the beams of the bay and anchored with 2 anchor bolts;
6. 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.

SUPER 4-5-6

B-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 5 - D/S RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	10S / 6D	15150	10S / 6D
	600	15150	15150	15150	14950	14850	15150	15150	15150	14850	14550	15150	15150	15150	15050	14700	15150	10S / 6D	15150	10S / 6D
	700	14950	14500	14250	13900	13700	14500	14450	14250	13650	13250	14450	14450	14450	14000	13400	15100	10S / 6D	15100	10S / 6D
	800	13950	13450	13150	12850	12500	13550	13500	13200	12500	12000	13300	13300	13250	12850	12200	14800	10S / 6D	14800	10S / 6D
	900	12950	12400	12000	11800	11350	12450	12400	12150	11450	10850	12200	12100	12050	11700	10950	14500	10S / 6D	14500	10S / 6D
	1000	11900	11350	10900	10700	10250	11400	11250	11050	10450	9800	11050	10900	10800	10500	9750	14150	10S / 7D	14150	10S / 7D
	1100	11050	10550	10200	10100	9550	10650	10500	10300	9750	9250	10300	10150	10050	9750	9050	13800	10S / 7D	13800	10S / 7D
	1200	10150	9750	9450	9350	8900	9900	9700	9550	9050	8650	9600	9400	9300	9000	8300	13450	10S / 7D	13450	10S / 7D
	1300	9500	9200	8900	8850	8350	9150	8950	8800	8350	8150	8950	8750	8600	8350	7700	12950	10S / 7D	12950	10S / 7D
	1400	8900	8600	8300	8300	7800	8550	8400	8250	7800	7600	8350	8100	7950	7700	7150	12450	10S / 8D	12450	10S / 8D
	1500	8300	8000	7700	7700	7250	8000	7800	7650	7250	7000	7800	7550	7400	7150	6650	12100	10S / 8D	12100	10S / 8D
	1600	7800	7550	7300	7250	6800	7450	7250	7100	6650	6450	7300	7050	6900	6650	6150	11750	10S / 8D	11750	10S / 8D
	1700	7350	7100	6850	6800	6450	7000	6800	6650	6300	6000	6850	6600	6500	6250	5750	11600	10S / 8D	11600	10S / 8D
	1800	6850	6600	6400	6350	6000	6550	6350	6250	5900	5650	6400	6200	6100	5850	5400	11400	10S / 8D	11400	10S / 8D
	1900	6400	6150	5950	5900	5650	6100	5900	5800	5500	5200	5950	5750	5650	5450	5050	11250	10S / 8D	11250	10S / 8D
	2000	5950	5700	5550	5450	5200	5700	5450	5400	5150	4800	5500	5350	5250	5050	4700	11050	10S / 9D	11050	10S / 9D
	2100	5650	5450	5300	5200	4950	5400	5200	5100	4900	4600	5200	5050	5000	4800	4450	10700	10S / 9D	10700	10S / 9D
	2200	5350	5150	5000	4900	4700	5100	4950	4850	4650	4350	4900	4800	4700	4550	4200	10300	10S / 9D	10300	10S / 9D
	2300	5050	4900	4750	4650	4450	4800	4650	4600	4400	4100	4600	4500	4450	4250	3950	9950	10S / 10D	9950	10S / 10D
	2400																9350	10S / 10D	9550	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 Super 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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1500mm and has a maximum length of 2720mm;
6. 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.

SUPER 4-5-6

B-3

FRAME LOAD BEARING CAPACITY TABLE [daN]

SUPER 5 - D/S RIVETED 140 BEAM

SUPER 5 - RIVETED 172 BEAM

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	15150	10S / 6D	15150	10S / 6D
	600	15150	15150	15150	15150	14950	15150	15150	15150	15150	14950	15150	15150	15150	15150	14950	15150	10S / 6D	15150	10S / 6D
	700	15100	15100	15100	15100	14750	15100	15100	15100	15100	14750	15100	15100	15100	15100	14750	15100	10S / 6D	15100	10S / 6D
	800	14800	14800	14800	14750	14250	14800	14800	14800	14800	14350	14800	14800	14800	14800	14350	14800	10S / 6D	14800	10S / 6D
	900	14500	14350	14200	13900	13250	14500	14500	14400	14100	13300	14350	14350	14350	14150	13400	14500	10S / 6D	14500	10S / 6D
	1000	13850	13600	13400	13050	12350	13600	13600	13500	13150	12300	13450	13450	13450	13250	12350	14150	10S / 7D	14150	10S / 7D
	1100	12950	12700	12550	12200	11500	12750	12750	12600	12250	11450	12550	12550	12550	12350	11500	13800	10S / 7D	13800	10S / 7D
	1200	12100	11850	11650	11300	10650	11900	11850	11750	11400	10650	11700	11700	11650	11400	10650	13450	10S / 7D	13450	10S / 7D
	1300	11300	11100	10900	10600	10000	11000	11000	10900	10550	9800	10850	10850	10800	10650	9900	12950	10S / 7D	12950	10S / 7D
	1400	10500	10300	10150	9900	9350	10300	10300	10200	9900	9250	10050	10000	10000	9850	9200	12450	10S / 8D	12450	10S / 8D
	1500	9700	9550	9400	9150	8600	9600	9550	9500	9250	8600	9400	9400	9350	9250	8600	12100	10S / 8D	12100	10S / 8D
	1600	9200	9050	8850	8650	8200	8850	8850	8800	8600	8050	8750	8750	8750	8650	8100	11750	10S / 8D	11750	10S / 8D
	1700	8650	8500	8350	8150	7700	8350	8350	8300	8150	7600	8250	8250	8250	8150	7600	11600	10S / 8D	11600	10S / 8D
	1800	8100	8000	7850	7700	7250	7850	7850	7800	7650	7150	7750	7750	7750	7650	7150	11400	10S / 8D	11400	10S / 8D
	1900	7550	7450	7350	7200	6750	7350	7350	7300	7150	6700	7250	7250	7200	7150	6700	11250	10S / 8D	11250	10S / 8D
	2000	7050	6950	6850	6700	6300	6850	6850	6800	6700	6250	6750	6750	6700	6650	6250	11050	10S / 9D	11050	10S / 9D
	2100	6700	6600	6550	6350	6000	6500	6500	6450	6350	5900	6400	6350	6350	6300	5900	10700	10S / 9D	10700	10S / 9D
	2200	6350	6300	6200	6050	5700	6150	6150	6100	6000	5600	6000	6000	5950	5900	5600	10300	10S / 9D	10300	10S / 9D
	2300	6000	5950	5900	5750	5450	5800	5800	5750	5650	5300	5650	5600	5600	5550	5200	9950	10S / 10D	9950	10S / 10D
	2400																9550	10S / 10D	9550	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 Super 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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 2000mm and has a maximum length of 2720mm;
6. 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]
SUPER 6 - RIVETED 70 BEAM**

		70/3			70/4				70/5				PARTIALLY BRACED			FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=1820	Lc=2420	Lc=2720	Lc=3320	70/3	70/4	70/5	BAYS	
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	9150	8500	5400	14050	12450	10800	5400	14300	14200	13200	6600	13050	18600	18600	18600	10S / 5D
	600	8350	7700	4850	12800	11300	9700	4850	13150	13000	11850	5900	11200	16800	18600	18600	10S / 5D
	700	7550	6950	4300	11500	10100	8600	4300	11950	11800	10550	5250	9300	14150	18550	18550	10S / 5D
	800	6750	6150	3750	10250	8950	7550	3750	10800	10600	9200	4600	8450	12900	17000	18200	10S / 5D
	900	5950	5400	3200	8950	7750	6450	3200	9600	9400	7900	3950	7600	11650	15400	17900	10S / 5D
	1000	5150	4600	2700	7650	6600	5400	2700	8450	8200	6600	3300	6750	10400	13800	17550	10S / 5D
	1100	4850	4300	2500	7200	6150	5000	2500	7850	7650	6150	3050	6100	9450	12700	17150	10S / 5D
	1200	4550	4050	2300	6700	5700	4650	2300	7300	7100	5700	2850	5450	8500	11600	16750	10S / 5D
	1300	4300	3750	2150	6200	5250	4300	2150	6750	6550	5250	2600	5200	8250	11550	16250	10S / 6D
	1400	4000	3450	1950	5750	4800	3950	1950	6200	6000	4800	2400	4950	8000	11550	15750	10S / 6D
	1500	3700	3150	1800	5250	4400	3600	1800	5600	5450	4400	2200	4550	7250	10200	15450	10S / 6D
	1600	3500	3000	1700	4950	4150	3400	1700	5300	5150	4150	2050	4100	6450	8900	15000	10S / 6D
	1700	3250	2850	1600	4650	3950	3200	1600	5000	4850	3950	1950	4000	6300	8850	14750	10S / 6D
	1800	3050	2700	1500	4400	3700	3050	1500	4650	4550	3700	1850	3850	6150	8850	14500	10S / 6D
	1900	2800	2550	1400	4100	3500	2850	1400	4350	4250	3500	1750	3700	6000	8850	14250	10S / 7D
	2000	2600	2400	1350	3800	3300	2700	1350	4050	3950	3300	1650	3550	5900	8850	14000	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. Maximum frame height 6000mm
3. Unbraced configuration contains a minimum of 3 suspended levels;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, apply a 50% reduction in the tabled frame load bearing capacities;
5. Frame base plates may only be aligned with the beams of the bay and anchored with 2 anchor bolts;
6. 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.

SUPER 4-5-6

C-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 6 - D/S RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	10S / 5D	18600	10S / 5D
	600	18600	18600	18050	17750	17700	18600	18550	18200	17400	17150	18350	18350	18200	17550	16950	18600	10S / 5D	18600	10S / 5D
	700	18000	17150	16600	16450	16100	17050	16850	16500	15600	15250	16750	16550	16400	15650	14800	18550	10S / 5D	18550	10S / 5D
	800	16450	15650	15150	15150	14550	15400	15150	14750	13750	13450	15350	15100	14900	14250	13400	18200	10S / 5D	18200	10S / 5D
	900	14900	14200	13700	13700	13050	14100	13800	13500	12750	12350	13950	13600	13400	12850	12000	17900	10S / 5D	17900	10S / 5D
	1000	13400	12750	12250	12250	11500	12800	12500	12250	11750	11300	12550	12150	11950	11450	10600	17550	10S / 5D	17550	10S / 5D
	1100	12450	11850	11350	11350	10650	12000	11600	11350	10900	10550	11700	11250	11000	10550	9800	17150	10S / 5D	17150	10S / 5D
	1200	11550	10950	10500	10500	9850	11150	10700	10500	10050	9800	10800	10350	10100	9600	9050	16750	10S / 5D	16750	10S / 5D
	1300	10800	10250	9800	9800	9200	10300	9850	9600	9150	9100	10050	9600	9350	8900	8300	16250	10S / 6D	16250	10S / 6D
	1400	10050	9500	9100	9100	8550	9650	9150	8950	8550	8400	9250	8850	8650	8200	7500	15750	10S / 6D	15750	10S / 6D
	1500	9300	8800	8400	8400	7900	8950	8500	8250	7950	7650	8650	8300	8050	7650	7050	15450	10S / 6D	15450	10S / 6D
	1600	8750	8250	7950	7950	7450	8300	7850	7600	7350	7000	8050	7700	7450	7100	6650	15000	10S / 6D	15000	10S / 6D
	1700	8200	7750	7450	7450	7000	7800	7400	7150	6850	6600	7550	7250	7050	6650	6250	14750	10S / 6D	14750	10S / 6D
	1800	7650	7250	6950	6950	6550	7300	6950	6750	6400	6200	7050	6800	6600	6250	5850	14500	10S / 6D	14500	10S / 6D
	1900	7100	6750	6500	6500	6100	6800	6450	6300	5950	5750	6600	6350	6150	5850	5450	14250	10S / 7D	14250	10S / 7D
	2000	6550	6200	6000	6000	5650	6300	6000	5850	5500	5400	6100	5850	5750	5450	5050	14000	10S / 7D	14000	10S / 7D
	2100	6250	5950	5700	5700	5400	6000	5750	5600	5250	5100	5750	5550	5450	5200	4750	13450	10S / 7D	13550	10S / 7D
	2200	5950	5650	5450	5450	5100	5700	5450	5300	5000	4800	5450	5250	5150	4900	4550	12500	10S / 8D	13150	10S / 7D
	2300	5650	5400	5200	5200	4800	5400	5150	5050	4750	4600	5150	4950	4850	4650	4300	11600	10S / 8D	12700	10S / 7D
	2400	5350	5100	4950	4900	4600	5100	4850	4750	4500	4300	4800	4650	4600	4350	4050	10650	10S / 9D	12250	10S / 8D
	2500																9750	10S / 10D	11850	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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1300mm and has a maximum length of 2720mm;
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.

SUPER 4-5-6

C-3

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 6 - D/S RIVETED 140 BEAM
SUPER 6 - RIVETED 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	18600	10S / 5D	18600	10S / 5D
	600	18600	18600	18600	18600	18400	18600	18600	18600	18600	18400	18600	18600	18600	18600	18400	18600	10S / 5D	18600	10S / 5D
	700	18550	18550	18550	18550	18150	18550	18550	18550	18550	18150	18550	18550	18550	18550	18150	18550	10S / 5D	18550	10S / 5D
	800	18200	18200	18200	17950	17400	18200	18200	18200	18150	17350	18200	18200	18200	18200	17550	18200	10S / 5D	18200	10S / 5D
	900	17900	17500	17200	16650	15950	17750	17650	17400	16750	15800	17450	17400	17350	16950	15950	17900	10S / 5D	17900	10S / 5D
	1000	16850	16300	15950	15300	14600	16400	16300	16050	15400	14250	16100	16000	15950	15550	14400	17550	10S / 5D	17550	10S / 5D
	1100	15650	15100	14750	14250	13600	15250	15150	14900	14300	13300	14900	14800	14750	14350	13300	17150	10S / 5D	17150	10S / 5D
	1200	14400	13950	13600	13200	12550	14100	13950	13750	13250	12350	13700	13600	13500	13150	12200	16750	10S / 5D	16750	10S / 5D
	1300	13450	13050	12750	12400	11800	12900	12800	12600	12200	11400	12750	12650	12550	12300	11400	16250	10S / 6D	16250	10S / 6D
	1400	12500	12200	11950	11600	11050	12100	12000	11850	11450	10650	11800	11700	11650	11450	10700	15750	10S / 6D	15750	10S / 6D
	1500	11550	11300	11100	10800	10300	11300	11200	11100	10750	10000	11100	11000	10900	10750	10050	15450	10S / 6D	15450	10S / 6D
	1600	10900	10700	10500	10200	9750	10500	10450	10350	10050	9350	10400	10250	10200	10050	9400	15000	10S / 6D	15000	10S / 6D
	1700	10300	10100	9900	9600	9200	9950	9850	9750	9450	8800	9800	9650	9600	9450	8800	14750	10S / 6D	14750	10S / 6D
	1800	9650	9450	9300	9000	8600	9350	9250	9150	8900	8250	9200	9050	9000	8850	8250	14500	10S / 6D	14500	10S / 6D
	1900	9000	8850	8700	8350	8050	8750	8650	8600	8300	7700	8600	8450	8400	8250	7700	14250	10S / 7D	14250	10S / 7D
	2000	8400	8250	8100	7750	7500	8150	8050	8000	7750	7200	8000	7850	7800	7650	7150	14000	10S / 7D	14000	10S / 7D
	2100	8000	7850	7700	7400	7150	7700	7650	7600	7350	6800	7550	7400	7350	7250	6750	13550	10S / 7D	13550	10S / 7D
	2200	7550	7450	7300	7050	6750	7300	7200	7150	6950	6450	7100	7000	6950	6850	6400	13150	10S / 7D	13150	10S / 7D
	2300	7150	7050	6950	6700	6450	6850	6800	6750	6550	6100	6650	6550	6500	6400	6000	12700	10S / 7D	12700	10S / 7D
	2400	6750	6650	6550	6300	6050	6450	6400	6350	6200	5700	6250	6100	6050	6000	5600	12250	10S / 8D	12250	10S / 8D
	2500																11850	10S / 8D	11850	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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1800mm and has a maximum length of 2720mm;
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.

SUPER 4-5-6

D-1

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 5R - D/S RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19200	19200	19200	18950	18800	19650	10S / 5D	19650	8S / 4D
	600	19600	19600	19600	19400	19300	19600	19600	19350	18700	18450	18550	18350	18250	17750	17250	19600	10S / 5D	19650	10S / 5D
	700	19250	18850	18500	18050	17800	18500	18000	17650	16950	16700	17900	17450	17250	16500	15750	19250	10S / 5D	19300	10S / 5D
	800	18100	17450	17050	16700	16150	17050	16350	15950	15250	14950	16350	15900	15650	14900	14050	19200	10S / 5D	19200	10S / 5D
	900	16800	15850	15400	15300	14250	15600	14850	14450	13750	13550	14800	14300	14050	13350	12350	18850	10S / 5D	18850	10S / 5D
	1000	15200	14000	13700	13700	12350	14200	13350	12900	12300	12200	13250	12750	12450	11750	10750	18350	10S / 5D	18350	10S / 5D
	1100	13950	12800	12500	12500	11350	13100	12300	11850	11350	11250	12300	11800	11500	10750	9950	17900	10S / 5D	17900	10S / 5D
	1200	12700	11550	11300	11300	10300	12000	11300	10850	10450	10250	11350	10800	10500	9900	9200	17250	10S / 5D	17450	10S / 5D
	1300	11800	10750	10500	10500	9550	10900	10250	9800	9450	9300	10450	9950	9650	9150	8500	16800	10S / 5D	16800	10S / 5D
	1400	10900	9950	9700	9700	8850	10150	9550	9150	8850	8550	9600	9150	8800	8450	7850	16150	10S / 5D	16150	10S / 5D
	1500	10000	9100	8900	8900	8200	9400	8850	8500	8200	7850	8950	8550	8250	7850	7300	15700	10S / 6D	15700	10S / 5D
	1600	9350	8550	8350	8350	7650	8700	8200	7900	7500	7200	8300	7900	7700	7300	6750	15100	10S / 6D	15250	10S / 6D
	1700	8750	8000	7800	7800	7200	8100	7650	7400	7000	6700	7800	7400	7200	6850	6350	14850	10S / 6D	15050	10S / 6D
	1800	8100	7450	7200	7200	6700	7550	7150	6900	6550	6300	7250	6950	6750	6400	5900	14650	10S / 6D	14800	10S / 6D
	1900	7500	6900	6650	6650	6200	7000	6650	6400	6050	5850	6700	6450	6250	5950	5550	14450	10S / 6D	14600	10S / 6D
	2000	6850	6350	6100	6100	5700	6450	6100	5900	5650	5450	6150	5950	5800	5550	5150	14200	10S / 7D	14300	10S / 6D
	2100	6550	6050	5850	5850	5500	6150	5850	5650	5350	5150	5850	5650	5500	5250	4850	13300	10S / 7D	13350	10S / 7D
	2200	6200	5800	5550	5550	5200	5850	5550	5350	5100	4900	5550	5350	5200	5000	4600	12400	10S / 8D	12450	10S / 8D
	2300	5900	5500	5300	5300	4900	5550	5300	5100	4800	4650	5250	5050	4950	4700	4300	11500	10S / 8D	11550	10S / 8D
	2400	5550	5200	5050	5000	4700	5250	5000	4800	4550	4400	4900	4750	4650	4450	4100	10600	10S / 9D	10650	10S / 9D
	2500	5250	4950	4800	4750	4400	4950	4700	4550	4300	4100	4600	4450	4350	4150	3850	9700	10S / 10D	10100	10S / 10D
	2600																9450	10S / 10D	9700	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 Super 5R frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
4. **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;
5. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 800mm and has a maximum length of 2720mm;
6. 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.

SUPER 4-5-6

D-2

FRAME LOAD BEARING CAPACITY TABLE [daN]

SUPER 5R - D/S RIVETED 140 BEAM

SUPER 5R - RIVETED 172 BEAM

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	19650	8S / 4D	19650	8S / 4D
	600	19650	19650	19650	19650	19400	19650	19650	19650	19650	19400	19650	19650	19650	19650	19400	19650	10S / 5D	19650	10S / 5D
	700	19250	19250	19250	19250	19150	19250	19250	19250	19250	19150	19250	19250	19250	19250	19150	19250	10S / 5D	19300	10S / 5D
	800	19200	19200	19200	19150	18500	19200	19200	19200	19200	18650	19200	19200	19200	18950	18150	19200	10S / 5D	19200	10S / 5D
	900	18850	18650	18450	18050	17200	18850	18850	18700	18300	17250	18000	18000	17950	17600	16650	18850	10S / 5D	18850	10S / 5D
	1000	18000	17650	17400	16950	16050	17650	17650	17550	17050	15950	16700	16650	16600	16200	15150	18350	10S / 5D	18350	10S / 5D
	1100	16800	16500	16300	15850	14950	16550	16550	16350	15900	14850	16200	16000	15900	15550	14500	17900	10S / 5D	17900	10S / 5D
	1200	15700	15400	15100	14650	13800	15450	15400	15250	14800	13800	15200	15200	15100	14800	13800	17250	10S / 5D	17450	10S / 5D
	1300	14650	14400	14150	13750	13000	14300	14300	14150	13650	12700	14100	14100	13950	13650	12750	16800	10S / 5D	16800	10S / 5D
	1400	13650	13350	13150	12850	12150	13350	13350	13250	12850	12000	13050	12800	12700	12450	11600	16150	10S / 5D	16150	10S / 5D
	1500	12600	12400	12200	11850	11150	12450	12400	12350	12000	11150	12200	12100	11950	11700	10900	15700	10S / 6D	15700	10S / 5D
	1600	11950	11750	11500	11200	10650	11500	11500	11400	11150	10450	11350	11350	11250	10950	10250	15250	10S / 6D	15250	10S / 6D
	1700	11200	11050	10850	10550	10000	10850	10850	10750	10550	9850	10700	10550	10450	10150	9500	15050	10S / 6D	15050	10S / 6D
	1800	10500	10400	10200	10000	9400	10200	10200	10100	9800	9150	9950	9700	9600	9400	8750	14800	10S / 6D	14800	10S / 6D
	1900	9800	9650	9550	9350	8750	9550	9400	9250	8950	8400	9050	8850	8800	8600	8000	14600	10S / 6D	14600	10S / 6D
	2000	9150	9000	8900	8700	8150	8700	8500	8400	8150	7600	8150	8000	7950	7800	7300	14300	10S / 6D	14300	10S / 6D
	2100	8700	8550	8500	8250	7800	8250	8100	8000	7750	7200	7750	7650	7600	7450	6950	13350	10S / 7D	13350	10S / 7D
	2200	8250	8150	8050	7850	7400	7850	7700	7600	7400	6850	7400	7250	7200	7050	6600	12450	10S / 8D	12450	10S / 8D
	2300	7800	7700	7650	7450	7050	7450	7300	7250	7000	6500	7000	6900	6800	6650	6250	11550	10S / 8D	11550	10S / 8D
	2400	7300	7250	7200	7050	6600	7050	6900	6850	6600	6150	6600	6500	6450	6300	5850	10650	10S / 9D	10650	10S / 9D
	2500	6850	6800	6750	6600	6200	6600	6500	6450	6250	5750	6250	6150	6050	5900	5550	10100	10S / 10D	10100	10S / 10D
	2600																9700	10S / 10D	9700	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 Super 5R frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2400mm;
4. **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;
5. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1500mm and has a maximum length of 2720mm;
6. 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.

SUPER 4-5-6

E-1

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 6R - D/S RIVETED 106 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22100	22500	8S / 4D	22500	8S / 4D
	600	22400	22400	21150	21150	20750	22400	22400	22050	21100	21050	21400	21000	20700	19900	19550	22400	8S / 4D	22400	8S / 4D
	700	22300	20550	19400	19400	18700	20650	19800	19350	18650	18550	19250	18550	18100	17200	17000	22300	8S / 4D	22300	8S / 4D
	800	20450	18600	17700	17700	16700	18150	17100	16650	16200	16100	17600	16900	16450	15550	15100	22200	8S / 4D	22200	8S / 4D
	900	18200	16650	15950	15950	14700	16650	15600	15100	14600	14400	15950	15250	14800	13900	13250	22100	8S / 4D	22100	8S / 4D
	1000	15950	14650	14250	14250	12800	15100	14150	13500	12950	12650	14300	13550	13200	12300	11450	22000	8S / 4D	22000	8S / 4D
	1100	14700	13400	13050	13050	11700	13900	13000	12450	11950	11700	13100	12450	12050	11250	10500	21950	8S / 4D	21950	8S / 4D
	1200	13450	12150	11800	11800	10650	12750	11850	11350	10950	10700	11950	11300	10900	10200	9550	21050	8S / 4D	21900	8S / 4D
	1300	12500	11300	11000	11000	9900	11550	10750	10300	9900	9700	11000	10450	10100	9400	8850	21150	8S / 4D	21800	8S / 4D
	1400	11550	10400	10200	10200	9200	10750	10000	9600	9250	9050	10100	9600	9300	8650	8150	21300	8S / 4D	21700	8S / 4D
	1500	10600	9550	9350	9350	8500	9950	9300	8900	8600	8450	9400	8950	8600	8100	7600	18950	10S / 5D	21000	8S / 4D
	1600	9950	9000	8800	8800	8000	9200	8600	8200	7950	7750	8750	8350	7950	7550	7050	16600	10S / 6D	19650	10S / 5D
	1700	9300	8450	8250	8250	7550	8600	8100	7750	7500	7250	8200	7800	7500	7100	6650	16550	10S / 6D	19250	10S / 5D
	1800	8600	7850	7700	7700	7000	8050	7550	7250	7000	6750	7650	7300	7050	6650	6200	16500	10S / 6D	18800	10S / 5D
	1900	7950	7300	7150	7150	6550	7450	7050	6750	6500	6250	7100	6800	6600	6200	5750	16450	10S / 6D	18400	10S / 5D
	2000	7300	6750	6600	6600	6050	6900	6500	6300	6000	5700	6550	6300	6150	5800	5300	16400	10S / 6D	17950	10S / 5D
	2100	7000	6450	6300	6300	5750	6600	6200	6000	5700	5500	6250	6000	5850	5500	5050	15350	10S / 6D	16900	10S / 5D
	2200	6650	6150	6000	6000	5500	6250	5900	5700	5450	5200	5900	5700	5550	5250	4800	14250	10S / 7D	15800	10S / 6D
	2300	6300	5850	5750	5700	5250	5950	5650	5450	5150	4900	5600	5350	5250	4950	4550	13200	10S / 7D	14750	10S / 6D
	2400	5950	5550	5450	5400	4950	5600	5350	5150	4900	4700	5250	5050	4950	4700	4300	12150	10S / 8D	13650	10S / 7D
	2500	5650	5250	5150	5050	4700	5300	5050	4850	4600	4400	4950	4750	4650	4400	4050	11100	10S / 9D	12600	10S / 7D
	2600	5300	4950	4850	4750	4400	4950	4750	4600	4350	4150	4750	4550	4450	4250	3900	11000	10S / 9D	12250	10S / 8D
	2700																10900	10S / 9D	11850	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. Frame base plates aligned with the beams of the bay and anchored with 2 anchor bolts;
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.

SUPER 4-5-6

E-2

**FRAME LOAD BEARING CAPACITY TABLE [daN]
SUPER 6R - D/S RIVETED 140 BEAM
SUPER 6R - RIVETED 172 BEAM**

		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	Lc=1820	Lc=2420	Lc=2720	Lc=3320	Lc=3620	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	8S / 4D	22500	8S / 4D
	600	22400	22400	22400	22400	22150	22400	22400	22400	22400	22150	22400	22400	22400	22400	22150	22400	8S / 4D	22400	8S / 4D
	700	22300	22300	22300	22300	21850	22300	22300	22300	22300	21850	22300	22300	22300	22300	21850	22300	8S / 4D	22300	8S / 4D
	800	22200	22200	22200	22200	21500	22200	22200	22200	22200	21500	22200	22200	22200	22200	21500	22200	8S / 4D	22200	8S / 4D
	900	22100	22100	22100	22100	21200	22100	22100	22100	21050	19850	21450	21150	21000	20450	19250	22100	8S / 4D	22100	8S / 4D
	1000	22000	21300	20650	19800	19100	20900	20400	20000	18950	17550	19450	19000	18850	18350	17100	22000	8S / 4D	22000	8S / 4D
	1100	20450	20050	19000	18350	17600	19450	18950	18600	17650	16500	18300	17950	17700	17300	16200	21950	8S / 4D	21950	8S / 4D
	1200	18800	18650	17400	16900	16150	18050	17500	17200	16400	15450	17100	16900	16600	16250	15350	21600	8S / 4D	21900	8S / 4D
	1300	17650	17450	16400	15950	15200	16600	16050	15800	15100	14450	15950	15650	15350	14900	14000	21700	8S / 4D	21800	8S / 4D
	1400	16550	16100	15400	14950	14250	15600	15050	14800	14100	13500	14850	14350	14100	13600	12600	21700	8S / 4D	21700	8S / 4D
	1500	15400	14800	14450	13950	13250	14600	14100	13800	13100	12550	13950	13500	13250	12700	11800	20400	8S / 4D	21000	8S / 4D
	1600	14450	13850	13550	13100	12400	13600	13100	12750	12100	11550	13000	12650	12400	11850	11000	19050	10S / 5D	19650	10S / 5D
	1700	13500	12950	12600	12250	11600	12650	12200	11900	11300	10800	12100	11750	11550	11050	10300	18800	10S / 5D	19250	10S / 5D
	1800	12500	12000	11700	11400	10800	11700	11300	11050	10550	10000	11150	10850	10700	10250	9550	18500	10S / 5D	18800	10S / 5D
	1900	11550	11050	10800	10500	10000	10750	10400	10150	9750	9200	10250	9950	9850	9450	8800	18250	10S / 5D	18400	10S / 5D
	2000	10600	10150	9900	9600	9200	9800	9500	9300	8950	8450	9300	9100	8950	8650	8100	17950	10S / 5D	17950	10S / 5D
	2100	10050	9650	9400	9150	8700	9300	9050	8850	8500	8000	8850	8650	8500	8250	7650	16850	10S / 5D	16900	10S / 5D
	2200	9550	9150	8950	8700	8300	8850	8600	8400	8100	7600	8350	8200	8100	7800	7300	15750	10S / 6D	15800	10S / 6D
	2300	9050	8700	8500	8250	7850	8350	8150	8000	7700	7150	7900	7750	7650	7400	6900	14650	10S / 6D	14750	10S / 6D
	2400	8500	8200	8050	7800	7400	7900	7700	7550	7250	6750	7450	7300	7200	6950	6500	13550	10S / 7D	13650	10S / 7D
	2500	8000	7700	7550	7400	6950	7400	7250	7100	6850	6350	6950	6800	6750	6550	6100	12450	10S / 8D	12600	10S / 7D
	2600	7450	7250	7100	6950	6500	6950	6800	6700	6400	5900	6650	6500	6450	6250	5800	12100	10S / 8D	12250	10S / 8D
	2700																11750	10S / 8D	11850	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. Frame base plates aligned with the bay beams are anchored to ground with 2 anchor bolts per upright. Alternatively base plates may be aligned with the frame only if these are anchored with 4 anchor bolts per upright and if the first beam height is no greater than 1200mm and has a maximum length of 2720mm;
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.

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 two paragraphs provide instructions for the correct interpretation of common pallet racking applications which fall outside the tables load bearing capacity assumptions.

10.1.**PICKING LEVELS**

The following limitations apply when one or more picking levels are placed under the first beam levels of a pallet racking bay:

1. The frame load bearing capacity must be taken as the total load to which the frame is subjected (ie: both picking and pallet loading levels);
2. The first beam level from ground (as defined in the frame load bearing capacity tables), shall be the first PALLET SUPPORTING beam level;
3. The picking beam load bearing capacities must comply with the beam pair load bearing capacities tabled in Paragraph 8.2 (standard beams) and Paragraph 8.4 (lowered connector beams).

10.2.**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.

SUPER 4-5-6

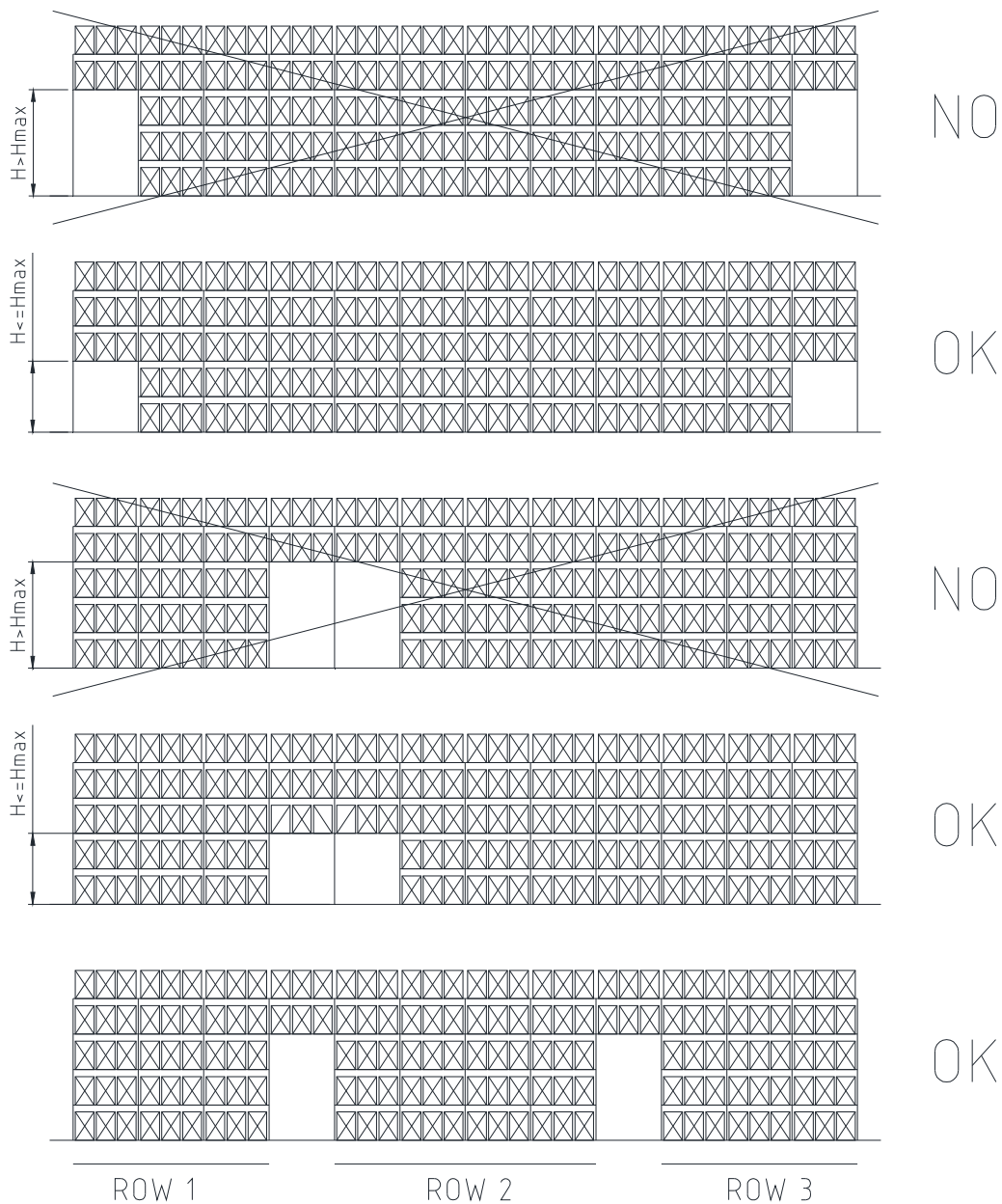


Fig. 10.1

11.

DIMENSIONAL CHARACTERISTICS

Lc BEAM LENGTH	Real beam dimension to body of upright
Fc EXTERNAL PROFILE DIMENSION	Dimension to outside edge of beam profile
Ln NET SPAN	Free span between uprights (external face of uprights)
Ls ACTUAL FRAME WIDTH	Actual frame width (external face of uprights)
CONNECTION PITCH	33mm
UPRIGHT CUT PITCH	33mm
SUPER 4-5-6 UPRIGHT BODY DIMENSION	76mm
SUPER 4-5-6 EXTERNAL UPRIGHT DIMENSION	89mm

Tab. 11.1

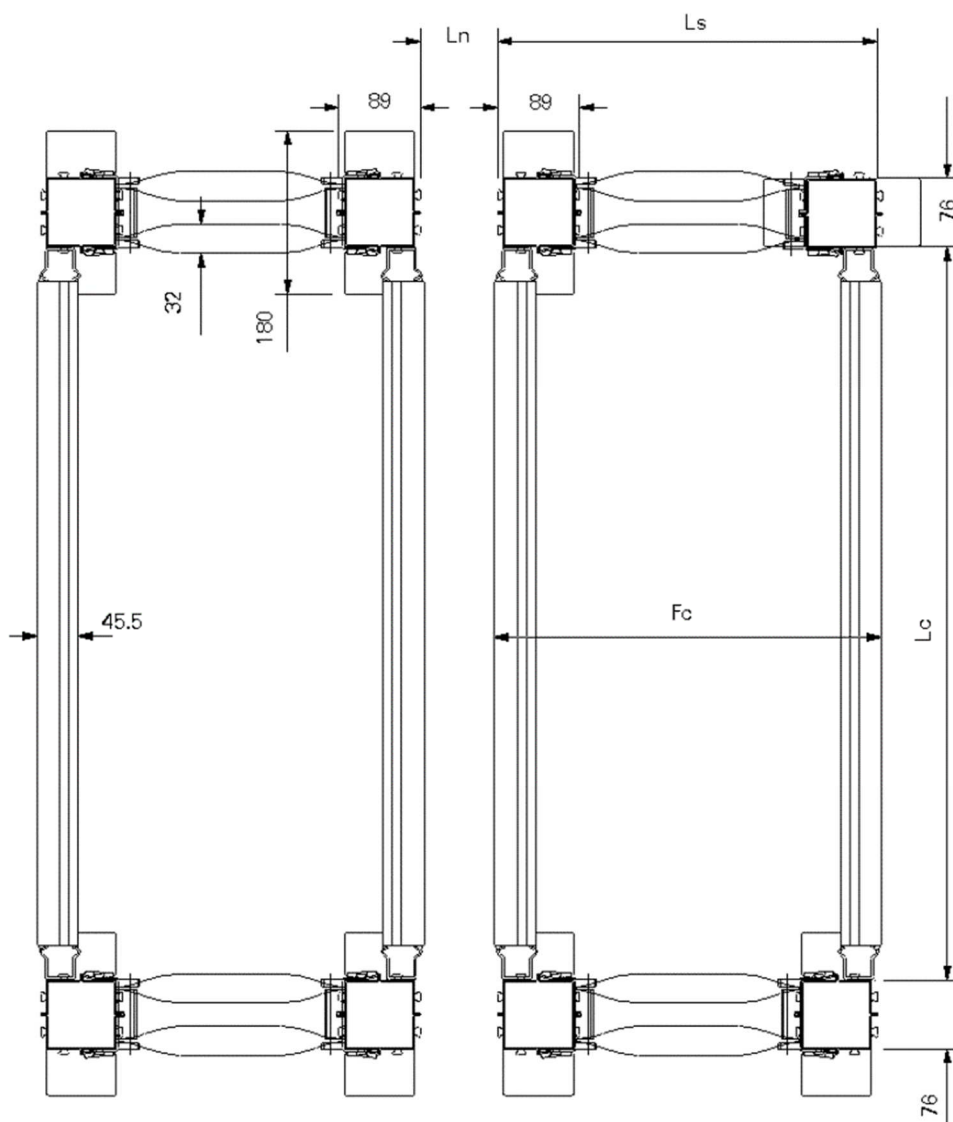


Fig. 11.1

SUPER 4-5-6

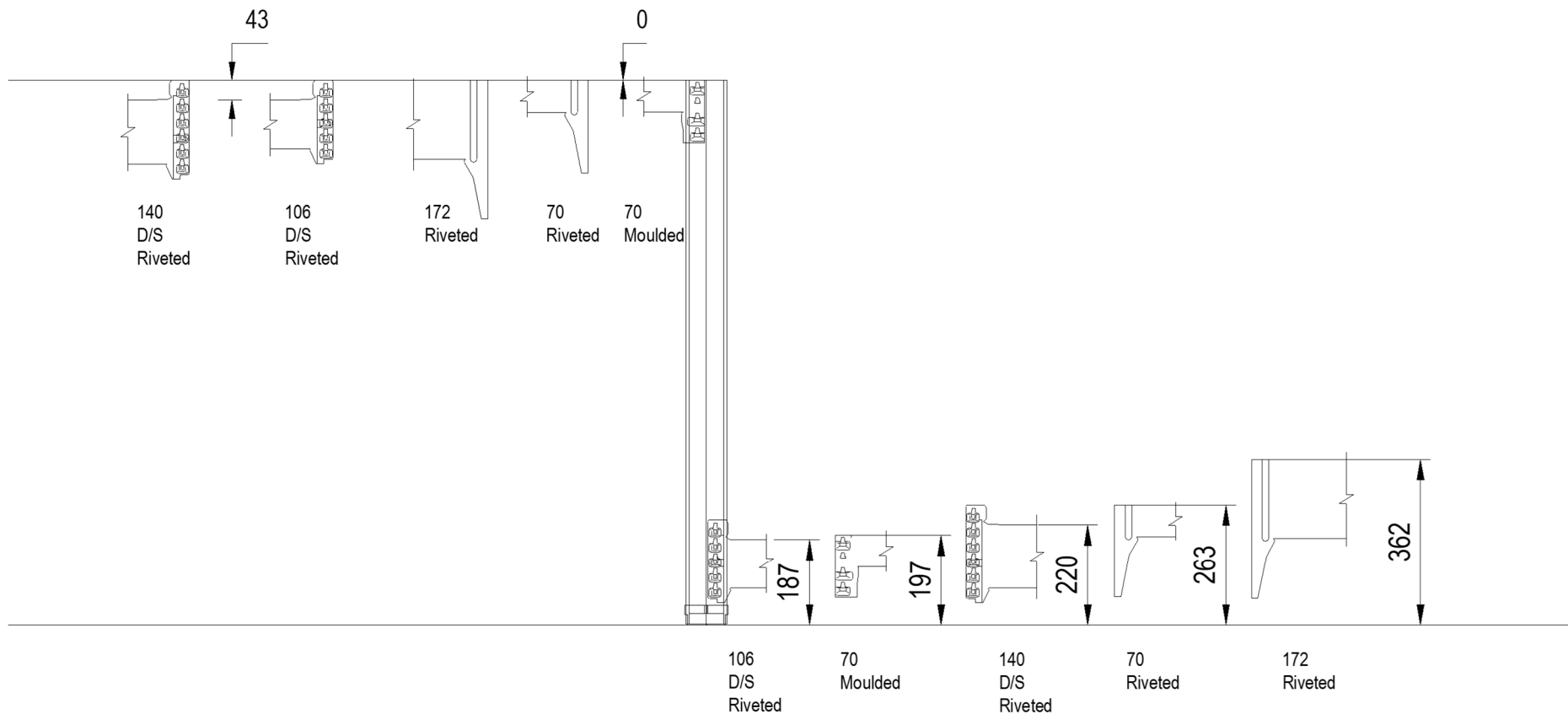


Fig. 11.2

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