

SUPERBUILD

TECHNICAL MANUAL



Revision 13 – 16.11.2020

**UNI EN 15512 STANDARD
CE MARKING OF STRUCTURAL COMPONENTS**

SUPERBUILD

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 of its documents. All dimensions shown in this document are subjected to production tolerances.

-	Force	Newton	(N)	(10N=1daN≅1Kg)
-	Length	millimetres	(mm)	

CLIENT SATISFACTION

Internet address:
www.metalsistem.com

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

REFERENCE DOCUMENTATION

REFERENCE DOCUMENTATION

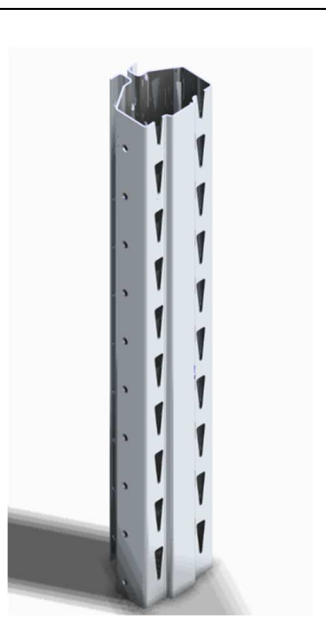
Doc. Code	Document Title
MUM01	Heavy Duty Pallet Racking, Drive-In and Mezzanine Operating and Maintenance Manual
MT07	Pallet Racking Accessories Technical Manual
ISTM-033	Assembly Instructions for Mezzanine and Pallet Racking Bracing
ISTM-030	Assembly Instructions for Vertical Bracing Applied to Single Entry Pallet Racking Bays with Back Stop Beams

REVISIONS

ISSUED BY:	Ufficio Tecnico Prodotto
APPROVED BY:	Ufficio Tecnico Prodotto
TECHNICAL MANAGER:	Eng. Lucio Gelmini

REVISIONS

Rev.	Descriptions	Author	Date
07	- Applied new structural steel strength - Applied UNI EN 15512 standards - Revised beam and frame load bearing capacity tables - New safety pin for double sided beam connector	David Terzi	12/2012
08	- Updated UNI EN 15512 reference standards - Revised beam and frame load bearing capacity tables - Revised bracing chapter - Inserted special configuration section	David Terzi Arturo di Gioia	07/2014
09	- Frame bracing profiles modification - Modification to 600mm and 700mm deep frames configuration - New prescriptions about usage of CE marked bolt assemblies and alternative anchor bolts	Arturo di Gioia	09/2018
10	- Replaced 140/3 beams with 140/33 beams	David Terzi	05/2019
11	- Introduced 172/5 code and load bearing capacity tables	David Terzi	06/2019
12	- Unbraced frame LBC for L=3600mm beams	Arturo di Gioia	05/2020
13	- General revisions to paragraph 1 and to the document - Replaced 106/3 beams with 106/33 beams	David Terzi	11/2020



07/2014

SUMMARY

1	SAFETY, CALCULATION AND ASSEMBLY STANDARDS	4
2	DIMENSIONING	8
2.1	PALLET RACKING LOAD BEARING CAPACITY PROCEDURE	8
2.2	PALLET RACKING DIMENSIONING EXAMPLE	9
3	SUPERBUILD BEAMS	10
3.1	NOTES ON THE SUPERBUILD BEAM POWDER COATING	10
3.2	SUPERBUILD BEAM SAFETY PINS	11
3.3	HEIGHT OF BEAM FROM GROUND	11
3.4	SUPERBUILD BEAM CODES	11
3.5	SUPERBUILD RIVETED GALVANISED BEAM CODES	12
3.6	SUPERBUILD RIVETED GALVANISED, PAINTED BEAM CODES	13
3.7	WELDED BEAM CODES	14
4	SUPERBUILD FRAMES	15
4.1	SUPERBUILD FRAMES UP TO 700 WITH SHORT DIAGONALS ONLY CODES	15
4.2	SUPERBUILD FRAMES FROM 800 UP TO 1400 CODES	16
4.3	1500 SUPERBUILD FRAME WITH SHORT DIAGONALS ONLY CODES	19
4.4	SUPERBUILD FRAME ASSEMBLY	20
4.5	SUPERBUILD SPECIAL FRAME BRACING CONFIGURATIONS	22
4.6	SUPERBUILD 75/110/145 HORIZONTAL, SHORT AND LONG DIAG. SPACER BARS	23
4.7	SUPERBUILD OVAL ROW SPACER AND SUPERBUILD OVAL WALL TIE	24
4.8	SUPERBUILD PORTAL TIE	25
5	SUPERBUILD 75-110-145 UPRIGHTS	26
5.1	UPRIGHT CODES	26
6	SUPERBUILD SPINE BRACING	27
6.1	PARTIALLY BRACED ROW – BRACING TOWER RULES OF APPLICATION	27
6.2	FULLY BRACED ROW – BRACING TOWER RULES OF APPLICATION	27
6.3	BRACING TOWER COMPONENTS	28
6.4	SINGLE ENTRY VERTICAL BRACING COMPONENTS	31
6.5	CALCULATION OF THE BRACING STIRRUP LENGTH	31
6.6	COMPONENTS FOR DOUBLE SIDED VERTICAL BRACING	33
6.7	HORIZONTAL BRACING COMPONENTS	34
6.8	BRACING STIRRUPS	35
6.9	BRACING ACCESSORY MACRO CODES	36
7	SUPERBUILD DEDICATED ACCESSORIES	38
7.1	SUPERBUILD UPRIGHT WOODEN PROFILE	38
7.2	SUPERBUILD SPLICE PROFILE	38
8	PALLET RACKING BEAM LOAD BEARING CAPACITY TABLES	39
8.1	LOAD BEARING CAPACITY TABLE NOTES FOR USE	39
8.2	SUPERBUILD HAND PICKING BEAM LOAD BEARING CAPACITIES	40
8.3	SUPERBUILD PALLET RACKING BEAM LOAD BEARING CAPACITIES	41
9	PALLET RACKING FRAME LOAD BEARING CAPACITIES	43
9.1	LOAD BEARING CAPACITY TABLE NOTES FOR USE	43
9.2	LOAD BEARING CAPACITY TABLE CONDITIONS FOR USE	44
9.3	PALLET RACKING ROWS USING CROSS BRACING ALTERNATIVE	45
9.4	BEAM ON GROUND APPLICATIONS	45
9.5	BASE PLATE CONSIDERATIONS	45
9.6	LOAD BEARING CAPACITY TABLES	46
10	SPECIAL CONFIGURATIONS	58
10.1	CROSS AISLE TUNNEL	58
11	DIMENSIONAL CHARACTERISTICS	61

1

CALCULATION, SAFETY AND INSTALLATION STANDARDS

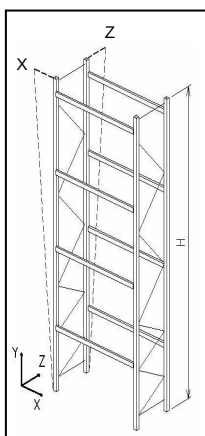


Fig. 1.1

Racking alignment

REF. N°	DESCRIZIONE	UNITA'
PORTATA SPALLA	1000	kg
PORTATA PIANO	1000	kg
PORTATA DOPPIA	1000	kg
ALTEZZA P. LIVELLO	1000	mm
UNITA' DI CARICO	1000	kg

Fig. 1.2

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



Fig. 1.3

CISI
Italian Manufacturers of Industrial Racking (FEM-RANDS member)

AISEM
Associazione Italiana sistemi di sollevamento, elevazione e movimentazione (FEM Member)

ANIMA
Confindustria – meccanica varia

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

a) Scope

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

b) Suitability of floor slabs

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

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

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

c) Clearances

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

d) Assembly

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

e) Rack alignment

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

f) Safety signage and load bearing capacity plaques

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

It is mandatory to install the following minimum safety signs:

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

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

Rev.	date	Page	Classification
13	16.11.2020	4 of 61	CONTROLLED

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

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

For frame base to height ratios:

- Up to 1:5 : Standard frame bracing
- Between 1:5 and 1:6 : Frame with 8 short diagonal spacer bars
- Between 1:6 and 1:7 : Frame with 8 short diagonal spacer bars
 - : Maximum bay length of 2720mm with
 - : 20% reduction in the admissible frame load bearing capacity for unbraced rows.
 - : 10% reduction in the admissible frame load bearing capacity for braced rows.

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

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

h) Reference standards

The structural calculation reference standard are:

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

Materials reference standards:

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

Other reference standards:

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

i) Structural component testing

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

j) Structural analysis

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

k) Beam pair load bearing capacities

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

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

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

l) Frame load bearing capacities

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

These tables are applicable to pallet racking with:

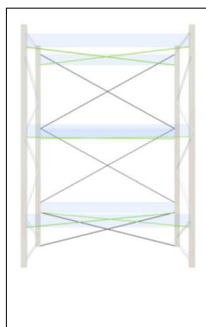


Fig. 1.4

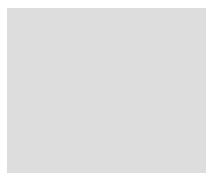


Fig. 1.5

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

Rev.	date	Page	Classification
13	16.11.2020	5 of 61	CONTROLLED

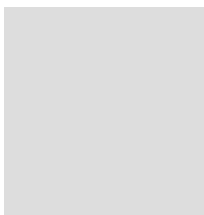


Fig. 1.6

Raw material:
Galvanized
structural
steel coils

- 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 in accordance with UNI EN 15512 standard, with material factors $\gamma_{M,0} = \gamma_{M,1} = 1,05$; $\gamma_{M,2} = 1,25$;
- every upright anchored to ground with a minimum of two (2) anchor bolts;
- compliance with the specific conditions listed under the load bearing capacity tables.

Given that the load bearing capacity of the frame is also dependent from other factors (height of beam from ground equal to or more than the centre distance between the bay beams, frame base to height ratio, seismicity of the area, environmental factors such as vibrations, atmospheric conditions, etc) contact Metalsistem Technical Office 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 the 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 Standards apply 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 $\gamma_{M,0}$ value of 1.05. Clients of member states which apply different $\gamma_{M,0}$ values shall contact Metalsistem Technical Office.

m) Installation environment, use and maintenance of the product

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

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

n) Bracing

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

o) Raw material

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

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

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

p) Bolted assemblies

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

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

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

q) Anchoring

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

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

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

Contact METALSISTEM technical office for further indications

r) Fire protection

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

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

Rev.	date	Page	Classification
13	16.11.2020	6 of 61	CONTROLLED

s) Controls

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

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

t) Certifications

Metalsistem production has been certified by the following international standards:

- | | |
|--|---|
| -- Structural steel fabrication center | - 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 |

u) Non Standard applications

For non-standard solutions and/or calculations, contact the METALSISTEM technical department.

METALSISTEM reserves the right to make any changes to the product it deems to be appropriate at any time.

v) Safety 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

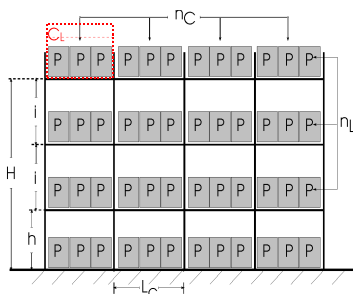


Fig. 2.1

The load bearing capacity of a pallet racking installation is derived from the combined performance of frames and beams and their geometric disposition 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	C_L	= Load per level
n_P	= number of pallets per pair of beams	S_S	= Base to height ratio
L_C	= clear beam span	C_S	= Frame load
n_L	= number of levels (excluding ground)		
n_C	= number of bays		
h	= height of first level		
l	= centre distance between beam levels		
H	= final beam level height		
P_S	= frame depth		

B) PAVEMENT ADEQUACY CHECK

Obtain confirmation from the client that the pavement is suited for the pallet racking installation.

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 section 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 4.6 to assess the base to height ratio. If required, act on the frame configuration and apply the load bearing capacity reduction.

Calculate the load acting on the frame

$$C_S (\text{frame _load}) = C_L \times n_L$$

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

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

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

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

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. 2.1

INPUT DATA

P = 500 daN;
 $n_p = 3$;
 $L_c = 2700$ mm;
 $n_L = 6$ (excluding ground);
 $n_c = 3$;
 $h = 600$ mm;
 $i = 600$ mm;
 $H = 3600$ mm;
 $P_s = 1000$ mm.

BEAM SIZING

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

From table 8.2 of paragraph 8.3 – we select the 106/33 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

$S_s (\text{frame slenderness}) = H / P_s = 3.6$

As the ratio is less than 1:5, following the notes of paragraph 4.6, 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 SUPERBUILD 75 106 RIVETED BEAM, table A-1;
2. Go to the H=6000 frame height group of columns and go to the intersection between the 600mm beam height and the 2700mm length;
3. Here a frame load of 11650 daN is obtained;
4. Therefore the installation requirements are satisfied with the selection of a SB75 frame.

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

- a) Exploring the partially braced or fully bracing portions of the frame load bearing capacity table;
- b) examining the SUPERBUILD110 or SUPERBUILD145 tables;
- c) examining all upright sections with varying beam sections (106 or 140 riveted or welded connectors).

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

A-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 75 - RIVETED 106 BEAM															
		H frame = 6000 mm				H frame = 8000 mm				H frame = 10000 mm				PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=1800	Lc=2400	Lc=2700	Lc=3300	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	10S/8C	11800	10S/8D
	600	11650	11650	11650	11600	11650	11650	11650	11650	11650	11650	11650	11650	11650	10S/8C	11650	10S/8D
	700	11500	11400	11250	11000	11500	11400	11350	11100	11500	11450	11400	11250	11500	10S/8C	11500	10S/8D
	800	11100	10850	10700	10350	11100	10900	10900	10550	11100	10950	10850	10650	11250	10S/8C	11250	10S/8D
	900	10650	10350	10150	9750	10650	10450	10450	9900	10650	10450	10300	10000	11050	10S/9C	11050	10S/9D
	1000	10200	9850	9550	9150	10150	9900	9700	9250	10150	9900	9750	9400	10850	10S/9C	10850	10S/9D
	1100	9650	9250	9000	8650	9650	9450	9350	8900	9650	9350	9200	8800	10600	10S/9C	10600	10S/9D
	1200	9150	8700	8400	8200	9150	8800	8600	8150	9150	8800	8600	8200	10350	10S/9C	10350	10S/9D
	1300	8650	8250	7950	7800	8650	8200	8050	7650	8650	8200	8150	7750	10050	10S/9C	10050	10S/9D
	1400	8200	7800	7550	7400	8200	7800	7600	7200	8200	7800	7650	7250	9700	10S/10D	9700	10S/10D
	1500	7700	7350	7100	7000	7700	7400	7200	6750	7700	7400	7250	6850	9500	10S/10D	9500	10S/10D
	1600	7350	6950	6700	6600	7300	6950	6750	6300	7300	6950	6800	6400	9300	10S/10D	9300	10S/10D
	1700	6950	6550	6350	6200	6950	6600	6400	5950	6950	6600	6450	6050	9250	10S/10D	9250	10S/10D
	1800	6600	6150	5950	5800	6550	6200	6000	5600	6550	6200	6050	5700	9150	10S/10D	9150	10S/10D
	1900	6250	5800	5550	5400	6200	5800	5650	5250	6100	5850	5700	5350	9100	10S/10D	9100	10S/10D
	2000	5850	5400	5200	5000	5800	5450	5250	4900	5700	5450	5300	4950	9000	10S/10D	9000	10S/10D
	2100	5550	5150	4950	4750	5500	5150	5000	4650	5400	5150	5000	4700	8900	10S/10D	8900	10S/10D
	2200	5250	4850	4700	4550	5200	4850	4700	4400	5050	4850	4700	4400	8800	10S/10D	8800	10S/10D
	2300	4950	4600	4450	4300	4850	4600	4450	4150	4750	4500	4400	4150	8700	10S/10D	8700	10S/10D
	2400	4700	4350	4200	4050	4550	4300	4150	3900	4400	4200	4100	3900	8600	10S/10D	8600	10S/10D
	2500					4550	4300	4150	3900	4400	4200	4100	3900	8500	10S/10D	8500	10S/10D

Frame load bearing capacity table extract.

Rev. 13	date 16.11.2020	Page 9 of 61	Classification CONTROLLED
------------	--------------------	-----------------	------------------------------

3

SUPERBUILD BEAMS



Fig. 3.1

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

The unique beam to upright connection has a series of distinctive features, including:

- Beams available in a standard galvanised finish;
- The cone shaped connection enables the joint to increase in rigidity as the load is increased.

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

3.1

NOTES ON THE SUPERBUILD BEAM POWDER COATING

SUPERBUILD beams are available in the following colour range:

STANDARD COLOURS:



Fig. 3.2

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).

Rev.	date	page	Classification
13	16.11.2020	10 of 61	CONTROLLED

3.2

SUPERBUILD BEAM SAFETY PINS



Riveted beam safety pin
code CP210030.95

Fig. 3.3

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

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

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



Welded beam safety pin
code SPACC003.95

Fig. 3.4

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

Tab. 3.1

3.3

HEIGHT OF BEAM FROM GROUND

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

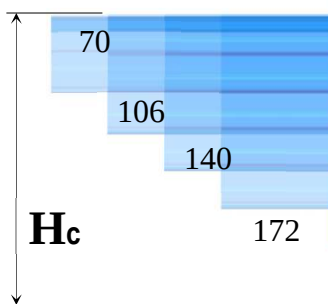


Fig. 3.5

BEAM MINIMUM HEIGHT FROM GROUND		
PROFILE HEIGHT	H _c (mm) Riveted	H _c (mm) Welded
70 BEAM		222
106 BEAM	219	222
140 BEAM	219	222
172 BEAM		272

Tab. 3.2

3.4

SUPERBUILD BEAM CODES

Two separate code table categories differentiated by beam connector have been developed. These have been colour coded for clarity.

The code tables and the load bearing capacity table categories refer to the same colour coding system. I.e:

- Orange load tables = riveted beams (I/22, I/33, I/4, I/44, I/5, I/6);
- Red load tables = welded beams (I/4, I/44, I/5, I/6);

Rev.	date	page	Classification
13	16.11.2020	11 of 61	CONTROLLED

3.5

SUPERBUILD RIVETED GALVANISED BEAM CODES



**CODE TABLE - TYPE : RIVETED CONNECTOR BEAMS
FINISH : GALVANISED**

- Beams assembled with CP210030.95 code safety pins



Beam Safety Pin
CP210030.95

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

Lc : beam length expressed in millimetres

Tab 3.3

■ : DIAGONAL STRUTS

Rev.	date	page	Classification
13	16.11.2020	12 of 61	CONTROLLED

3.6
SUPERBUILD RIVETED GALVANISED, PAINTED BEAM CODES

**CODE TABLE - TYPE :RIVETED CONNECTOR BEAMS
FINISH :GALVANISED + POWDER COATING**

- Beams assembled with CP210030.95 code safety pins


 Beam Safety Pin
CP210030.95

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

Lc : beam length expressed in millimetres

Tab 3.4

 : DIAGONAL STRUTS

Rev.	date	page	Classification
13	16.11.2020	13 of 61	CONTROLLED

3.7

WELDED BEAMS CODES

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



Beam Safety Pin
SPACC003.95

Lc : beam length expressed in millimetres

 : DIAGONAL STRUTS

Tab 3.5

Rev.	date	page	Classification
13	16.11.2020	14 of 61	CONTROLLED

4

SUPERBUILD FRAMES

4.1

SUPERBUILD FRAMES UP TO 700 WITH SHORT DIAGONALS ONLY CODES

Frame bracing

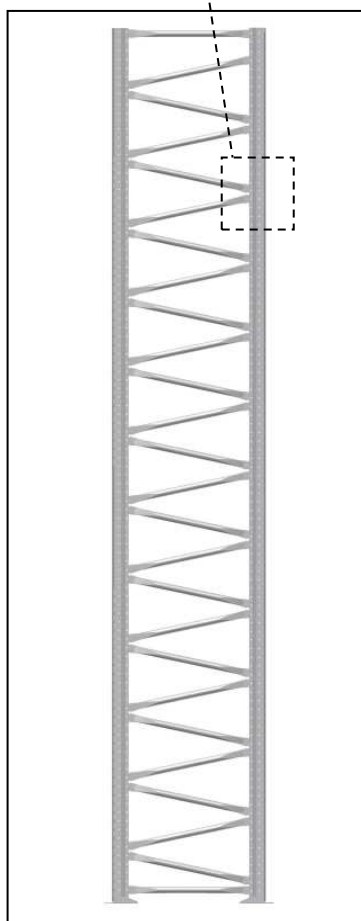


Fig 4.1

Superbuild frame configuration up to **700mm** with short diagonals only

NOTE:

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

FRAME HEIGHT (mm)	SUPERBUILD 75 FRAME Code	SUPERBUILD 110 FRAME Code	SUPERBUILD 145 FRAME Code	DEPTH (mm)
2000	SB11R001.95	SB11R171.95	SB11R341.95	600
2500	SB11R002.95	SB11R172.95	SB11R342.95	
3000	SB11R003.95	SB11R173.95	SB11R343.95	
3500	SB11R004.95	SB11R174.95	SB11R344.95	
4000	SB11R005.95	SB11R175.95	SB11R345.95	
4500	SB11R006.95	SB11R176.95	SB11R346.95	
5000	SB11R007.95	SB11R177.95	SB11R347.95	
5500	SB11R008.95	SB11R178.95	SB11R348.95	
6000	SB11R009.95	SB11R179.95	SB11R349.95	
6500	SB11R010.95	SB11R180.95	SB11R350.95	
7000	SB11R011.95	SB11R181.95	SB11R351.95	
7500	SB11R012.95	SB11R182.95	SB11R352.95	
8000	SB11R013.95	SB11R183.95	SB11R353.95	
8500	SB11R014.95	SB11R184.95	SB11R354.95	
9000	SB11R015.95	SB11R185.95	SB11R355.95	
9500	SB11R016.95	SB11R186.95	SB11R356.95	
10000	SB11R017.95	SB11R187.95	SB11R357.95	
2000	SB11R018.95	SB11R188.95	SB11R358.95	700
2500	SB11R019.95	SB11R189.95	SB11R359.95	
3000	SB11R020.95	SB11R190.95	SB11R360.95	
3500	SB11R021.95	SB11R191.95	SB11R361.95	
4000	SB11R022.95	SB11R192.95	SB11R362.95	
4500	SB11R023.95	SB11R193.95	SB11R363.95	
5000	SB11R024.95	SB11R194.95	SB11R364.95	
5500	SB11R025.95	SB11R195.95	SB11R365.95	
6000	SB11R026.95	SB11R196.95	SB11R366.95	
6500	SB11R027.95	SB11R197.95	SB11R367.95	
7000	SB11R028.95	SB11R198.95	SB11R368.95	
7500	SB11R029.95	SB11R199.95	SB11R369.95	
8000	SB11R030.95	SB11R200.95	SB11R370.95	
8500	SB11R031.95	SB11R201.95	SB11R371.95	
9000	SB11R032.95	SB11R202.95	SB11R372.95	
9500	SB11R033.95	SB11R203.95	SB11R373.95	
10000	SB11R034.95	SB11R204.95	SB11R374.95	

Tab. 4.1

4.2

SUPERBUILD FRAMES FROM 800 UP TO 1400 CODES



Fig.4.2

Superbuild frame configuration from **800** up to **1400** mm with short and long diagonals.

FRAME HEIGHT (mm)	SUPERBUILD 75 FRAME Code	SUPERBUILD 110 FRAME Code	SUPERBUILD 145 FRAME Code	DEPTH (mm)
2000	SB11R035.95	SB11R205.95	SB11R375.95	800
2500	SB11R036.95	SB11R206.95	SB11R376.95	
3000	SB11R037.95	SB11R207.95	SB11R377.95	
3500	SB11R038.95	SB11R208.95	SB11R378.95	
4000	SB11R039.95	SB11R209.95	SB11R379.95	
4500	SB11R040.95	SB11R210.95	SB11R380.95	
5000	SB11R041.95	SB11R211.95	SB11R381.95	
5500	SB11R042.95	SB11R212.95	SB11R382.95	
6000	SB11R043.95	SB11R213.95	SB11R383.95	
6500	SB11R044.95	SB11R214.95	SB11R384.95	
7000	SB11R045.95	SB11R215.95	SB11R385.95	
7500	SB11R046.95	SB11R216.95	SB11R386.95	
8000	SB11R047.95	SB11R217.95	SB11R387.95	
8500	SB11R048.95	SB11R218.95	SB11R388.95	
9000	SB11R049.95	SB11R219.95	SB11R389.95	900
9500	SB11R050.95	SB11R220.95	SB11R390.95	
10000	SB11R051.95	SB11R221.95	SB11R391.95	
2000	SB11R052.95	SB11R222.95	SB11R392.95	
2500	SB11R053.95	SB11R223.95	SB11R393.95	
3000	SB11R054.95	SB11R224.95	SB11R394.95	
3500	SB11R055.95	SB11R225.95	SB11R395.95	
4000	SB11R056.95	SB11R226.95	SB11R396.95	
4500	SB11R057.95	SB11R227.95	SB11R397.95	
5000	SB11R058.95	SB11R228.95	SB11R398.95	
5500	SB11R059.95	SB11R229.95	SB11R399.95	
6000	SB11R060.95	SB11R230.95	SB11R400.95	
6500	SB11R061.95	SB11R231.95	SB11R401.95	
7000	SB11R062.95	SB11R232.95	SB11R402.95	
7500	SB11R063.95	SB11R233.95	SB11R403.95	
8000	SB11R064.95	SB11R234.95	SB11R404.95	
8500	SB11R065.95	SB11R235.95	SB11R405.95	
9000	SB11R066.95	SB11R236.95	SB11R406.95	
9500	SB11R067.95	SB11R237.95	SB11R407.95	
10000	SB11R068.95	SB11R238.95	SB11R408.95	

Tab. 4.2

SUPERBUILD

SUPERBUILD FRAMES FROM 800 UP TO 1400 CODES



Fig. 4.3

Bolts used in SUPERBUILD frame assembly

Bolts for frame assembly

- M8x20 CHS bolt Code 00002.20
- M8 nut Code 00021.20

IMPORTANT:

The frames must be anchor bolted to ground with a minimum of 4 anchor bolts code 00041.20 (fig. 4.4).

Use shims (fig. 4.6) as required to plumb the racking.



Fig. 4.4

M10X80 anchor bolt code 00041.20

Notes:

FRAME HEIGHT (mm)	SUPERBUILD 75 FRAME Code	SUPERBUILD 110 FRAME Code	SUPERBUILD 145 FRAME Code	DEPTH (mm)
2000	SB11R069.95	SB11R239.95	SB11R409.95	1000
2500	SB11R070.95	SB11R240.95	SB11R410.95	
3000	SB11R071.95	SB11R241.95	SB11R411.95	
3500	SB11R072.95	SB11R242.95	SB11R412.95	
4000	SB11R073.95	SB11R243.95	SB11R413.95	
4500	SB11R074.95	SB11R244.95	SB11R414.95	
5000	SB11R075.95	SB11R245.95	SB11R415.95	
5500	SB11R076.95	SB11R246.95	SB11R416.95	
6000	SB11R077.95	SB11R247.95	SB11R417.95	
6500	SB11R078.95	SB11R248.95	SB11R418.95	
7000	SB11R079.95	SB11R249.95	SB11R419.95	
7500	SB11R080.95	SB11R250.95	SB11R420.95	
8000	SB11R081.95	SB11R251.95	SB11R421.95	
8500	SB11R082.95	SB11R252.95	SB11R422.95	
9000	SB11R083.95	SB11R253.95	SB11R423.95	
9500	SB11R084.95	SB11R254.95	SB11R424.95	
10000	SB11R085.95	SB11R255.95	SB11R425.95	

2000	SB11R086.95	SB11R256.95	SB11R426.95	1100
2500	SB11R087.95	SB11R257.95	SB11R427.95	
3000	SB11R088.95	SB11R258.95	SB11R428.95	
3500	SB11R089.95	SB11R259.95	SB11R429.95	
4000	SB11R090.95	SB11R260.95	SB11R430.95	
4500	SB11R091.95	SB11R261.95	SB11R431.95	
5000	SB11R092.95	SB11R262.95	SB11R432.95	
5500	SB11R093.95	SB11R263.95	SB11R433.95	
6000	SB11R094.95	SB11R264.95	SB11R434.95	
6500	SB11R095.95	SB11R265.95	SB11R435.95	
7000	SB11R096.95	SB11R266.95	SB11R436.95	
7500	SB11R097.95	SB11R267.95	SB11R437.95	
8000	SB11R098.95	SB11R268.95	SB11R438.95	
8500	SB11R099.95	SB11R269.95	SB11R439.95	
9000	SB11R100.95	SB11R270.95	SB11R440.95	
9500	SB11R101.95	SB11R271.95	SB11R441.95	
10000	SB11R102.95	SB11R272.95	SB11R442.95	

Tab. 4.2

Rev.	date	page	Classification
13	16.11.2020	17 of 61	CONTROLLED

SUPERBUILD FRAMES FROM 800 UP TO 1400 CODES

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

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

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

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



Fig. 4.5

SUPERBUILD Base plate cod. SPACC001.95
3 mm thick

Bolted to upright with 2 x M8x20 CHS bolts

2 x Code 00002.20 M8x20 CHS bolt
2 x Code 00021.20 M8 nut



Fig. 4.6

SUPERBUILD Base plate shim
2 mm code SPACC014.95

FRAME HEIGHT (mm)	SUPERBUILD 75 FRAME Code	SUPERBUILD 110 FRAME Code	SUPERBUILD 145 FRAME Code	DEPTH (mm)
2000	SB11R103.95	SB11R273.95	SB11R443.95	1200
2500	SB11R104.95	SB11R274.95	SB11R444.95	
3000	SB11R105.95	SB11R275.95	SB11R445.95	
3500	SB11R106.95	SB11R276.95	SB11R446.95	
4000	SB11R107.95	SB11R277.95	SB11R447.95	
4500	SB11R108.95	SB11R278.95	SB11R448.95	
5000	SB11R109.95	SB11R279.95	SB11R449.95	
5500	SB11R11R.95	SB11R280.95	SB11R450.95	
6000	SB11R111.95	SB11R281.95	SB11R451.95	
6500	SB11R112.95	SB11R282.95	SB11R452.95	
7000	SB11R113.95	SB11R283.95	SB11R453.95	
7500	SB11R114.95	SB11R284.95	SB11R454.95	
8000	SB11R115.95	SB11R285.95	SB11R455.95	
8500	SB11R116.95	SB11R286.95	SB11R456.95	
9000	SB11R117.95	SB11R287.95	SB11R457.95	
9500	SB11R118.95	SB11R288.95	SB11R458.95	
10000	SB11R119.95	SB11R289.95	SB11R459.95	

2000	SB11R120.95	SB11R290.95	SB11R460.95	1300
2500	SB11R121.95	SB11R291.95	SB11R461.95	
3000	SB11R122.95	SB11R292.95	SB11R462.95	
3500	SB11R123.95	SB11R293.95	SB11R463.95	
4000	SB11R124.95	SB11R294.95	SB11R464.95	
4500	SB11R125.95	SB11R295.95	SB11R465.95	
5000	SB11R126.95	SB11R296.95	SB11R466.95	
5500	SB11R127.95	SB11R297.95	SB11R467.95	
6000	SB11R128.95	SB11R298.95	SB11R468.95	
6500	SB11R129.95	SB11R299.95	SB11R469.95	
7000	SB11R130.95	SB11R300.95	SB11R470.95	
7500	SB11R131.95	SB11R301.95	SB11R471.95	
8000	SB11R132.95	SB11R302.95	SB11R472.95	
8500	SB11R133.95	SB11R303.95	SB11R473.95	
9000	SB11R134.95	SB11R304.95	SB11R474.95	
9500	SB11R135.95	SB11R305.95	SB11R475.95	
10000	SB11R136.95	SB11R306.95	SB11R476.95	

Tab. 4.2

SUPERBUILD

SUPERBUILD FRAMES FROM 800 UP TO 1400 CODES

FRAME HEIGHT (mm)	SUPERBUILD 75 FRAME Code	SUPERBUILD 110 FRAME Code	SUPERBUILD 145 FRAME Code	DEPTH (mm)
2000	SB11R137.95	SB11R307.95	SB11R477.95	1400
2500	SB11R138.95	SB11R308.95	SB11R478.95	
3000	SB11R139.95	SB11R309.95	SB11R479.95	
3500	SB11R140.95	SB11R310.95	SB11R480.95	
4000	SB11R141.95	SB11R311.95	SB11R481.95	
4500	SB11R142.95	SB11R312.95	SB11R482.95	
5000	SB11R143.95	SB11R313.95	SB11R483.95	
5500	SB11R144.95	SB11R314.95	SB11R484.95	
6000	SB11R145.95	SB11R315.95	SB11R485.95	
6500	SB11R146.95	SB11R316.95	SB11R486.95	
7000	SB11R147.95	SB11R317.95	SB11R487.95	
7500	SB11R148.95	SB11R318.95	SB11R488.95	
8000	SB11R149.95	SB11R319.95	SB11R489.95	
8500	SB11R150.95	SB11R320.95	SB11R490.95	
9000	SB11R151.95	SB11R321.95	SB11R491.95	
9500	SB11R152.95	SB11R322.95	SB11R492.95	
10000	SB11R153.95	SB11R323.95	SB11R493.95	

Tab. 4.2

4.3

1500 SUPERBUILD FRAME WITH SHORT DIAGONALS ONLY CODES



Fig. 4.6

2000	SB11R154.95	SB11R324.95	SB11R494.95	1500
2500	SB11R155.95	SB11R325.95	SB11R495.95	
3000	SB11R156.95	SB11R326.95	SB11R496.95	
3500	SB11R157.95	SB11R327.95	SB11R497.95	
4000	SB11R158.95	SB11R328.95	SB11R498.95	
4500	SB11R159.95	SB11R329.95	SB11R499.95	
5000	SB11R160.95	SB11R330.95	SB11R500.95	
5500	SB11R161.95	SB11R331.95	SB11R501.95	
6000	SB11R162.95	SB11R332.95	SB11R502.95	
6500	SB11R163.95	SB11R333.95	SB11R503.95	
7000	SB11R164.95	SB11R334.95	SB11R504.95	
7500	SB11R165.95	SB11R335.95	SB11R505.95	
8000	SB11R166.95	SB11R336.95	SB11R506.95	
8500	SB11R167.95	SB11R337.95	SB11R507.95	
9000	SB11R168.95	SB11R338.95	SB11R508.95	
9500	SB11R169.95	SB11R339.95	SB11R509.95	
10000	SB11R170.95	SB11R340.95	SB11R510.95	

Tab. 4.3

1500 mm FRAME BRACING
CONFIGURATION CONTAINING SHORT
DIAGONAL SPACER BARS ONLY.

Rev.	date	page	Classification
13	16.11.2020	19 of 61	CONTROLLED

4.4
SUPERBUILD FRAME ASSEMBLY

Table 4.3 lists the number of frame bracing components. Refer to table 4.5 for the real frame dimensions (external uprights distance) as well as the dimensions of the frame bracing components.

Height (mm)	Horizontal spacer bar (n°)	Depth Up to 700 mm	Depth from 800 up to 1400 mm		Depth of 1500 mm
		Short diagonal spacer bar (n°)	Short diagonal spacer bar (n°)	Long diagonal spacer bar (n°)	Short diagonal spacer bar (n°)
2000	2	4	4	-	4
2500	2	5	4	1	5
3000	2	6	4	1	7
3500	2	7	4	2	8
4000	2	8	4	3	9
4500	2	9	4	3	10
5000	2	10	4	4	12
5500	2	11	4	5	13
6000	2	13	4	5	14
6500	2	14	4	6	15
7000	2	15	4	7	17
7500	2	16	4	7	18
8000	2	17	4	8	19
8500	2	18	4	9	20
9000	2	19	4	9	22
9500	2	20	4	10	23
10000	2	21	4	11	24

Tab. 4.4

Frames up to 700mm deep and of 1500mm deep contain horizontal spacer bars and short diagonals only. Frames from 800mm up to 1400mm deep contain horizontal spacer bars and both short and long diagonal spacer bars. Horizontal spacer bars always close the frame at the top and at the bottom of the frame. Figure 4.8 shows the correct assembly of the frame components and the finished frame heights (including base plates) from 2'000mm to 10'000mm nominal dimensions.

IMPORTANT: 3 additional M8x20 CHS bolts (codes 00002.20 and 00021.20) **must** be bolted at the base of the frame in the locations shown as black dots in the above figure; On completion of frame assembly, pass over all frame bolts a second time to ensure all bolts are firmly tightened.

TABLE OF DIMENSIONS OF SUPERBUILD 75/110/145 FRAME BRACING

NOM. FRAME DEPTH (mm)	REAL FRAME DEPTH Ls (mm)	HORIZ. SPACER BAR DIM. (mm)	SHORT DIAG. SPACER BAR DIM. (mm)	LONG DIAG. SPACER BAR DIM. (mm)	REAL SHELF DIM. (mm) (horiz. spac. bar +71mm)	REAL SECONDARY BEAM DIM. (mm) (horiz. spac. bar +71mm)
500	484	388	536	-	441	-
600	583	487	609.4	-	540	-
700	682	586	689.8	-	639	639
800	781	685	774.8	994.5	738	738
900	880	784	863	1063.7	837	837
1000	979	883	953.4	1137.6	936	936
1100	1078	982	1045.4	1215.2	1035	1035
1200	1177	1081	1138.7	1295.8	1134	1134
1300	1276	1180	1232.9	1378.9	1233	1233
1400	1375	1279	1327.8	1464.1	1332	1332
1500	1474	1378	1423.3	-	1431	1431

Tab. 4.5

Rev.	date	page	Classification
13	16.11.2020	20 of 61	CONTROLLED

SUPERBUILD

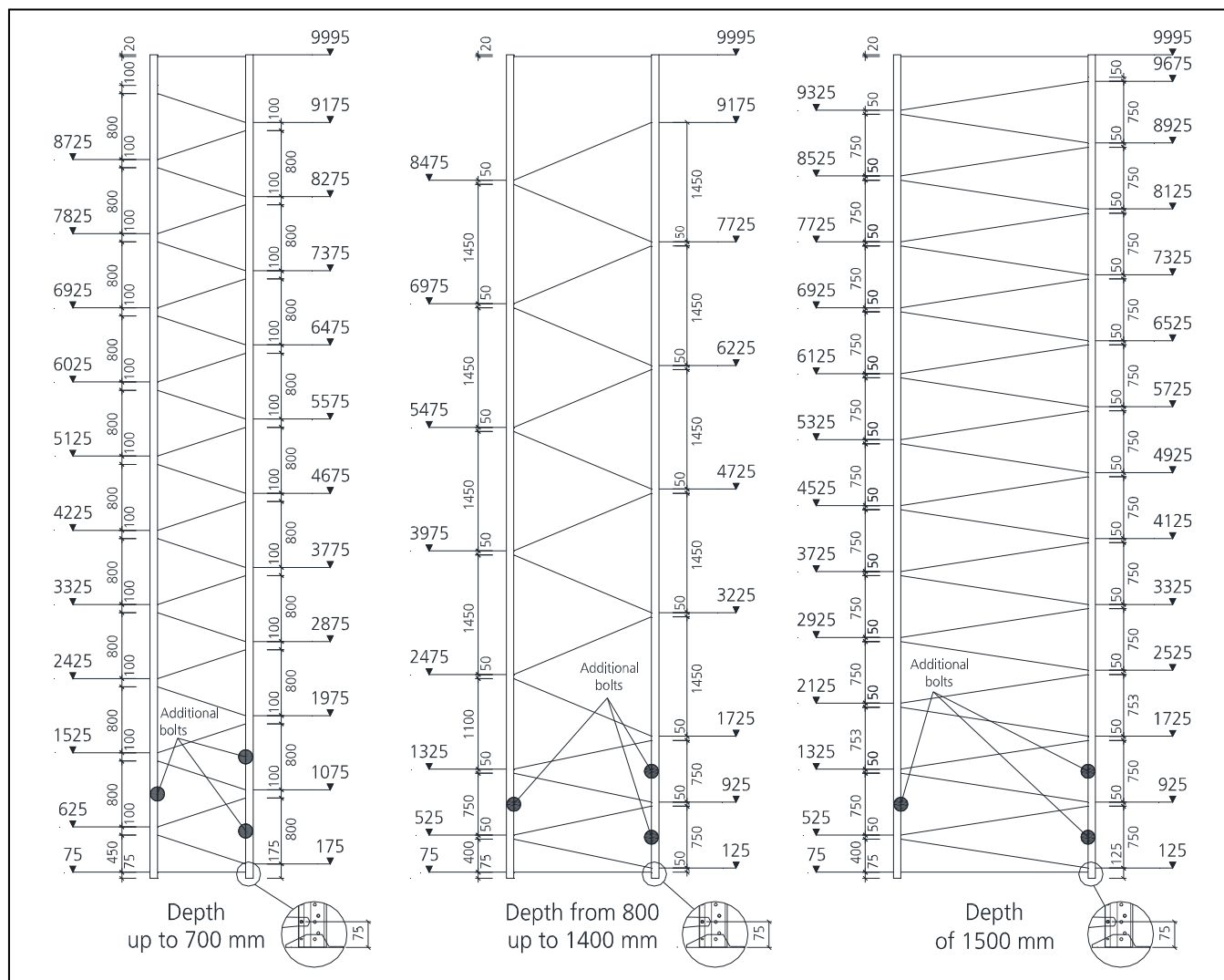


Fig. 4.8

Rev.	date	page	Classification
13	16.11.2020	21 of 61	CONTROLLED

4.5

SUPERBUILD SPECIAL FRAME BRACING CONFIGURATIONS

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

- ratios up to **5** : Standard frame bracing;
- ratios from **5** to **6** : Frame bracing containing 8 short diagonal spacer bars;
- ratios from **6** to **7** : - Frame bracing containing 8 short diagonal spacer bars;
- maximum bay lengths of 2700mm;
- 20% reduction in the admissible frame load bearing capacity for unbraced bays.
- 10% reduction in the admissible frame load bearing capacity for braced bays.

Use the height of the top loading level to calculate the height to depth ratio (figure 4.9)

NOTE:

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

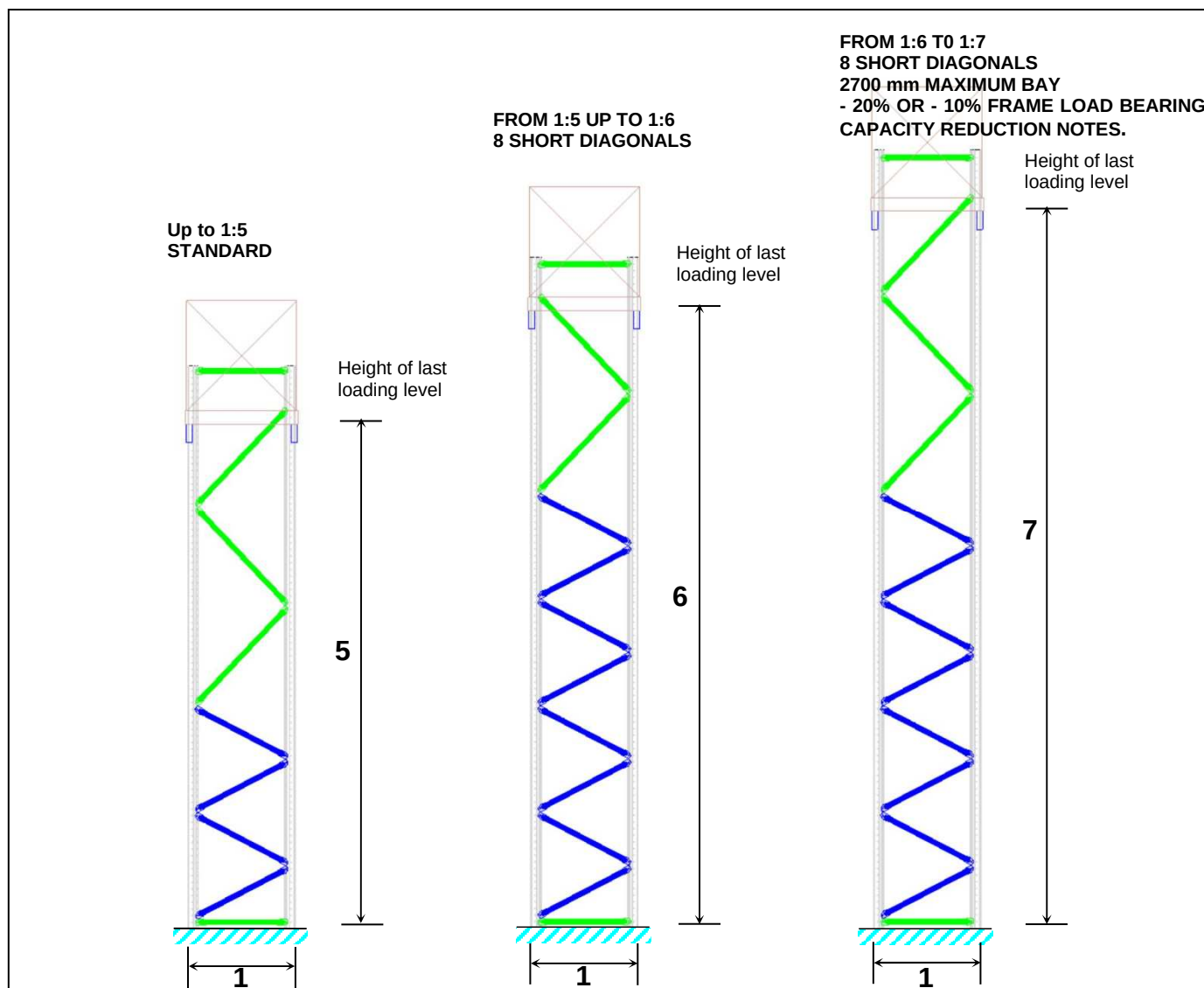


Fig. 4.9

Rev.	date	page	Classification
13	16.11.2020	22 of 61	CONTROLLED

4.6

SUPERBUILD 75/110/145

HORIZONTAL, SHORT AND LONG DIAGONAL SPACER BARS

FRAME BRACING SECTION



Horizontal, short and long diagonal section SUPERBUILD spacer bar

Fig. 4.10

FRAME DEPTH mm	HORIZONTAL SPACER Article Code	SHORT DIAG. SPACER BAR Article Code	LONG DIAG. SPACER BAR Article Code
600	SB140001.95	SB140011.95	SB140021.95
700	SB140002.95	SB140012.95	SB140022.95
800	SB140003.95	SB140013.95	SB140023.95
900	SB140004.95	SB140014.95	SB140024.95
1000	SB140005.95	SB140015.95	SB140025.95
1100	SB140006.95	SB140016.95	SB140026.95
1200	SB140007.95	SB140017.95	SB140027.95
1300	SB140008.95	SB140018.95	SB140028.95
1400	SB140009.95	SB140019.95	SB140029.95
1500	SB140010.95	SB140020.95	-
SPECIAL	SB140030.95	SB140031.95	SB140032.95

Tab. 4.7

SPECIAL lengths are ordered using the finished length of the frame bracing spacer bars ($L_{\text{real horz./diag}}$, fig. 4.11) resulting from the formulae of table 4.7. Contact Metalsistem Technical Office for frame depths greater than 1500mm.

FORMULAE FOR THE CALCULATION OF SPECIAL FRAME BRACING SPACER BAR DIMENSIONS			
SPACER BAR	FORMULA	ORDER LENGTH	
		Min (mm)	Max (mm)
Horizontal	$L_{\text{real horz.}} = L_{\text{real frame}} - 96 \text{ mm}$	380	-
Short diagonal	$L_{\text{real short diag}} = \sqrt{(L_{\text{real horz.}} - 48)^2 + (350)^2} + 48 \text{ mm}$	530	1473
Long diagonal	$L_{\text{real long diag}} = \sqrt{(L_{\text{real horz.}} - 48)^2 + (700)^2} + 48 \text{ mm}$	987	1473

Tab. 4.7

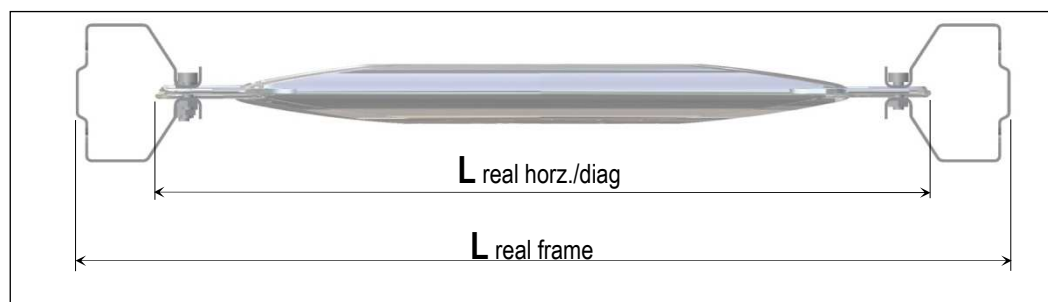


Fig. 4.11

4.7

**SUPERBUILD OVAL ROW SPACER
AND SUPERBUILD OVAL WALL TIE**

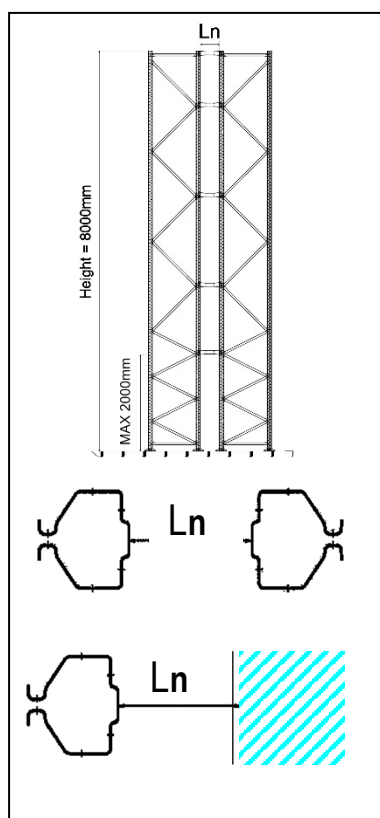


Fig. 4.12



Fig. 4.13

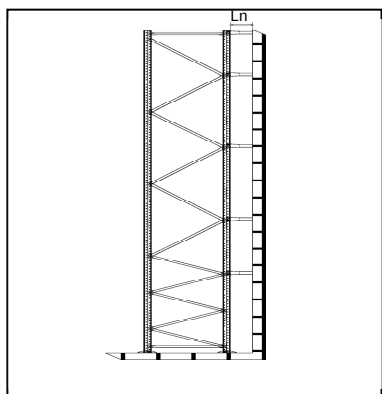


Fig. 4.14

The SB/UB Oval Row Spacers (figure 4.12) is used to connect two frames (section 1, Point e).

The Oval Row Spacers must always be used in pairs. These are bolted to the uprights with an M8x110 bolt (code 00011.20) and M8 nylon insert nut (code 00022.20).

EN 15620:2009 suggests that the distance between pallets in a double sided configuration in a CLASS 400 pallet racking installation should be 100 mm. Assuming an application with euro pallets on 1000 mm deep Superbuild frames this translates to a net distance between uprights (L_n) of 320 mm. The order length (L) is calculated using the following formula:

$$L = L_n + 76 \text{ mm}$$

where:

L = Total (order) length of the Oval Row Spacer

L_n = Net distance between double entry frames (fig. 4.12)

Example

$$L = 320 \text{ mm} + 76 \text{ mm} = 396 \text{ mm}$$

Note: The formula assumes that the row spacer is connected to a hole along the upright which is in line with the beam bracket side holes.

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

In the example shown in figure 4.12 the back to back frames are 8 meters in height; therefore 4 pairs of spacer bars (8 spacer bars) are applied per pair of frames.

The following tables show the codes of the oval row spacers (table 4.8).
(Note: each code represents 1 component).

CODE FOR THE UB/SB OVAL SPACER BAR	
CODE	DESCRIPTION
08320.95	UB/SB OVAL SPACER BAR

Tab. 4.8

IMPORTANT:

The oval row spacers cannot be produced in net lengths (L_n) less than 150mm.

WALL TIES:

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

IMPORTANT:

The wall ties are assembled in pairs at a maximum centre distance of 2000mm along the height of the frame. (Fig.4.14).

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

Rev.	date	page	Classification
13	16.11.2020	24 of 61	CONTROLLED

4.8

SUPERBUILD PORTAL TIE

Portal ties become necessary and wall ties are not permitted or if the frame base to height ratio has exceeded the indications of Paragraph 4.5.

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

NOTE: If the base to height ratio of double side frames exceed the parameters set in section 1, point e) or paragraph 4.5 refer to the Metalsistem Technical Office.



Fig. 4.15

A portal tie is formed by connecting a SUPERBUILD upright to the top of the corridor facing upright of the bay frames. Universal fasteners ("pallet racking accessories" MT07), bolted, with M8x110 bolts, to the left and to the right of the upright on either side of the corridor provide the connection points for the creation of this component. Table 4.9 shows all the components necessary for the creation of one portal tie

SUPERBUILD PORTAL TIE		
Code	Quantity	Description
SB13Rxxx.95	1	SUPERBUILD upright (portal tie. Max. length 5000 mm)
00002.20	1 every 500mm + 1	M8x20 Bolt
00022.20	1 every 500mm + 1	M8 nylex nut UNI7473
08374.95	4	L=310 universal fastener
00011.20	6	Hex M8x110 bolt UNI5739 8.8ZB
00022.20	6	M8 nylex nut UNI7473

Tab. 4.9

Note:

1. The portal tie upright length needs to be 200mm longer than the corridor width (rounded upwards to the nearest pitch)
2. This solution aligns to the upright holes and is therefore set at an even 50 + 4mm (XX04 – XX54) pitch. The corridor can be untied from the standard pitch by bolting an additional pair of Universal fasteners (code 08374.95) onto the portal tie upright.
3. The portal tie uprights must be bolted closed at the ends and at a constant pitch of 500mm.

Rev.	date	page	Classification
13	16.11.2020	25 of 61	CONTROLLED

5

SUPERBUILD 75/110/145 UPRIGHTS

5.1

UPRIGHT CODES

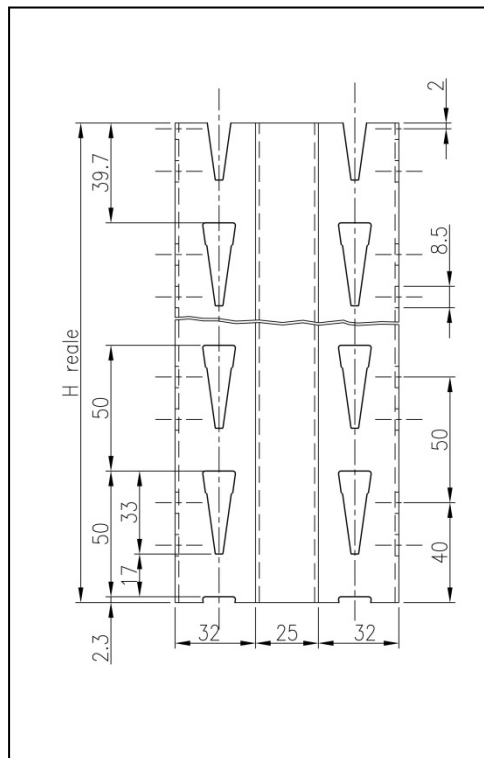


Fig. 5.1

HEIGHT (H _{nom}) mm	SUPERBUILD 75 UPRIGHT Article Code	SUPERBUILD 110 UPRIGHT Article Code	SUPERBUILD 145 UPRIGHT Article Code
2000	SB13R001.95	SB13R018.95	SB13R035.95
2500	SB13R002.95	SB13R019.95	SB13R036.95
3000	SB13R003.95	SB13R020.95	SB13R037.95
3500	SB13R004.95	SB13R021.95	SB13R038.95
4000	SB13R005.95	SB13R022.95	SB13R039.95
4500	SB13R006.95	SB13R023.95	SB13R040.95
5000	SB13R007.95	SB13R024.95	SB13R041.95
5500	SB13R008.95	SB13R025.95	SB13R042.95
6000	SB13R009.95	SB13R026.95	SB13R043.95
6500	SB13R010.95	SB13R027.95	SB13R044.95
7000	SB13R011.95	SB13R028.95	SB13R045.95
7500	SB13R012.95	SB13R029.95	SB13R046.95
8000	SB13R013.95	SB13R030.95	SB13R047.95
8500	SB13R014.95	SB13R031.95	SB13R048.95
9000	SB13R015.95	SB13R032.95	SB13R049.95
9500	SB13R016.95	SB13R033.95	SB13R050.95
10000	SB13R017.95	SB13R034.95	SB13R051.95
SPECIAL	SB13R052.95	SB13R053.95	SB13R054.95

Tab. 5.1

SUPERBUILD 75/110/145 UPRIGHT

50mm PITCH

50mm UPRIGHT CUT PITCH

NOTE:

The above are nominal heights. The real upright height is given by the formula:

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

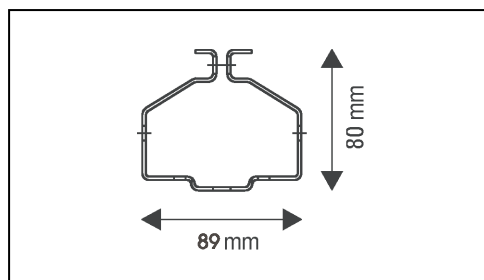


Fig. 5.2



Fig. 5.3

6

SUPERBUILD 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 in between a double sided pallet racking rows. The bracing tower is connected to the pallet racking row with row spacers and by tensioners attaching the tower uprights 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 dimensions it can be preassembled and placed in position with ease and at speed.

The cross bracing method uses bracing stirrups that are connected to the frames at every beam level both vertically and horizontally. Single sided applications apply additional struts connecting the bracing connection brackets behind the loading beams while double sided 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. This bracing tower must rise to the first beam level at or above half 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

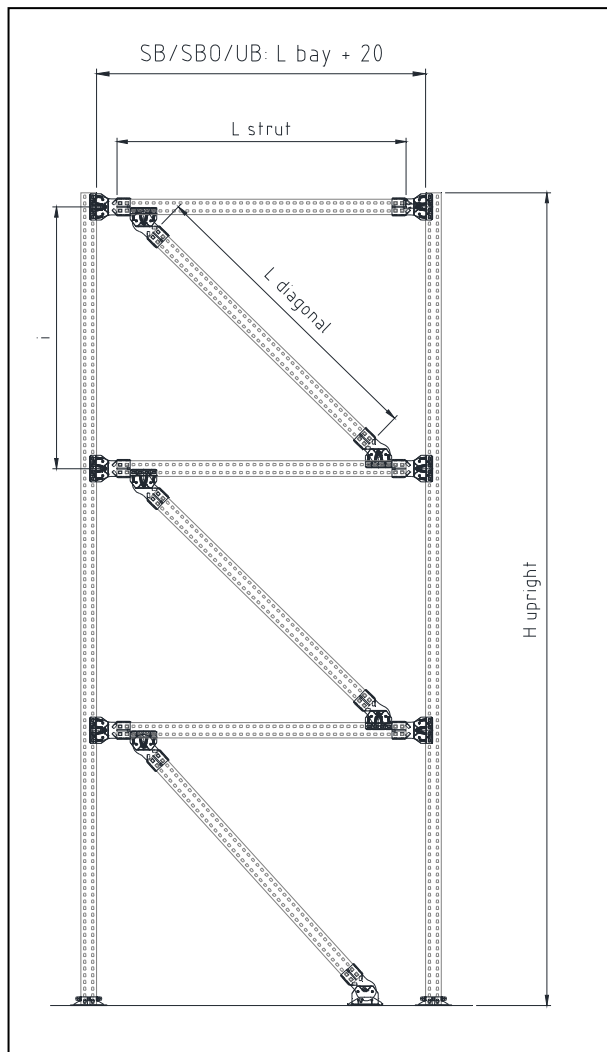


Fig 6.1

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. Table 6.1 provides the corresponding upright codes together with the position of the horizontal struts and the quantity of horizontal and diagonal struts of the bracing tower.

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

Tab. 6.1

Step 2 – Determine length of TS3 horizontal strut

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

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

Tab. 6.2

Step 3 – Determine the length of the TS3 diagonal strut

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

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

Tab. 6.3

Step 4 – Selection of bracing tower assembly accessory codes

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

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

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

Tab. 6.4

Step 5 – Row spacers

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

The row spacer code is **08320.95**, these have an order length of:

$$L_{tower} = L_n + 44 \quad (\text{figure 6.2})$$

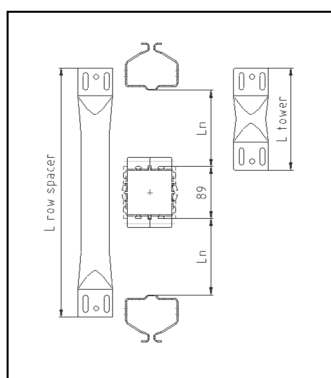


Fig 6.2

The row spacers are connected to the bracing tower uprights in pairs with Drive-in couplings and bolts. The SB210150.98 macro code has been developed to simplify the ordering process of the bracing tower connection accessories. Table 6.5 provides the row spacer and accessory codes and quantities required for the 8 standard bracing tower heights.

TOWER HEIGHT (mm)	SINGLE SIDED codes/qty		DOUBLE SIDED codes/qty	
	SB210150.98	08320.95	SB210150.98	08320.95
3000	3	12	6	24
4000	4	16	8	32
5000	5	20	10	40
6000	6	24	12	48
7000	7	28	14	56
8000	8	32	16	64
9000	9	36	18	72
10000	10	40	20	80

Tab. 6.5

The standard row spacers for double sided installations (paragraph 4.8) require to be produced in a length which is compatible with the bracing tower row spacers. The length is obtained with the following formula.

$$L_{row\ spacer} = 2 \times L_n + 165 \quad (\text{figure 6.2})$$

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 row spacers and plan bracing between the pallet bracing bay and the bracing tower.

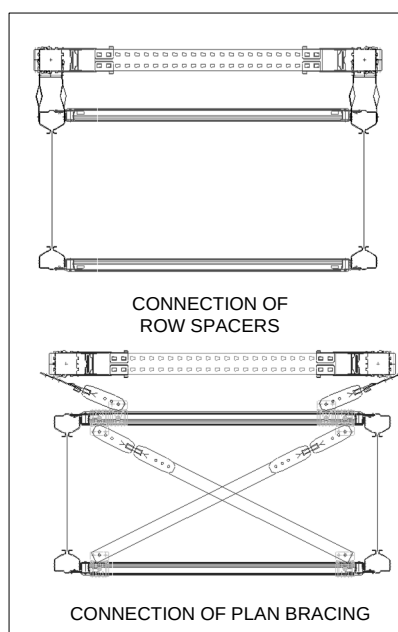


Fig 6.3

6.4

SINGLE SIDED VERTICAL BRACING WITH STRUT COMPONENTS



Inclined and Straight SB vertical bracing connection bracket with strut

Fig. 6.4



70x70x1 Raised Pallet Support Beam

Fig. 6.5

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

Tab. 6.6

Calculation of the bracing strut length (code 08650.95)

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

Refer to ISTM-030 "Single entry bracing systems for bays containing back stop beams" for the assembly procedure.

6.5

CALCULATION OF THE SINGLE SIDED BRACING STIRRUP LENGTH

The stirrup length calculations uses the following variables referring to figures 6.6 and 6.7:

- L_c = beam length
- H_2 = Ground to top beam height
- H_1 = Ground to bottom beam height
- K = Height between the top of the beam profile and the bracing bracket hole. For :

= 106 and 140 riveted beam	= 227 mm
= 70, 106 and 140 welded beam	= 230 mm
= 172 welded beam	= 280 mm
- D = Height of the first bracing bracket hole from ground = 142mm

To calculate the lengths:

- $D_h = L_c - 36$ centre distance between bracket holes on opposite sides of the bay.
- $d_{v1} = H_1 - K - D$ centre distance between ground and first level bracket holes.
- $d_v = H_2 - H_1$ centre distance between upper level and lower level brackets

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

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

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

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

Example:

Input:

$$\text{bay L} = 2700 \text{ mm}$$

$$\text{beam Lc} = 2700 \text{ mm}$$

$$H1 = 1519 \text{ mm}$$

$$H2 = 2569 \text{ mm}$$

Therefore:

$$Dh = Lc - 36 = 2664 \text{ mm}$$

$$dv1 = 1519 - 227 - 142 = 1150 \text{ mm}$$

$$dv2 = 2569 - 1519 = 1050 \text{ mm}$$

$$\text{Centre distance between bracing bracket holes at ground level} = \sqrt{1150^2 + 2664^2} = 2902 \text{ mm}$$

$$\text{Centre distance between bracing bracket holes between beam levels} = \sqrt{1050^2 + 2664^2} = 2863 \text{ mm}$$

Use the "PIATTI SPECIALI / SPEC. BRACING" button of the METAL Excel sheet to determine the standard and special bracing stirrup codes corresponding to the dimensions resulting from the above calculation.

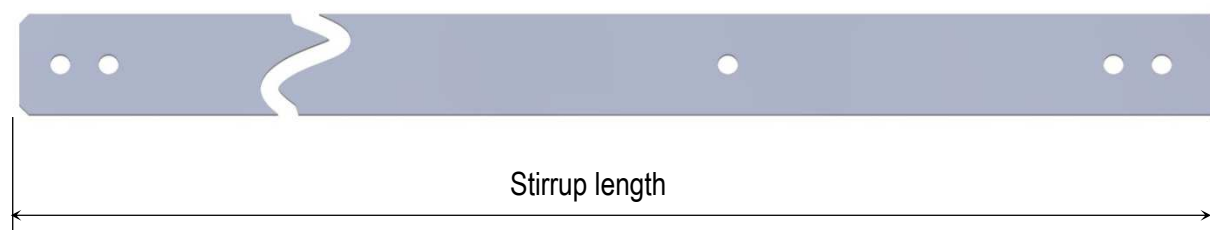


Fig. 6.6

SUPERBUILD

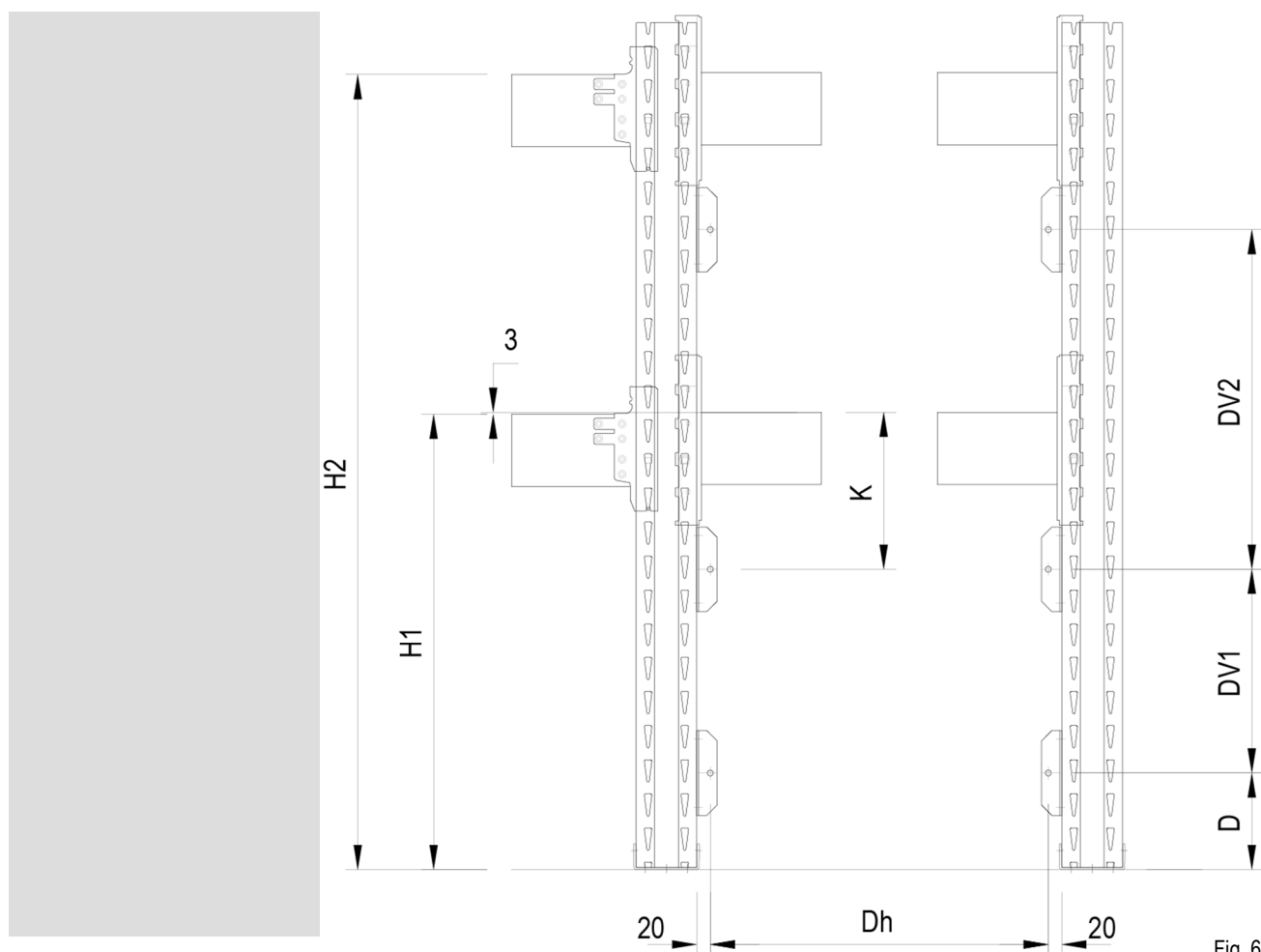


Fig. 6.7

6.6

COMPONENTS FOR DOUBLE SIDED VERTICAL BRACING

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

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



SB Double sided vertical bracing bracket

Fig. 6.8

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

Tab. 6.7

Rev.	date	Page	Classification
13	16.11.2020	33 of 61	CONTROLLED



Double sided spacer for vertical bracing

Fig.6.9

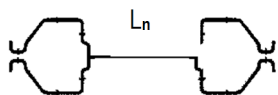


Fig.6.10

IMPORTANT:

The length of the Double Entry Bracing Spacer Bar (fig.6.9) is not equal to the length of the UB/SB Oval Spacer Bar. The Double Entry Bracing Spacer Bar is ordered using the resultant of the following formula:

$$L \text{ (Bracing spacer)} = L_n \text{ (Net dist. Between frames)} + 90 \text{ mm}$$

NOTE:

The minimum distance between frames (L_n) is **200 mm**

6.7

HORIZONTAL BRACING COMPONENTS



Bracket for horizontal bracing

Fig.6.11

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

Tab. 6.8

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

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

6.8

BRACING STIRRUPS

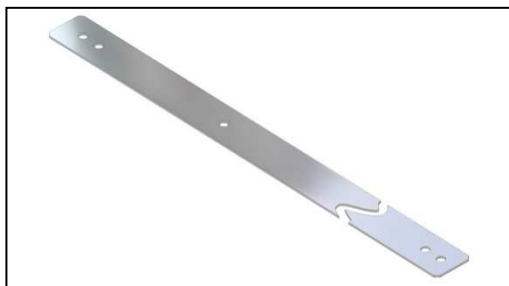


Fig 6.12

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

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

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

Tab. 6.9

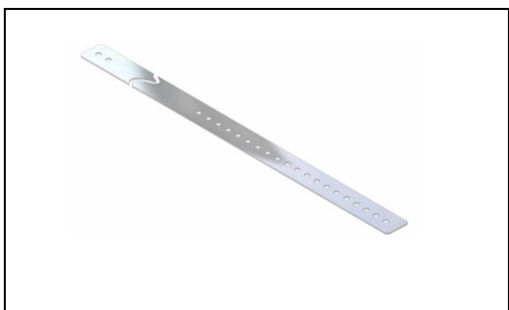


Fig 6.13

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

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

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

Tab. 6.10

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

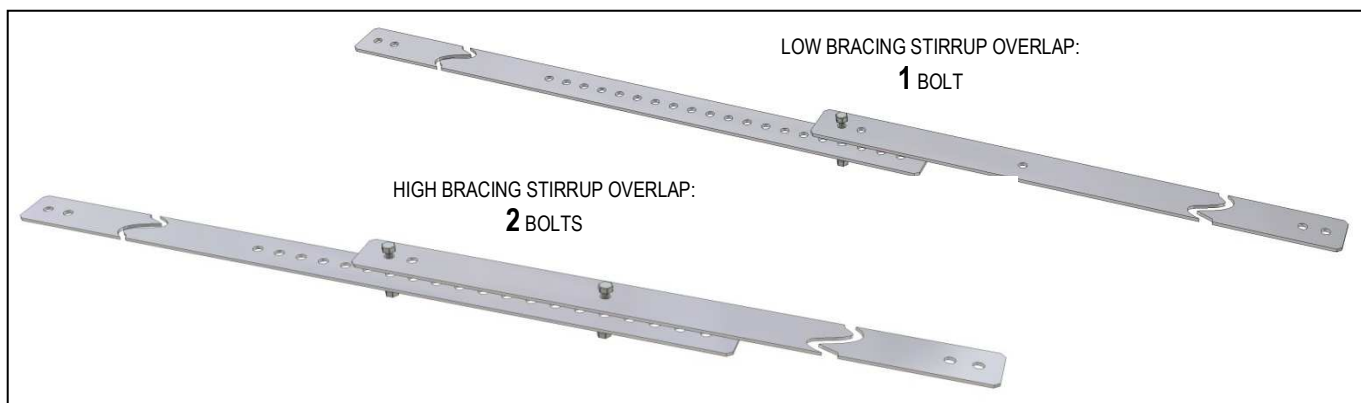


Fig 6.14

***NOTE:** The Metalsistem Excel Spread Sheet must be used to determine the correct combination of modular bracing stirrups to be applied to any one given bay/height combination. If this program is not available, contact the Metalsistem technical office.

6.9

BRACING ACCESSORY MACRO CODES

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

SINGLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.15 Colours
SB SINGLE ENTRY GROUND BRACING ACCESSORIES	SPACC061.98	Brackets and bolts	
+			
SB SINGLE ENTRY BRACING ACCESSORIES	SPACC060.98	Brackets, tensioners and bolts	
+			
HORIZONTAL STRUT	08650.95	Raised pallet support bar	
+			
42X2 OR 42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Table 6.9 & 6.10	-	

Tab. 6.11

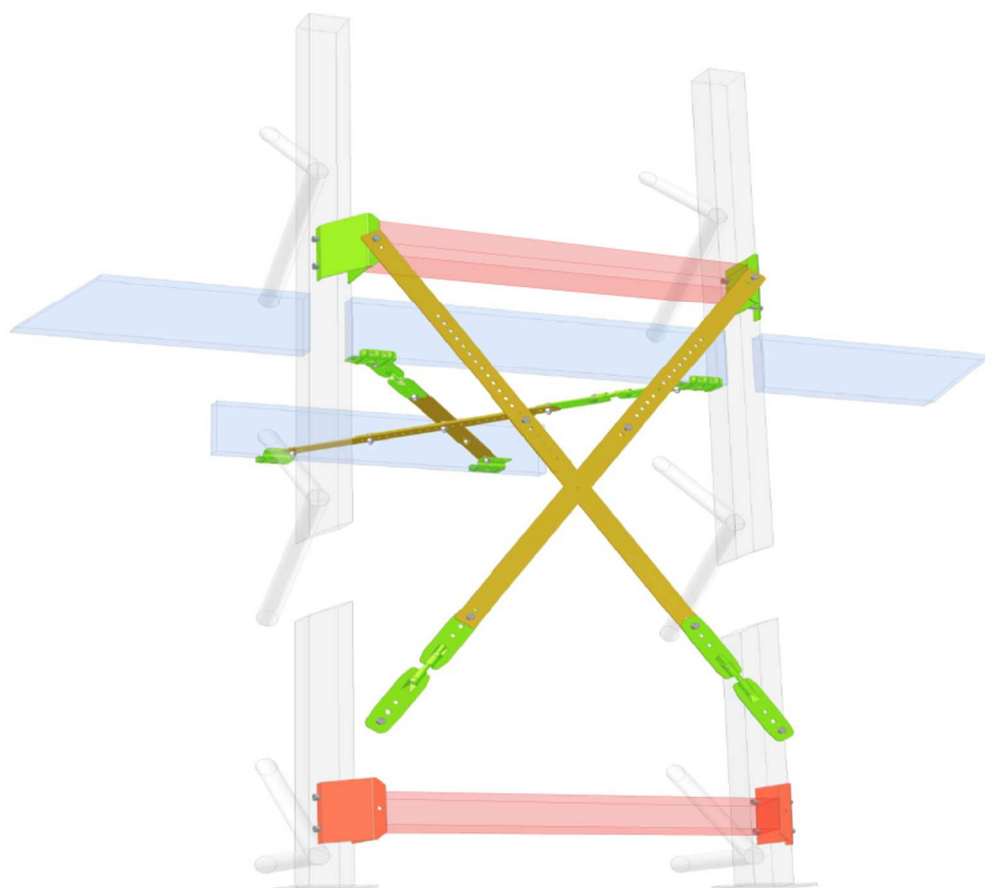


Fig. 6.15

EXAMPLE: the components required to make up the braced bay of figure 6.14 are:

- N° 2 Table 6.9 & 6.10 42x3 modular bracing stirrup + 42x3 compensator (for vertical bracing)
- N° 2 Table 6.9 & 6.10 42x2 modular stirrup + 42x2 compensator (for horizontal bracing) – 42 x 3 stirrup and compensator in alternative
- N° 2 08650.95 Raised pallet support bar (Horizontal strut) L= beam length – 2mm
- N° 1 SPACC061.98 SINGLE ENTRY GROUND BRACING ACCESSORIES
- N° 1 SPACC060.98 SINGLE ENTRY BRACING ACCESSORIES

Rev.	date	Page	Classification
13	16.11.2020	36 of 61	CONTROLLED

DOUBLE ENTRY BRACING ACCESSORY MACRO CODES

	MACROCODES	CONTENTS	Fig. 6.16 Colours
SB DOUBLE ENTRY GROUND BRACING ACCESSORIES	SPACC063.98	Brackets and bolts	
+			
SB DOUBLE ENTRY BRACING ACCESSORIES	SPACC062.98	Brackets, tensioners and bolts	
+			
42X2 OR 42X3 MODULAR BRACING STIRRUPS + COMPENSATORS	Table 6.9 & 6.10	-	
+			
DOUBLE SIDED SPACERS FOR VERTICAL BRACING	08355.95	-	

Tab. 6.12

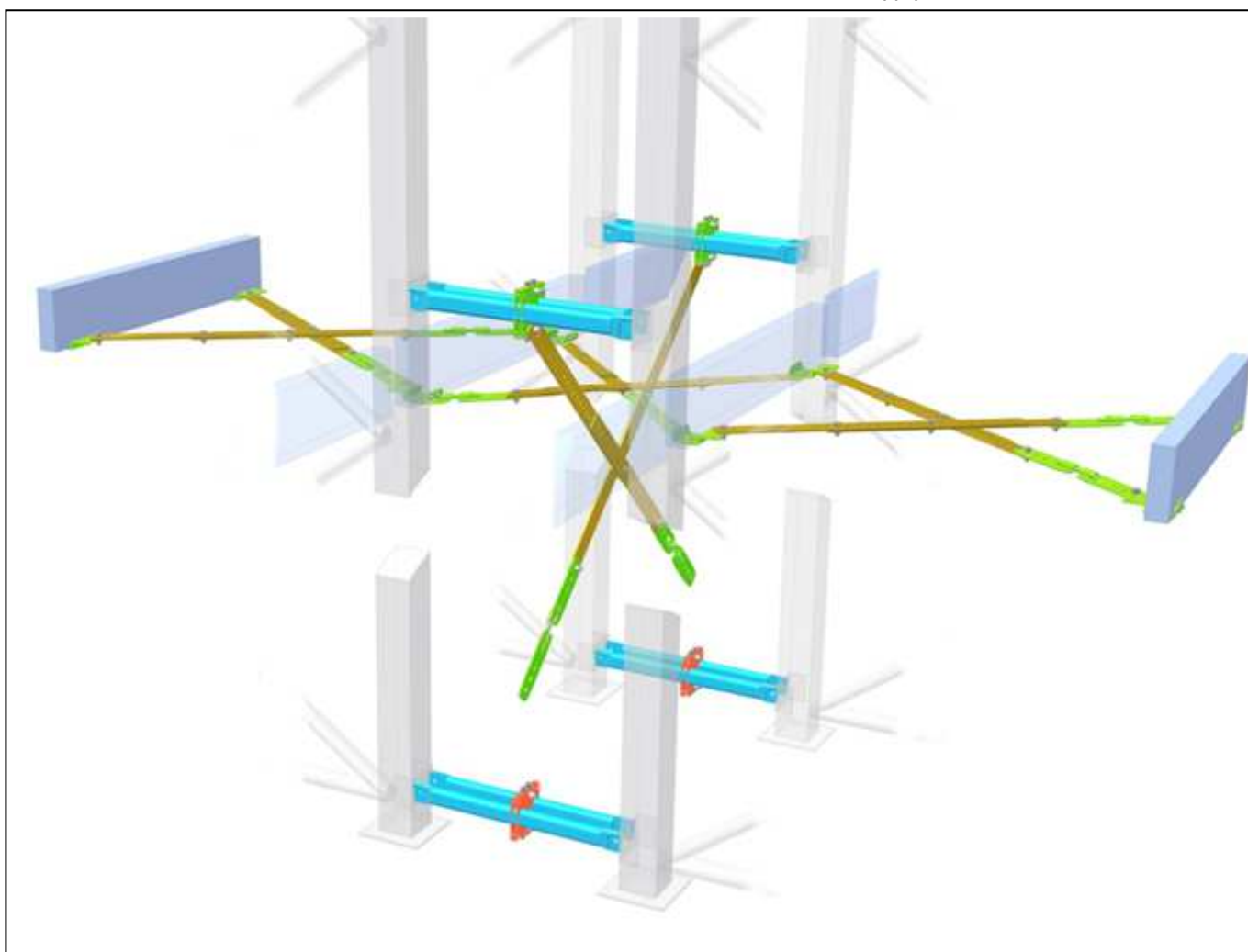


Fig. 6.16

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

- N° 2 Tab. 6.9 & 610 42x3 modular bracing stirrup + 42x3 compensator (for vertical bracing)
- N° 6 Tab. 6.9 & 6.10 42x2 modular stirrup + 42x2 compensator (for horizontal bracing, 42 x 3 stirrup and compensator in alternative)
within and between the bays
- N° 1 SPACC063.98 SB DOUBLE ENTRY GROUND BRACING ACCESSORIES
- N° 1 SPACC062.98 SB DOUBLE ENTRY BRACING ACCESSORIES
- N° 8 08355.95 DOUBLE SIDED SPACERS FOR VERTICAL BRACING $L = L_n + 90 \text{ mm}$

Rev. 13	date 16.11.2020	Page 37 of 61	Classification CONTROLLED
------------	--------------------	------------------	------------------------------

7

SUPERBUILD DEDICATED ACCESSORIES

7.1

SUPERBUILD UPRIGHT WOODEN PROFILE



Fig. 7.1

Wooden Profile for SB Upright
code [SPACC024.98](#)
1000 mm standard height

The Superbuild Upright Wooden Profile has been designed to protect a frame from accidental knocks and small manoeuvring errors.

It is advised to insert the SB Upright Wooden Profile in the corridor facing uprights only

IMPORTANT:

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

7.2

SUPERBUILD SPLICE PROFILE

The "SUPERBUILD SPLICE PROFILE" is used in applications where it is necessary to "extend" the height of an existing installation.

This component (inserted at the junction between two upright profiles) provides a solid connection between the existing upright and the additional upright stub.

IMPORTANT!

The Superbuild Splice Profile allows an existing installation to be extended with the stub of the same upright gauge by a maximum of 1 additional loading level and a maximum height of no more than 1500mm.

The adequacy of the frame load bearing capacity must be checked before adding the splice.

Contact the Metalsistem Technical Office should there be any doubt for the application of this component.

COMPONENTS REQUIRED TO SPLICE ONE UPRIGHT

Items	Product description	Code
4	M8 x 110 HEX Bolt 8.8 DIN931 Zp	00011.20
4	M8 High nylon insert Nut DIN982 Zp	00022.20
1	SB upright	eg. SB13Rxxx.95
1	H 500mm SB splice profile	SPACC012.95

Tab. 7.1

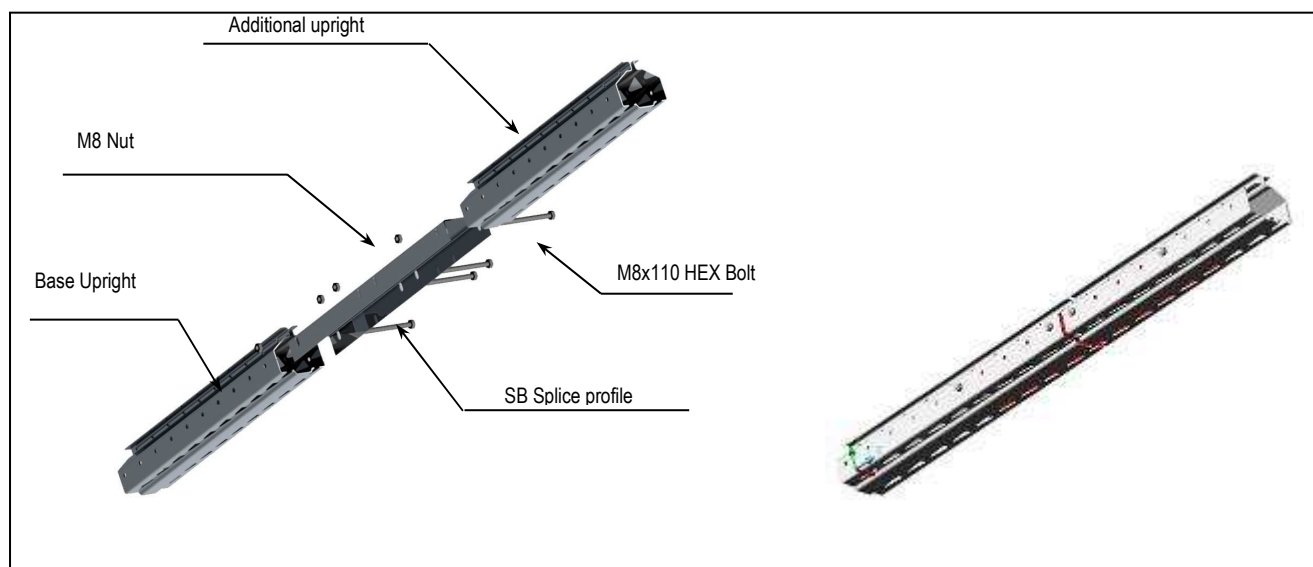


Fig. 7.2

8

PALLET RACKING BEAM LOAD BEARING CAPACITY TABLES

8.1

LOAD BEARING CAPACITY TABLE NOTES FOR USE

CHOOSING THE CORRECT SUPERBUILD BEAM PAIR

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

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

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

NOTE: The SUPERBUILD series uprights have a net span between the uprights equal to the dimension of the beam (L_c) plus 4mm

Special beam lengths are ordered with the **Lc** dimension (beam length).

NOTE: Contact the Metalsistem Technical Office for beam lengths exceeding **4000 mm**

Rev.	date	Page	Classification
13	16.11.2020	39 of 61	CONTROLLED

8.2

SUPERBUILD HAND PICKING BEAM LOAD BEARING CAPACITIES

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

LOAD BEARING CAPACITY TABLE PER PAIR OF PICKING BEAMS WITH RIVETED CONNECTORS



Beam Safety PinCP210030.95

- Beams assembled with **CP210030.95** code safety pins and uniformly distributed load;
- Maximum deflection: 1/200 of "Lc"

	Beam Length Lc (mm)	106/22 daN/pair
	1500	2000
	1800	1950
	2000	1750
	2100	1650
	2200	1600
	2300	1500
	2400	1450
	2700	1250
	2800	1150
	3000	900
	3300	700

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

Tab 8.1

Rev.	date	Page	Classification
13	16.11.2020	40 of 61	CONTROLLED

SUPERBUILD

8.3

SUPERBUILD PALLET RACKING BEAM LOAD BEARING CAPACITIES

		LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS WITH RIVETED CONNECTORS									
		- Beams assembled with CP210030.95 code safety pins; - uniformly distributed load; - maximum deflection: 1/200 of the beam length "Lc"									Beam Safety Pin CP210030.95
Profile Version	106/22	106/33	106/4	106/44	106/5	106/6	140/33	140/4	140/44	140/5	140/6
Maximum Unit Load	400 daN Unit Load	1100 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load	1050 daN Unit Load	1200 daN Unit Load	1350 daN Unit Load	1500 daN Unit Load	1800 daN Unit Load
Lc Beam length [mm]	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair	L.B.C. daN/ pair
1500	2000	3000	3000	3000	3000	3000	3500	3800	3800	3800	3800
1800	1950	3000	3000	3000	3000	3000	3500	3700	3800	3800	3800
2000	1750	3000	3000	3000	3000	3000	3500	3600	3700	3800	3800
2100	1650	3000	3000	3000	3000	3000	3500	3550	3650	3750	3800
2200	1600	3000	3000	3000	3000	3000	3500	3500	3650	3750	3800
2300	1500	2800	3000	3000	3000	3000	3450	3500	3600	3700	3800
2400	1450	2600	2900	3000	3000	3000	3450	3450	3550	3650	3800
2700	1250	2100	2300	2550	2850	3000	3300	3300	3450	3550	3700
2800	-	1900	2100	2300	2550	3000	3150	3250	3400	3500	3650
3000	-	1300	1800	2000	2250	2650	2750	3200	3300	3450	3600
3300	-	1100	1500	1700	1850	2200	2250	2850	3150	3350	3500
3500	-	-	1300	1450	1600	1900	2000	2450	2700	3000	3450
3600	-	-	1250	1400	1500	1800	-	2300	2550	2850	3400
4000	-	-	1000	1100	1250	1450	-	1900	2100	2300	2750

L.B.C. = LOAD BEARING CAPACITY

Tab 8.2

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

 : MANDATORY USE OF DIAGONAL STRUTS

Maximum load per beam level frame limit:

Superbuild 75 = 4 000 daN
Superbuild 110 = 5 000 daN

SUPERBUILD



LOAD BEARING CAPACITY TABLE PER PAIR OF BEAMS WITH WELDED CONNECTORS

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



Beam Safety Pin
SPACC003.95

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

L.B.C. = LOAD BEARING CAPACITY

Tab 8.3

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

 : MANDATORY USE OF DIAGONAL STRUTS

Maximum load per beam level frame limit:

Superbuild 75 = 4 000 daN
Superbuild 110 = 5 000 daN

9

PALLET RACKING FRAME LOAD BEARING CAPACITIES

9.1

LOAD BEARING CAPACITY TABLE NOTES FOR USE

A set of 12 tables has been developed for the dimensioning of the frame load bearing capacities. These tables are divided by frame series and beam type as follows:

A-1	SUPERBUILD 75 / 106 RIVETED BEAM
A-2	SUPERBUILD 75 / 140 RIVETED BEAM
A-3	SUPERBUILD 75 / 70-106 WELDED BEAM
A-4	SUPERBUILD 75 / 140-172 WELDED BEAM
B-1	SUPERBUILD 110 / 106 RIVETED BEAM
B-2	SUPERBUILD 110 / 140 RIVETED BEAM
B-3	SUPERBUILD 110 / 70-106 WELDED BEAM
B-4	SUPERBUILD 110 / 140-172 WELDED BEAM
C-1	SUPERBUILD 145 / 106 RIVETED BEAM
C-2	SUPERBUILD 145 / 140 RIVETED BEAM
C-3	SUPERBUILD 145 / 70-106 WELDED BEAM
C-4	SUPERBUILD 145 / 140-172 WELDED BEAM

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

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

S = Singled sided row
D = Double sided row set

The columns referring to partially and fully braced bays show the frame load bearing capacities to the left with the corresponding single bracing tower performance to the right. If we take, for example, table C-1 we note a frame load bearing capacity of 11800 daN corresponding to the symbol 10S/8D for a first loading level of 2400mm under the partially braced columns. This means that a Superbuild 145 pallet racking frame, in loading conditions as defined in this manual, has the tabled load bearing capacity if 1 bracing tower is placed in every 10 consecutive bays for single sided rows or every 8 consecutive sets of double sided bays.

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 10 meters;
9. Frame base anchored with at least 2 anchor bolts;
10. frame base to height ratio in conformity with the indications of paragraph 4.6;
11. class 300 or 400 pallet racking installation as defined by the UNI EN 15620 standards;
12. absence of forces such as wind, vibration, impact, seismic action and other forces not related to the standard conditions of static storage.

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

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

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

9.3

PALLET RACKING ROWS USING CROSS BRACING ALTERNATIVE

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

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

In the example used to explain the application of the bracing towers in paragraph 9.1, table C-1 provided a load bearing capacity of 11800daN for a partially braced bay with a frequency of 10S/8D (or 1 bracing tower every 10 consecutive bays for single sided rows or ever 8 double sided rows). If the cross bracing alternative were to be employed the fully braced columns are immediately excluded. 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 sided rows or ever 4 double sided rows.

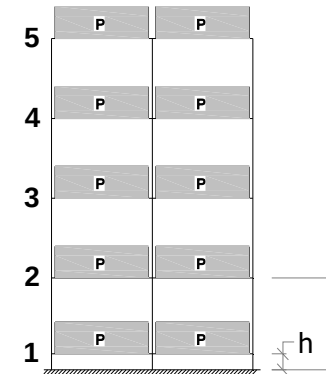
9.4

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.



9.5

BASE PLATE CONSIDERATIONS

A single SUPERBUILD upright places a load on ground equivalent to half of the frame load over an area of 90mm x 120mm.

9.6

LOAD BEARING CAPACITY TABLES

A-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 75 - RIVETED 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	10S / 8D	11800	10S / 8D
	600	11650	11650	11650	11600	11300	11650	11650	11650	11650	11400	11650	11650	11650	11650	11500	11650	10S / 8D	11650	10S / 8D
	700	11500	11400	11250	11000	10600	11500	11400	11350	11100	10700	11500	11450	11400	11250	10900	11500	10S / 8D	11500	10S / 8D
	800	11100	10850	10700	10350	9950	11100	11000	10900	10550	10000	11100	10950	10850	10650	10150	11250	10S / 8D	11250	10S / 8D
	900	10650	10350	10150	9750	9350	10650	10450	10300	9900	9250	10650	10450	10300	10000	9450	11050	10S / 9D	11050	10S / 9D
	1000	10200	9850	9550	9150	8700	10150	9900	9700	9250	8550	10150	9900	9750	9400	8700	10850	10S / 9D	10850	10S / 9D
	1100	9650	9250	9000	8650	8300	9650	9350	9150	8700	8050	9650	9350	9200	8800	8150	10600	10S / 9D	10600	10S / 9D
	1200	9150	8700	8400	8200	7900	9150	8800	8600	8150	7600	9150	8800	8600	8200	7600	10350	10S / 9D	10350	10S / 9D
	1300	8650	8250	7950	7800	7500	8650	8200	8050	7650	7150	8650	8300	8150	7750	7150	10050	10S / 9D	10050	10S / 9D
	1400	8200	7800	7550	7400	7050	8200	7800	7600	7200	6700	8100	7850	7650	7250	6700	9700	10S / 10D	9700	10S / 10D
	1500	7700	7350	7100	7000	6650	7700	7400	7200	6750	6300	7700	7400	7250	6850	6300	9500	10S / 10D	9500	10S / 10D
	1600	7350	6950	6700	6600	6300	7300	6950	6750	6300	5900	7300	7000	6800	6400	5850	9300	10S / 10D	9300	10S / 10D
	1700	6950	6550	6350	6200	5900	6950	6600	6400	5950	5600	6900	6600	6450	6050	5550	9250	10S / 10D	9250	10S / 10D
	1800	6600	6150	5950	5800	5600	6550	6200	6000	5600	5250	6500	6250	6050	5700	5200	9150	10S / 10D	9150	10S / 10D
	1900	6250	5800	5550	5400	5200	6200	5800	5650	5250	4900	6100	5850	5700	5350	4850	9100	10S / 10D	9100	10S / 10D
	2000	5850	5400	5200	5000	4800	5800	5450	5250	4900	4600	5700	5450	5300	4950	4550	9000	10S / 10D	9000	10S / 10D
	2100	5550	5150	4950	4750	4600	5500	5150	5000	4650	4350	5400	5150	5000	4700	4300	8750	10S / 10D	8750	10S / 10D
	2200	5250	4850	4700	4500	4350	5200	4850	4700	4400	4100	5050	4850	4700	4400	4050	8500	10S / 10D	8500	10S / 10D
	2300	4950	4600	4450	4300	4100	4850	4600	4450	4150	3850	4750	4500	4400	4150	3800	8250	10S / 10D	8250	10S / 10D
	2400	4700	4350	4200	4050	3850	4550	4300	4150	3900	3650	4400	4200	4100	3900	3550	8000	10S / 10D	8000	10S / 10D
	2500																	7700	10S / 10D	7700

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 Superbuild 75 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

A-2		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 75 - RIVETED 140 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	10S / 8D	11800	10S / 8D
	600	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	10S / 8D	11650	10S / 8D
	700	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	10S / 8D	11500	10S / 8D
	800	11250	11250	11250	11250	10850	11250	11250	11250	11250	10900	11250	11250	11250	11250	10900	11250	10S / 8D	11250	10S / 8D
	900	11050	11050	11000	10850	10350	11050	11050	11050	10950	10400	11050	11050	11000	10950	10450	11050	10S / 9D	11050	10S / 9D
	1000	10750	10650	10600	10400	9800	10750	10650	10600	10500	9850	10750	10650	10600	10500	9900	10850	10S / 9D	10850	10S / 9D
	1100	10300	10200	10100	9900	9350	10300	10200	10150	9950	9400	10300	10200	10150	10000	9450	10600	10S / 9D	10600	10S / 9D
	1200	9850	9700	9650	9400	8850	9800	9700	9650	9450	8850	9800	9700	9650	9500	8900	10350	10S / 9D	10350	10S / 9D
	1300	9400	9250	9150	8900	8400	9350	9250	9150	8950	8400	9350	9250	9150	9000	8450	10050	10S / 9D	10050	10S / 9D
	1400	8900	8750	8650	8450	7900	8900	8750	8650	8500	7950	8850	8750	8650	8500	7950	9700	10S / 10D	9700	10S / 10D
	1500	8450	8250	8200	7950	7450	8400	8250	8200	8050	7550	8400	8250	8200	8050	7550	9500	10S / 10D	9500	10S / 10D
	1600	8050	7850	7800	7600	7100	7950	7800	7700	7550	7100	7900	7800	7700	7550	7100	9300	10S / 10D	9300	10S / 10D
	1700	7650	7500	7400	7200	6750	7550	7400	7350	7200	6700	7500	7400	7350	7200	6750	9250	10S / 10D	9250	10S / 10D
	1800	7250	7100	7000	6850	6400	7150	7050	6950	6800	6400	7100	7000	6950	6800	6400	9150	10S / 10D	9150	10S / 10D
	1900	6800	6700	6600	6450	6050	6750	6650	6600	6450	6050	6750	6650	6600	6450	6050	9100	10S / 10D	9100	10S / 10D
	2000	6400	6300	6250	6100	5700	6350	6250	6200	6100	5700	6350	6250	6200	6100	5700	9000	10S / 10D	9000	10S / 10D
	2100	6100	6000	5950	5800	5450	6050	5950	5900	5750	5400	6000	5900	5850	5750	5400	8750	10S / 10D	8750	10S / 10D
	2200	5800	5700	5650	5500	5150	5750	5650	5550	5450	5100	5700	5600	5550	5400	5050	8500	10S / 10D	8500	10S / 10D
	2300	5500	5400	5350	5200	4850	5400	5300	5250	5150	4750	5350	5250	5200	5100	4750	8250	10S / 10D	8250	10S / 10D
	2400	5150	5100	5050	4900	4600	5100	5000	4950	4800	4500	5000	4950	4900	4750	4450	8000	10S / 10D	8000	10S / 10D
	2500																7700	10S / 10D	7700	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 Superbuild 75 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

A-3		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 75 - WELDED 70 and 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	10S / 8D	11800	10S / 8D
	600	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	10S / 8D	11650	10S / 8D
	700	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	10S / 8D	11500	10S / 8D
	800	11250	11250	11250	11250	10900	11250	11250	11250	11250	10900	11250	11250	11250	11250	10900	11250	10S / 8D	11250	10S / 8D
	900	11050	11050	11000	10900	10450	11050	11050	11050	10900	10400	11050	11050	11050	10950	10450	11050	10S / 9D	11050	10S / 9D
	1000	10750	10700	10550	10500	9950	10700	10700	10650	10450	9850	10650	10650	10600	10500	9900	10850	10S / 9D	10850	10S / 9D
	1100	10350	10200	10050	10000	9500	10250	10200	10150	9950	9400	10200	10200	10150	10000	9450	10600	10S / 9D	10600	10S / 9D
	1200	9900	9700	9550	9450	8950	9800	9750	9650	9450	8950	9750	9700	9650	9500	8950	10350	10S / 9D	10350	10S / 9D
	1300	9400	9250	9050	9000	8500	9350	9250	9150	8900	8500	9300	9250	9200	9000	8450	10050	10S / 9D	10050	10S / 9D
	1400	8950	8750	8550	8550	7950	8850	8800	8650	8450	8050	8800	8750	8700	8450	7950	9700	10S / 10D	9700	10S / 10D
	1500	8500	8250	8050	8150	7500	8400	8300	8200	8000	7600	8350	8250	8200	8000	7550	9500	10S / 10D	9500	10S / 10D
	1600	8050	7850	7650	7750	7150	7900	7800	7700	7500	7150	7850	7800	7700	7500	7100	9300	10S / 10D	9300	10S / 10D
	1700	7650	7450	7300	7350	6750	7500	7450	7350	7150	6750	7450	7400	7350	7150	6700	9250	10S / 10D	9250	10S / 10D
	1800	7250	7050	6900	6950	6450	7150	7050	6950	6750	6450	7100	7000	6950	6800	6400	9150	10S / 10D	9150	10S / 10D
	1900	6850	6650	6500	6550	6050	6750	6650	6600	6400	6100	6700	6600	6600	6400	6000	9100	10S / 10D	9100	10S / 10D
	2000	6400	6250	6100	6150	5700	6350	6300	6200	6050	5700	6300	6250	6200	6050	5700	9000	10S / 10D	9000	10S / 10D
	2100	6100	5950	5800	5850	5450	6050	5950	5900	5700	5400	5950	5900	5850	5700	5350	8750	10S / 10D	8750	10S / 10D
	2200	5800	5650	5550	5550	5150	5700	5650	5550	5400	5100	5650	5550	5550	5400	5000	8500	10S / 10D	8500	10S / 10D
	2300	5500	5350	5250	5250	4850	5400	5300	5250	5100	4750	5300	5250	5200	5050	4750	8250	10S / 10D	8250	10S / 10D
	2400	5150	5050	4950	4950	4600	5050	5000	4950	4750	4500	5000	4900	4850	4700	4400	8000	10S / 10D	8000	10S / 10D
	2500																7700	10S / 10D	7700	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 Superbuild 75 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

A-4		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 75 - WELDED 140 and 172 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	11800	10S / 8D	11800	10S / 8D
	600	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	11650	11650	11650	11500	11650	10S / 8D	11650	10S / 8D
	700	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	11500	11500	11500	11250	11500	10S / 8D	11500	10S / 8D
	800	11250	11250	11250	11250	10900	11250	11250	11250	11250	10900	11250	11250	11250	11250	10900	11250	10S / 8D	11250	10S / 8D
	900	11050	11050	11050	11050	10550	11050	11050	11050	11050	10600	11050	11050	11050	11050	10600	11050	10S / 9D	11050	10S / 9D
	1000	10850	10850	10850	10750	10050	10800	10800	10800	10800	10250	10700	10700	10700	10700	10250	10850	10S / 9D	10850	10S / 9D
	1100	10500	10500	10450	10250	9500	10350	10350	10350	10350	9750	10250	10250	10250	10250	9800	10600	10S / 9D	10600	10S / 9D
	1200	10050	10050	10000	9750	9050	9900	9900	9900	9900	9300	9850	9850	9850	9850	9400	10350	10S / 9D	10350	10S / 9D
	1300	9600	9600	9550	9250	8550	9500	9500	9500	9400	8800	9350	9350	9350	9350	8900	10050	10S / 9D	10050	10S / 9D
	1400	9150	9150	9050	8750	8100	9000	9000	9000	8950	8350	8900	8900	8900	8900	8450	9700	10S / 10D	9700	10S / 10D
	1500	8700	8700	8600	8250	7600	8550	8550	8550	8450	7850	8450	8450	8450	8450	8000	9500	10S / 10D	9500	10S / 10D
	1600	8250	8250	8150	7850	7250	8050	8050	8050	8000	7450	7950	7950	7950	7950	7550	9300	10S / 10D	9300	10S / 10D
	1700	7850	7850	7750	7450	6850	7650	7650	7650	7600	7050	7550	7550	7550	7550	7150	9250	10S / 10D	9250	10S / 10D
	1800	7400	7400	7350	7050	6550	7250	7250	7250	7200	6650	7150	7150	7150	7150	6750	9150	10S / 10D	9150	10S / 10D
	1900	7000	7000	6900	6650	6150	6850	6850	6850	6800	6300	6750	6750	6750	6750	6400	9100	10S / 10D	9100	10S / 10D
	2000	6550	6550	6500	6250	5750	6450	6450	6450	6400	5950	6350	6350	6350	6350	6000	9000	10S / 10D	9000	10S / 10D
	2100	6250	6250	6200	6000	5550	6150	6150	6150	6100	5700	6050	6050	6050	6050	5700	8750	10S / 10D	8750	10S / 10D
	2200	5900	5900	5850	5700	5250	5800	5800	5800	5750	5350	5700	5700	5700	5700	5450	8500	10S / 10D	8500	10S / 10D
	2300	5600	5600	5550	5400	5000	5500	5500	5500	5450	5050	5400	5400	5400	5400	5100	8250	10S / 10D	8250	10S / 10D
	2400	5250	5250	5250	5100	4750	5150	5150	5150	5150	4750	5050	5050	5050	5050	4800	8000	10S / 10D	8000	10S / 10D
	2500																7700	10S / 10D	7700	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 Superbuild 75 frames = 4000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2000mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1000mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBUILD

B-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 110 - RIVETED 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15450	15450	15450	15350	15250	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	10S / 6D	15450	10S / 6D
	600	15250	15200	14950	14450	14400	15250	15200	15000	14550	14200	15250	15250	15100	14750	14400	15250	10S / 6D	15250	10S / 6D
	700	14750	14300	14000	13600	13350	14750	14350	14100	13500	13000	14750	14500	14300	13750	13150	15050	10S / 6D	15050	10S / 6D
	800	13950	13350	13050	12750	12400	13950	13550	13200	12400	11850	13950	13600	13350	12800	12050	14750	10S / 6D	14750	10S / 6D
	900	13200	12450	12100	11850	11400	13200	12600	12250	11500	10950	13200	12700	12400	11800	11000	14450	10S / 6D	14450	10S / 6D
	1000	12400	11500	11150	10950	10450	12400	11650	11300	10650	10150	12400	11800	11450	10800	9950	14150	10S / 7D	14150	10S / 7D
	1100	11650	10800	10450	10350	9800	11650	10950	10600	10000	9550	11650	11050	10700	10100	9250	13800	10S / 7D	13800	10S / 7D
	1200	10850	10100	9750	9750	9150	10850	10300	9900	9350	8950	10850	10300	10000	9350	8550	13500	10S / 7D	13500	10S / 7D
	1300	10300	9500	9150	9150	8550	10250	9600	9250	8700	8350	10200	9650	9350	8750	8000	13050	10S / 7D	13050	10S / 7D
	1400	9700	8900	8550	8550	8000	9650	9000	8650	8200	7850	9500	9000	8700	8100	7450	12600	10S / 7D	12600	10S / 7D
	1500	9100	8300	7950	7950	7450	9050	8450	8100	7650	7350	8900	8400	8100	7600	6950	12300	10S / 8D	12300	10S / 8D
	1600	8600	7850	7500	7500	7000	8450	7850	7550	7150	6850	8300	7800	7550	7050	6450	12050	10S / 8D	12050	10S / 8D
	1700	8100	7400	7050	7050	6650	7950	7400	7100	6700	6450	7800	7350	7100	6650	6050	11950	10S / 8D	11950	10S / 8D
	1800	7600	6950	6600	6600	6200	7450	6900	6650	6250	6000	7250	6850	6650	6200	5700	11800	10S / 8D	11800	10S / 8D
	1900	7100	6450	6200	6150	5800	6950	6450	6200	5800	5550	6750	6400	6200	5800	5300	11700	10S / 8D	11700	10S / 8D
	2000	6600	6000	5750	5700	5400	6450	6000	5750	5350	5100	6250	5900	5700	5350	4900	11600	10S / 8D	11600	10S / 8D
	2100	6250	5750	5450	5400	5100	6100	5650	5450	5100	4800	5900	5550	5400	5050	4700	11250	10S / 8D	11250	10S / 8D
2200	5900	5450	5200	5100	4800	5750	5350	5150	4800	4550	5550	5250	5100	4800	4400	10850	10S / 9D	10850	10S / 9D	
2300	5600	5150	4950	4850	4600	5400	5050	4850	4550	4250	5150	4900	4750	4500	4150	10500	10S / 9D	10500	10S / 9D	
2400	5250	4850	4650	4550	4300	5050	4700	4550	4300	3950	4800	4550	4450	4200	3850	9950	10S / 10D	10150	10S / 9D	
2500	4900	4550	4400	4300	4000	4700	4400	4250	4050	3700	4450	4250	4100	3900	3650	9350	10S / 10D	9800	10S / 10D	
2600																9050	10S / 10D	9450	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 Superbuild 110 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBUILD

B-2		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 110 - RIVETED 140 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	10S / 6D	15450	10S / 6D
	600	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	10S / 6D	15250	10S / 6D
	700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	10S / 6D	15050	10S / 6D
	800	14750	14750	14600	14350	13850	14750	14750	14750	14500	13950	14750	14750	14700	14550	14000	14750	10S / 6D	14750	10S / 6D
	900	14300	14100	13950	13600	13000	14300	14150	14050	13750	13050	14300	14150	14050	13800	13100	14450	10S / 6D	14450	10S / 6D
	1000	13750	13450	13250	12900	12200	13700	13450	13300	13000	12150	13700	13500	13350	13050	12250	14150	10S / 7D	14150	10S / 7D
	1100	13050	12700	12500	12150	11450	13000	12700	12550	12250	11400	13000	12750	12600	12250	11450	13800	10S / 7D	13800	10S / 7D
	1200	12350	12000	11800	11400	10750	12300	12000	11800	11500	10750	12300	12000	11850	11500	10700	13500	10S / 7D	13500	10S / 7D
	1300	11650	11350	11150	10800	10200	11600	11250	11100	10700	10050	11550	11300	11150	10800	10100	13050	10S / 7D	13050	10S / 7D
	1400	11000	10650	10500	10200	9650	10950	10650	10500	10150	9500	10850	10550	10450	10150	9500	12600	10S / 7D	12600	10S / 7D
	1500	10300	10000	9850	9550	9100	10300	10050	9900	9600	8950	10250	10000	9850	9600	8950	12300	10S / 8D	12300	10S / 8D
	1600	9800	9500	9350	9050	8600	9650	9450	9300	9050	8450	9600	9450	9300	9050	8450	12050	10S / 8D	12050	10S / 8D
	1700	9300	9000	8850	8550	8100	9150	8950	8800	8550	7950	9100	8900	8800	8550	7950	11950	10S / 8D	11950	10S / 8D
	1800	8750	8500	8350	8050	7600	8650	8450	8300	8000	7500	8600	8400	8300	8000	7500	11800	10S / 8D	11800	10S / 8D
	1900	8250	8000	7850	7550	7100	8150	7950	7800	7500	7000	8100	7900	7800	7500	7000	11700	10S / 8D	11700	10S / 8D
	2000	7750	7500	7350	7050	6650	7650	7450	7300	7000	6550	7550	7400	7250	7000	6550	11600	10S / 8D	11600	10S / 8D
	2100	7350	7100	6950	6700	6300	7250	7050	6900	6650	6200	7150	6950	6850	6650	6150	11250	10S / 8D	11250	10S / 8D
	2200	6950	6750	6600	6350	5950	6850	6650	6500	6300	5800	6700	6550	6450	6250	5800	10850	10S / 9D	10850	10S / 9D
	2300	6550	6350	6250	6000	5650	6400	6250	6150	5900	5500	6250	6150	6050	5850	5450	10500	10S / 9D	10500	10S / 9D
	2400	6200	6000	5900	5650	5300	6000	5850	5750	5550	5150	5850	5700	5650	5450	5050	10150	10S / 9D	10150	10S / 9D
	2500	5800	5600	5500	5350	5000	5600	5450	5350	5150	4800	5400	5300	5200	5050	4750	9800	10S / 10D	9800	10S / 10D
	2600																9450	10S / 10D	9450	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 Superbuild 110 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

B-3		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 110 - WELDED 70 and 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	10S / 6D	15450	10S / 6D
	600	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	10S / 6D	15250	10S / 6D
	700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	10S / 6D	15050	10S / 6D
	800	14750	14700	14550	14450	13850	14750	14750	14750	14500	14100	14750	14750	14750	14500	13950	14750	10S / 6D	14750	10S / 6D
	900	14350	14000	13850	13750	12950	14350	14200	14050	13750	13250	14250	14150	14050	13750	13050	14450	10S / 6D	14450	10S / 6D
	1000	13800	13350	13150	13050	12000	13700	13500	13300	13000	12450	13600	13500	13400	12950	12200	14150	10S / 7D	14150	10S / 7D
	1100	13100	12550	12300	12250	11250	13000	12750	12500	12200	11700	12900	12750	12600	12150	11500	13800	10S / 7D	13800	10S / 7D
	1200	12400	11800	11450	11400	10450	12250	12000	11700	11450	10950	12200	12000	11800	11400	10900	13500	10S / 7D	13500	10S / 7D
	1300	11700	11100	10850	10800	9850	11550	11250	10900	10700	10200	11500	11250	11100	10700	10250	13050	10S / 7D	13050	10S / 7D
	1400	11000	10450	10200	10150	9300	10950	10600	10300	10100	9600	10800	10550	10400	10050	9550	12600	10S / 7D	12600	10S / 7D
	1500	10350	9750	9550	9500	8650	10300	10000	9700	9550	9050	10200	9950	9800	9400	9000	12300	10S / 8D	12300	10S / 8D
	1600	9800	9250	9050	9000	8250	9650	9400	9100	8950	8550	9600	9350	9200	8800	8450	12050	10S / 8D	12050	10S / 8D
	1700	9300	8750	8550	8500	7750	9150	8850	8600	8450	8050	9100	8850	8700	8300	7900	11950	10S / 8D	11950	10S / 8D
	1800	8800	8250	8000	8000	7300	8650	8350	8100	7950	7600	8600	8350	8150	7750	7450	11800	10S / 8D	11800	10S / 8D
	1900	8250	7750	7500	7500	6800	8150	7850	7600	7450	7100	8100	7850	7650	7250	6900	11700	10S / 8D	11700	10S / 8D
	2000	7750	7200	7000	7000	6350	7650	7350	7100	6950	6650	7600	7300	7150	6700	6400	11600	10S / 8D	11600	10S / 8D
	2100	7350	6850	6650	6650	6050	7250	6950	6700	6550	6250	7150	6900	6750	6350	6000	11250	10S / 8D	11250	10S / 8D
	2200	6950	6550	6350	6300	5700	6850	6550	6350	6200	5850	6700	6500	6350	5950	5650	10850	10S / 9D	10850	10S / 9D
	2300	6550	6200	6000	5950	5400	6400	6150	5950	5800	5550	6300	6100	5950	5600	5300	10500	10S / 9D	10500	10S / 9D
	2400	6200	5850	5650	5600	5100	6000	5800	5600	5450	5150	5850	5650	5550	5200	4900	10150	10S / 9D	10150	10S / 9D
2500	5800	5500	5350	5250	4750	5600	5400	5200	5050	4750	5450	5250	5150	4850	4550	9800	10S / 10D	9800	10S / 10D	
2600																9450	10S / 10D	9450	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 Superbuild 110 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBUILD

B-4		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 110 - WELDED 140 and 172 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	15450	10S / 6D	15450	10S / 6D
	600	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	15250	15250	15250	15050	15250	10S / 6D	15250	10S / 6D
	700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	15050	15050	15050	14700	15050	10S / 6D	15050	10S / 6D
	800	14750	14750	14750	14700	14100	14750	14750	14750	14750	14300	14750	14750	14750	14750	14300	14750	10S / 6D	14750	10S / 6D
	900	14450	14450	14450	14000	13250	14450	14450	14450	14400	13600	14400	14400	14400	14400	13750	14450	10S / 6D	14450	10S / 6D
	1000	14150	14100	13900	13250	12400	13950	13950	13950	13700	12700	13800	13800	13800	13800	13000	14150	10S / 7D	14150	10S / 7D
	1100	13550	13400	13150	12450	11650	13300	13300	13300	12950	11950	13150	13150	13150	13100	12250	13800	10S / 7D	13800	10S / 7D
	1200	12900	12700	12400	11650	10900	12650	12650	12600	12150	11200	12500	12500	12500	12400	11450	13500	10S / 7D	13500	10S / 7D
	1300	12200	12000	11700	11000	10350	12000	12000	11900	11350	10450	11750	11750	11750	11650	10800	13050	10S / 7D	13050	10S / 7D
	1400	11550	11300	11000	10350	9800	11300	11300	11250	10750	9850	11050	11050	11050	10900	10100	12600	10S / 7D	12600	10S / 7D
	1500	10850	10650	10300	9750	9250	10600	10600	10550	10100	9350	10450	10450	10450	10250	9500	12300	10S / 8D	12300	10S / 8D
	1600	10300	10100	9800	9250	8750	9950	9950	9900	9500	8750	9800	9800	9800	9650	8950	12050	10S / 8D	12050	10S / 8D
	1700	9750	9550	9300	8750	8300	9450	9450	9350	9000	8300	9300	9300	9300	9100	8500	11950	10S / 8D	11950	10S / 8D
	1800	9200	9000	8800	8250	7800	8900	8900	8850	8500	7800	8800	8800	8800	8600	8000	11800	10S / 8D	11800	10S / 8D
	1900	8650	8500	8250	7700	7350	8400	8400	8350	8000	7350	8250	8250	8250	8100	7550	11700	10S / 8D	11700	10S / 8D
	2000	8100	7950	7750	7200	6850	7900	7900	7850	7500	6850	7750	7750	7750	7600	7050	11600	10S / 8D	11600	10S / 8D
	2100	7650	7550	7350	6900	6600	7450	7450	7400	7100	6550	7300	7300	7300	7200	6650	11250	10S / 8D	11250	10S / 8D
2200	7250	7150	7000	6550	6250	7050	7050	7000	6700	6150	6900	6900	6900	6750	6250	10850	10S / 9D	10850	10S / 9D	
2300	6850	6750	6600	6250	5900	6600	6600	6600	6350	5800	6450	6450	6450	6300	5850	10500	10S / 9D	10500	10S / 9D	
2400	6400	6350	6200	5900	5600	6200	6200	6200	5950	5450	6000	6000	6000	5900	5500	10150	10S / 9D	10150	10S / 9D	
2500	6000	5950	5850	5550	5250	5750	5750	5750	5550	5100	5600	5600	5600	5450	5100	9800	10S / 10D	9800	10S / 10D	
2600																9450	10S / 10D	9450	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 Superbuild 110 frames = 5000 daN;
3. **2 unbraced suspended levels:** maximum ground to first beam height of 2200mm;
4. **1 unbraced bay:** maximum ground to first beam height of 1500mm, minimum 3 suspended levels, apply a 50% reduction in the tabled frame load bearing capacities;
5. The partially and fully braced columns of this table refer to BRACING TOWER applications only. Refer to Paragraph 9.3 for instructions on the proper application of the cross bracing alternative.

SUPERBUILD

C-1		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 145 - RIVETED 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	20900	20600	20050	19400	19400	20900	20800	20400	19400	19200	20900	20900	20600	19800	19350	20900	8S / 4D	20900	8S / 4D
	600	20100	18950	18200	17850	17800	20050	19200	18800	17850	17550	20050	19350	18900	17900	17250	20650	8S / 4D	20650	8S / 4D
	700	18800	17600	17000	16750	16350	18700	17650	17150	16250	15950	18700	17750	17150	16000	15200	20400	8S / 4D	20400	8S / 4D
	800	17550	16300	15750	15600	14900	17400	16050	15500	14700	14400	17400	16400	15850	14800	14000	20000	10S / 5D	20000	10S / 5D
	900	16250	14950	14500	14450	13500	16150	14900	14350	13700	13350	16050	15100	14550	13550	12750	19650	10S / 5D	19650	10S / 5D
	1000	14950	13600	13250	13250	12200	14900	13750	13200	12650	12350	14650	13750	13250	12300	11500	19250	10S / 5D	19250	10S / 5D
	1100	14000	12650	12350	12350	11250	13900	12850	12300	11750	11550	13550	12700	12250	11350	10550	18800	10S / 5D	18800	10S / 5D
	1200	13050	11700	11400	11400	10300	12900	11900	11400	10850	10700	12450	11650	11250	10400	9650	18400	10S / 5D	18400	10S / 5D
	1300	12250	11000	10700	10700	9600	11900	10950	10500	9950	9900	11550	10800	10450	9650	8950	17800	10S / 5D	17800	10S / 5D
	1400	11450	10300	9950	9950	8900	11100	10250	9850	9300	9250	10600	9950	9600	8900	8300	17200	10S / 5D	17200	10S / 5D
	1500	10650	9600	9200	9200	8200	10300	9550	9150	8700	8550	9900	9300	8950	8300	7700	16850	10S / 5D	16850	10S / 5D
	1600	10050	9050	8650	8650	7700	9550	8800	8450	8050	7950	9200	8650	8300	7700	7200	16000	10S / 6D	16500	10S / 6D
	1700	9400	8500	8050	8050	7250	8950	8300	7950	7550	7400	8650	8100	7800	7250	6700	15900	10S / 6D	16350	10S / 6D
	1800	8800	7900	7450	7450	6750	8400	7750	7450	7050	6850	8100	7600	7300	6800	6250	15750	10S / 6D	16150	10S / 6D
	1900	8200	7350	6900	6900	6300	7800	7200	6950	6500	6300	7550	7050	6800	6350	5750	15600	10S / 6D	16000	10S / 6D
	2000	7600	6800	6300	6300	5850	7250	6700	6450	6000	5750	7000	6550	6300	5900	5350	15500	10S / 6D	15850	10S / 6D
	2100	7200	6450	6050	6050	5600	6850	6350	6100	5700	5450	6600	6200	5950	5550	5050	14550	10S / 6D	15350	10S / 6D
	2200	6850	6150	5750	5750	5300	6500	6000	5750	5400	5150	6200	5850	5650	5250	4750	13650	10S / 7D	14900	10S / 6D
	2300	6450	5850	5450	5450	5000	6100	5650	5450	5050	4800	5850	5500	5300	4950	4500	12700	10S / 7D	14400	10S / 6D
	2400	6100	5500	5200	5200	4750	5750	5300	5100	4750	4550	5450	5150	4950	4650	4250	11800	10S / 8D	13950	10S / 7D
2500	5700	5200	4900	4900	4450	5350	5000	4800	4450	4200	5100	4800	4650	4350	3950	10900	10S / 9D	13450	10S / 7D	
2600	5350	4900	4600	4600	4150	5000	4650	4450	4150	3900	4850	4550	4400	4100	3800	10900	10S / 9D	13000	10S / 7D	
2700																10950	10S / 9D	12550	10S / 7D	

SPECIFIC LOAD CONDITIONS:

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

C-2		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 145 - RIVETED 140 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	8S / 4D	20900	8S / 4D
	600	20650	20650	20650	20650	20250	20650	20650	20650	20650	20250	20650	20650	20650	20650	20400	20650	8S / 4D	20650	8S / 4D
	700	20400	20250	19950	19500	19000	20400	20250	20050	19550	18900	20400	20400	20200	19750	19100	20400	8S / 4D	20400	8S / 4D
	800	19650	19100	18850	18350	17750	19650	19250	18950	18350	17500	19650	19250	19000	18500	17650	20000	10S / 5D	20000	10S / 5D
	900	18650	18000	17700	17200	16500	18650	18100	17750	17100	16100	18600	18100	17800	17200	16250	19650	10S / 5D	19650	10S / 5D
	1000	17650	16900	16550	16000	15250	17600	16900	16550	15900	14800	17500	16950	16650	15950	14850	19250	10S / 5D	19250	10S / 5D
	1100	16700	15900	15550	15100	14400	16550	15950	15600	14950	13950	16400	15900	15600	15000	13950	18800	10S / 5D	18800	10S / 5D
	1200	15700	14850	14600	14150	13500	15550	14950	14650	14050	13150	15300	14800	14550	14050	13050	18400	10S / 5D	18400	10S / 5D
	1300	14850	14100	13850	13250	12650	14550	14000	13700	13150	12350	14400	13950	13700	13200	12250	17800	10S / 5D	17800	10S / 5D
	1400	14000	13350	13050	12300	11800	13700	13200	12950	12350	11450	13500	13100	12850	12350	11400	17200	10S / 5D	17200	10S / 5D
	1500	13200	12600	12300	11350	10900	12900	12450	12150	11600	10600	12700	12300	12100	11600	10750	16850	10S / 5D	16850	10S / 5D
	1600	12500	11950	11650	10750	10350	12100	11650	11400	10800	9750	11900	11500	11300	10850	10050	16500	10S / 6D	16500	10S / 6D
	1700	11800	11300	11000	10100	9700	11400	11000	10750	10200	9200	11200	10850	10650	10200	9500	16350	10S / 6D	16350	10S / 6D
	1800	11100	10650	10300	9500	9100	10750	10350	10150	9600	8600	10500	10200	10050	9600	8900	16150	10S / 6D	16150	10S / 6D
	1900	10400	9950	9650	8850	8550	10050	9700	9500	8950	8100	9850	9550	9400	9000	8350	16000	10S / 6D	16000	10S / 6D
	2000	9700	9300	8950	8250	7900	9400	9050	8900	8350	7550	9150	8900	8750	8400	7750	15850	10S / 6D	15850	10S / 6D
	2100	9250	8850	8500	7850	7550	8900	8600	8400	7900	7150	8650	8400	8250	7950	7350	15350	10S / 6D	15350	10S / 6D
	2200	8750	8400	8100	7500	7150	8400	8100	7950	7500	6750	8100	7900	7800	7500	6900	14900	10S / 6D	14900	10S / 6D
	2300	8250	7900	7650	7100	6750	7900	7650	7500	7100	6400	7600	7400	7300	7050	6500	14400	10S / 6D	14400	10S / 6D
	2400	7750	7450	7200	6700	6400	7400	7150	7050	6650	6050	7100	6900	6800	6550	6050	13950	10S / 7D	13950	10S / 7D
	2500	7250	6950	6750	6350	6000	6900	6700	6550	6250	5700	6550	6450	6300	6100	5650	13450	10S / 7D	13450	10S / 7D
	2600	6750	6500	6350	5950	5650	6400	6200	6100	5800	5300	6200	6050	5950	5750	5350	13000	10S / 7D	13000	10S / 7D
	2700																12550	10S / 7D	12550	10S / 7D

SPECIFIC LOAD CONDITIONS:

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

C-3		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 145 - WELDED 70 and 106 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	8S / 4D	20900	8S / 4D
	600	20650	20650	20650	20650	20400	20650	20650	20650	20650	20400	20650	20650	20650	20650	20400	20650	8S / 4D	20650	8S / 4D
	700	20400	20400	20400	19950	19250	20400	20400	20400	20400	19600	20400	20400	20400	20400	19950	20400	8S / 4D	20400	8S / 4D
	800	20000	20000	19650	18700	17950	20000	20000	20000	19350	18200	20000	20000	20000	19700	18750	20000	10S / 5D	20000	10S / 5D
	900	19650	19200	18500	17500	16800	19400	19350	19050	18050	16750	19050	19050	19050	18500	17300	19650	10S / 5D	19650	10S / 5D
	1000	18850	18250	17350	16250	15550	18450	18350	17950	16750	15250	18100	18100	18100	17350	15950	19250	10S / 5D	19250	10S / 5D
	1100	17850	17200	16400	15450	14600	17400	17250	16850	15700	14400	17050	17050	16950	16100	14800	18800	10S / 5D	18800	10S / 5D
	1200	16900	16100	15400	14550	13650	16400	16150	15700	14700	13600	16050	16050	15800	14900	13700	18400	10S / 5D	18400	10S / 5D
	1300	15900	15200	14550	13750	13050	15350	15050	14600	13650	12750	15050	15000	14750	13950	12850	17800	10S / 5D	17800	10S / 5D
	1400	14950	14250	13700	12950	12400	14500	14150	13750	12850	12000	14050	13900	13700	13000	12000	17200	10S / 5D	17200	10S / 5D
	1500	13950	13350	12850	12150	11800	13600	13300	12900	12050	11250	13300	13050	12850	12200	11200	16850	10S / 5D	16850	10S / 5D
	1600	13250	12650	12200	11500	11200	12750	12400	12050	11250	10500	12500	12200	12000	11350	10450	16500	10S / 6D	16500	10S / 6D
	1700	12500	11950	11500	10850	10550	12050	11700	11400	10650	9900	11800	11500	11300	10700	9800	16350	10S / 6D	16350	10S / 6D
	1800	11800	11250	10850	10250	9950	11350	11000	10700	10000	9350	11100	10800	10600	10050	9250	16150	10S / 6D	16150	10S / 6D
	1900	11050	10550	10150	9600	9350	10650	10300	10000	9350	8750	10400	10150	9900	9400	8600	16000	10S / 6D	16000	10S / 6D
	2000	10350	9850	9500	8950	8700	9950	9600	9350	8750	8200	9700	9450	9200	8750	8050	15850	10S / 6D	15850	10S / 6D
	2100	9800	9350	9000	8500	8250	9400	9100	8850	8300	7700	9200	8900	8700	8250	7600	15350	10S / 6D	15350	10S / 6D
	2200	9300	8850	8550	8100	7800	8900	8600	8350	7850	7300	8650	8400	8200	7800	7200	14900	10S / 6D	14900	10S / 6D
	2300	8750	8350	8100	7700	7400	8400	8100	7900	7400	6850	8150	7900	7700	7300	6700	14400	10S / 6D	14400	10S / 6D
	2400	8250	7850	7650	7250	6950	7850	7600	7400	6950	6450	7600	7350	7200	6850	6300	13950	10S / 7D	13950	10S / 7D
	2500	7700	7350	7200	6850	6500	7350	7050	6900	6500	6000	7100	6850	6700	6350	5850	13450	10S / 7D	13450	10S / 7D
	2600	7200	6900	6700	6400	6050	6850	6550	6400	6050	5600	6700	6450	6350	6050	5550	13000	10S / 7D	13000	10S / 7D
	2700																12550	10S / 7D	12550	10S / 7D

SPECIFIC LOAD CONDITIONS:

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

SUPERBUILD

C-4		FRAME LOAD BEARING CAPACITY TABLE [daN] SUPERBUILD 145 - WELDED 140 and 172 BEAM																		
		H frame = 6000 mm					H frame = 8000 mm					H frame = 10000 mm					PARTIALLY BRACED		FULLY BRACED	
		Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	Lc=1800	Lc=2400	Lc=2700	Lc=3300	Lc=3600	daN	BAYS	daN	BAYS
HEIGHT OF FIRST BEAM LEVEL FROM GROUND [mm]	500	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	20900	8S / 4D	20900	8S / 4D
	600	20650	20650	20650	20650	20400	20650	20650	20650	20650	20400	20650	20650	20650	20650	20400	20650	8S / 4D	20650	8S / 4D
	700	20400	20400	20400	19950	19250	20400	20400	20400	20400	19600	20400	20400	20400	20400	19950	20400	8S / 4D	20400	8S / 4D
	800	20000	20000	19650	18700	17950	20000	20000	20000	19350	18200	20000	20000	20000	19700	18750	20000	10S / 5D	20000	10S / 5D
	900	19650	19200	18500	17500	16800	19400	19350	19050	18050	16750	19050	19050	19050	18500	17300	19650	10S / 5D	19650	10S / 5D
	1000	18850	18250	17350	16250	15550	18450	18350	17950	16750	15250	18100	18100	18100	17350	15950	19250	10S / 5D	19250	10S / 5D
	1100	17850	17200	16400	15450	14600	17400	17250	16850	15700	14400	17050	17050	16950	16100	14800	18800	10S / 5D	18800	10S / 5D
	1200	16900	16100	15400	14550	13650	16400	16150	15700	14700	13600	16050	16050	15800	14900	13700	18400	10S / 5D	18400	10S / 5D
	1300	15900	15200	14550	13750	13050	15350	15050	14600	13650	12750	15050	15000	14750	13950	12850	17800	10S / 5D	17800	10S / 5D
	1400	14950	14250	13700	12950	12400	14500	14150	13750	12850	12000	14050	13900	13700	13000	12000	17200	10S / 5D	17200	10S / 5D
	1500	13950	13350	12850	12150	11800	13600	13300	12900	12050	11250	13300	13050	12850	12200	11200	16850	10S / 5D	16850	10S / 5D
	1600	13250	12650	12200	11500	11200	12750	12400	12050	11250	10500	12500	12200	12000	11350	10450	16500	10S / 6D	16500	10S / 6D
	1700	12500	11950	11500	10850	10550	12050	11700	11400	10650	9900	11800	11500	11300	10700	9800	16350	10S / 6D	16350	10S / 6D
	1800	11800	11250	10850	10250	9950	11350	11000	10700	10000	9350	11100	10800	10600	10050	9250	16150	10S / 6D	16150	10S / 6D
	1900	11050	10550	10150	9600	9350	10650	10300	10000	9350	8750	10400	10150	9900	9400	8600	16000	10S / 6D	16000	10S / 6D
	2000	10350	9850	9500	8950	8700	9950	9600	9350	8750	8200	9700	9450	9200	8750	8050	15850	10S / 6D	15850	10S / 6D
	2100	9800	9350	9000	8500	8250	9400	9100	8850	8300	7700	9200	8900	8700	8250	7600	15350	10S / 6D	15350	10S / 6D
	2200	9300	8850	8550	8100	7800	8900	8600	8350	7850	7300	8650	8400	8200	7800	7200	14900	10S / 6D	14900	10S / 6D
	2300	8750	8350	8100	7700	7400	8400	8100	7900	7400	6850	8150	7900	7700	7300	6700	14400	10S / 6D	14400	10S / 6D
	2400	8250	7850	7650	7250	6950	7850	7600	7400	6950	6450	7600	7350	7200	6850	6300	13950	10S / 7D	13950	10S / 7D
	2500	7700	7350	7200	6850	6500	7350	7050	6900	6500	6000	7100	6850	6700	6350	5850	13450	10S / 7D	13450	10S / 7D
	2600	7200	6900	6700	6400	6050	6850	6550	6400	6050	5600	6700	6450	6350	6050	5550	13000	10S / 7D	13000	10S / 7D
	2700																12550	10S / 7D	12550	10S / 7D

SPECIFIC LOAD CONDITIONS:

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

10

SPECIAL CONFIGURATIONS

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

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

10.1

CROSS AISLE TUNNEL

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

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

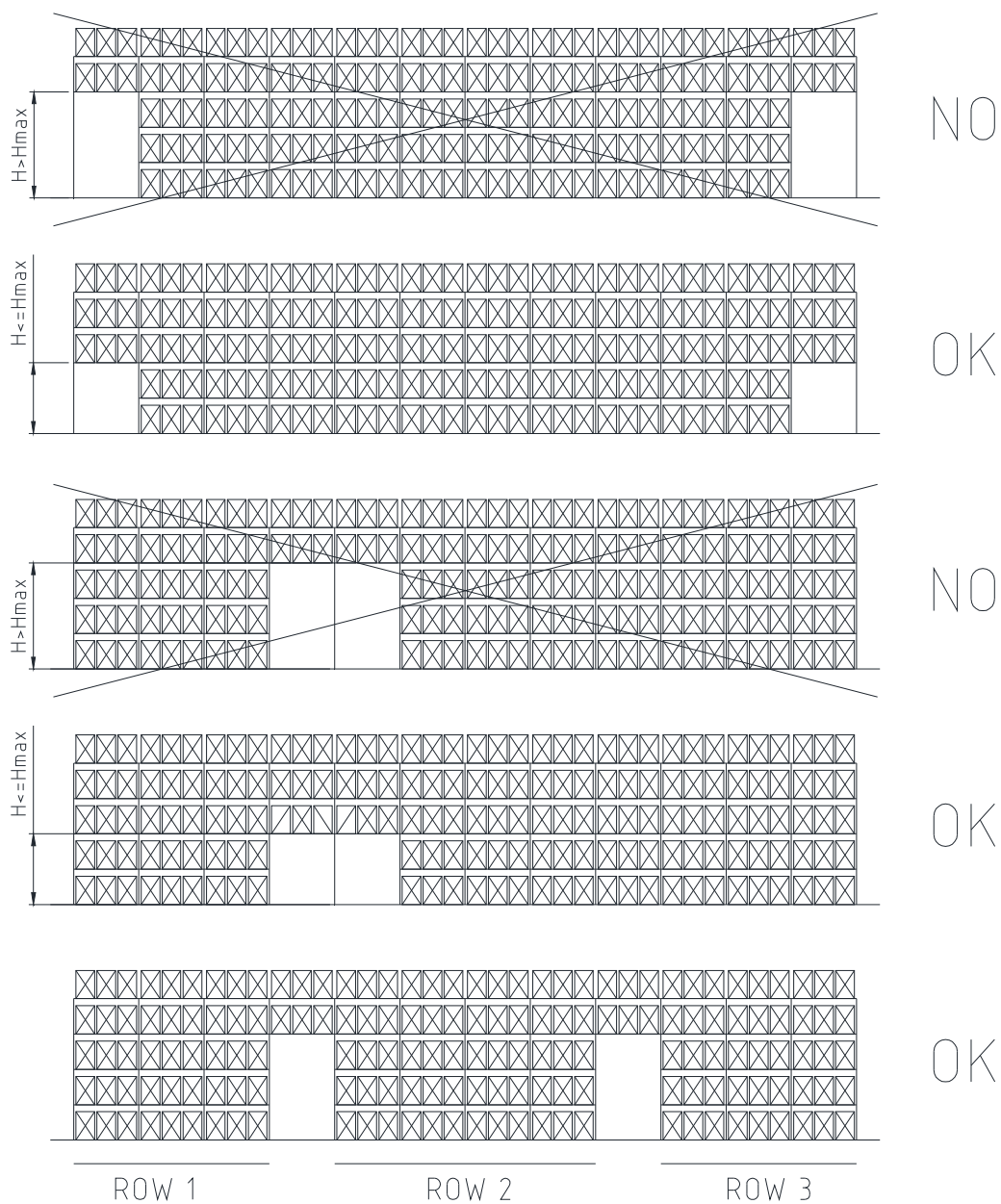
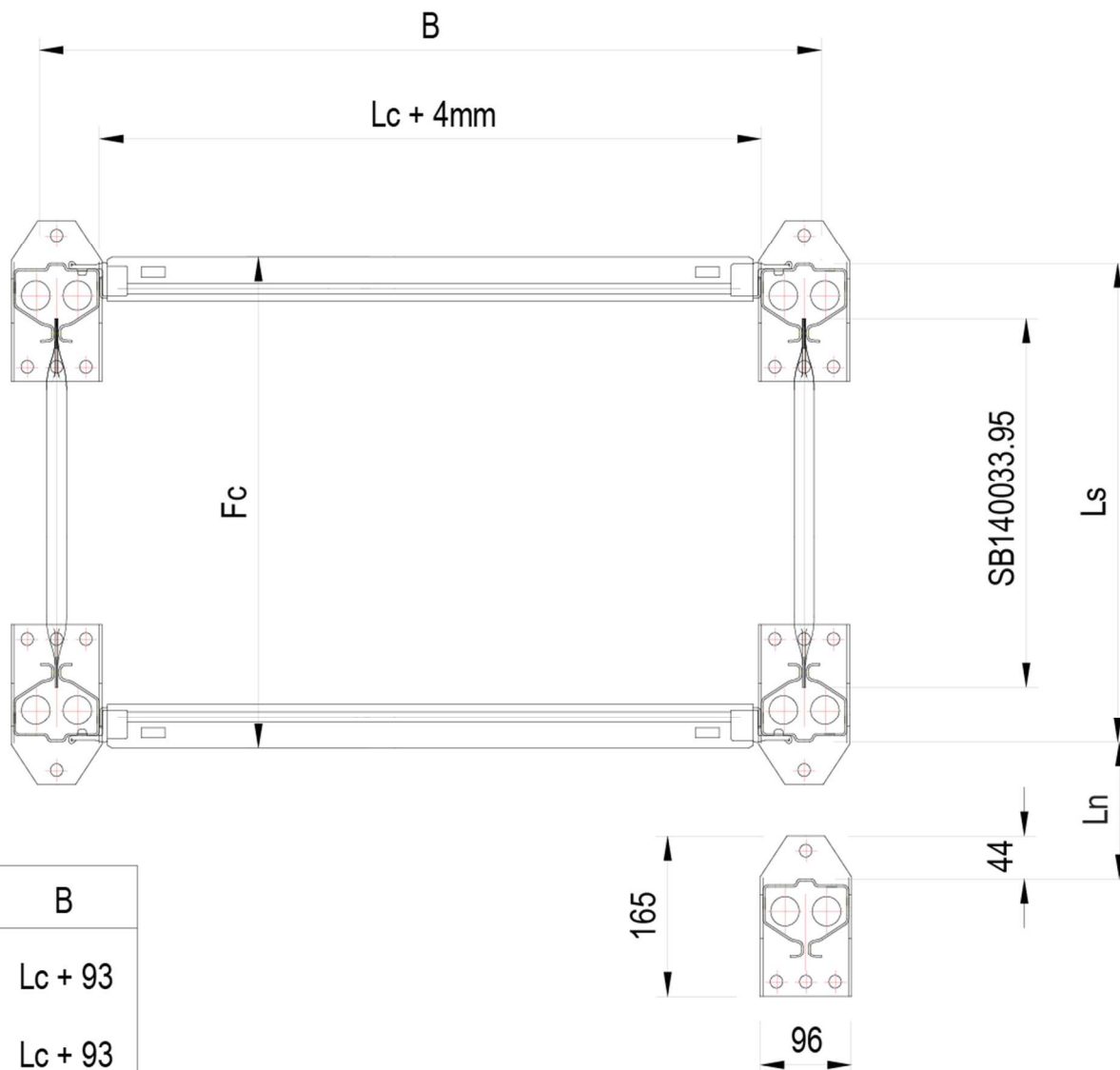


Fig. 10.1

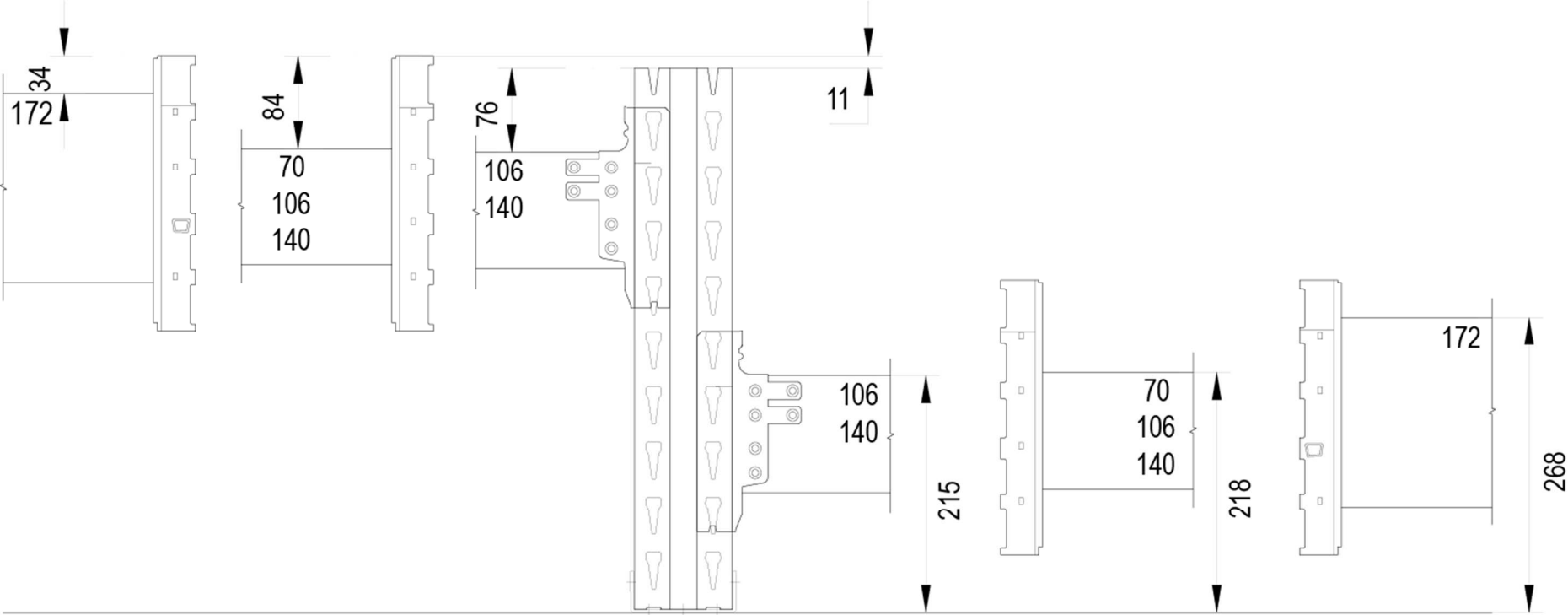
11

DIMENSIONAL CHARACTERISTICS



	A	B
SB75	89	$Lc + 93$
SB110	89	$Lc + 93$
SB145	90	$Lc + 94$

Lc = Beam length:	Overall length of beam.
Ls = Actual frame width:	Overall width of frame (to the outer most face of the uprights)
Ln = Net span:	Clear span between uprights
Fc = External face of beam	Total dimension to external face of beam.



MINIMUM AND MAXIMUM BEAM CONNECTION LEVELS FOR SUPERBUILD FRAMES