



TECNOLOGIE E
LOGISTICHE DI MAGAZZINO

MANUAL ASSEMBLY, USE AND MAINTENANCE EVALUATION OF RISK



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Table of contents





	BY PAGE
SECTION 1	
FOREWORD	3
1.1 OBLIGATIONS, PROHIBITIONS AND SPECIAL INSTRUCTIONS DURING INSTALLATION OPERATIONS	3
1.2 RESPONSIBILITIES OF THE USER, WORKER, MANAGER, AND ALL OTHERS AUTHORISED TO HAVE ACCESS TO THE AREA OF THE RACKS	4
SECTION 2	
GENERAL INSTRUCTIONS FOR THE ASSEMBLY OF RACKS	5
2.1 ASSEMBLY SAFETY REGULATIONS	5
2.2 LOCATION AND CHARACTERISTICS OF THE SUPPORT SURFACE/FLOORING	6
2.3 ASSEMBLY PREPARATION AND ACTIVITY	7
SECTION 3	
COMPLETION AND DISPLAY OF LOAD CAPACITY PLATE	8
3.1 SAFETY SIGNS REGARDING RACKS	9
SECTION 4	
CORRECT USE OF RACKS	10
4.1 OPERATOR TRAINING	10
4.2 FORKLIFT	11
4.3 MOVEMENT AND STORAGE OF INTERSPACE LOADS	11
4.4 COMPOSITION AND ARRANGEMENT OF LOADS	16
4.5 PROHIBITION OF IMPROPER USE AND INSTRUCTIONS IN CASE OF COLLISIONS	17
SECTION 5	
SAFETY OF EQUIPMENT, MAINTENANCE AND INSPECTIONS	18
5.1 GENERAL INSTRUCTIONS	18
5.2 REFERENCE PERSONNEL FOR RACK SAFETY	18
5.3 INSTALLATION OF SAFETY DEVICES	19
5.4 SYSTEM MAINTENANCE: USER OBLIGATIONS	20
5.5 PERIODIC INSPECTION AND MAINTENANCE OF THE SYSTEM (UNI EN 15635)	20
PERIODIC INSPECTION SHEET OF RACKS	23
5.6 MAINTENANCE OF THE SYSTEM	24
SECTION 6	
FIRE SAFETY	25
6.1 RACK FIRE RESISTANCE	25
6.2 RACK FIRE REACTION	25
SECTION 2	
IDENTIFICATION AND EVALUATION OF POTENTIAL RISKS LINKED TO ASSEMBLY AND USE OF RACKS	26
7.1 SCALE OF OVERALL POSSIBILITY AN EVENT MIGHT OCCUR	27
7.2 SCALE OF AMOUNT OF DAMAGE PROVOKED BY AN INCIDENT	27
7.3 RISK INDEX ($R = P \times D$)	28
7.4 MAXIMUM LOAD TO LIFT WITHOUT AUXILIARY DEVICES: 15 KG	28
7.5 ASSIGNMENT OF RISK CATEGORIES DURING RACK ASSEMBLY	29
7.6 ASSIGNMENT OF RISK CATEGORIES DURING USE OF RACKS	30
PALLET RACKS	31
DRIVE-IN RACKS	47
CANTILEVER RACKS	59
MODULEVER RACKS	66
EASYBLOK RACKS	74

1 FOREWORD

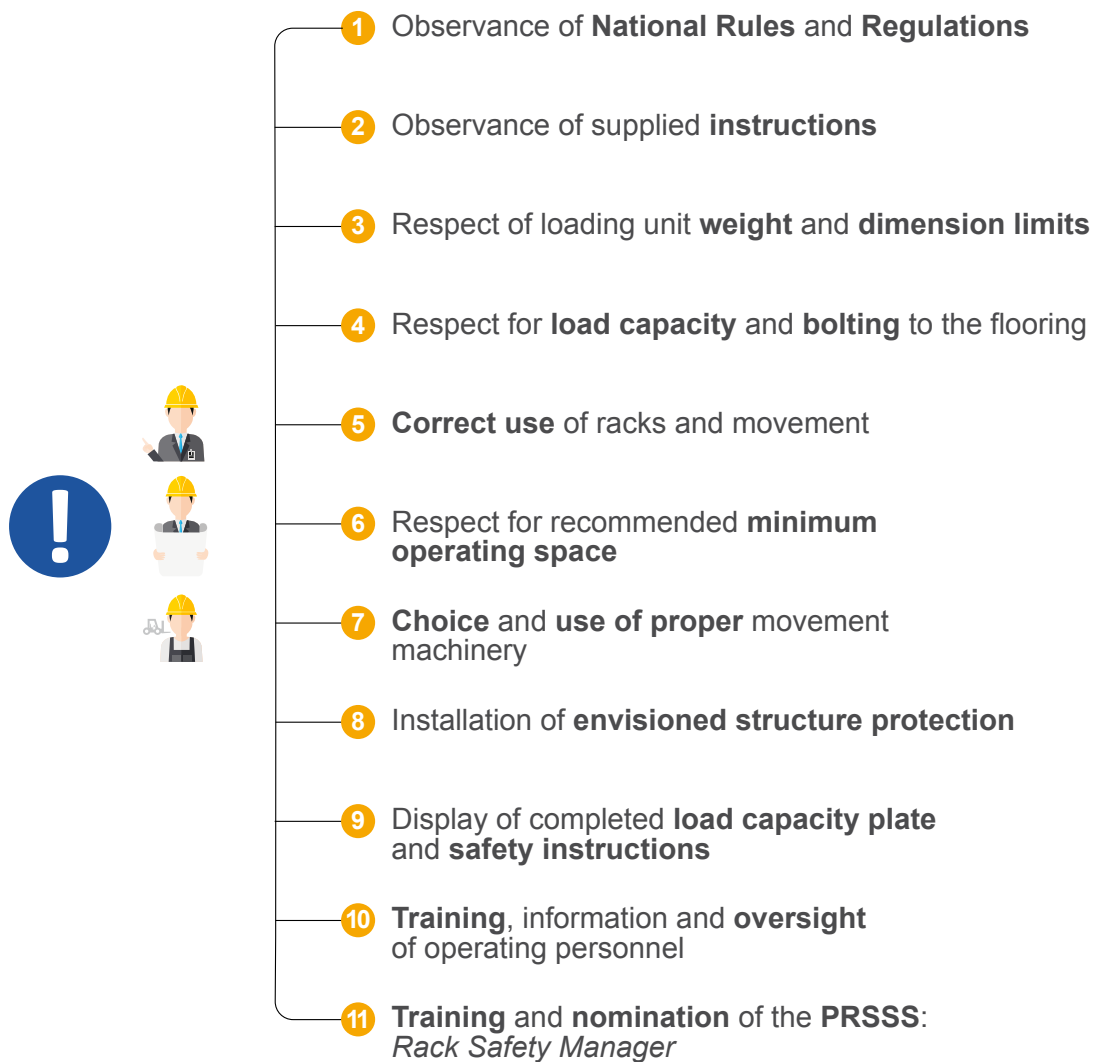
The following recommendations regard the assembly, installation, disassembly, use and maintenance of the main types of MODULBLOK racks.

The evaluation of risks is based upon Italian Legislative Decree no. 81/2008, which incorporates the European Framework Directive no. 89/391 CEE. For indications regarding the correct use and maintenance, please refer to European regulation no. EN15635:2009. For all countries outside of Italy, we decline any responsibility for the verification and application of specific local directives.

1.1 OBLIGATIONS, PROHIBITIONS AND SPECIAL INSTRUCTIONS DURING INSTALLATION OPERATIONS

	<p>The assembly of all joining structures produced by MODULBLOK S.p.A. must always be performed in the observance:</p> <ul style="list-style-type: none"> - of the indications that follow - of the manufacturer layouts - of safety regulations (according to the regulations of the country of installation - see Foreword)
	<p>Should assembly be performed by the client, Modulblok declines any responsibility for damage to objects and/or persons caused by those activities.</p>
	<p>In the case of assembly performed by Modulblok/third parties engaged by Modulblok:</p> <ul style="list-style-type: none"> - Contract tender (according to the regulations of the country of installation - see Foreword) <ul style="list-style-type: none"> a. The client shall communicate to Modulblok the general risks and specific interference risks of the installation activity. b. The client shall promote coordination among the various hired companies and/or self-employed workers, developing a document of evaluation of the risks with the adequate prevention and protection measures to adopt. - Contract tender (according to the regulations of the country of installation - see Foreword) <ul style="list-style-type: none"> a. The client shall draft and transmit a Safety and Coordination Plan as envisioned.
<p>In general assembly envisions elements in sheet metal of limited thickness and cold profiled.</p>	
	<p>All operations related to the installation of the system, from unloading of the machinery to storage at the worksite from assembly to the completion of installation, must be performed avoiding bending the thin elements or significant forcing. In the case of permanent deformations, in fact, the structural efficiency of the system will be gravely compromised.</p>
<p>We recommend to read the entire instruction manual carefully before beginning assembly.</p>	

1.2 RESPONSIBILITIES OF THE USER, WORKER, MANAGER, AND ALL OTHERS AUTHORISED TO HAVE ACCESS TO THE AREA OF THE RACKS



Art. 20 Legislative
Decree no.81/2008
for workers



Art. 19 Legislative
Decree no.81/2008
for managers



2 GENERAL INSTRUCTIONS FOR THE ASSEMBLY OF RACKS

2.1 ASSEMBLY SAFETY REGULATIONS

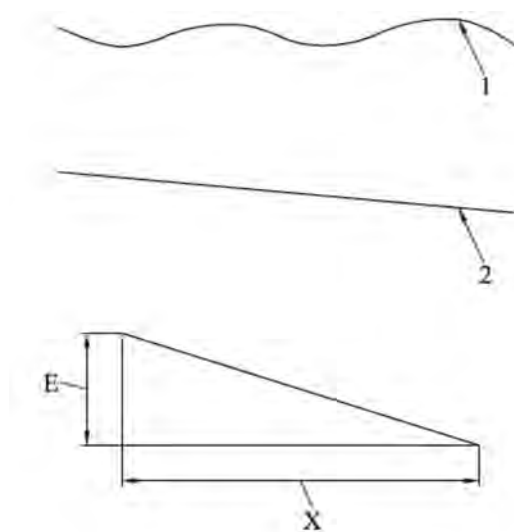


In particular companies that perform installations of the Modulblok S.p.A. systems must respect all regulations related to hygienic and worker safety (according to the regulations of the country of installation - see Foreword), especially those identified in the Prevention and Protection Service and when applicable contained in the documentation of risk evaluation, as well as the Unified Document of Evaluation of Interference Risks (UDEIR) or the Operational Safety Plan (OSP) on the basis of the type of worksite .

Personnel performing assembly operations must wear all Individual Protective Devices (IPD) required in relation to the specific operations of assembly (helmet, gloves, safety boots, safety belts, etc) so as to safeguard the safety of oneself and others.

2.2 LOCATION AND CHARACTERISTICS OF THE SUPPORT SURFACE/FLOORING

The installation of the racks must take place on stable support surfaces/flooring that is suitable to support the envisioned weights. If not otherwise specified we assume industrial flooring in reinforced concrete, with a minimum thickness of 200 mm produced with class C20/25 concrete.



Legend:

- 1) Profile level of the flooring, but not flat
- 2) Flat profile of the flooring, but not at level
- X) 3m
- E) Difference in elevation between the adjacent fixed points, at a distance of 3m

The pavement must have a flatness error such that the difference between the lowest and highest points of the installation are less than 30mm.

Within any distance of 3 metres, the maximum allowable difference is 4mm.

These tolerances are valid only for a warehouse served exclusively by a front lift (Class 400 UNI EN 15620).

Should it be necessary to adjust the vertical alignment of the racks, it is possible to use the thickness plates provided to insert under the support bases.

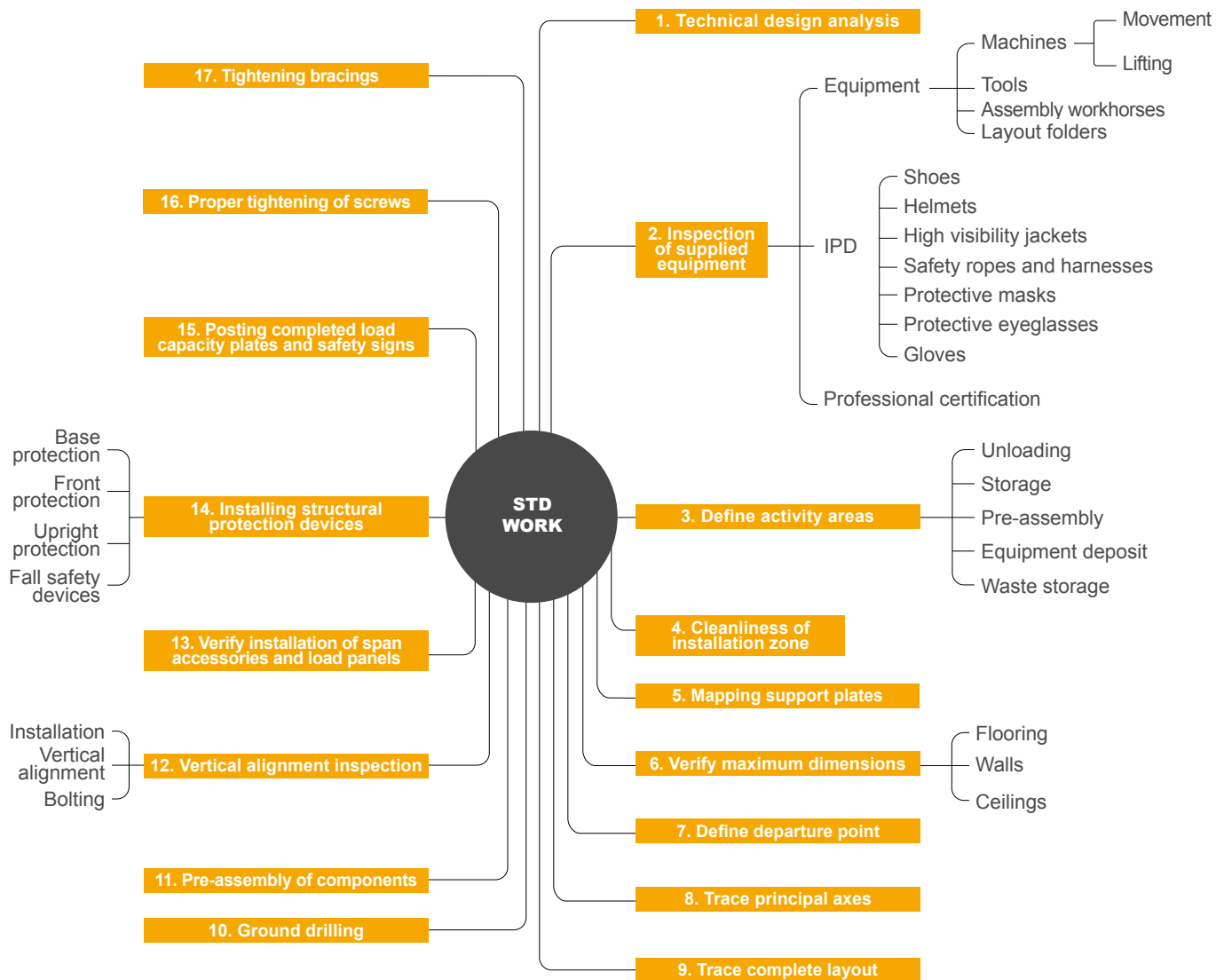
Plates with a thickness of over 30 mm are not permitted for use.



The preliminary inspection of the adequateness of the support/pavement shall be charged to the client. In the case of third-party installations, higher load characteristics might be necessary as the racks react also to stresses due to atmospheric conditions. We also wish to emphasise that verification that the structure corresponds to local urban regulations remains the responsibility of the client.


2.3 ASSEMBLY PREPARATION AND ACTIVITY

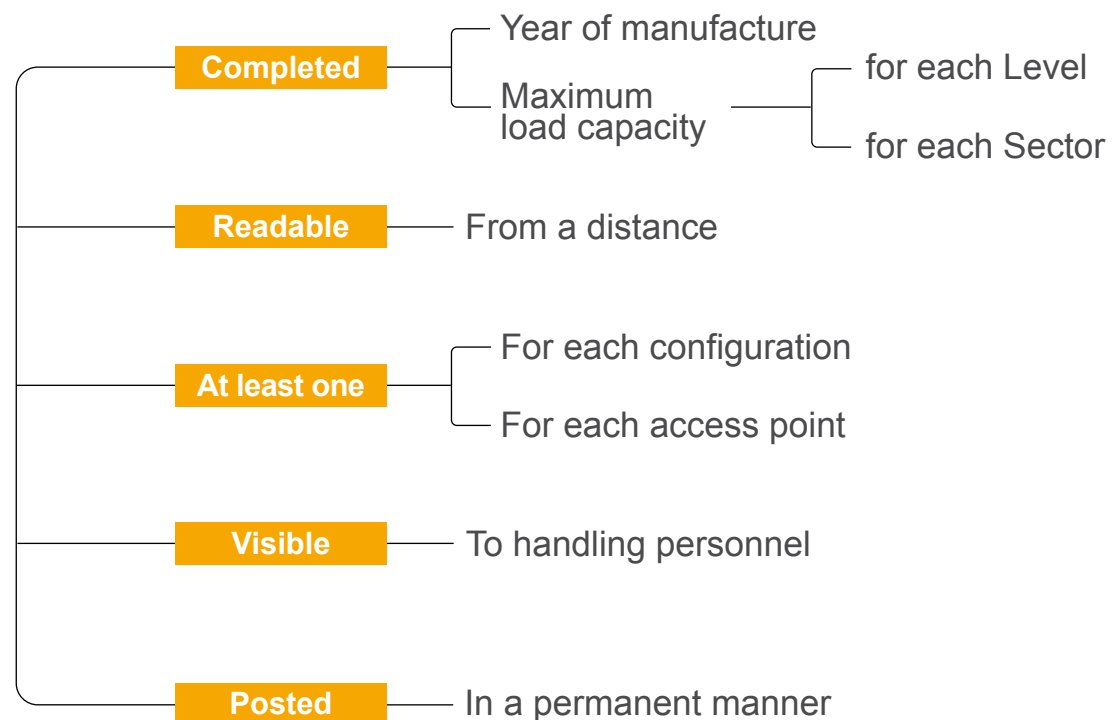
The notes included in this chapter represent recommended suggestions for the preparation of activities necessary for the assembly of industrial racks.



Upon completion the assembly must always be checked so that **all safety devices included in the project**, in particular the anti-release devices of the frame-beam/shelves connections (safety pins for the pallet rack, Easyblock, Drive-in) the frontal protections and the anti-fall back-stops, are in place. Finally, the flooring bolts for the frame elements must be checked.

3 FILLING AND DISPLAY OF LOAD CAPACITY PLATE

	<p>The posting of load capacity plates adequately completed is compulsory and included in current law. This obligation applies to the user.</p>
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3.1 SAFETY SIGNS REGARDING RACKS

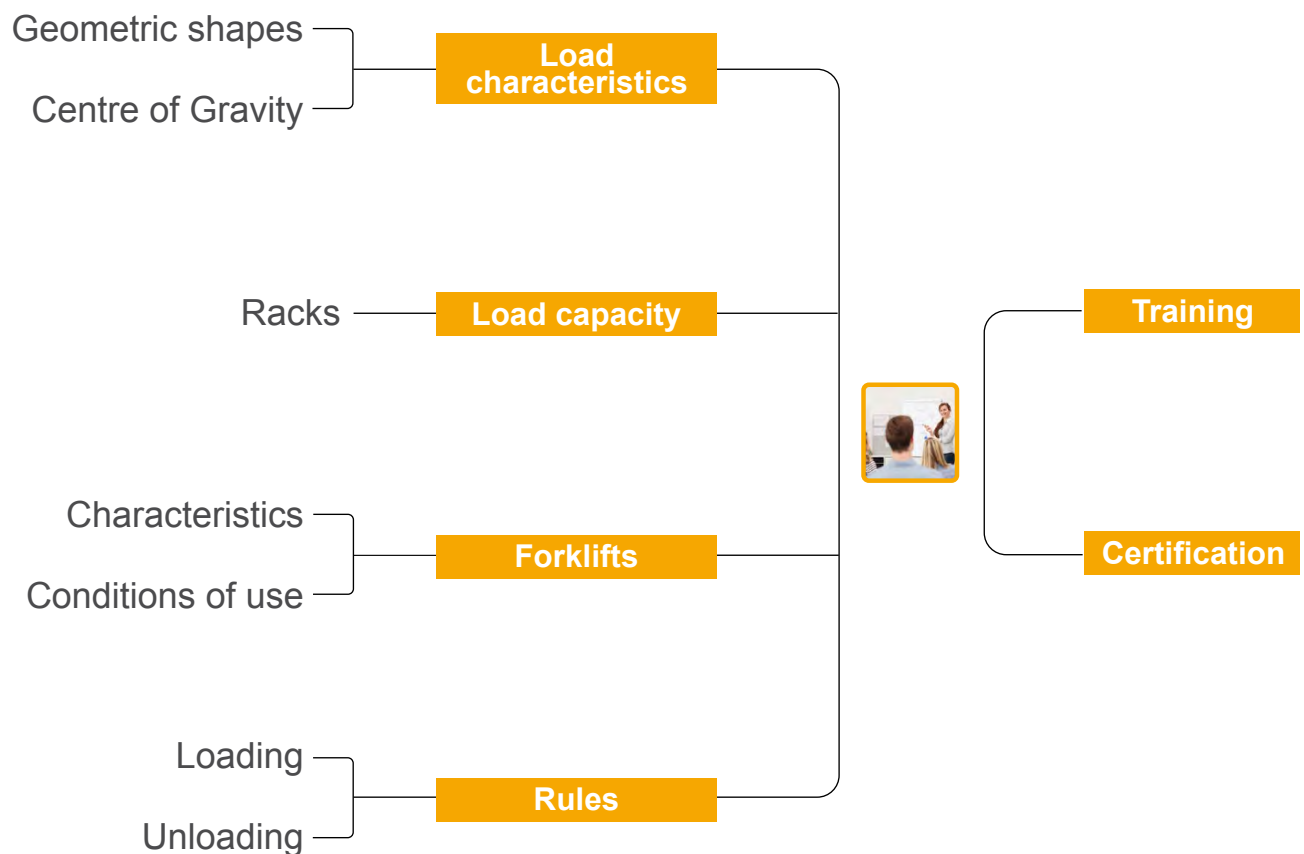
In addition to the recommended capacity plate, we advise the installation of all envisioned safety signs of which we supply an incomplete list of examples.

	Conduct regular inspections to check: <ul style="list-style-type: none"> - correct application and use - loads must be within the safety limits allowed - accidental damage or loosening of structural components
	Please refer any damage to the personal responsible for the safety of the racks
	Do not modify the structure without: <ul style="list-style-type: none"> - checking the effects against the technical data of the manufacturer - obtaining the approval of the supplier
	DO NOT CLIMB UP ON THE RACKS
	Please refer to UNI EN 15635 regulation Use and Maintenance of Storage Equipment For non-EU countries, please refer to local regulations (see Foreword)
	IN CASE OF ANY DOUBTS, PLEASE CONTACT THE SUPPLIER

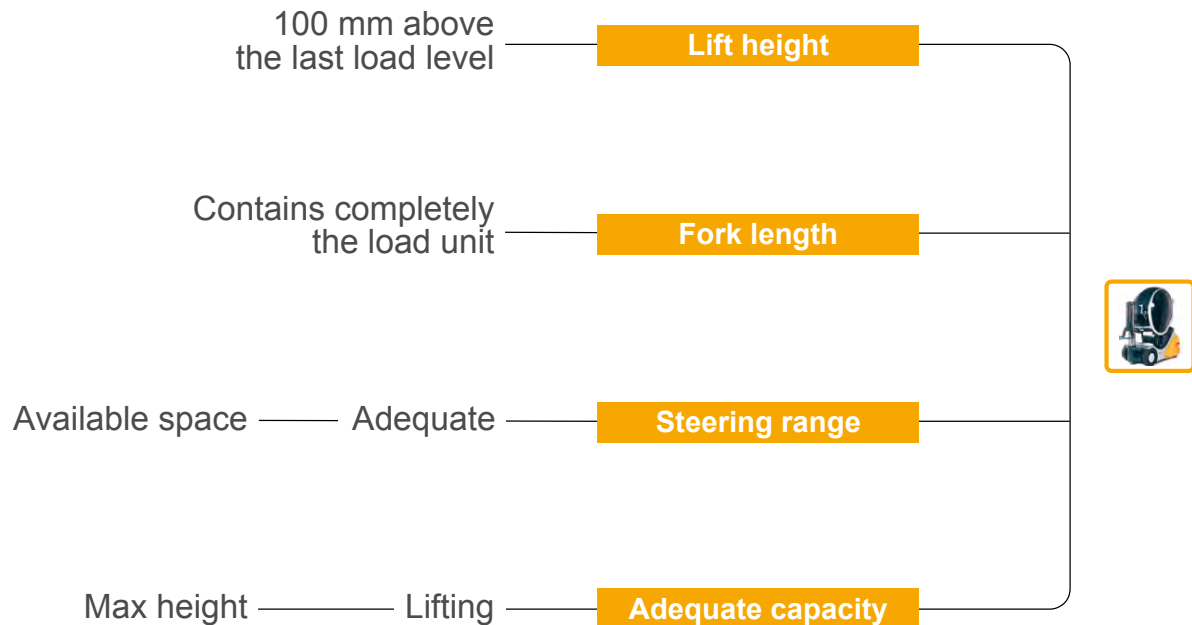
4 CORRECT USE OF RACKS

	<p>Before using the racks make sure the following directions are respected:</p>
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4.1 OPERATOR TRAINING



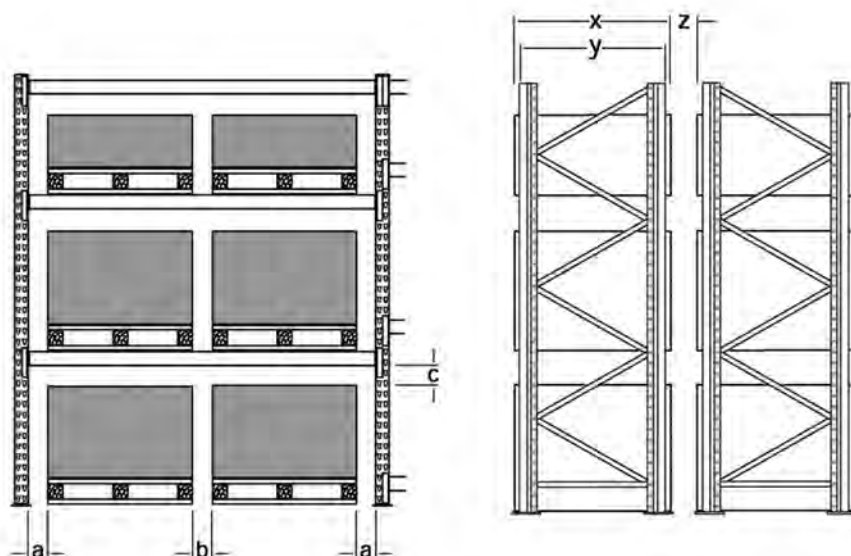
4.2 FORKLIFT



4.3 HANDLING AND STORAGE OF INTERSPACE LOADS

INTERSPACE

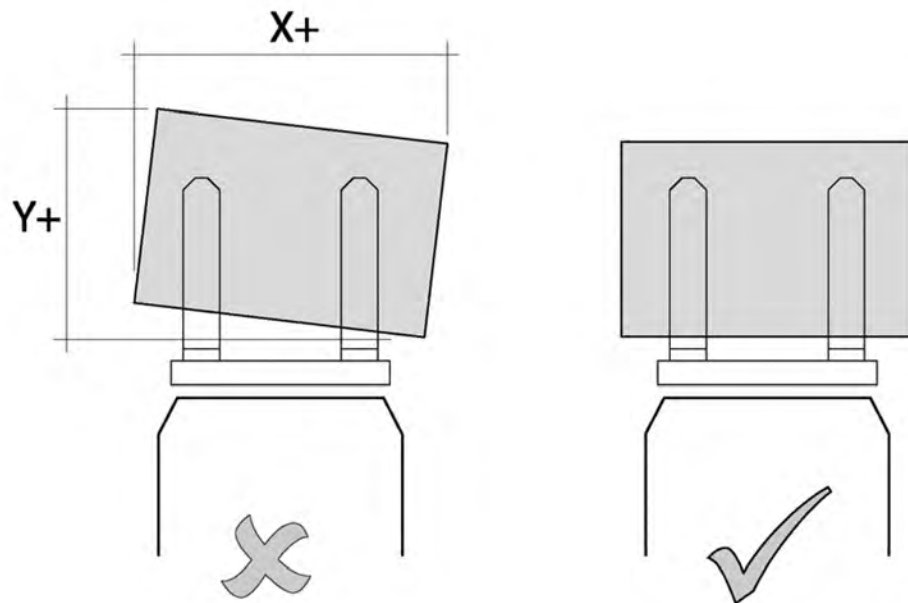
The positioning of the loading unit on the racks must guarantee the minimum operating space defined in regulations, as a function of the type of warehouse and the height of the deposit level.



SL0182

LIFTING THE LOADING UNIT

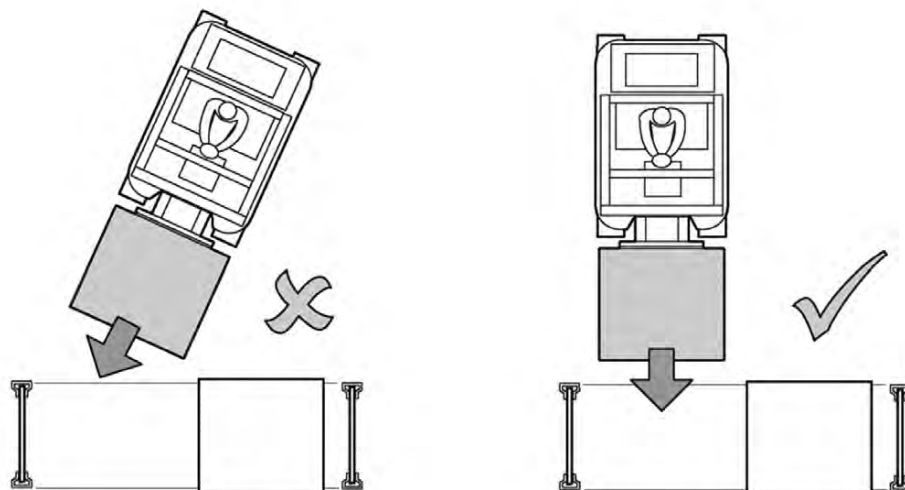
Before lifting, ensure that the loading unit is positioned aligned with the machine.



SL0184

APPROACH AND DEPOSIT

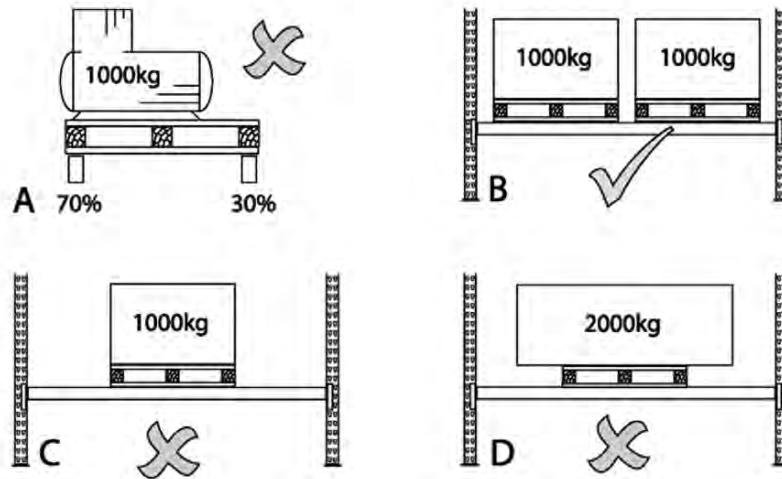
Before positioning on the racks, the approach must be made with the machine aligned.



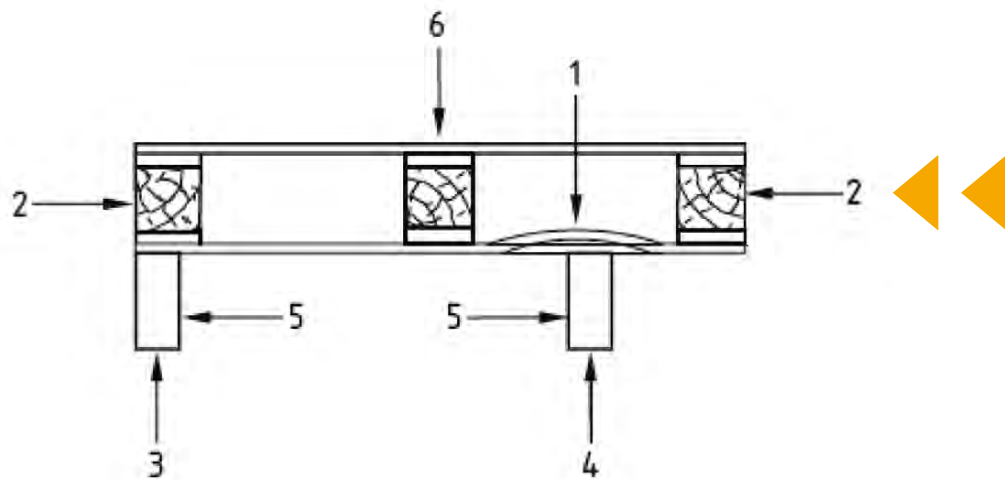
SL0185

POSITIONING ON THE RACK

Please arrange for symmetric positioning and the uniform distribution of loads.



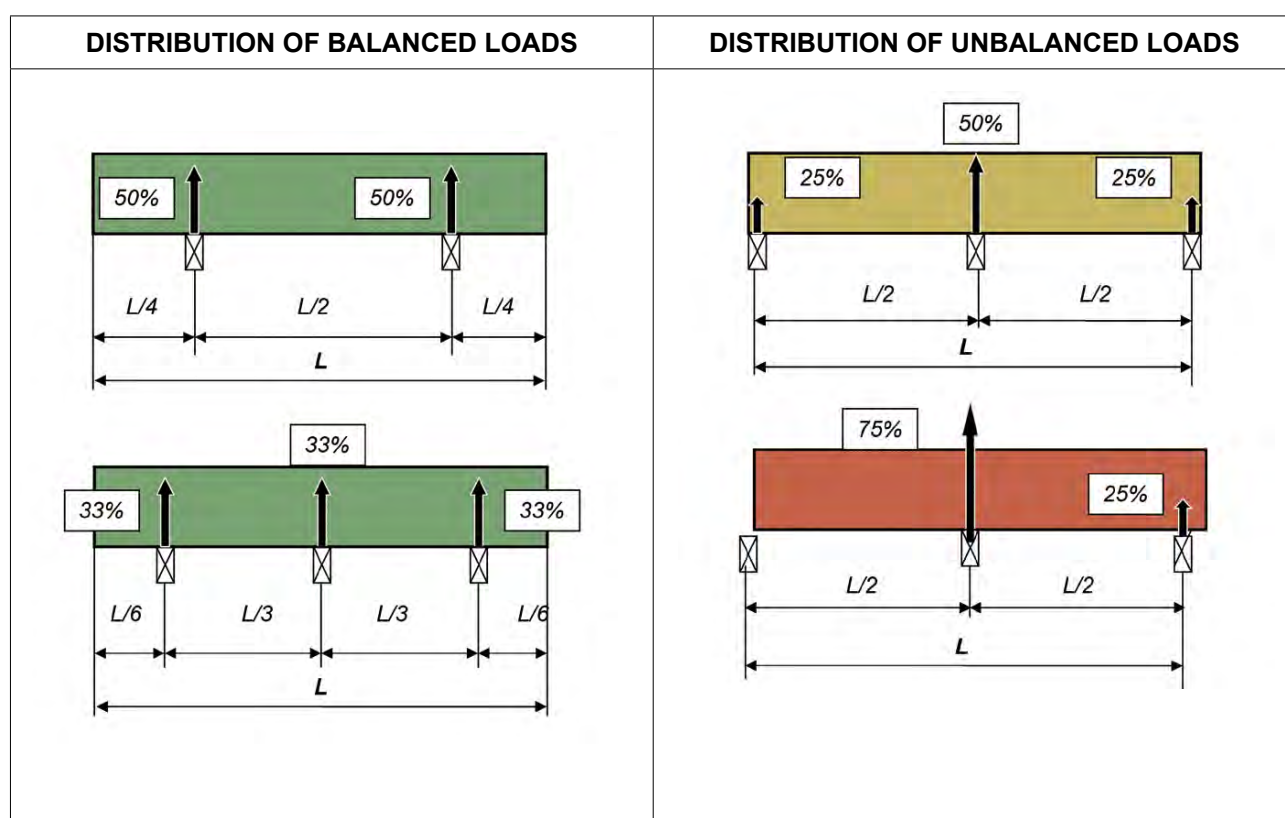
SL0185

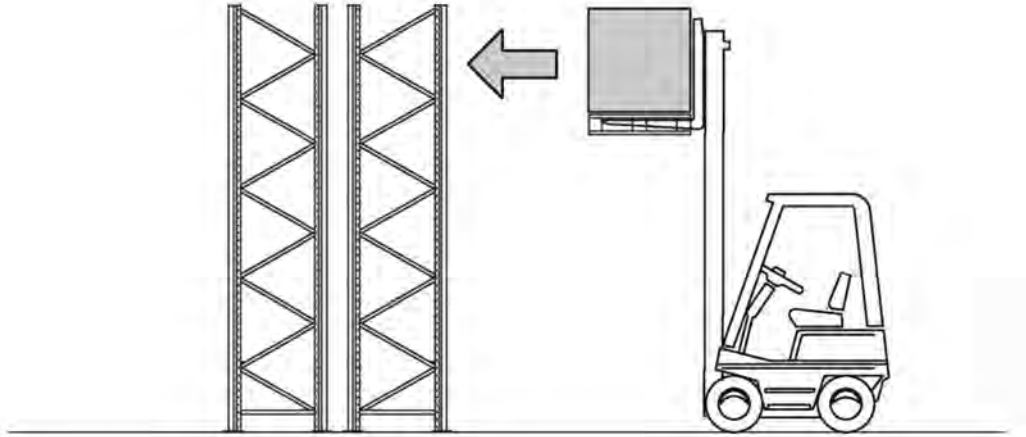


DEPOSIT ON CANTILEVER STRUCTURES



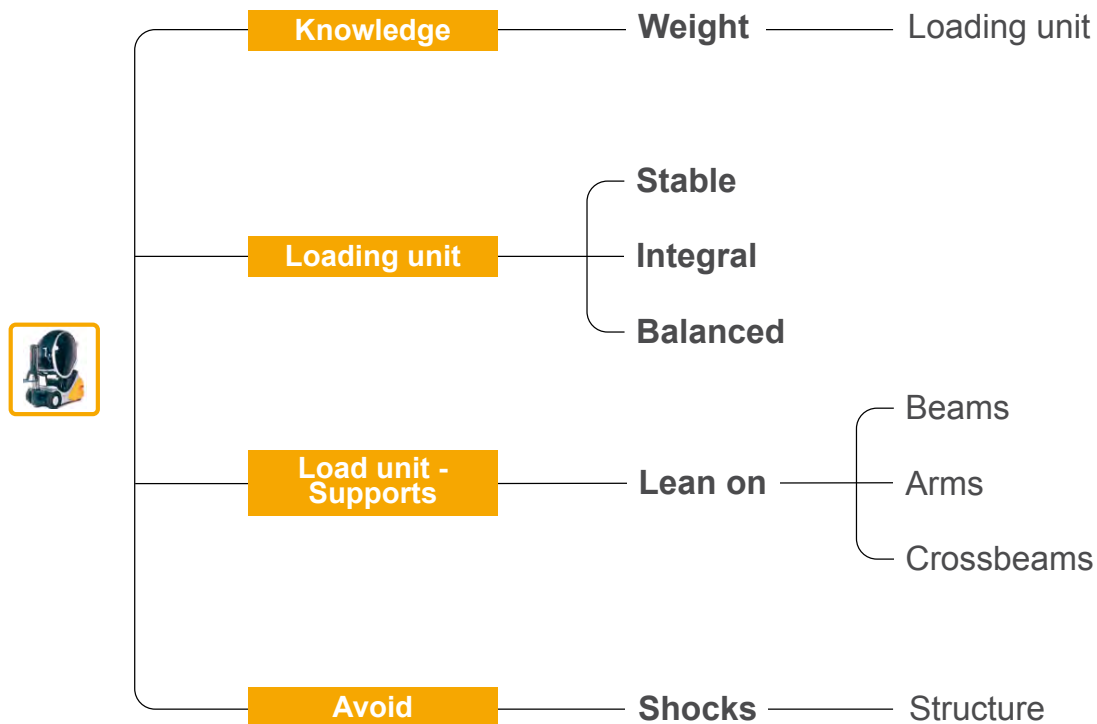
Please pay attention to the symmetric positioning on the shelves and avoid **dangerous imbalances**.



LOADING MOVEMENT OF THE LOADING UNIT**In general anyway:**

- avoid oscillations of the loading unit immediately before positioning on the rack
- align the forks with the horizontal plane before removal and deposit of materials
- avoid dragging or bumping operations that may lead to horizontal stress on the rack





4.4 COMPOSITION AND ARRANGEMENT OF LOADS



FURTHER PRECAUTIONS FOR MATERIALS:

	Always provide for the stable stacking of materials on pallets and try to reduce their extension beyond the edges.	
	In case of deposit of lengthy materials, reduce excessive bending.	
	Deposit the pallets in a direction so as to ensure support of the lower spars.	
	Always use good quality pallets.	


4.5 PROHIBITION OF IMPROPER USE AND INSTRUCTIONS IN CASE OF COLLISIONS

	<p>Improper use of the system is forbidden, given that it may lead to compromising the effectiveness or creation of further risks during use. The following operation practises are to be avoided:</p> <ul style="list-style-type: none"> - climbing onto the structure - using the racks for the deposit or support of materials, systems or structures not approved - linking the system to other structural elements - subjecting the structure to dynamic stress or shocks that are not envisioned in their use.
	<p>In case of improper stress or shocks, during loading, unloading or movement:</p> <ul style="list-style-type: none"> - the operator who caused or noticed the event must immediately notify the safety manager (PRSSS) - the safety manager (PRSSS) must ensure the unloading of the racks and the securing of the structure area - the safety manager (PRSSS), after repairs are made, must provide for the immediate verification of the proper nature of the load. - the safety manager (PRSSS), must record the results of the inspections and actions taken to return to conditions of safety.
	<p>Note</p> <p>A collapse of all or part of the damaged racks may happen even long after the event that produced the instability. The delay depends on different factors, such as gravity and the position of the damage, the real weight deposited, unstable temperatures, etc.</p>
	<p>Modifications of the rack configuration</p> <p>It is forbidden to modify the configuration of the project without prior approval of our Technical Office or with the supplier. Any modification may, with even significant reductions, have negative effects on the capacity of the system and the consequent increase of risks in using the racks.</p>



5 SAFETY OF EQUIPMENT, MAINTENANCE AND INSPECTIONS

5.1 GENERAL INSTRUCTIONS

The following indications are to be implemented for all industrial racks supplied by the company MODULBLOK S.p.A.


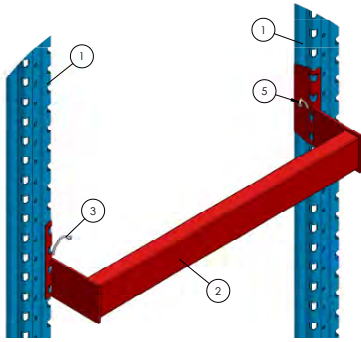
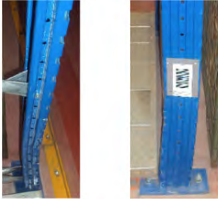
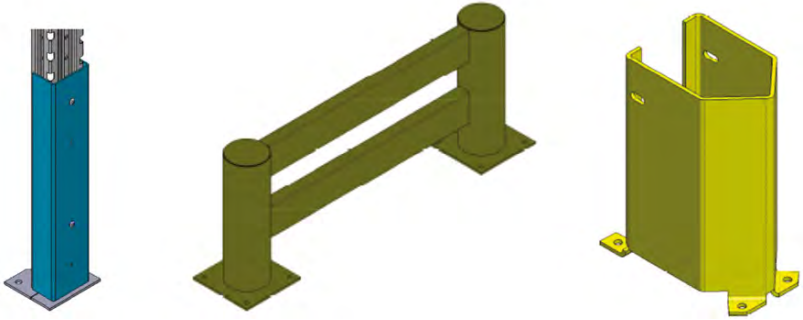

	The user must be aware of the fact that damage reduces the safety factors and the load capacity. It is therefore essential to ensure the rapid identification of any damage.
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5.2 REFERENCE PERSONNEL FOR RACK SAFETY

	The user of the racks must nominate within the company a Person Responsible for the safety of the storage structure, identified as the PRSSS (UNI EN 15635 8.1.1) . For countries outside the EU, please refer to local regulations (see Foreword)
	The user must also implement a management procedure that regards at least the following points: <ul style="list-style-type: none">- use of the storage system in conformance with its specifications- performance of internal periodic inspections by the Competent Technicians- performance of maintenance- limiting damage.

5.3 INSTALLATION OF SAFETY DEVICES

During use of the racks, any shocks or wrong positioning of the loading unit, will lead to the increase of residual risks such as for example items falling from above, the collapse of the structure, etc. So as to reduce the effects of improper use, Modulblok includes the following types of devices.

<p>BACK-STOP SAFETY DEVICES</p>  <p>ATTENTION FOR MATERIALS FALLING FROM ABOVE</p>	
<p>SHOCKS TO BRACES:</p> <ul style="list-style-type: none"> - shock protection - front protection - equivalents 	
	<p>THE PURCHASER ASSUMES ALL LIABILITY</p> <ul style="list-style-type: none"> - should use of the racks involve the risks listed above, and should the purchaser not have bought the equipment indicated above, he shall provide with his own means for the elimination or reduction to the minimum said risks. - should use of the racks involve the risks listed above, and should the purchaser have bought the equipment indicated above, he shall provide with own means for the elimination or reduction to the minimum of said risks, keeping in consideration the contribution to safety supplied by the equipment itself.

5.4 SYSTEM MAINTENANCE: USER OBLIGATIONS

The good functioning of the system is linked to its proper use and preservation. The task of inspecting and maintaining efficient the racks is the **responsibility of the user**.

For Italy the reference regulation for the aspects of health and safety is Legislative Decree no. 81/2008 “Unified Text on Safety”. In particular article **15 “General Measures and Protection”** which lists in general but complete terms all those obligations and duties of the Employer. From this we notice specifically **article 71 “Obligations of the Employer”** regarding equipment in general.

For other countries: according to the regulations of the country of installation - see Foreword).


5.5 PERIODIC INSPECTION AND MAINTENANCE OF THE SYSTEM (UNI EN 15635)






The fundamental purpose of inspecting the racks is to confirm any damage or malfunction that might compromise the safety of the structure and its operating procedures. Any irregularity must be registered or classified according to the level of damage that characterises the accompanying risk factor.

To reduce or, better, eliminate the risk factor produced, it is important to determine the type of action to be taken, whether this might be for example a repair or a modification to the warehouse operating procedures.

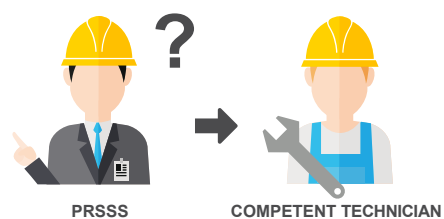
1. GENERAL INSPECTIONS

- 
- 1 Structural damage
 - 2 Presence and observation of capacity plate
 - 3 Presence and observation of safety signs
 - 4 Pallet loading mode
 - 5 Rack loading mode
 - 6 Support panel integrity
 - 7 Deformations of components under loads
 - 8 Deformations void in full unloading of components
 - 9 Connections between base plates, braces, beams
 - 10 Integrity and tightening of ground bolts
 - 11 Absence of cracks or crevices (welds)
 - 12 Presence and integrity of devices
 - 13 Presence and correct insertion of anti-release safety devices
 - 14 Condition of vertical frame
 - 15 Correspondence to the configuration of the delivered system



2. GRAVITY LEVEL

-  Frequent monitoring
-  Repairs in defined times
-  Limit access and emptying

3. ACTION DECISION




The stages of periodic inspections may be divided into two categories:

	<p>Inspections that are mainly visual, being easy and frequent to perform by internal personnel. We recommend a quarterly report to the PRSSS.</p>
	<p>Periodic inspections, including measurements, performed by a competent technician at least every 12 months (UNI EN 15635 – 9.4.2.3), a technician that must issue to the PRSSS a report indicating each anomaly discovered:</p> <ul style="list-style-type: none"> - the position in the racks and the type of component damaged, with indications of the possible cause that generated it - activities recommended for recovery of operations - the level of the damage

For non-EU countries, please refer to local regulations (see Foreword).

We recommend that the results, both of this inspection and of every corrective action taken for anomalies discovered **should be recorded** in chronological succession in a specific registry by the system manager. An example of the registration sheet of internal inspection activities is illustrated here below.

	<p>Following any accident specific inspections must be programmed</p>
---	--



Identifying number:

[] other

M WWW.MODULBLOK.COM

5.6 MAINTENANCE OF THE SYSTEM

If it becomes necessary to intervene on damaged components, we recommend their replacement with the same material from the same manufacturer and of new production. In case of modification to the technical specifications of the components, it will be up to the Technical Office to indicate the most adequate compatible solution.

6 FIRE SAFETY

6.1 RACK FIRE RESISTANCE

Given the morphology of the racks, essentially made up of sheet metal of low thickness, it is impossible to equip them with any R, assuming therefore the value $R=0$.

6.2 RACK FIRE REACTION

In Italy Ministerial Decree of 10.3.2005 "Classes of reaction to fire for construction products to be used in works for which safety requirements are recommended in case of fire", permits among other things the classification of racks entirely in steel for Classes A1 and A1 FL (the old Class 0, intended for non-combustible products) without having to perform experimental tests (Attachment C to the MD of 10.3.2005).

7 IDENTIFICATION AND EVALUATION OF POTENTIAL RISKS LINKED TO ASSEMBLY AND USE OF RACKS

The addressee of the contents of the following chapter is the Health & Safety Manager of the user. Herein we propose an evaluation of the risks deriving from work activity and reasonably predictable results. Identification of risk factors has been guided by the knowledge available on legal regulations and technical standards and data derived from experience. A more punctual evaluation, managed by the user, may be necessary on the basis of the peculiar characteristics of the place where the racks are to be installed/used, **considering this evaluation as one in general terms.**

The estimate of risk is produced taking into consideration the **seriousness of the damage**, in terms of a range of predictable consequences of the event (lesions, disturbances, pathologies), and the **probability of occurrence** of the dangerous event.

All this has been translated adopting a pseudo-mathematic model, among other things equal to that used internally in the company for the general evaluation of risks (GER), where we highlight how the amount of risk (R) is a function of the combined probability (CP) that a certain event might occur and the amount of damage (D) caused.

$$R = CP \times D$$

Where **CP** is the function of:

- **Frequency**/time of exposure to dangerous event
- **Probability** of occurrence of dangerous event
- **Ability to avoid** dangerous event (competence/training/awareness)

7.1 SCALE OF OVERALL POSSIBILITY AN EVENT MIGHT OCCUR

Level	Description	Definition
5	Frequent	There exists a direct correlation between the noticed risk and the occurrence of hypothetical damage for the worker. Damage has already occurred for the same risk registered by the same company or other similar company. The occurrence of possible damage would provoke no surprise.
4	Occasional	The risk registered may provoke damage, even if not in an automatic or direct way. Several episodes have been noted in which the risk provoked damage. The occurrence of possible damage would provoke only moderate surprise.
3	Rare	The risk registered may provoke damage, even if not in an automatic or direct way. Several episodes have been noted in which the risk provoked damage. The occurrence of possible damage would provoke surprise in the company.
2	Small probability	The risk registered may provoke damage only in an unfortunate circumstance of events. Only very rare episodes have been noted of episodes already occurred. The occurrence of possible damage would provoke great surprise.
1	Improbable	The risk registered may provoke damage through a series of improbable independent events happening together. No episodes have been registered. The occurrence of damage would provoke incredulity.

7.2 SCALE OF AMOUNT OF DAMAGE PROVOKED BY AN INCIDENT

Level	Description	Definition
5	Lethal	Accident or incident of acute exposure with lethal effects or total invalidity. Chronic exposure with lethal effects and/or total invalidity. Death.
4	Very serious	Accident or incident of acute exposure with partially handicapping events. Chronic exposure with irreversible or partially handicapping effects. Serious and permanent damage to health.
3	Serious	Accident or incident of acute exposure with partially reversible handicap. Chronic exposure with partially reversible effects. Slight permanent damage to health.
2	Medium	Accident or incident of acute exposure with reversible handicap. Chronic exposure with reversible effects. Damage to health is curable with work absence.
1	Light	Accident or incident of a cute exposure with rapidly reversible handicaps. Chronic exposure with rapidly reversible effects. Damage to health is curable without work absence.

7.3 RISK INDEX (R = CPxD)

MATRIX OF RISK EVALUATION





PROBABILITY	5	10	15	20	25
	4	8	12	16	20
	3	6	9	12	15
	2	4	6	8	10
	1	2	3	4	5
	DAMAGE				

Legend:

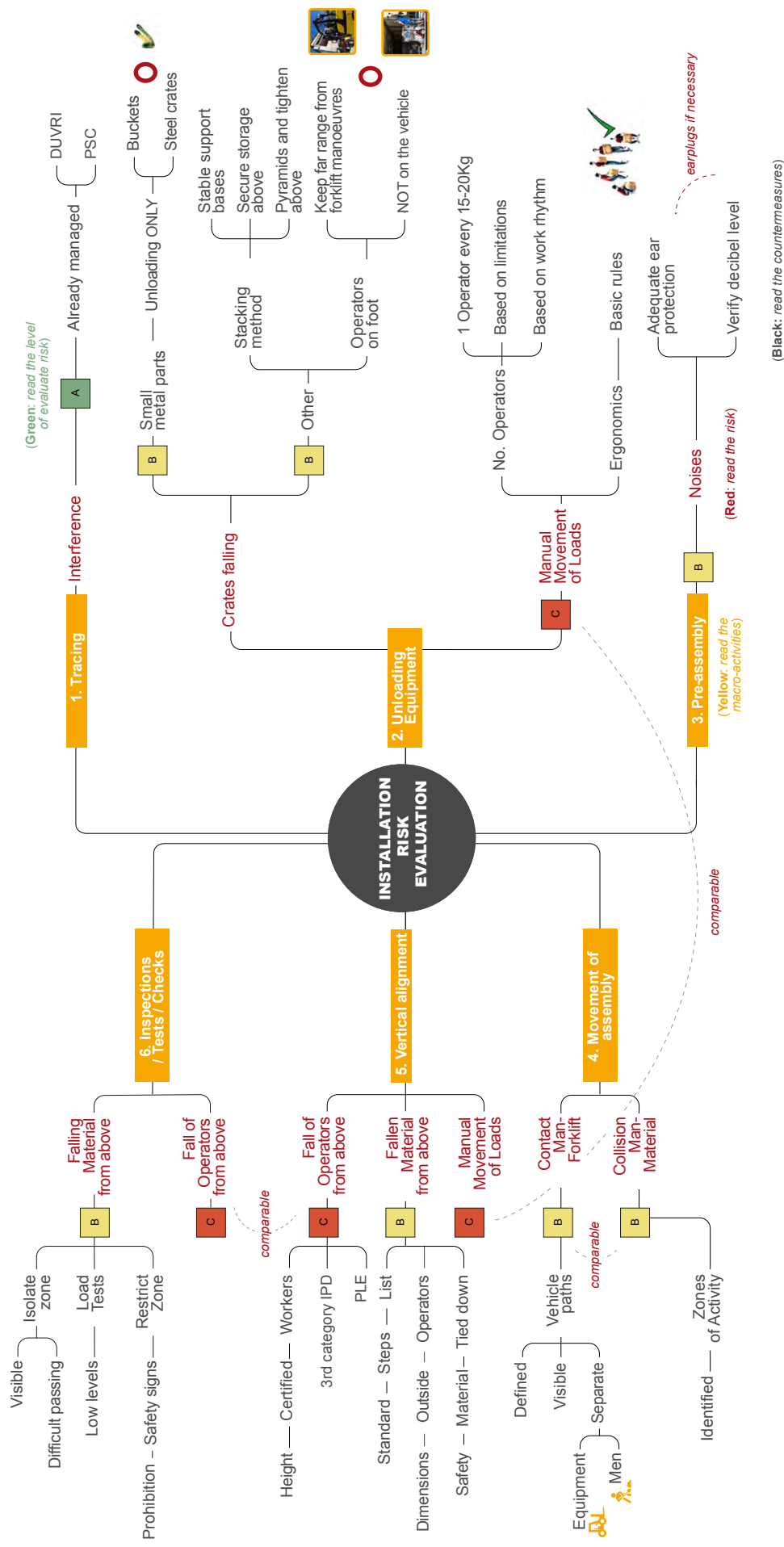
A	ZONE A MODEST RISKS Improvement action to be evaluated during design stage
B	ZONE B: MEDIUM RISKS / UNCERTAINTY ZONE Remedial/improvement action to be planned in the short term. A specific evaluation of risks becomes necessary
C	ZONE C: IMPORTANT RISKS Remedial actions must be planned urgently

7.4 MAXIMUM LOAD TO LIFT WITHOUT AUXILIARY DEVICES: 15 KG

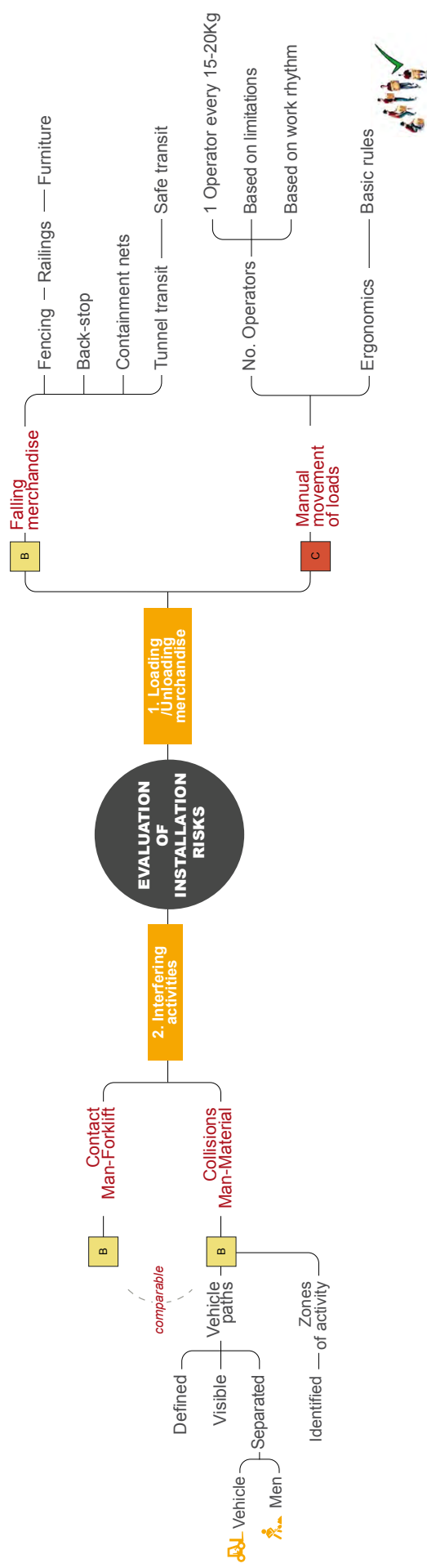


GENERAL CONSIDERATIONS			
	The evaluation of the Risk Level takes into consideration an obligation of the Employer, which includes the Collective Protection Device. That is to say that adequate and specific training must be performed, as well as training and the relative verification of acquired knowledge.		
	Herein we mention several overall risks in each stage judged as moderate which require the use of Individual Protective Devices.		
1. Bumps to the head 2. Contusions 	1. Contusions 2. Hole-punching 3. Crushing 4. Slipping 	1. Collisions 2. Cuts 3. Abrasions 4. Punctures 	

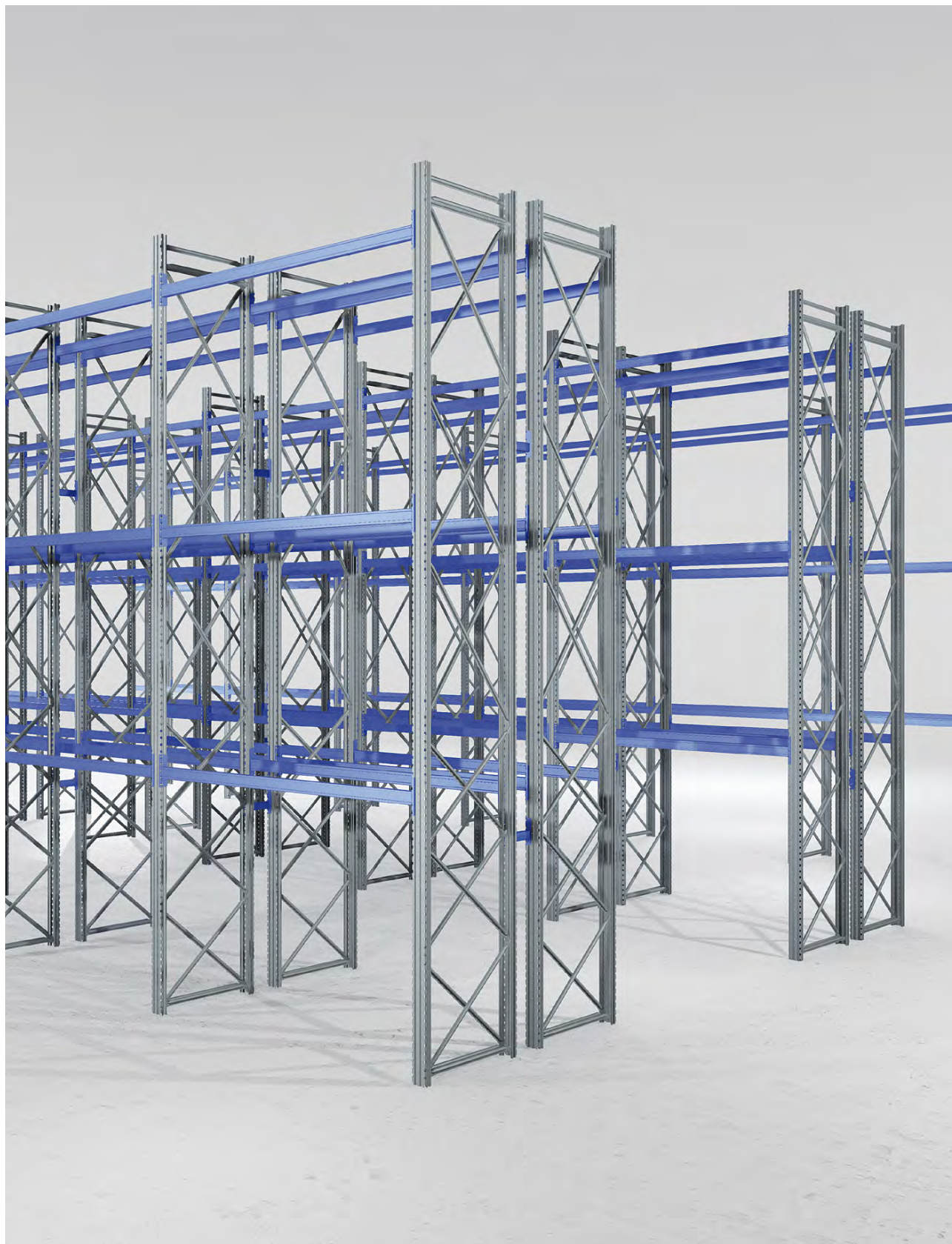
7.5 ASSIGNMENT OF RISK CATEGORIES DURING RACK ASSEMBLY



7.6 ASSIGNMENT OF RISK CATEGORIES DURING USE OF RACKS



PALLET RACKS



GENERAL DESCRIPTION

Pallet holder type racks are essentially made up of vertical elements, frame pieces, and horizontal elements, beams, which cross the locked connection and make up the load panels.

MAIN ELEMENTS:

- **Frame:** Vertical support element made up of two uprights, connected by a bolted bracing and anchored to the ground using feet
- **Upright:** Vertical support element, on which the beams are connected, to support the weight
- **Bracing:** Connecting poles in tubular or open C sections of the uprights, which are divided into traverses and diagonals
- **Foot plate:** Structural support component used to attach to the base of the uprights
- **Beam:** Horizontal element connected to the frame uprights; a pair of beams (front and back) represent a load level
- **Safety pin:** Device to avoid the accidental unlocking of the beams; the pin **MUST** always be present

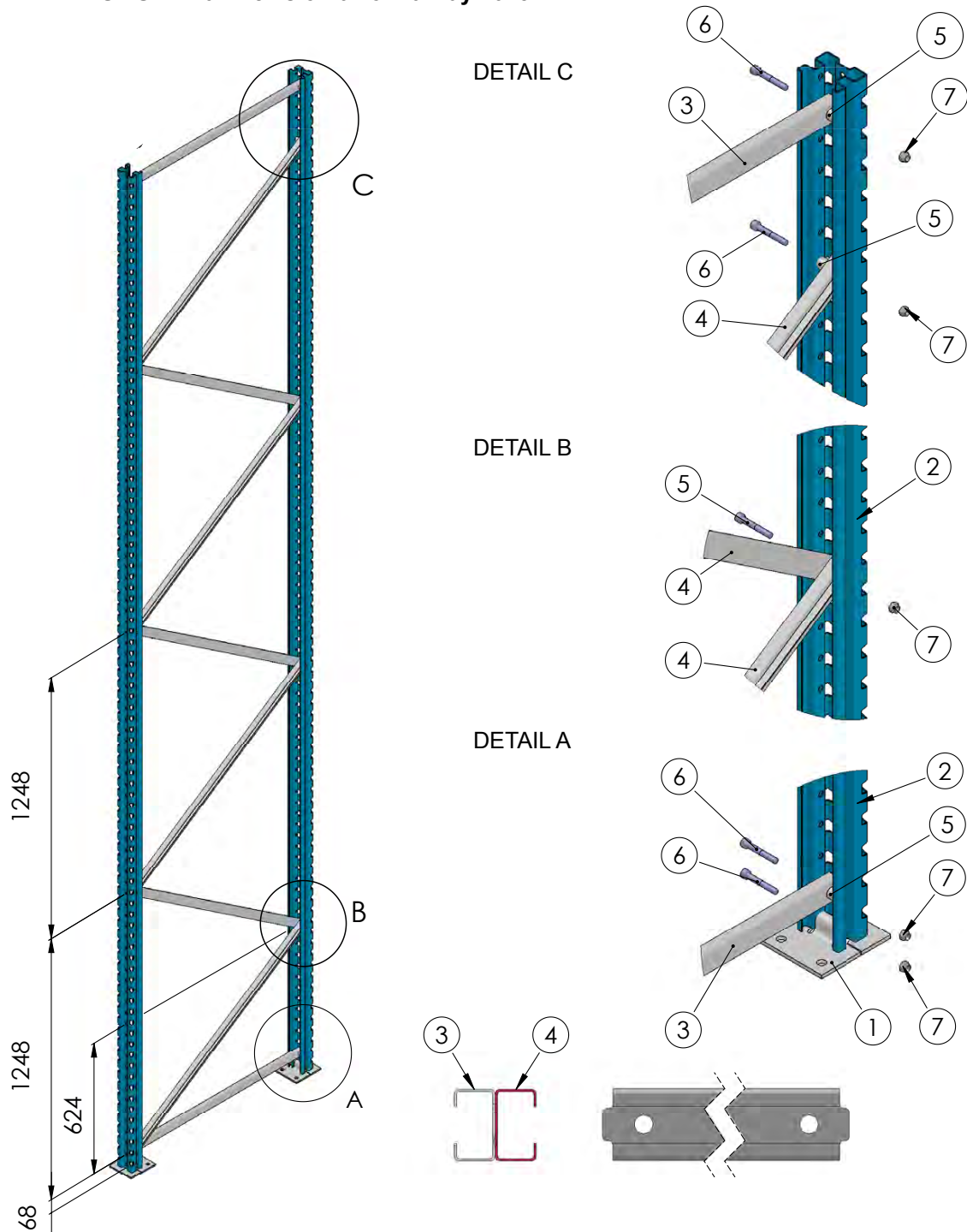
DEFINITIONS:

- **Longitudinal direction:** Parallel to the main axis of the racks and the corridor
- **Horizontal direction:** Parallel to the frame panel. Front with respect to the person observing the racks from the corridor
- **Single side:** Racks made up of only one row of frames, generally loaded from only one side
- **Double side:** Racks made up of two rows of frames, connected using spacers, generally loaded from two sides

The frames are delivered unassembled and must therefore be assembled according to the indications shown on the specific layout and the typical sketch shown below.

Before assembly of the frames, please arrange two workhorses on which to lean the two uprights of a frame. Insert the bracing elements and proceed with the attachment of these according to the directions to the configuration drawing.

PALLET RACKS - SCD 10 - Revision 01 of 20 May 2015

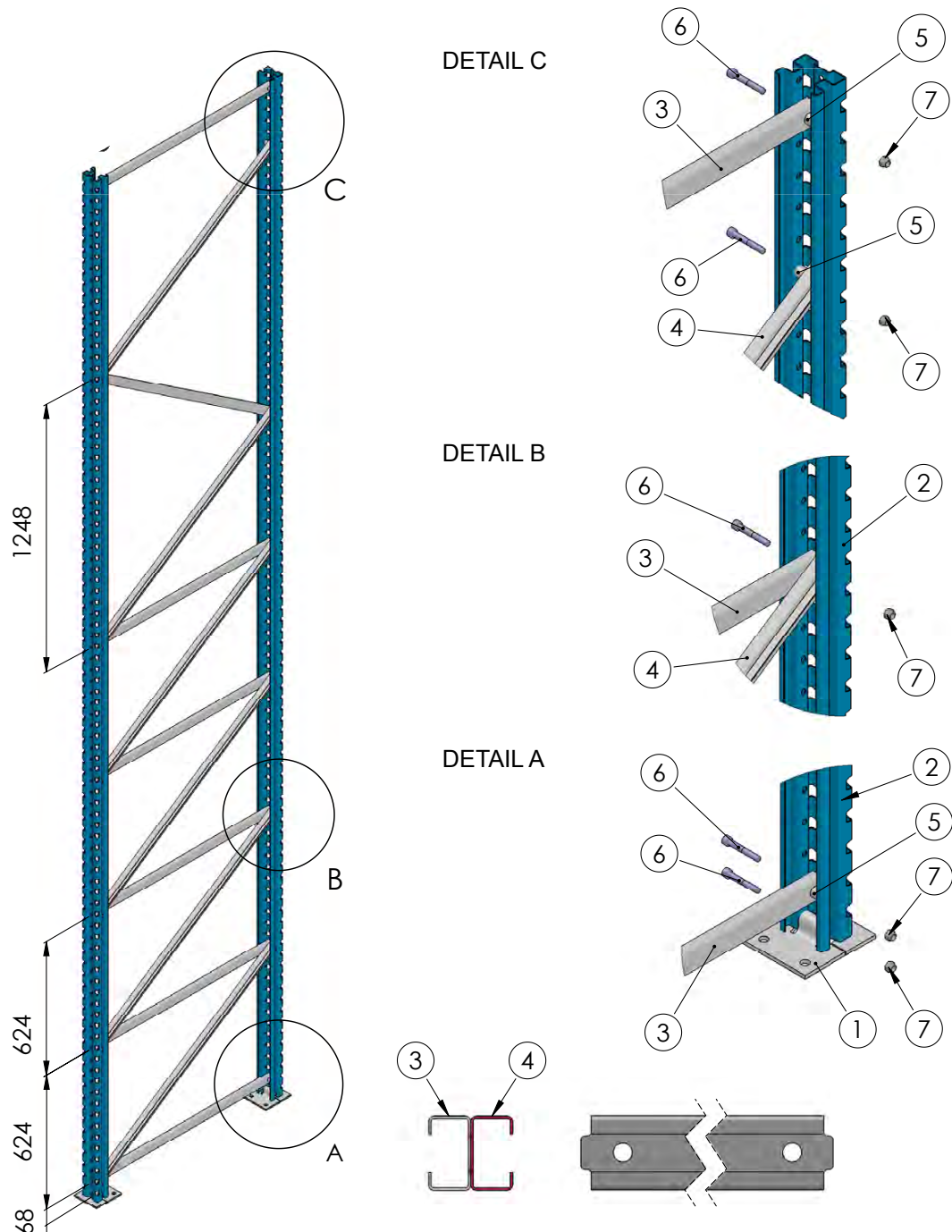


TYPE OF FRAME A15D - B18D

COMPONENTS

- 1) Foot plate A-B
- 2) Upright A-B
- 3) Traverse "C" 35x20x8.5x1.2
- 4) Diagonal "C" 35x20x8.5x1.2
- 5) Spacer L=20
- 6) Screw M8x55 UNI 5931
- 7) Nut M8 UNI 7474

PALLET RACKS - SCD 11 - Revision 01 of 20 May 2015

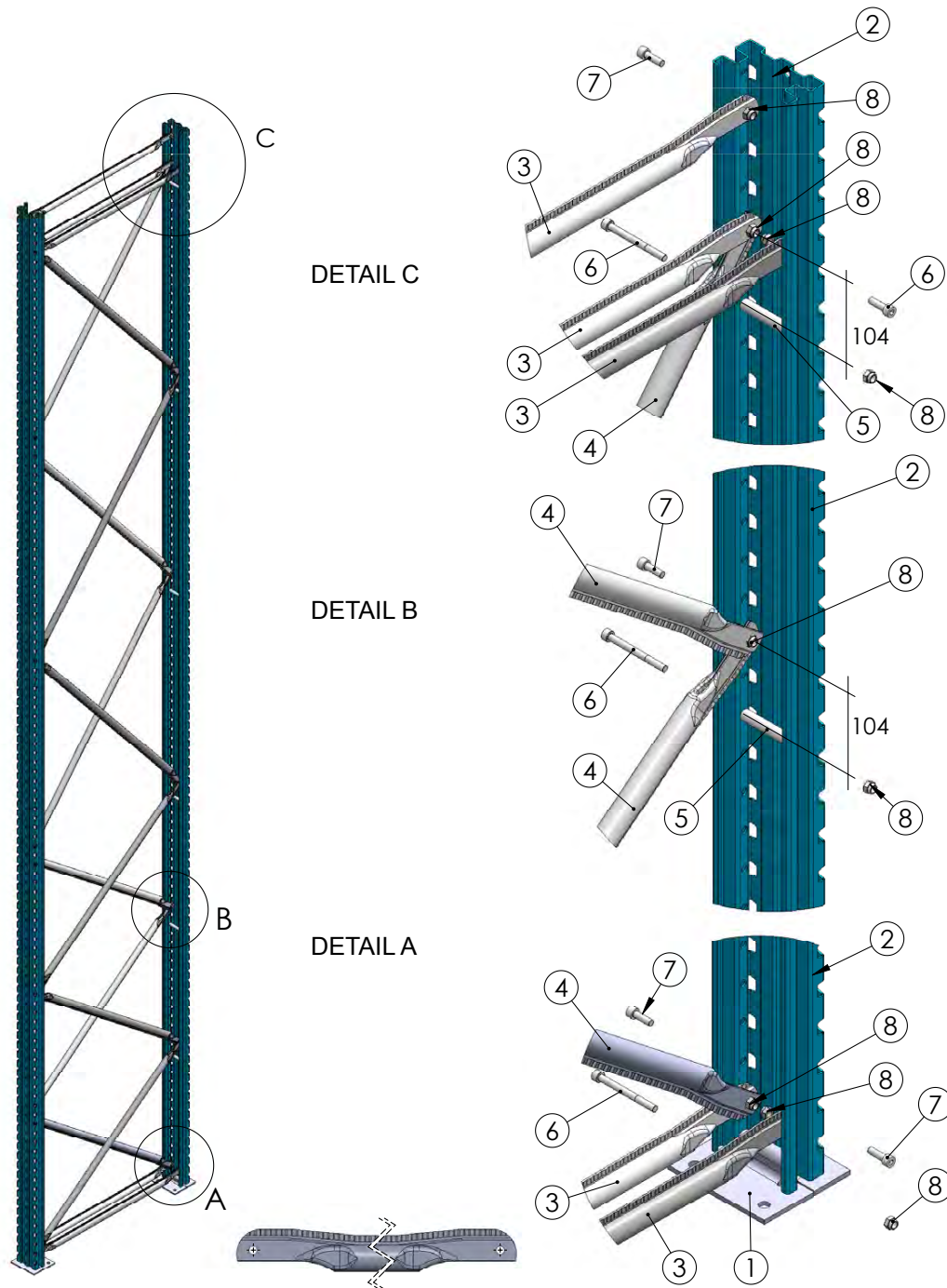


TYPE OF FRAME A15ZD - B18ZD

COMPONENTS

- 1) Foot plate A-B
- 2) Upright A-B
- 3) Traverse "C" 35x20x8.5x1.2
- 4) Diagonal "C" 35x20x8.5x1.2
- 5) Spacer L=20
- 6) Screw M8x55 UNI 5931
- 7) Nut M8 UNI 7474

PALLET RACKS - SCD 13 - Revision 01 of 10 June 2015



TYPE OF FRAME C18X - C20X - D20X

COMPONENTS

- 1) Foot plate C-D
- 2) Upright C-D
- 3) Traverse NPRF Ø30
- 4) Diagonal NPRF Ø30
- 5) Spacer L=70
- 6) Screw M8x25 UNI 5931
- 7) Nut M8 UNI 7474

ASSEMBLY STEPS

1	Assemble the frames according to the project instructions and the attached layouts
2	If necessary, once assembled and before vertical alignment, we recommend depositing the extended frames, stacking no more than 10 elements together in each stack
3	Lift the frame off the ground, arrange it sideways and then, manually, or using a lifting device and adequate equipment, along the attachment point traced out in advance and maintain it on the site
4	Lift and position the second frame piece following the method indicated in the preceding point
5	Connect the beams and insert immediately the safety hook. In the case of tall structures, it will be convenient to start with the last load level and then descend. For low racks, it is possible to pre-assemble the first span module on the ground and then lift it using harnesses
6	Proceed with the vertical alignment as per numbers 3-5
7	If present, assemble the bracing span first and then proceed with the racks. This will contribute also to maintaining alignments
8	Attach all the upright braces to the ground using the equipped bolts (standard 2 bolts per foot) taking care that the positioning of the bolt enters the hole and that the bolts are all tightened, after which re-verify by sample respect of the tolerances according to the tables in the project. (UNI EN 15620)

At the end of the work, measure the arrangement and the heights of the racks that must respect the following tolerance limits:

- vertical alignment in a horizontal direction equal to 1/500 (frame level/plane) of the upright height
- vertical alignment in a longitudinal direction equal to 1/500 (beam level/plane) of the upright height

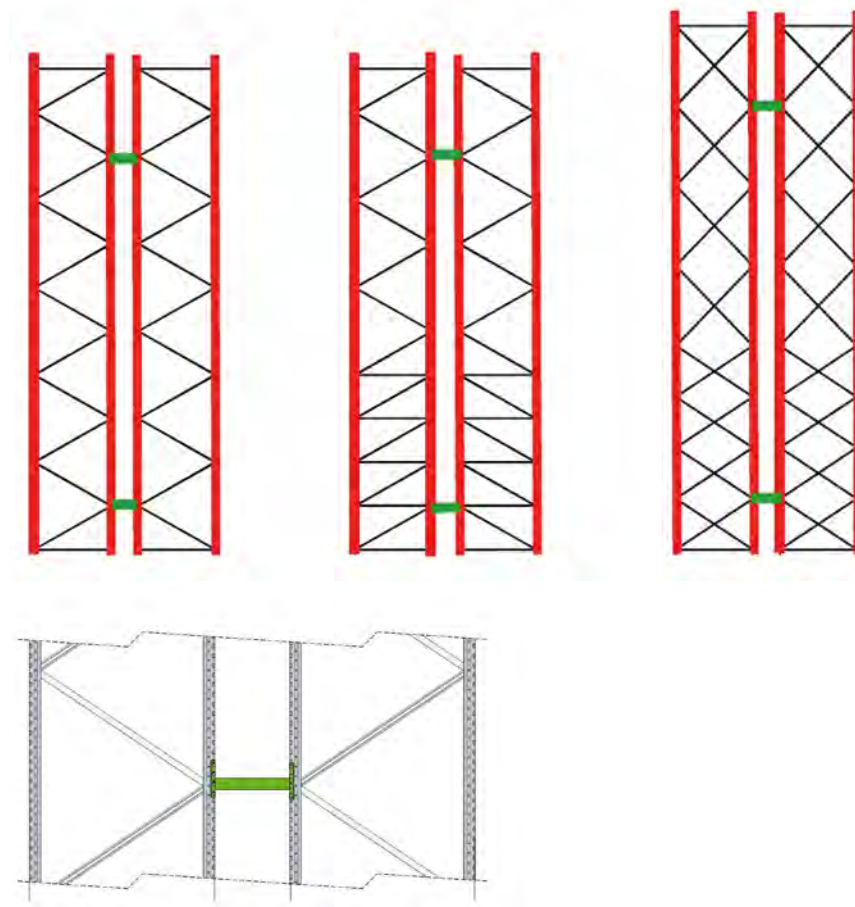
These tolerances are valid **ONLY** for systems served by front forklift and/or except when otherwise indicated on the supplied layouts. (Class 400 UNI EN 15620).

DOUBLE SIDE RACKS:

The arrangement of the spacers must respond to the following requirements:

- at least two spacers per pair of frame pieces, one in correspondence to the first lattice-work knot, one in correspondence to the last
- at least one spacer about every 2.5m between each.

Examples of frames with different bracings with the spacer elements indicated in green.

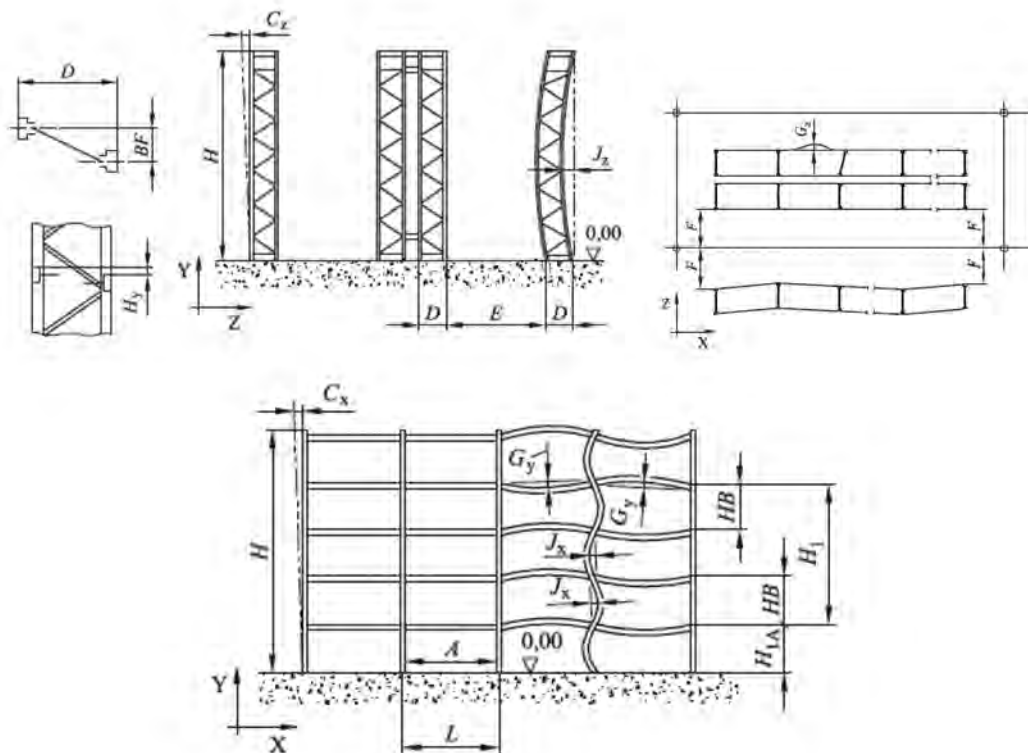


Pay attention to the positioning of the frames so that the bracings are specular

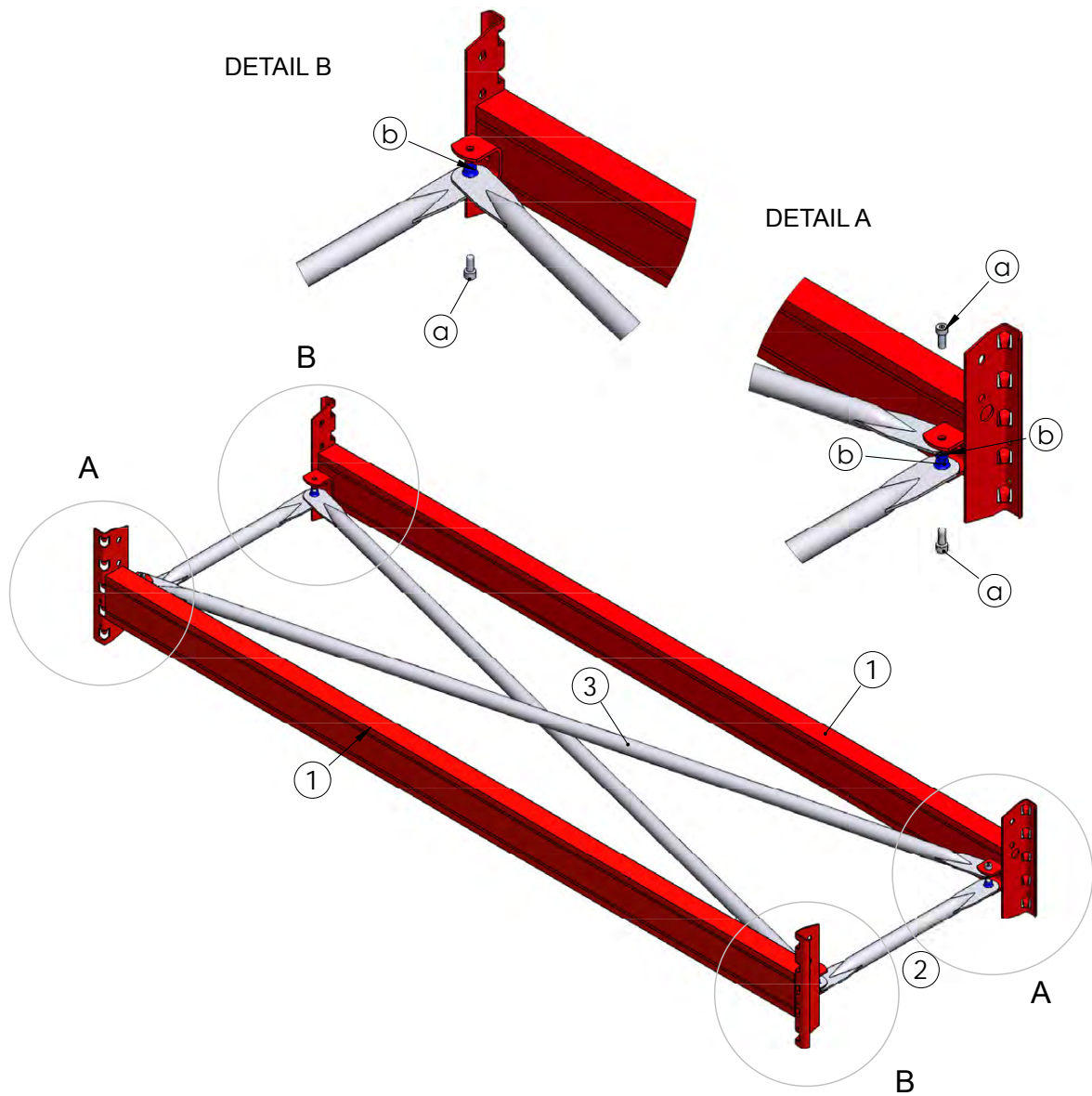
ASSEMBLY TOLERANCES:

Valid for racks served only by front lift (Class 400)

Symbol	Description	Tolerance
BF	Non-alignment between upright frames	± 20 mm
Cx	Longitudinal direction frame non-aligned	H/500
Cz	Horizontal direction frame non-aligned	H/500
δE	Tolerance of the straightness of the corridor compared to the ideal axis	± 15 mm
δH_{1A}	Variation of the first load level above the base plate	± 10 mm
δH_n	Variation of any load level compared to the first	± 5 mm
H_y	Variation of the level of support between front and back beams	± 10 mm



PALLET RACKS - SCD03 - Revision 01 of 10 March 2015

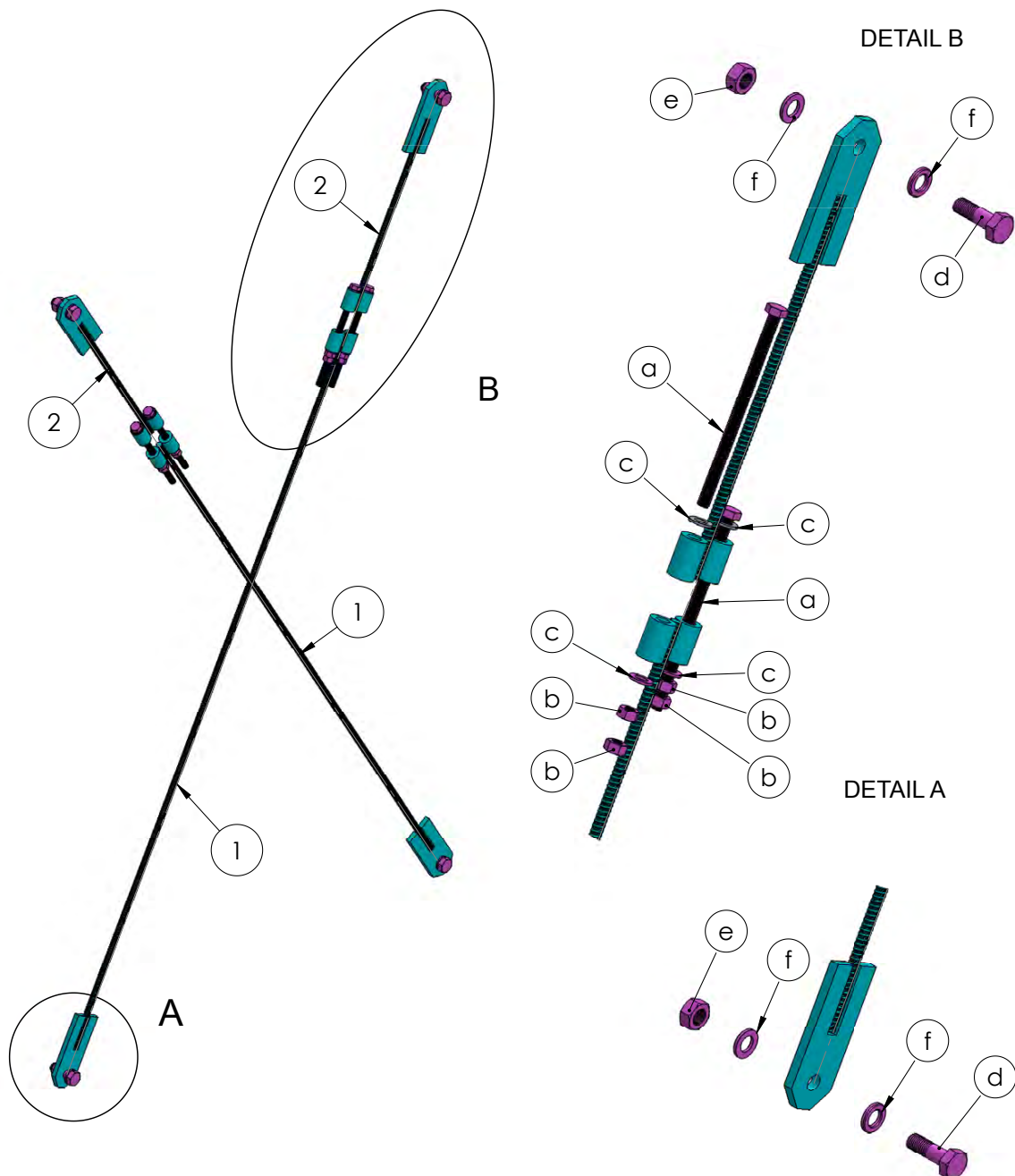


HORIZONTAL BRACING

COMPONENTS

- 1) Beam with fork
- 2) Traverse
- 3) Diagonal
- a) Screw M8x20 UNI 5931
- b) Nut M8 UNI 7474

PALLET RACKS - SCD12 - Revision 01 of 20 May 2015

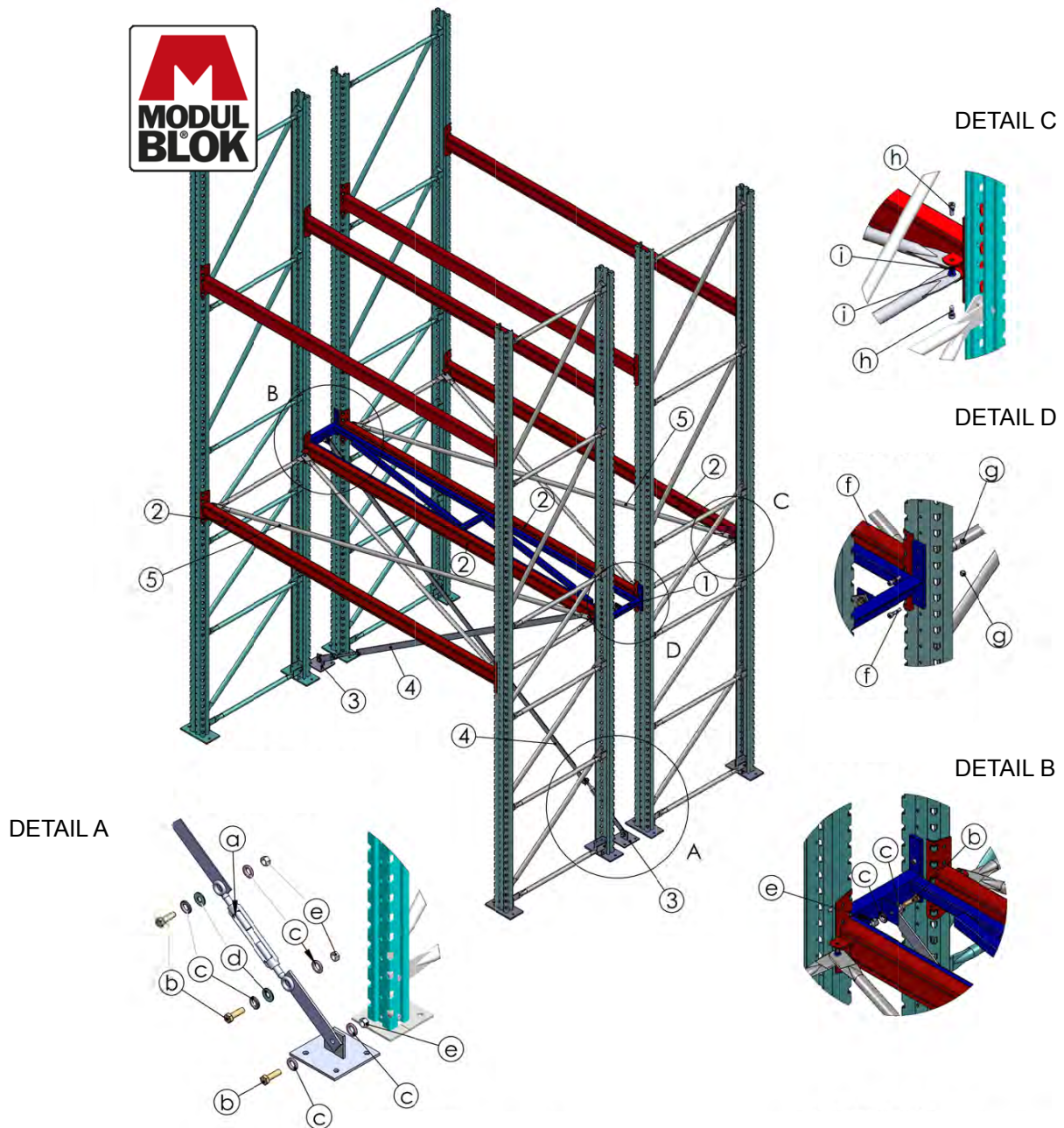


ROUND VERTICAL BRACING

COMPONENTS

- 1) Tie rod L1
- 2) Tie rod L2
- a) Screw M12x200 UNI 5739
- b) Nut M12 UNI 5588
- c) Washer M12 UNI 6592
- d) Screw M16x50 UNI 5712
- e) Nut M16 UNI 5713
- f) Washer M16 UNI 5714

PALLET RACKS - SCD 01 - Revision 01 of 10 March 2015

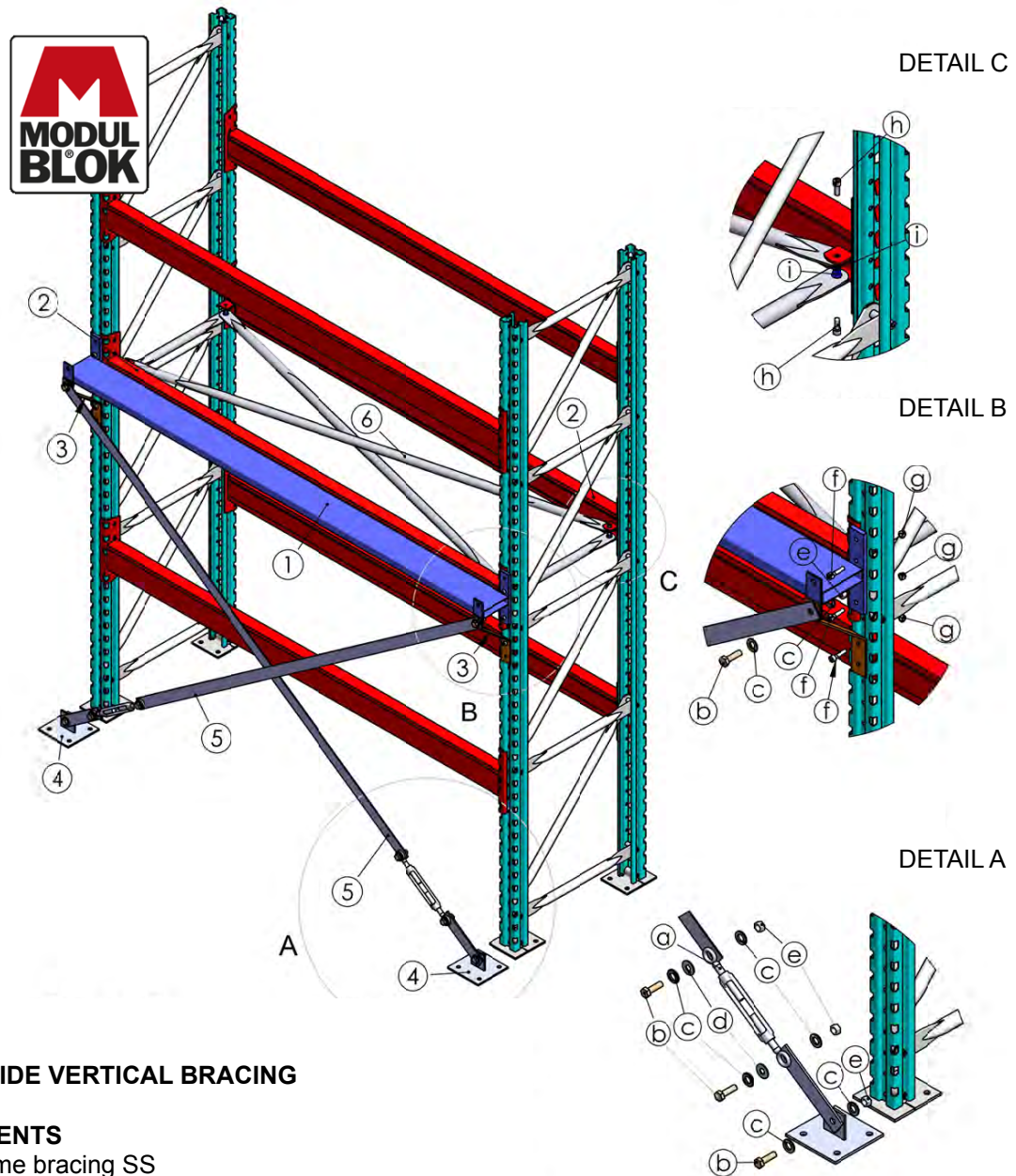


DOUBLE SIDE VERTICAL BRACING

COMPONENTS

- | | | | |
|----|--------------------|----|-----------------------|
| 1) | Frame Bracing DS | a) | Tensioner |
| 2) | Beams support CV | b) | Screw M12x40 UNI 5739 |
| 3) | Foot-plate CV | c) | Washer M12 UNI 6592 |
| 4) | Bracing | d) | Washer M12 UNI 6593 |
| 5) | Horizontal bracing | e) | Nut M12 UNI 5588 |
| | | f) | Screw M8x40 UNI 5739 |
| | | g) | Nut M8 UNI 7474 |
| | | h) | Screw M8x20 UNI 5739 |
| | | i) | Nut M8 UNI 6923 |

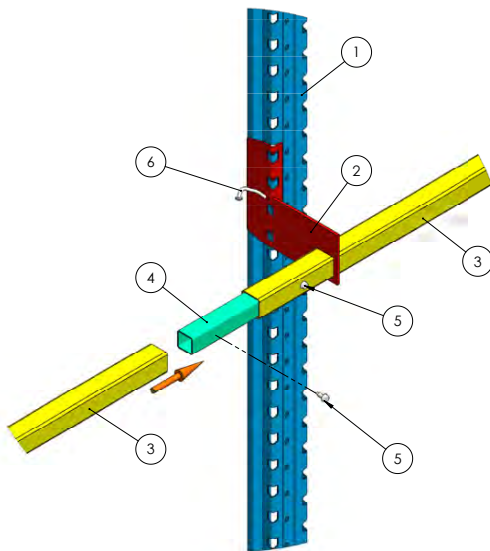
PALLET RACKS - SCD 02 - Revision 01 of 10 March 2015



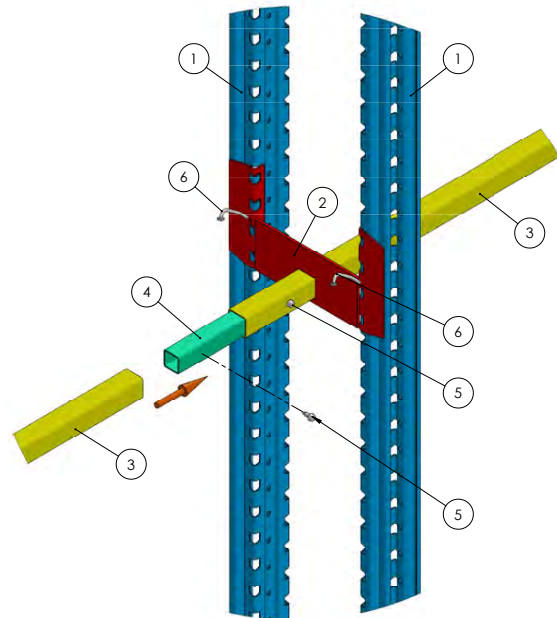
SINGLE SIDE VERTICAL BRACING

COMPONENTS

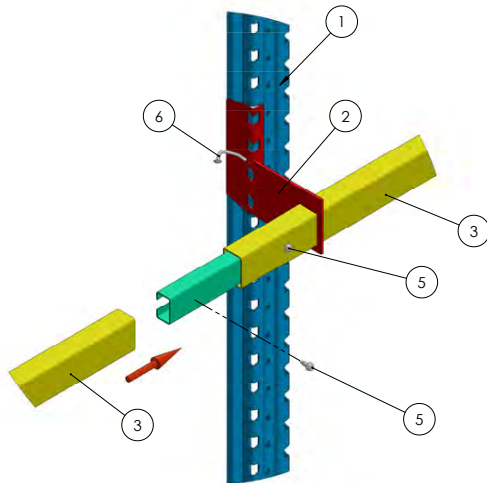
- 1) Frame bracing SS
 - 2) Beams support CV
 - 3) Bracket CV
 - 4) Foot-plate CV
 - 5) Bracing
 - 6) Horizontal bracing
-
- a) Tensioner
 - b) Screw M12x40 UNI 5739
 - c) Washer M12 UNI 6592
 - d) Washer M12 UNI 6593
 - e) Nut M12 UNI 5588
 - f) Screw M8x40 UNI 5739
 - g) Nut M8 UNI 7474
 - h) Screw M8x20 UNI 5739
 - i) Nut M8 UNI 6923

PALLET RACKS**SCD 04 - Revision 01 of 10 March 2015****BACK-STOP CONNECTION TUBE Q40****COMPONENTS**

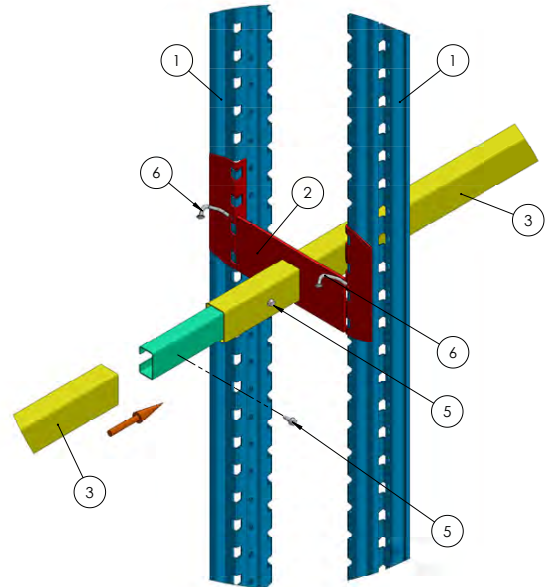
- 1) Upright
- 2) Support back-stop SS
- 3) Back-stop tube Q40
- 4) Back-stop connection tube Q 30
- 5) Self drilling screw 6,3x19 UNI 8117
- 6) Safety pin

PALLET RACKS**SCD 05 - Revision 01 of 10 March 2015****BACK-STOP CONNECTION TUBE Q40****COMPONENTS**

- 1) Upright
- 2) Support back-stop DS
- 3) Back-stop tube Q40
- 4) Back-stop connection tube Q 30
- 5) Self drilling screw 6,3x19 UNI 8117
- 6) Safety pin

PALLET RACKS**SCD 06 - Revision 01 of 10 March 2015****BACK-STOP CONNECTION TUBE N60****COMPONENTS**

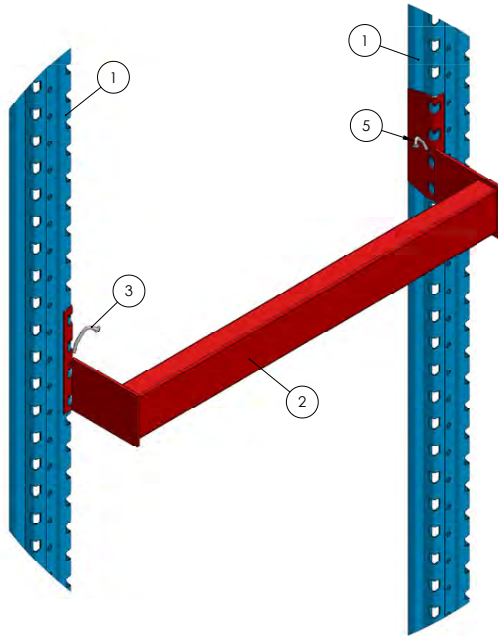
- 1) Upright
- 2) Support back-stop SS
- 3) Back-stop tube N060
- 4) Back-stop connection tube C 50x30x15
- 5) Self drilling screw 6,3x19 UNI 8117
- 6) Safety pin

PALLET RACKS**SCD 07 - Revision 01 of 10 March 2015****BACK-STOP CONNECTION TUBE N60****COMPONENTS**

- 1) Upright
- 2) Support back-stop DS
- 3) Back-stop tube N060
- 4) Back-stop connection tube C 50x30x15
- 5) Self drilling screw 6,3x19 UNI 8117
- 6) Safety pin

PALLET RACKS

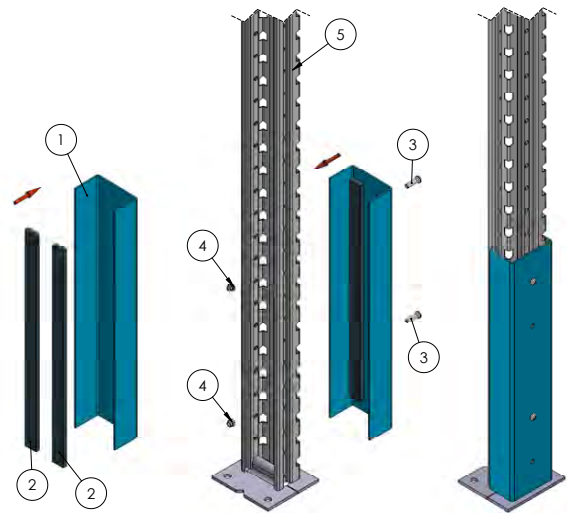
SCD 08 - Revision 01 of 20 May 2015

**BACK-STOP****COMPONENTS**

- 1) Upright
- 2) Back-stop
- 3) Safety pin

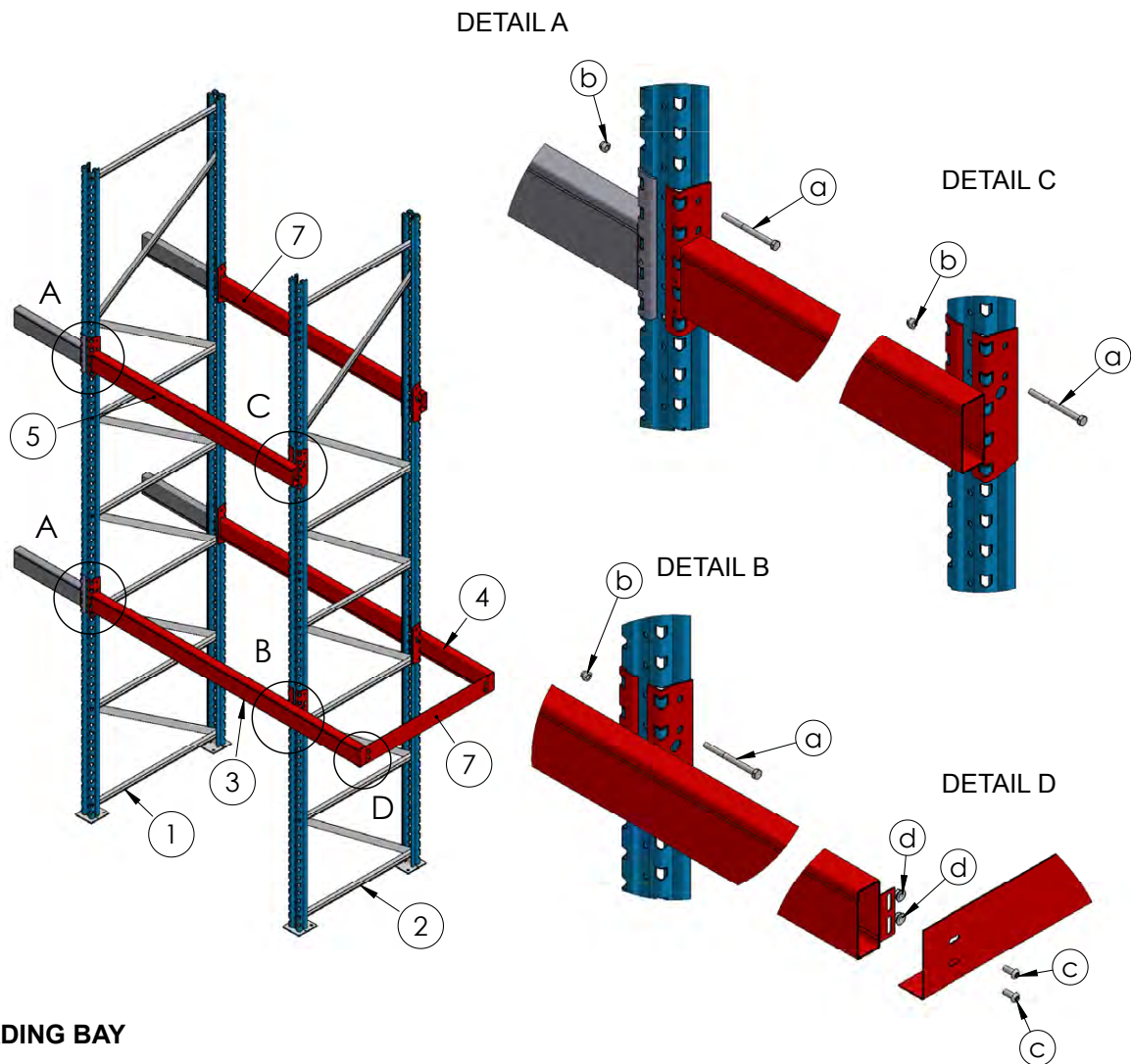
PALLET RACKS

SCD 07 - Revision 01 of 10 March 2015

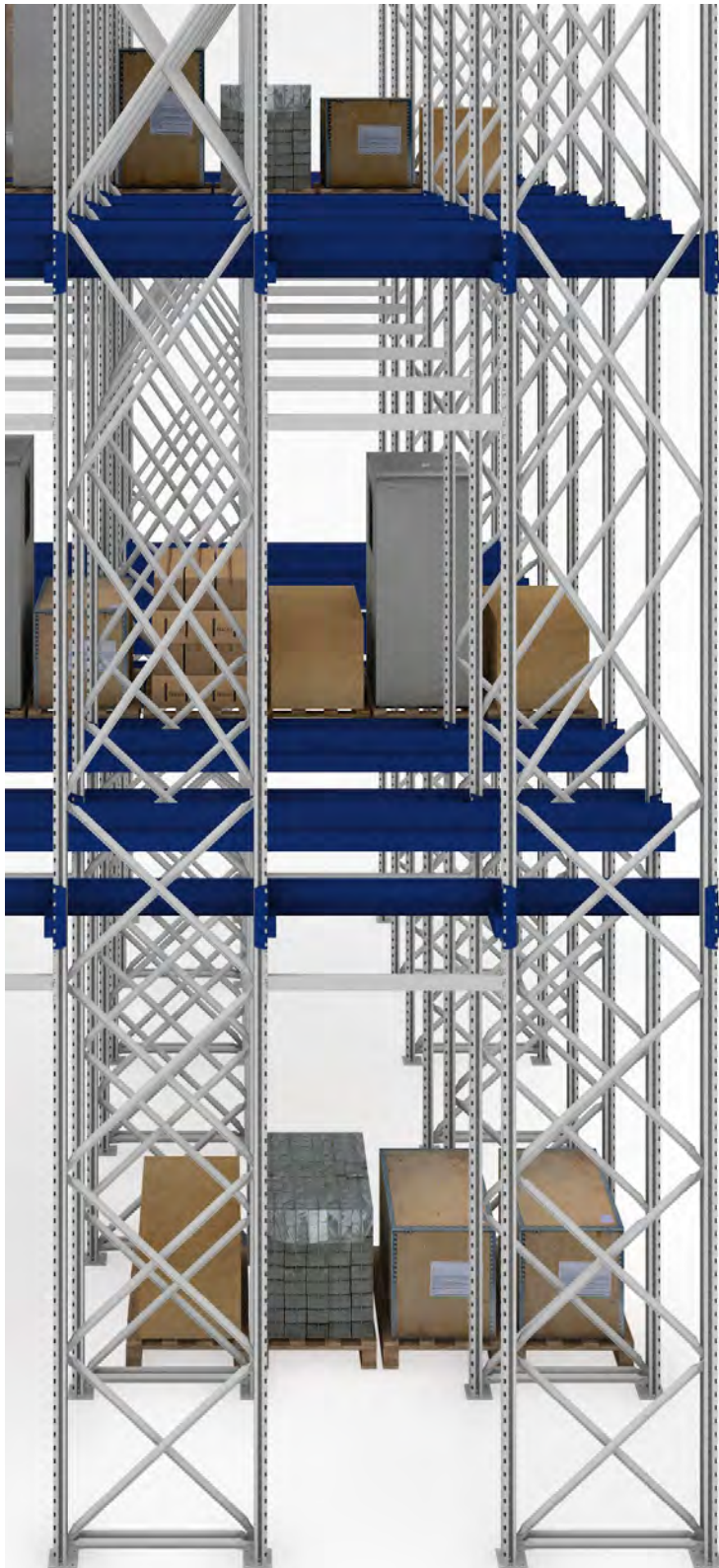
**UPRIGHT BASE PROTECTION****COMPONENTS**

- 1) "U" Profile
- 2) Neoprene L = 500 mm
- 3) Screw M8x30 UNI 7380
- 4) Nut M8 UNI 7474
- 5) Upright

PALLET RACKS - SCD 14 - Revision 01 of 16 September 2015



DRIVE-IN RACKS



GENERAL DESCRIPTION

Drive-in type racks are essentially made up of a load tunnel on many levels, accessible internally by intensive storage. Structurally the tunnels are made up of vertical elements, frames, to which the lateral guides are attached to support merchandise. Above all the frame pieces are connected, to maintain the rigidity of the structure.

MAIN ELEMENTS:

- **Frame:** Vertical support element made up of two uprights connected using a bracing and anchored to the ground using feet
- **Upright:** Vertical support element, on which the beams are connected, to support the weight
- **Bracing:** Connecting poles in tubular or open C sections of the uprights, which are divided into traverses and diagonals
- **Foot plate:** Structural support component used to attach to the base of the uprights
- **Upper cap:** mixed connecting structure of the frame, made up of connecting beams and horizontal bracing.
- **Support guide:** Lateral support element for the load units

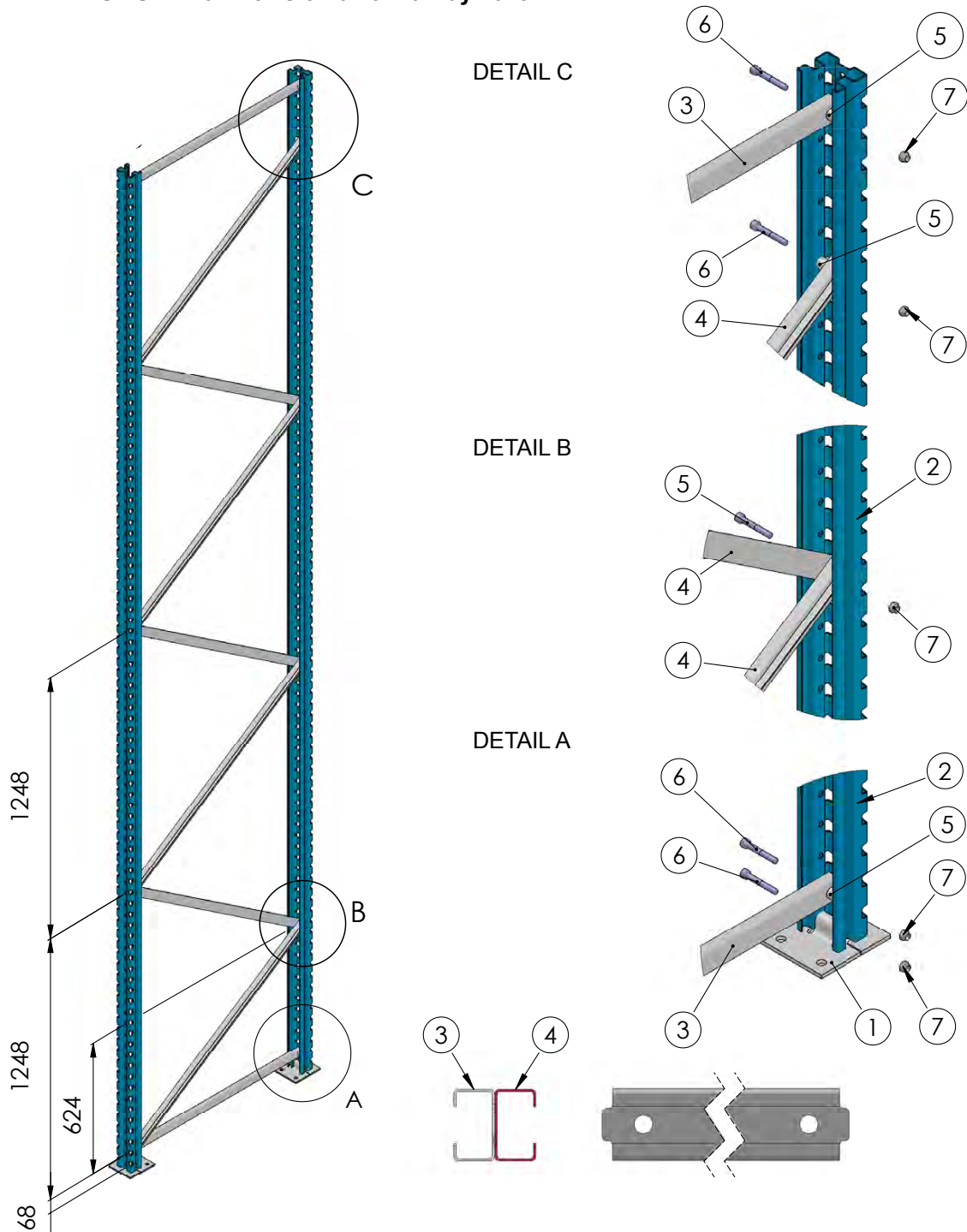
DEFINITIONS:

- **Drive-In single side:** Racks accessible only from one side – LIFO Storage
- **Drive-In double side:** Racks accessible from two sides - LIFO Storage
- **Drive Through:** Racks accessible from two sides – FIFO Storage
- **Horizontal direction:** Parallel to frame plate. Front side with respect to a person observing the racks from the corridor.

The frames are delivered unassembled and must be assembled according to the directions shown on the specific layout and the typical sketch shown below.

Before assembly of the frames: Arrange two workhorses upon which to lean the two uprights of a frame. Insert the bracing elements and proceed to connect these according to the directions in the configuration drawing.

PALLET RACKS - SCD 10 - Revision 01 of 20 May 2015

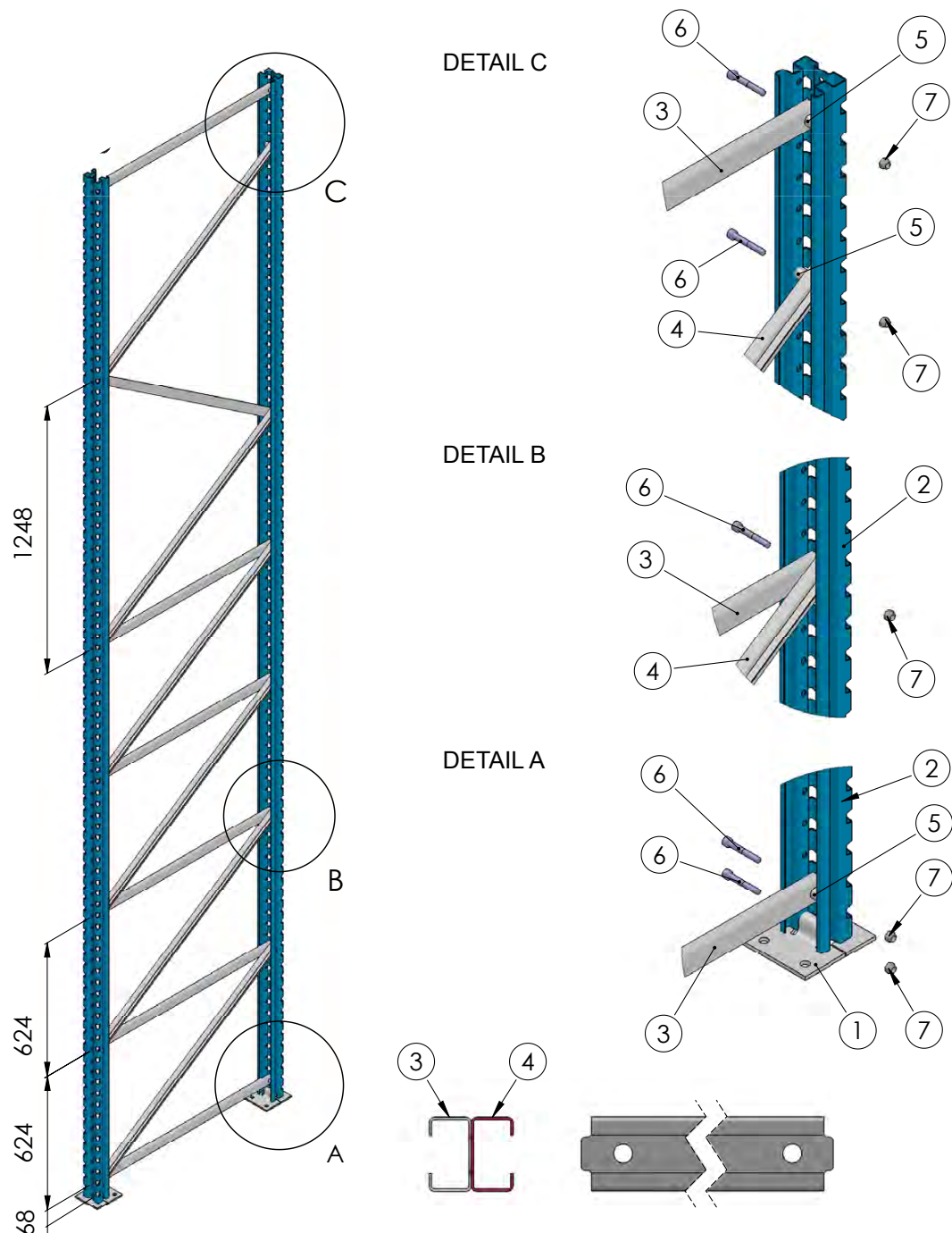


FRAME TYPE A15D - B18D

COMPONENTS

- 1) Foot plate A-B
- 2) Upright A-B
- 3) Traverse "C" 35x20x8.5x1.2
- 4) Diagonal "C" 35x20x8.5x1.2
- 5) Spacer L=20
- 6) Screw M8x55 UNI 5931
- 7) Nut M8 UNI 7474

PALLET RACKS - SCD 11 - Revision 01 of 20 May 2015

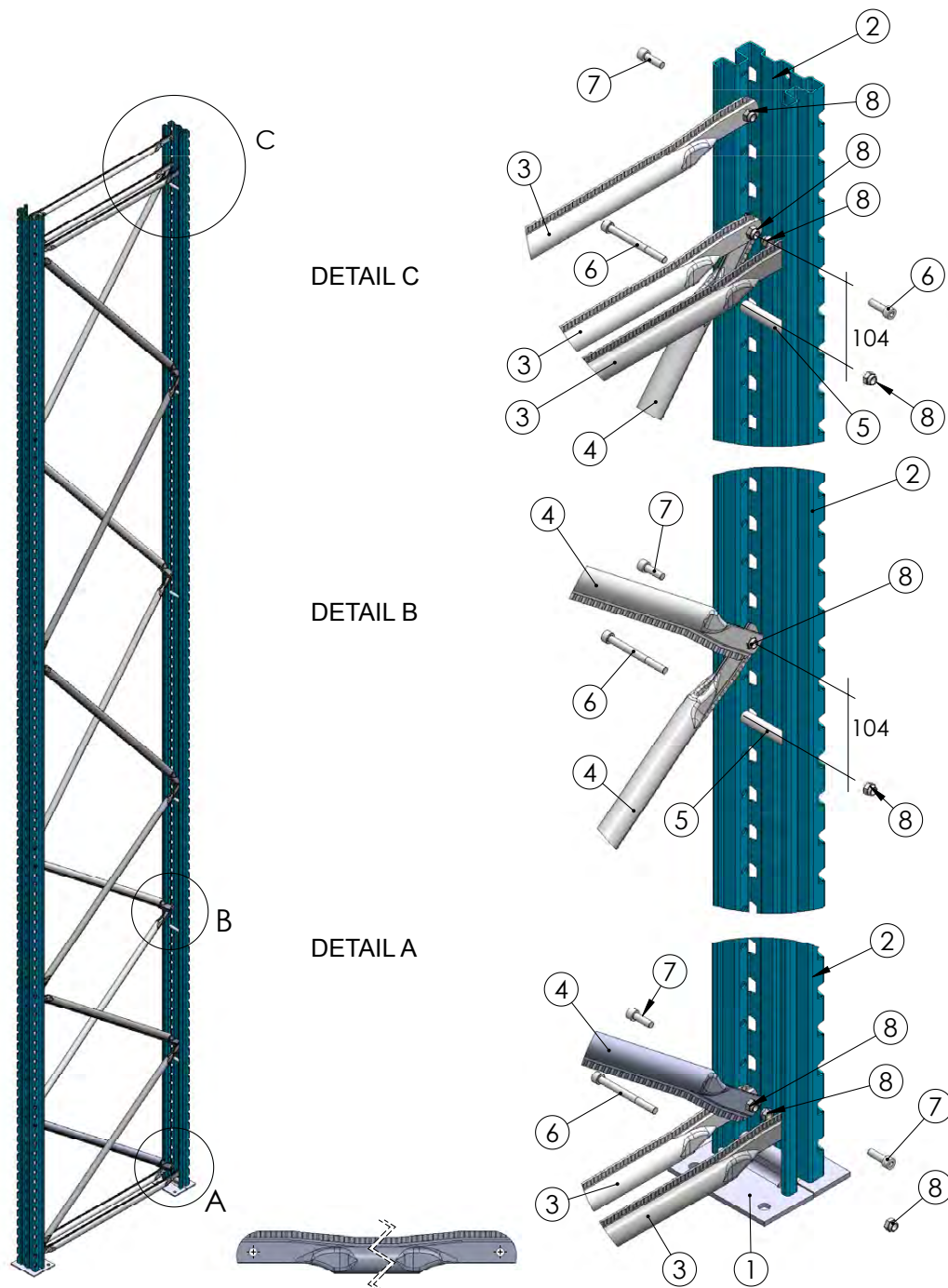


FRAME TYPE A15ZD - B18ZD

COMPONENTS

- 1) Foot plate A-B
- 2) Upright A-B
- 3) Traverse "C" 35x20x8.5x1.2
- 4) Diagonal "C" 35x20x8.5x1.2
- 5) Spacer L=20
- 6) Screw M8x55 UNI 5931
- 7) Nut M8 UNI 7474

PALLET RACKS - SCD 13 - Revision 01 of 10 June 2015



FRAME TYPE C18X - C20X - D20X

COMPONENTS

- 1) Foot plate C-D
- 2) Upright C-D
- 3) Traverse NPRF Ø30
- 4) Diagonal NPRF Ø30
- 5) Spacer L=70
- 6) Screw M8x25 UNI 5931
- 7) Nut M8 UNI 7474

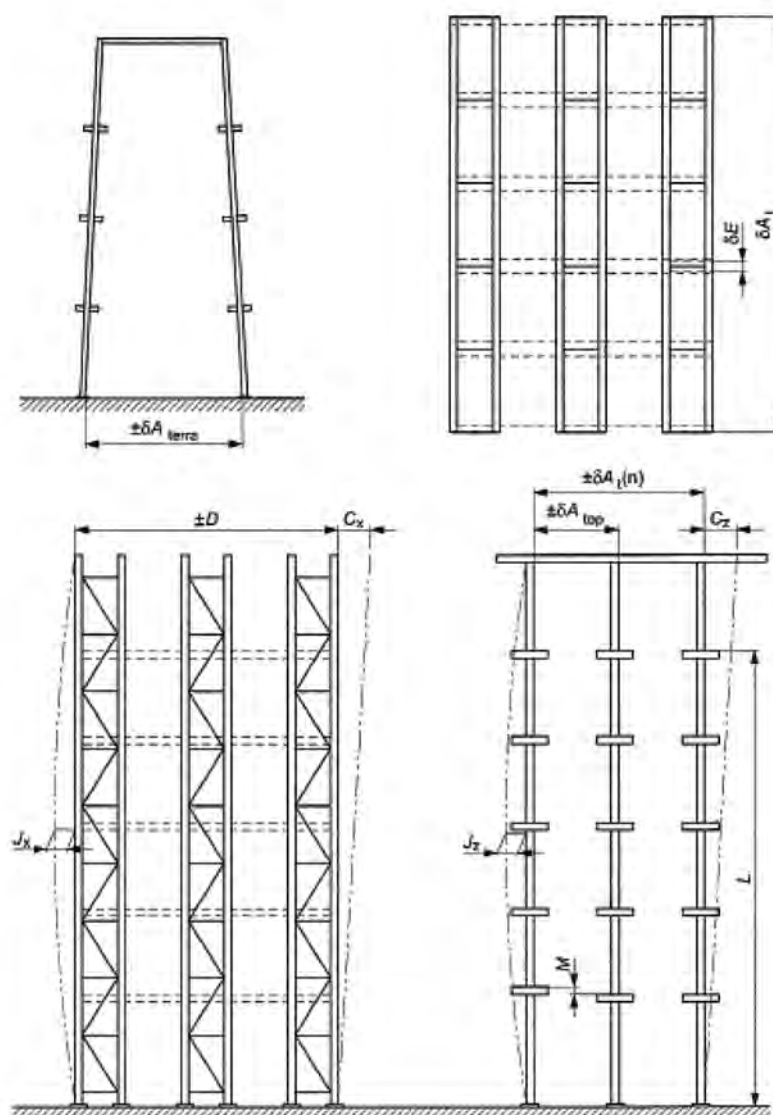
ASSEMBLY STEPS

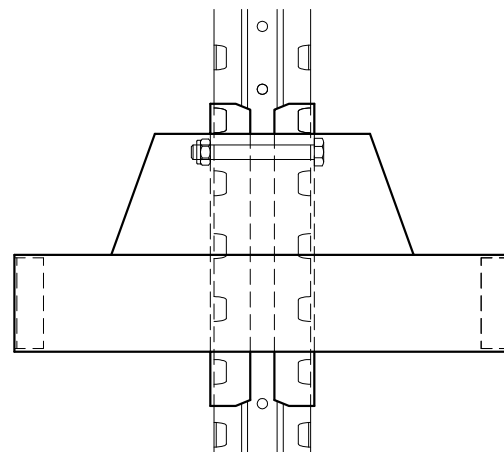
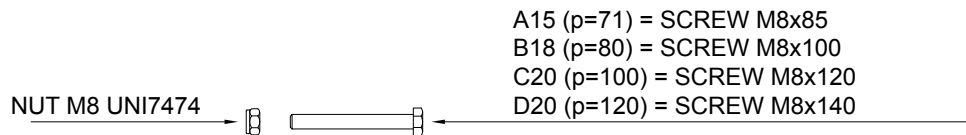
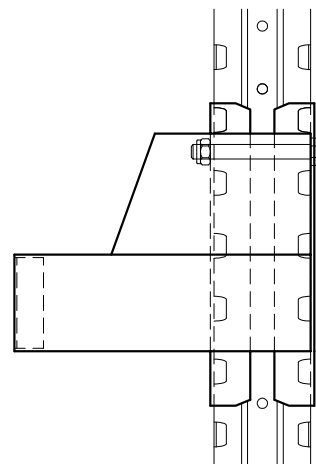
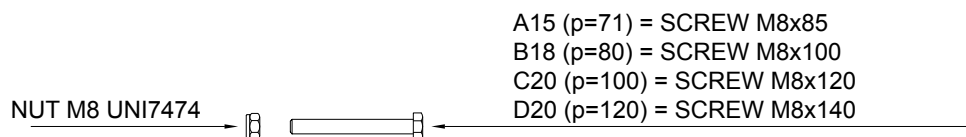
1	Assemble the frame pieces according to the project instructions and the attached layouts.
2	If necessary, once assembled and before vertical alignment, we recommend depositing the extended frame pieces, stacking no more than 10 elements together in each stack.
3	Position two pieces vertically and on site relative to the first corridor, lifting the frame piece off of the ground and arrange it first sideways and then, manually or with the help of lifting equipment, vertically along the ground attachment point traced out in advance, maintaining the piece on site.
4	Temporarily connect the frame pieces using a pair of beams and shoulder height, then install the definitive upper beams. The connectors are installed at first with manual pressure and then completed using a hammer with a plastic head so as to avoid local deformations of the beam.
5	Then to complete the first corridor, assemble the frame pieces, connecting them with those already assembled using spacers and upper beams and at least one temporary intermediate brace.
6	Proceed with the sequence until finishing the assembly of the first bracing tunnel or tower. At this point, adjust the structure performing an inspection of the alignments and vertical alignment, then locking the structure into place and attaching the feet to the ground.
7	Assemble the next frame pieces of the corridor proceeding to their connection using spacers and only upper braces attached to the first nucleus performed.
8	Proceed to assemble the guide support shelves relative to the various load levels, and then to the installation of the Pallet holder guides.
9	Complete the installation of the horizontal and vertical bracing as indicated in the layouts and/or construction figures supplied by the Modulblok technical office.
10	Attach all the braces and bracing plates to the ground using the bolts equipped (standard issue 2 per foot) verifying that the bolts enter the proper holes and that they are tightened, by sample inspecting the tolerances according to the tables indicated in the project.
11	At the end of the work, measure the arrangement and the height of the racks which must respect the following tolerance limits: - vertically in a horizontal direction equal to 1/500 (frame level/plane) of the upright height - vertically in a longitudinal direction equal to 1/500 (lane level/plane) of the upright height

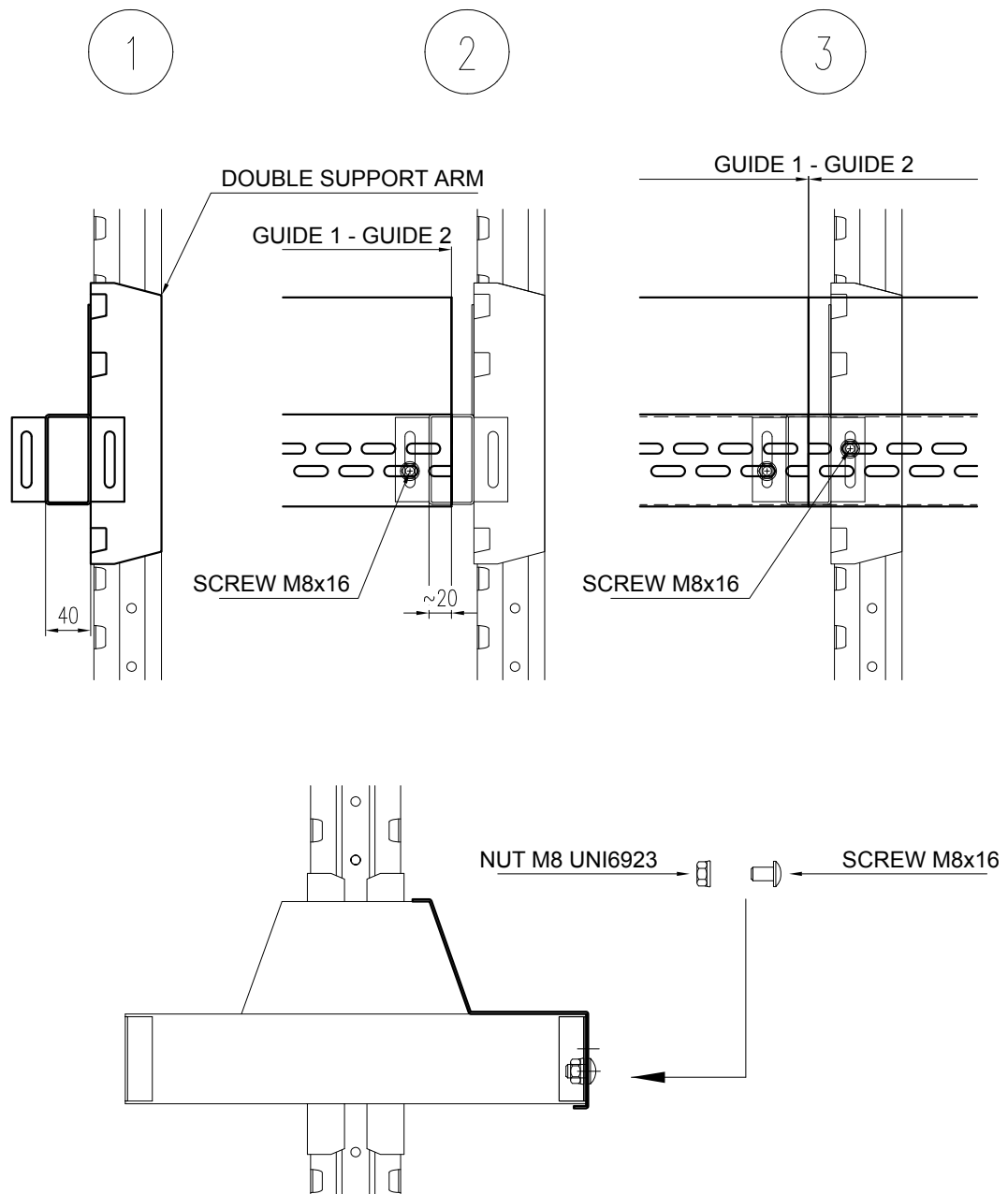
ASSEMBLY TOLERANCES:

Valid for the racks served only by a Front lift (Class 400)

Symbol	Description	Tolerance
δA_{terra}	Tolerance on the width of the corridor	$\pm 5 \text{ mm}$
Cx	Longitudinal direction frame non-aligned	H/500
Cz	Horizontal direction frame non-aligned	H/500
δE	Alignment tolerance of the frame pieces	$\pm 3 \text{ mm}$
δH_{1A}	Variation of the support level on two sides of the pallet	6 mm



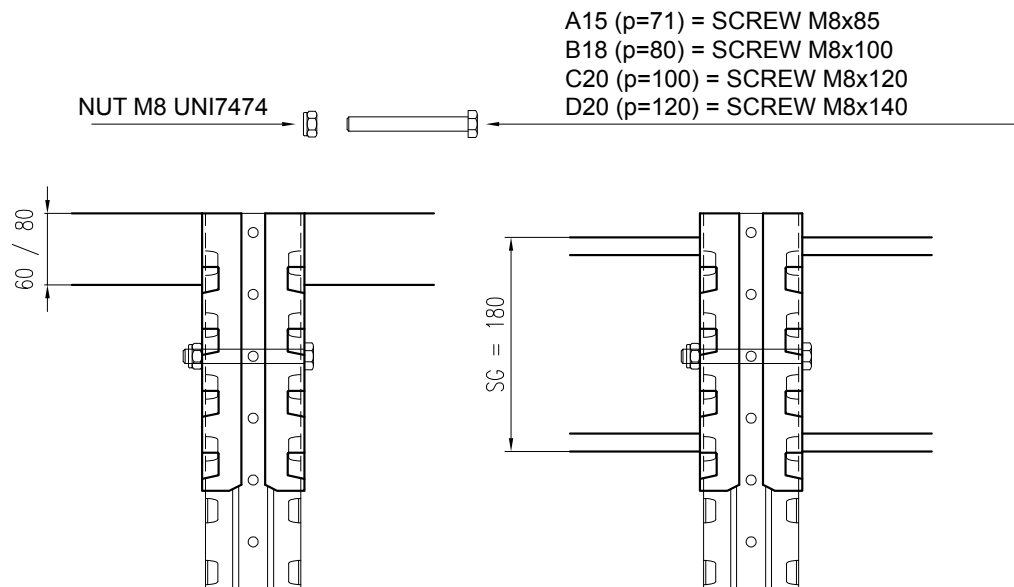
DRIVE-IN - SCD 01 - Revision 01 of 10 December 2014**DRIVE-IN ARMS ASSEMBLY****DOUBLE ARM****SINGLE ARM**

DRIVE-IN - SCD 02 - Revision 01 of 10 December 2014**DRIVE-IN GALVANISED GUIDE ASSEMBLY**

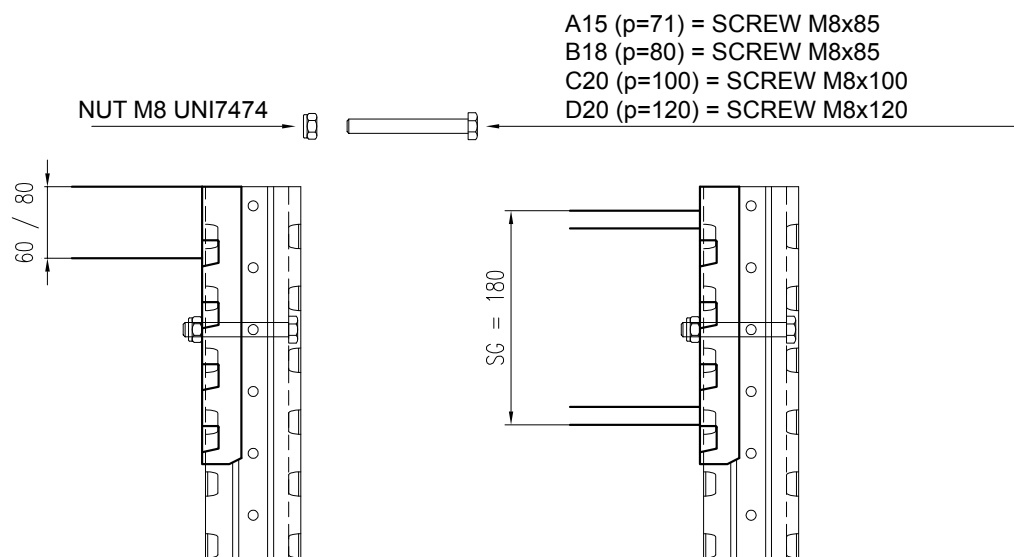
DRIVE-IN - SCD 03 - Revision 01 of 10 December 2014

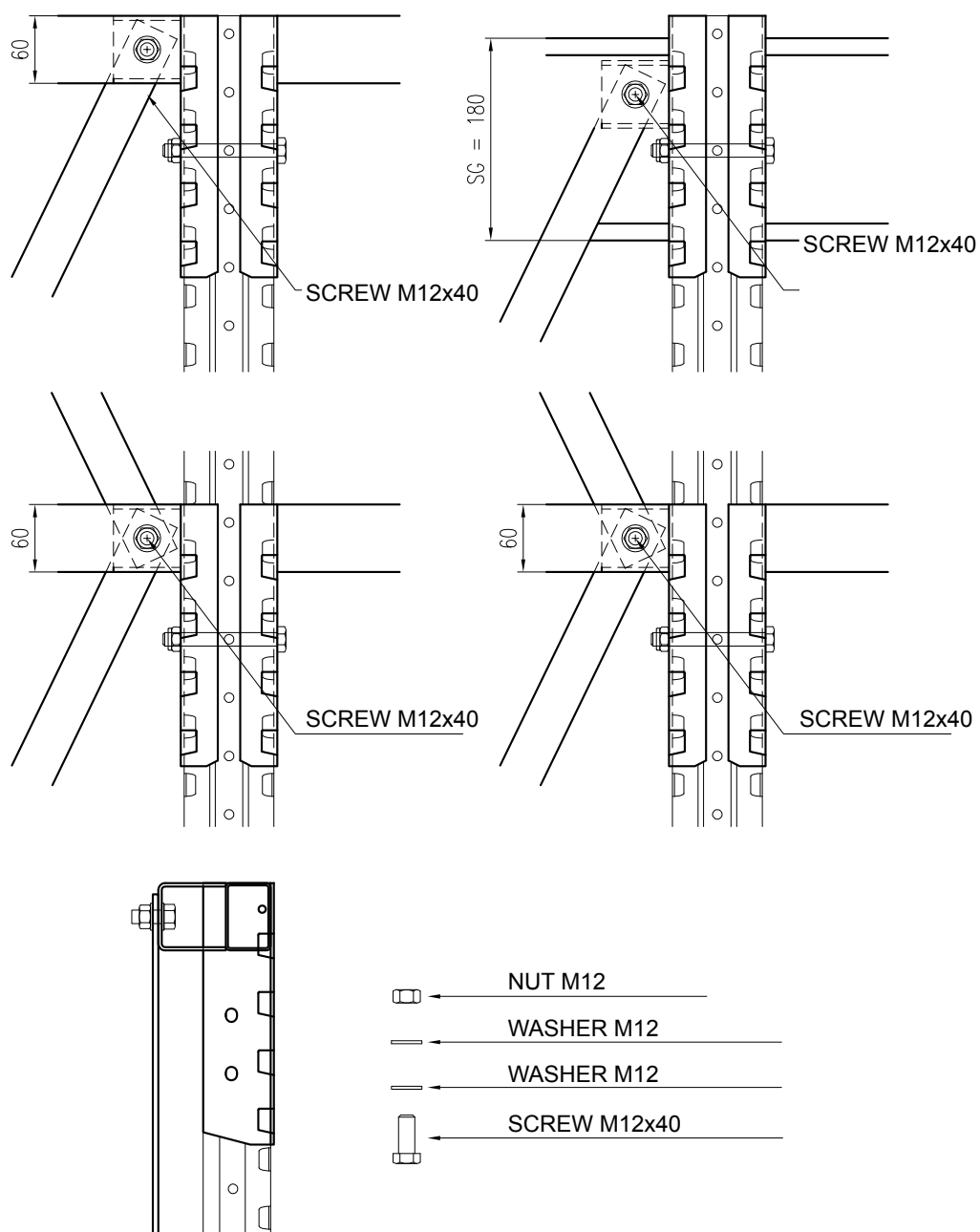
DRIVE-IN TOP BEAMS ASSEMBLY

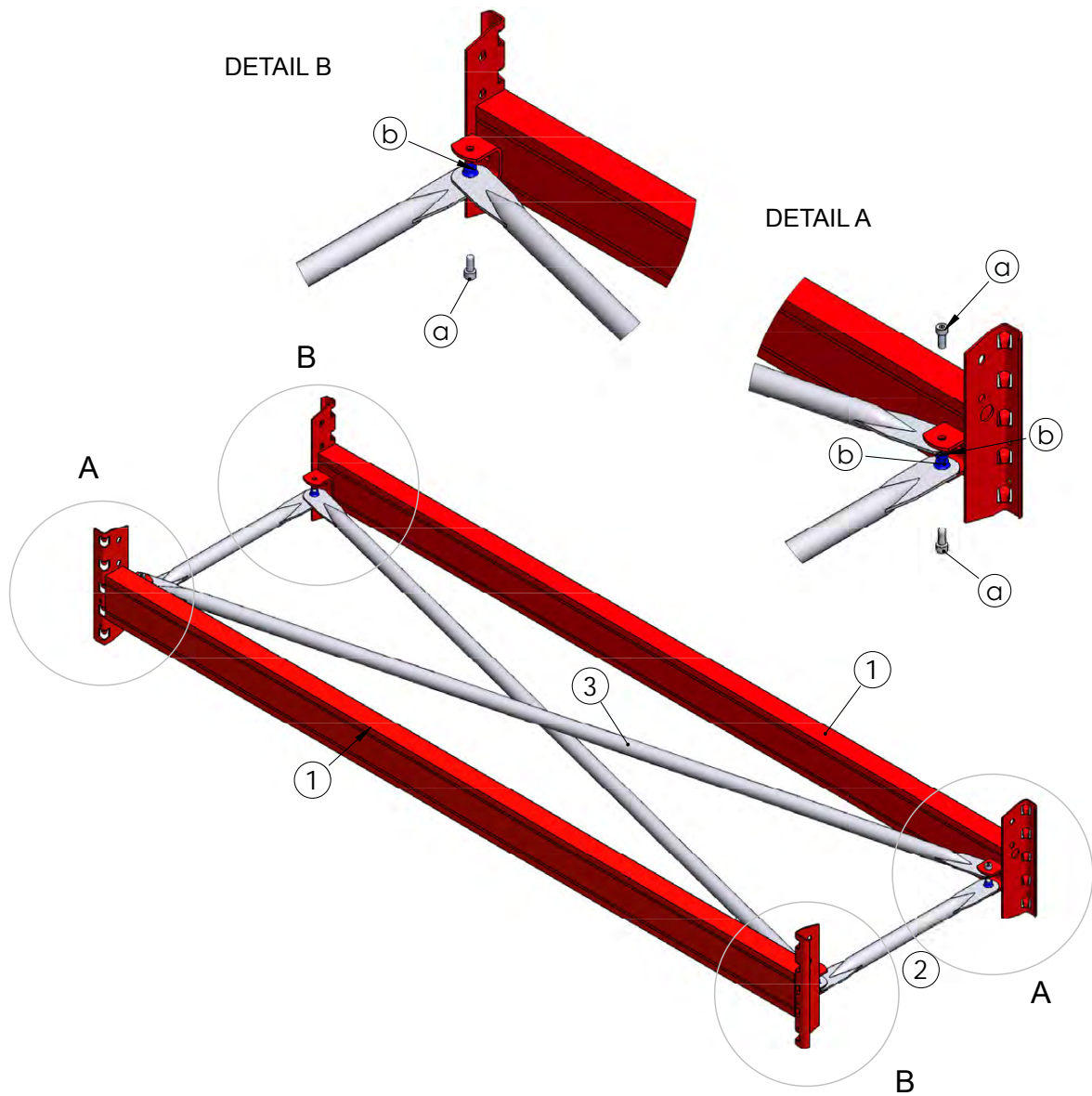
DOUBLE BEAM (SPAN)



SINGLE BEAM (HEAD)



DRIVE-IN - SCD 04 - Revision 01 of 10 December 2014**DRIVE-IN TOP BEAMS ASSEMBLY**

PALLET RACKS - SCD03 - Revision 01 of 10 March 2015**COMPONENTS**

- 1) Beam with fork
- 2) Traverse
- 3) Diagonal
- a) Screw M8x20 UNI 5931
- b) Nut M8 UNI 7474

CANTILEVER RACKS



GENERAL DESCRIPTION

The Cantilever type racks are essentially made up of vertical elements, columns, and horizontal elements, shelves, destined for the deposit of long material.

MAIN ELEMENTS:

- **Column:** Vertical support element made up of a vertical part connected with bolts to the semi-base
- **Arm:** Horizontal element, connected to the column, with the function of supporting stored materials
- **Locking pin:** Device connecting a shelf to the column

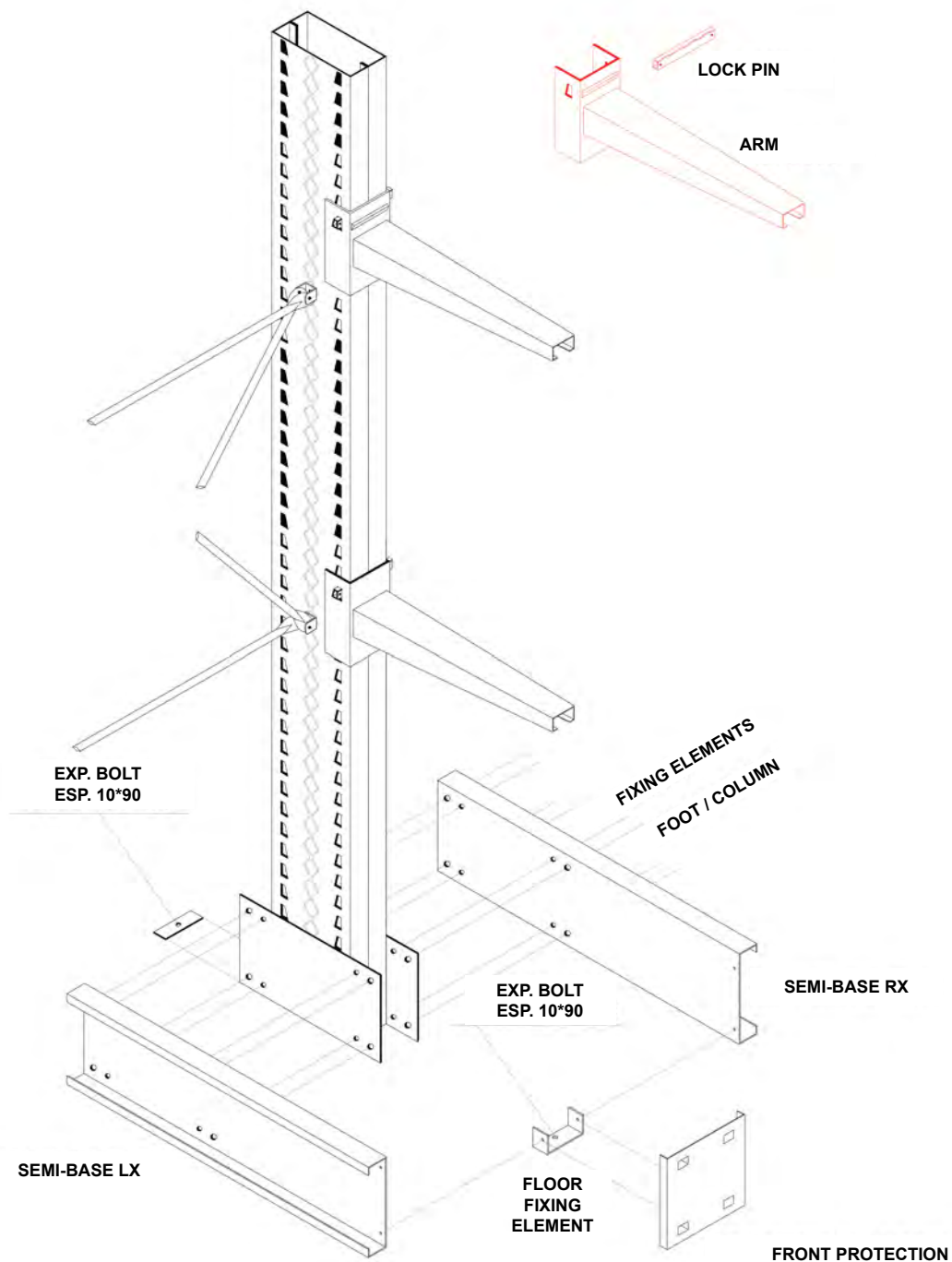
DEFINITIONS:

- **Longitudinal direction:** Parallel to the main axis of the racks and the corridor
- **Horizontal direction:** Parallel to the panel of the shelves. Front side with respect to a person observing the racks from the corridor
- **Single side:** Racks made up of one row and only one loading side
- **Double side:** Racks made up of one row and two loading sides

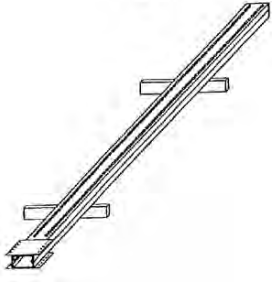
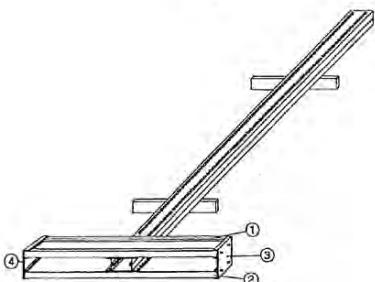
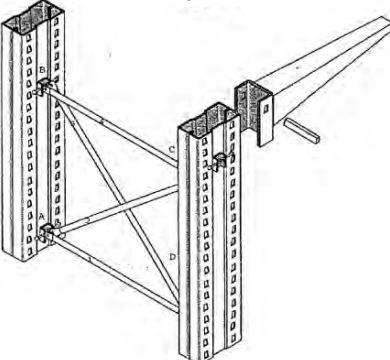
The columns are delivered unassembled and must be assembled according to the instructions shown on the specific layout and the typical sketch shown below.

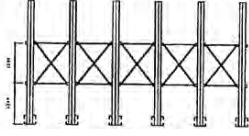
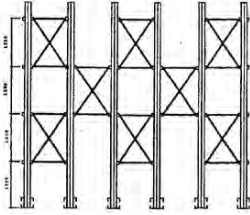
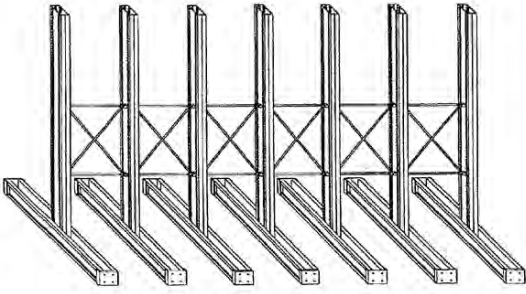
ASSEMBLY AND INSTALLATION

In the following figure one can see the elements representing a column (Figure 1).

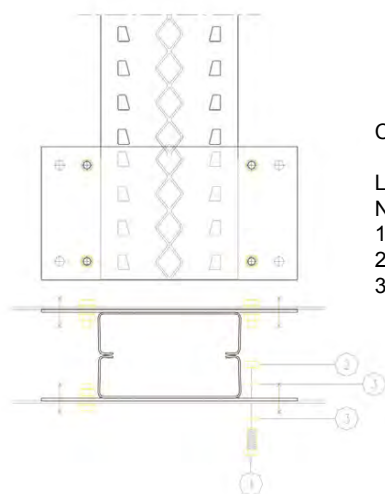


ASSEMBLY STEPS

A	Position the column on the ground, leaning it on thickness plates so that it remains above the ground (Figure 1)
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> <p><i>Figure 1</i></p>  </div> <div style="text-align: center;"> <p><i>Figure 2</i></p>  </div> </div>	
B	Attach the base no. 1 as indicated in the Figure and according to the indicated assembly layout (see assembly Layouts on page 64).
C	Attach the base no. 2. (Figure 2)
D	Attach the front protections 3 and 4 and vertically align the column. (Figure 2)
E	Assemble the bracings, beginning with the horizontal brace 1, following with diagonals 2, 3 and traverses 4, referring to the positions indicated (A, B, C, D) of the traverses and diagonals. (Figure 3)
<div style="text-align: center;"> <p><i>Figure 3</i></p>  </div>	

F	For the height of the bracings, please follow the layout in Figure 4.
<p style="text-align: center;"><i>Figure 4</i></p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>FOR COLUMNS UP TO 4800 MM NO. 1 CROSS TIE</p> </div> <div style="text-align: center;">  <p>FOR COLUMNS TALLER THAN 4800 MM " " 1 OR 2 CROSS TIES ALTERNATING</p> </div> </div> <p>N.B. At the beginning and end of the train always use cross ties.</p>	
G	After having vertically aligned all the columns and positioned all the bracings, please align the columns and attach them to the ground with the bolts provided. (Figure 5)
<p style="text-align: center;"><i>Figure 5</i></p> 	
H	Position the arms by locking them into place with the provided locking pins.

ASSEMBLY OF THE TYPE “L” COLUMN-BASE

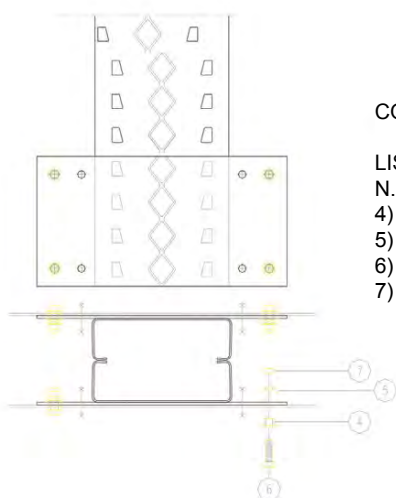


COLUMN CODE EXAMPLE: 4200 CY30 PY30 **L** M120 ECC.

LIST OF ELEMENTS FOR THE TYPE “L” CONNECTION

- N. 4 BOLTS M16
 1) N. 1 screw M16x35
 2) N. 1 nut M16
 3) N. 2 washers M16

ASSEMBLY OF THE TYPE “I” COLUMN-BASE

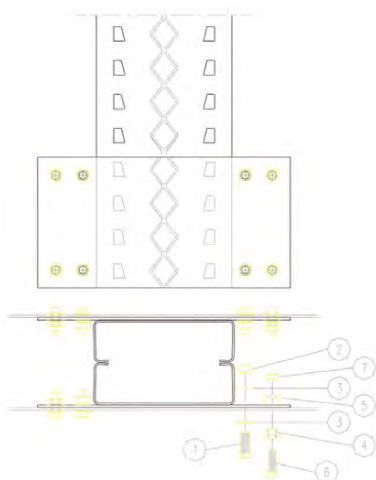


COLUMN CODE EXAMPLE: 4200 CY30 PY30 **I** M120 ECC.

LIST OF ELEMENTS FOR THE TYPE “I” CONNECTION

- N. 4 BOLTS M12
 4) N. 1 sleeve
 5) N. 1 counter-sleeve
 6) N. 1 screw M12x40
 7) N. 1 nut M12

ASSEMBLY OF THE TYPE “P” COLUMN-BASE



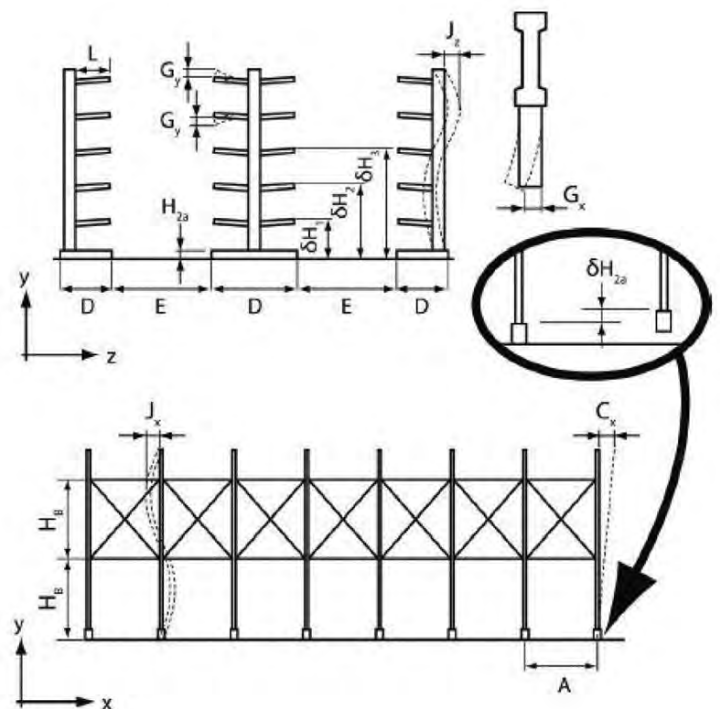
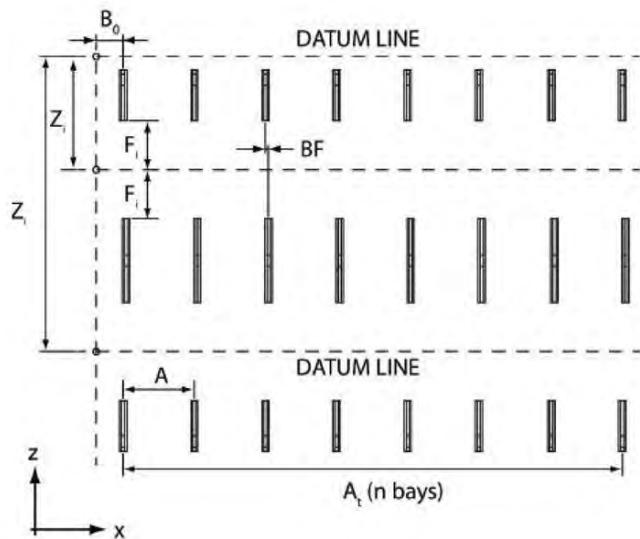
COLUMN CODE EXAMPLE: 4200 CY30 PY30 **P** M120 ECC.

LIST OF ELEMENTS FOR THE TYPE “P” CONNECTION

- N. 4 BOLTS M16
 1) N. 1 screw M16x35
 2) N. 1 nut M16
 3) N. 2 washers M16
 4) N. 1 sleeve
 5) N. 1 counter-sleeve
 6) N. 1 screw M12x40
 7) N. 1 nut M12

ASSEMBLY TOLERANCES:

Symbol	Description	Tolerance
BF	Non-alignment of the columns opposite the corridor	± 25 mm
δE	Tolerance of the width of the corridor	± 15 mm
δF	Tolerance of the straightness of the corridor compared to the ideal axis	± 15 mm
δA	Tolerance of the interaxis columns	± 5 mm
Cx	Longitudinal direction column non-aligned	H/500
Cz	Horizontal direction column non-aligned	H/500
δH_{1A}	Variation of the load level on two adjacent bases	± 5 mm
δH_1	Variation of the first load level above the base plate	± 10 mm
δH_n	Variation of any load level compared to the first	± 10 mm
H_y	Variation of the support level between the front and rear beams	± 10 mm



MODULEVER RACKS



GENERAL DESCRIPTION

The Modulever type racks are essentially light cantilevers made up of vertical elements, columns and horizontal elements, arms, dedicated to the deposit of long materials.

MAIN ELEMENTS:

- **Column:** Vertical supporting element made up of a vertical part connected with bolts to the base
- **Arm:** Horizontal element connected to the column, used to support material
- **Lock pin:** Device to connect the arm to the column

DEFINITIONS:

- **Longitudinal direction:** Parallel to the main axis of the racks and the corridor
- **Horizontal direction:** Parallel to the arms. Front side with respect to a person observing the racks from the corridor
- **Single side:** Racks made up of one row and only one loading side
- **Double side:** Racks made up of one row and two loading sides

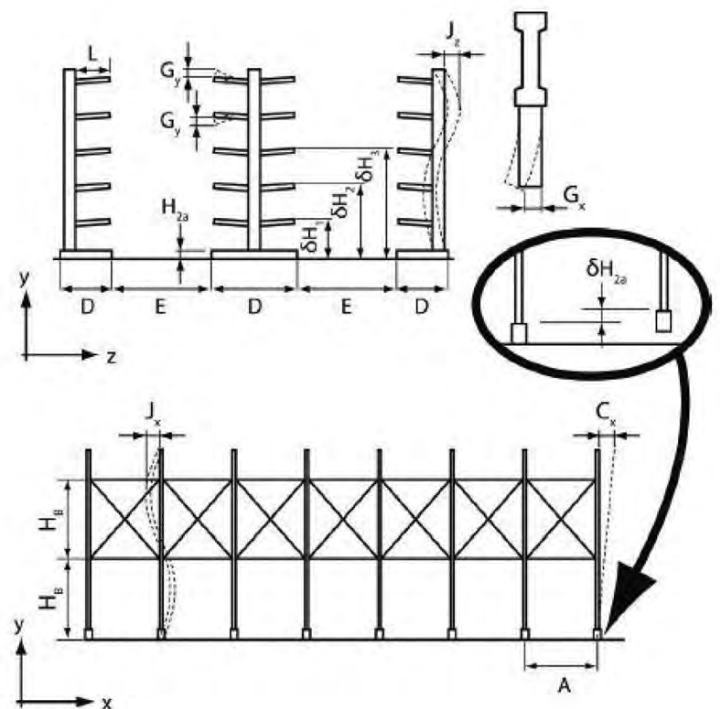
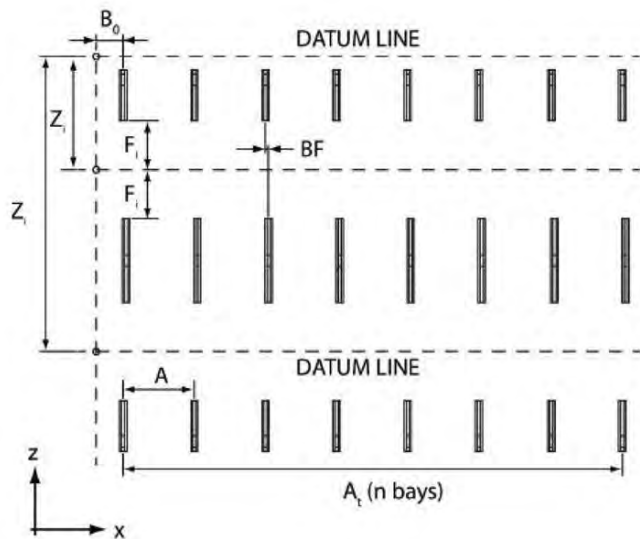
The columns are delivered unassembled and must be assembled according to the indications shown on the specific layout and the typical sketch shown below.

Before assembly of the columns:

- Arrange two workhorses upon which to lean the column one of the two workhorses must be positioned at the lower of the column for the support of the semi-base.
- Proceed to assemble the columns following the following drawings.

ASSEMBLY TOLERANCES:

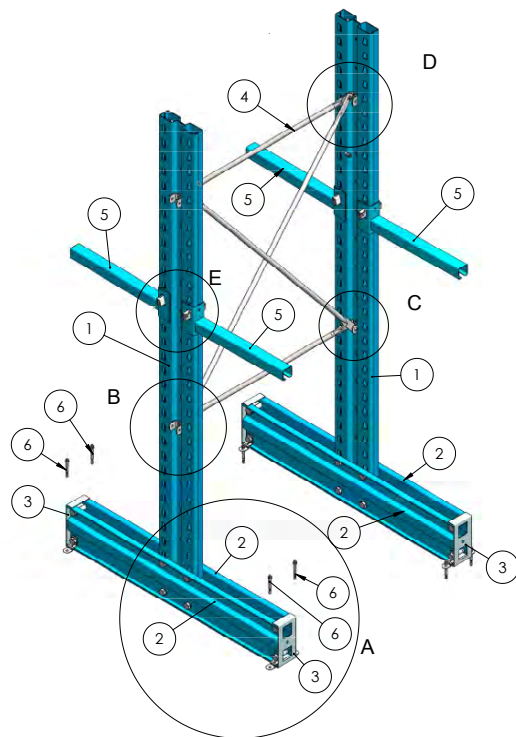
Symbol	Description	Tolerance
BF	Non-alignment between columns opposite the corridor	± 25 mm
δE	Tolerance of the corridor width	± 15 mm
δF	Tolerance of the corridor straightness as compared to ideal axis	± 15 mm
δA	Tolerance of the inter-axis columns	± 5 mm
Cx	Longitudinal direction column non-aligned	H/500
Cz	Horizontal direction column non-aligned	H/500
δH_{1A}	Variation of the load level on two adjacent bases	± 5 mm
δH_1	Variation of the first level of load above the base plate	± 10 mm
δH_n	Variation of any level of load with respect to the first	± 10 mm
H_y	Variation of the support level between the front and rear braces	± 10 mm



ASSEMBLY AND INSTALLATION

MODULEVER

SCD 01 - Revision 01 of 09 February 2015

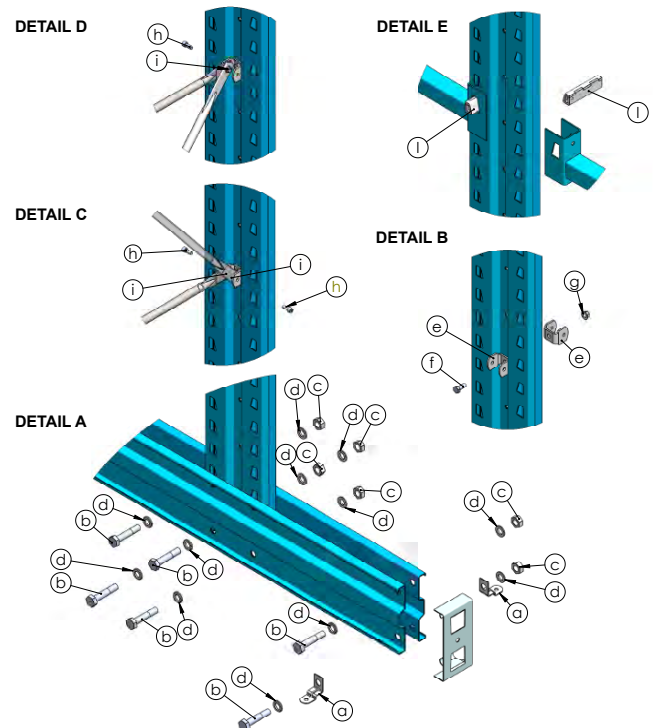


COMPONENTS

- 1) Column
- 2) Base
- 3) Frontal plate ML
- 4) Bracing
- 5) Arm
- 6) Exp. Bolt

MODULEVER

SCD 01 - Revision 01 of 09 February 2015

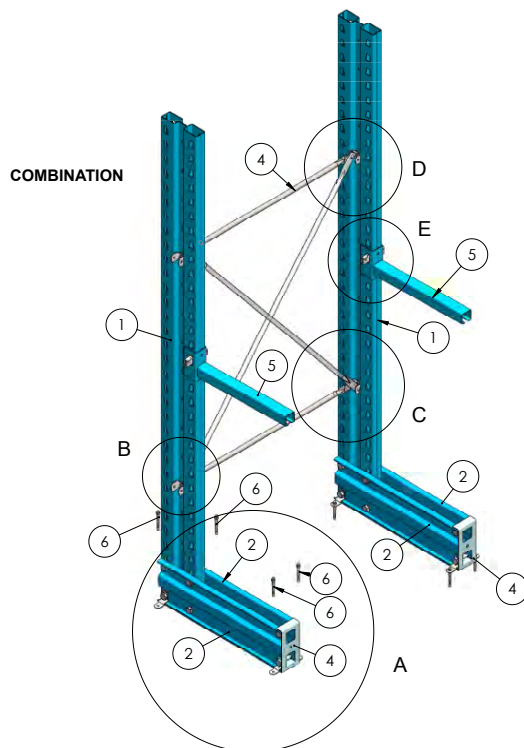


COMPONENTS

- a) Shaped Locking Plate ML
- b) Screw M16x80 UNI 5737
- c) Nut M16 UNI 5588
- d) Wascher M16 UNI 6592
- e) Fork
- f) Screw M10x25 UNI 5739
- g) Nut M10 UNI 6923
- h) Screw M8 UNI 5931
- i) Nut M8 UNI 6923
- l) Lock Pin

MODULEVER

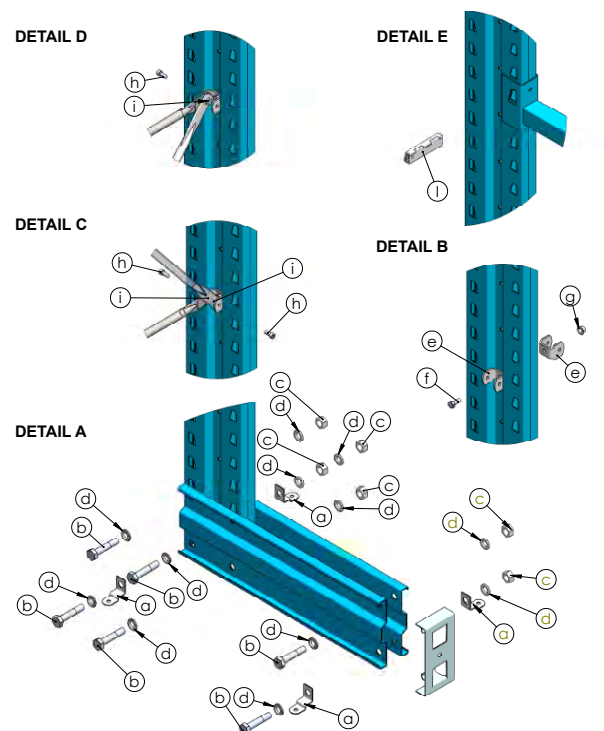
SCD 02 - Revision 01 of 09 February 2015

**COMPONENTS**

- 1) Column
- 2) Base
- 3) Frontal plate ML
- 4) Bracing
- 5) Arm
- 6) Exp. Bolt

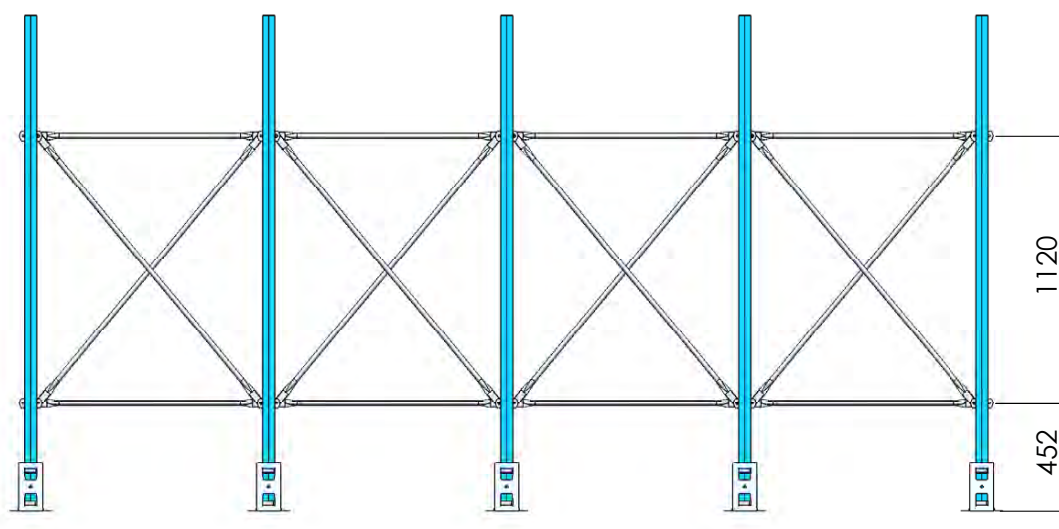
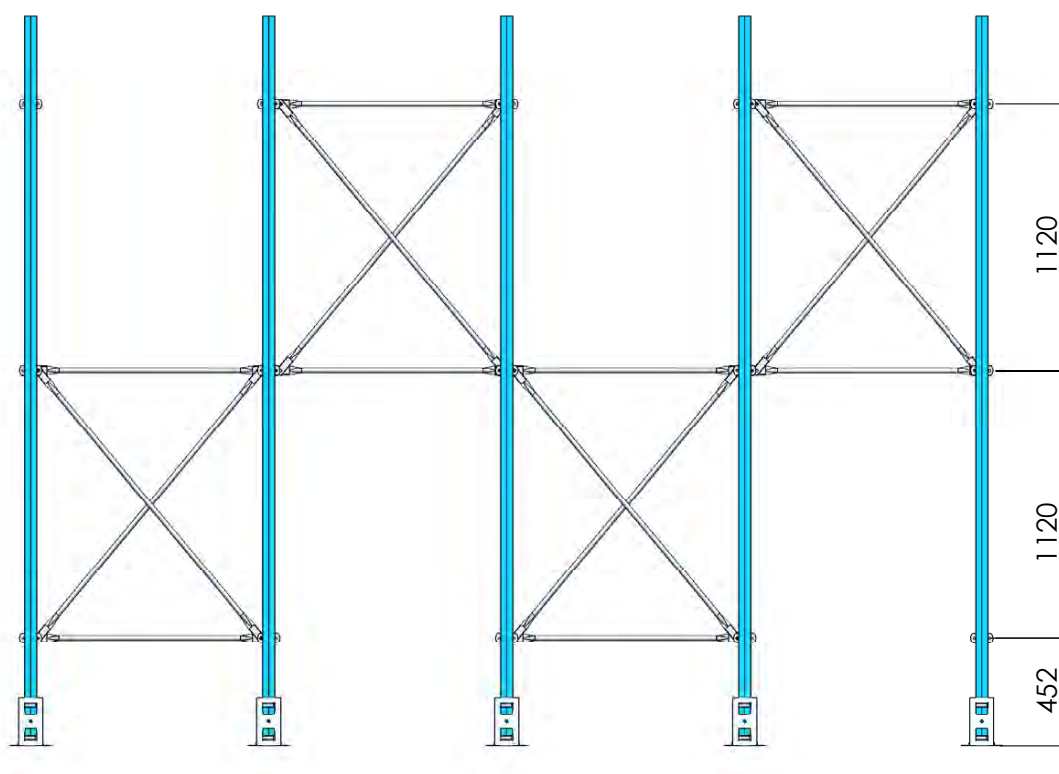
MODULEVER

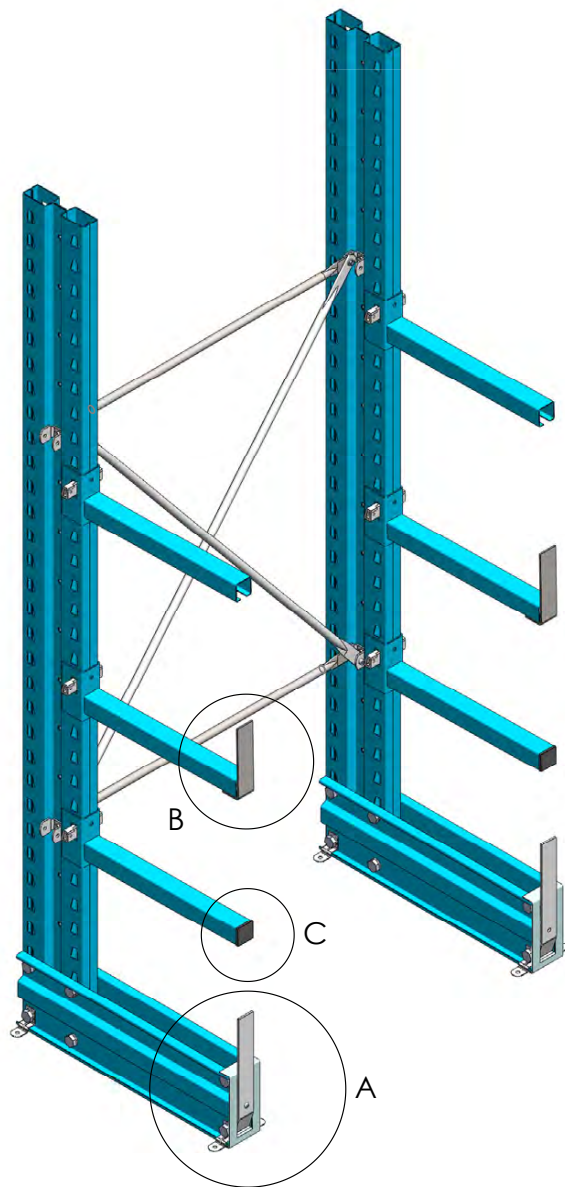
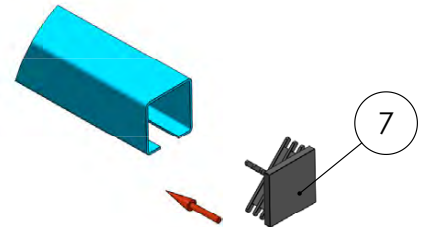
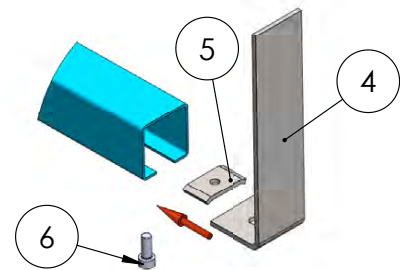
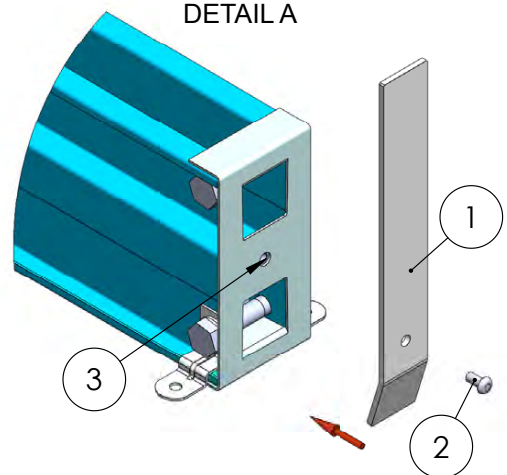
SCD 02 - Revision 01 of 09 February 2015

**COMPONENTS**

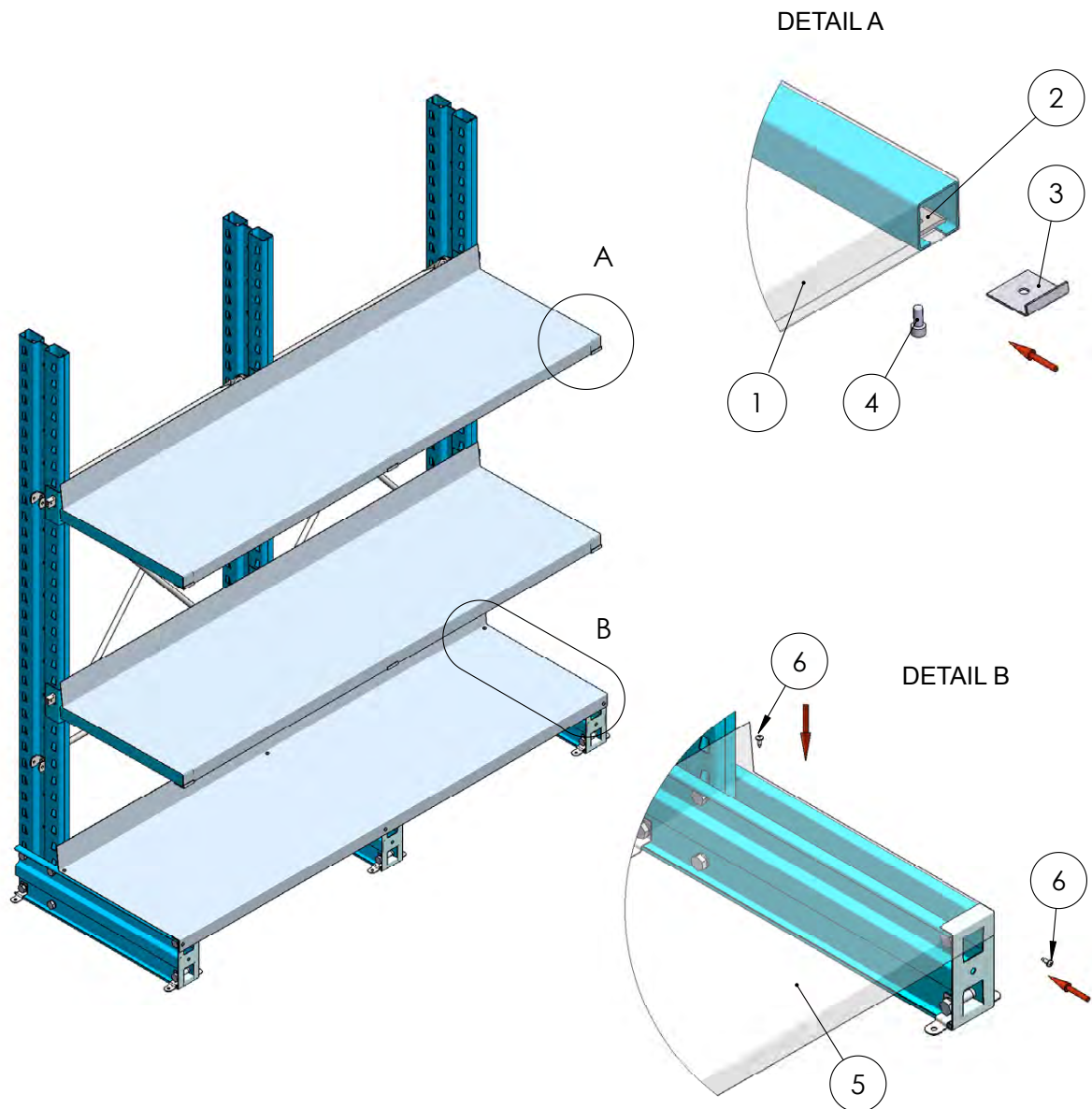
- a) Shaped Locking Plate ML
- b) Screw M16x80 UNI 5737
- c) Nut M16 UNI 5588
- d) Wascher M16 UNI 6592
- e) Fork
- f) Screw M10x25 UNI 5739
- g) Nut M10 UNI 6923
- h) Screw M8x20 UNI 5931
- i) Nut M8 UNI 6923
- l) Lock Pin

MODULEVER - SCD 05 - Revision 01 of 25 March 2015

LAYOUT CV
 $H < 3334$ LAYOUT CV
 $H \geq 3334$ 

MODULEVER - SCD 03 - Revision 01 of 25 March 2015**DETAIL C****DETAIL B****DETAIL A****COMPONENTS**

- 1) Front base protection
- 2) Screw M8x16 UNIADIS 4.8
- 3) Nut M8 UNI 692
- 4) Arm Stop
- 5) Screwed Plate on arm
- 6) Screw M8x20 UNI 5931
- 7) Plastic Plug

MODULEVER - SCD 04 - Revision 01 of 25 March 2015**COMPONENTS**

- 1) Panel on arm
- 2) Screwed Plate on arm
- 3) Assembly Plate ML
- 4) Screw M8x20 UNI 5931
- 5) Panel on base
- 6) Self Drilling Screw 6.3x19 UNI 8118

EASYBLOK RACKS



GENERAL DESCRIPTION

The Easyblok type racks are essentially made up of vertical elements, frame pieces, and horizontal elements, braces, that cross the interlocking connection. They constitute the load shelves and are generally closed to deposit loose material.

MAIN ELEMENTS:

- **Frame:** Vertical supporting element made up of two upright, connected through bolted bracings and anchored to the ground using feet
- **Upright:** Vertical structural element, on which beams are connected, to support weight
- **Bracing:** connection poles, which are tubular brace sections, divided into traverses and diagonals
- **Foot plate:** Structural component to support and bolt the bottom of the uprights
- **Beam:** Horizontal element, connected to the frame's uprights; the pair of beams (front and rear) represents a load level
- **Safety pin:** Device to avoid the accidental unhooking of the beams; the safety hook **MUST** always be present.
- **Anti-twist bar:** Connecting element between the front and rear beams that may be used to reduce the bending of the load shelf

DEFINITIONS:

- **Longitudinal direction:** Parallel to the principal axis of the racks and corridor
- **Horizontal direction:** Parallel to the frame floor. Front with respect to the person observing the racks from the corridor
- **Single side:** Racks made up of a single row of frame pieces, generally loaded from only one side
- **Double side:** Racks made up of two rows of frame pieces, connected by spacers, generally loaded from two sides

The frames are delivered unassembled and must be assembled according to the directions shown on the specific layout and the typical sketch shown below.

Before assembly of the frames:

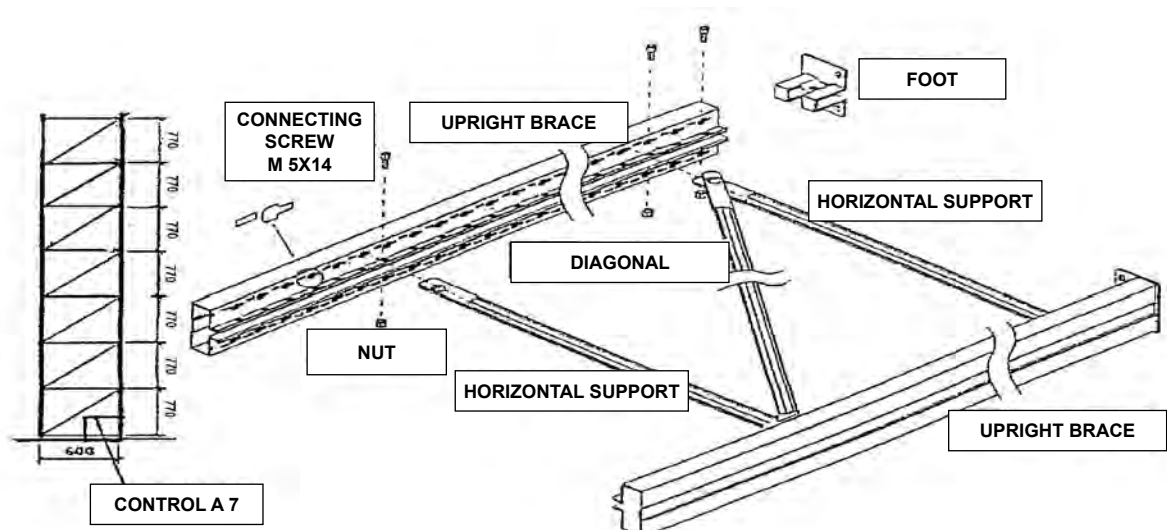
- Arrange two workhorses upon which to lean the two uprights of a frame piece. Insert the elements of the bracings and proceed to attach them according to the directions on the configuration drawing.

ASSEMBLY STEPS

1	In case of need, once assembled and before the vertical inspection, we recommend depositing the frames extended, stacking at most 10 pieces in each group.
2	Lift the frame off the ground arrange them sideways and then, either manually or using a lift and adequate equipment, vertically along the locking point traced out in advance, and then keep the frame there.
3	Lift and position the second frame by following the method indicated in the preceding point.
4	Connect the beams and immediately insert the safety hooks. In the case of tall structures, it is convenient to start with the last load level and then descend. For low racks, it is possible to pre-assemble the first module base on the ground and then lift it with the help of harnesses.
5	Proceed with the vertical alignment following the sequence in steps 2-4.
6	Attach to the ground all the frame pieces with the supplied bolts (standard one for each leg) giving special attention to both the positioning of bolt inside the hole and the tightening of the bolt, effecting a sample inspection of the tolerances as according to the tables indicated in the project. (UNI EN 15620)

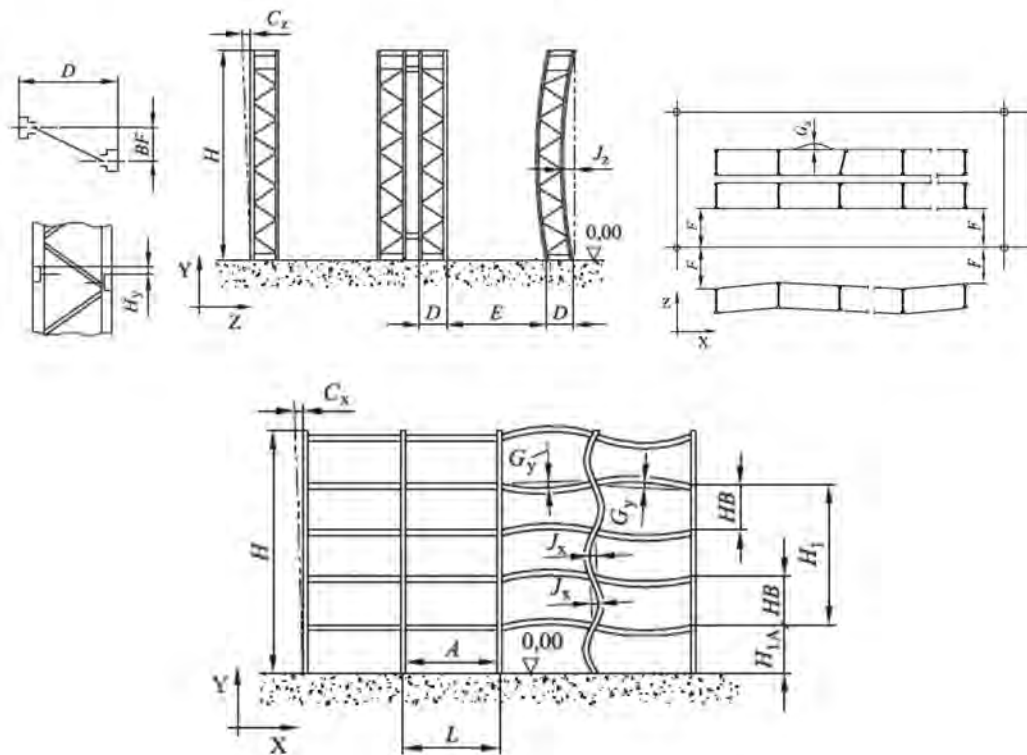
At the end of assembly, measure the arrangement and the heights of the racks which must respect the following tolerance limits:

- the vertical alignment in a cross direction equal to 1/500 (frame plane) of the upright height
- in a longitudinal direction equal to 1/500 (beams plane) of the upright height



ASSEMBLY TOLERANCES:

Symbol	Description	Tolerance
BF	Non-alignment between columns opposite the corridor	± 25 mm
Cx	Longitudinal direction frame non-aligned	H/500
Cz	Horizontal direction frame non-aligned	H/500
δE	Tolerance of the corridor width	± 15 mm
δF	Tolerance of the corridor straightness as compared to ideal axis	± 15 mm
δH_{1A}	Variation of the first level of load above the base plate	± 10 mm
δH_n	Variation of any level of load with respect to the first	± 5 mm
H_y	Variation of the support level between the front and rear uprights	± 10 mm





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