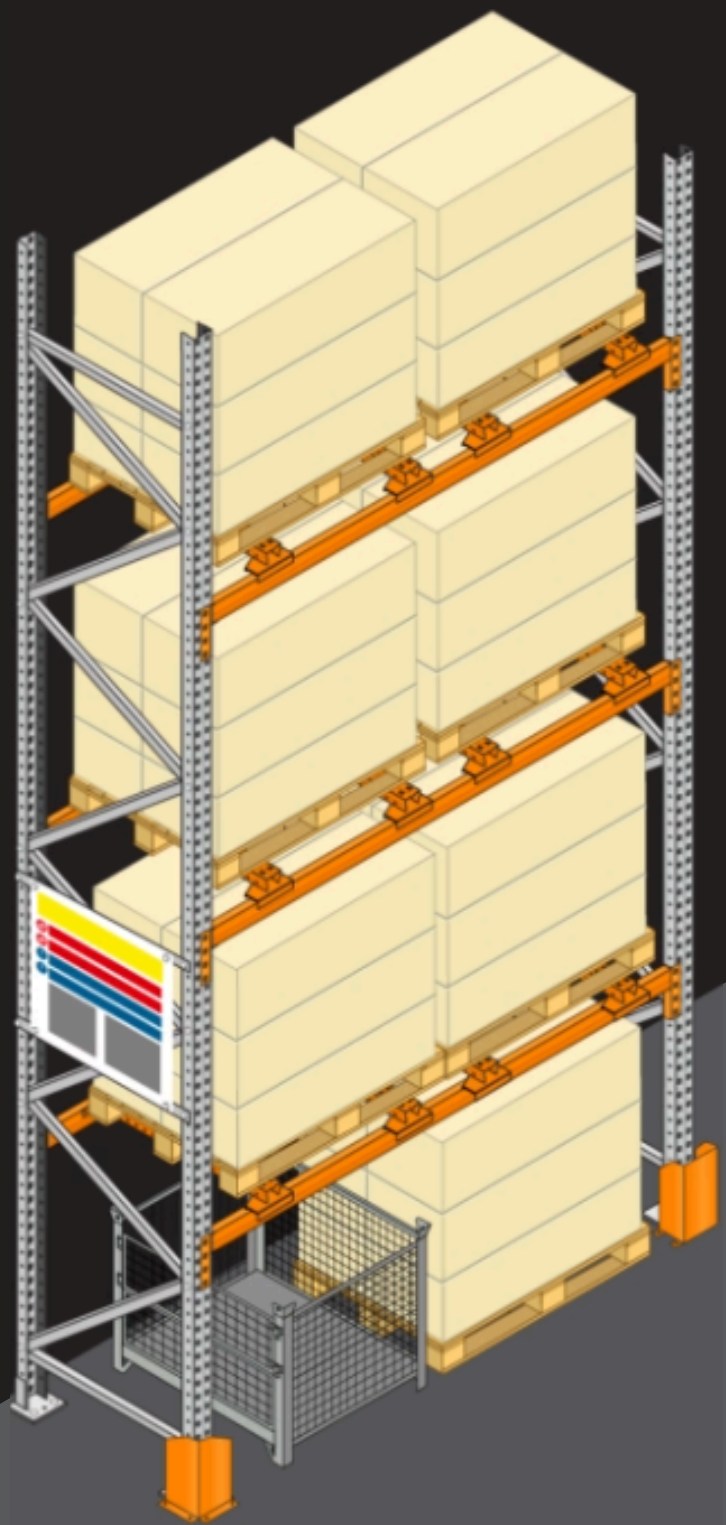
APEX RACKING

USER MANUAL

Version 1
November 2024



CONTENTS

NOTE

This document only covers APEX Selective Pallet Racking.

This document does not cover other racking including, but not limited to:

- Drive-in racking;
- Push-back racking;
- Cantilever racking;
- Mobile racking; and
- Racking made of materials other than steel.

SECTION 1
ASSEMBLY SPECIFICATION

The below instructions are to assemble APEX Selective Pallet Racking within the following specifications:

- Frame heights of no higher than 7315mmH.
- Frame depths of 609mmD, 838mmD or 1219mmD.
- No less than one single completed bay with a minimum of 2 beam levels.
- Height to first beam level and consecutive beam spacings as discussed with a representative of APEX.
- Load to be uniformly distributed on each pair of beams as well as along each beam. Discuss in detail with your APEX representative.

Contact your APEX representative for assembly of APEX Selective Pallet Racking beyond these specifications.

SITE REQUIREMENTS

FLOOR

Pallet Racking is designed to be installed on a suitable concrete surface. This implies that the concrete has been reinforced and will be able to accept the load that will be applied at the of the footplates of the system.

Although most warehouse floors are designed with pallet racking loading in mind, you should always check with a structural engineer if unsure.

The current AS4084.1:2023 specifies that the floor must be a suitable concrete floor. Contact an APEX project manager for further information should you wish to install on a surface other than concrete to come up with a suitable solution, such as strip concrete footings, for your needs.

DRY CONDITIONS

All engineering calculations relevant to the specification of this document have been based on dry internal application. Should you have an external racking requirement, cool room or humid environment (such as an industrial laundry or abattoir), please refer to your local APEX representative for further information.

TEMPERATURE RANGE

All engineering calculations relevant to the specification of this document have been based on greater than +4°C and in the freezing range of -24°C to -16°C.

Should you wish to install APEX in a chilled environment in the range of -16°C to +4°C or any other humid or outdoor environment, it is recommended that you have the additional corrosion protection of galvanised racking. Temperatures below -24°C must be discussed with your APEX representative.

COMPONENTS REQUIRED (AS SPECIFIED BY YOUR APEX REPRESTATIVE TO SUIT YOUR SPECIFIC LOADING REQUIREMENTS)

- Frames;
- Beams (usually a minimum of 2 beam levels);
- Minimum of 2 beam safety clips or pins per beam;
- Stud, screw or chemical anchors as specified to reach appropriate depth;
- Safe Work Load (SWL) sign;
- Rack protection to suit minimum AS4084.1:2023 requirements; and
- Shims to level the rack as per AS4084.1:2023.

ENSURE A SAFE WORK ENVIRONMENT PRIOR TO ASSEMBLY

RISK ASSESSMENT

Prior to assembly, a risk assessment should be undertaken which considers all tasks necessary to complete the assembly of your APEX Selective Pallet Racking. This includes the equipment being used as well as any hazardous substances being handled. This will highlight associated risks and ensure necessary steps taken to reduce the risk to acceptable levels. From this risk assessment, a Safe Working Method Statement (SWMS) should be produced.

SAFE WORK METHOD STATEMENT (SWMS)

A SWMS is developed for activities undertaken by workers, which identify the hazards associated with a work activity. A SWMS will assess the risk of these hazards occurring and outline the preventative controls to be put in place. It is a requirement of Work Health and Safety legislation that a SWMS be prepared for high risk work, prior to work commencing.

For further information regarding SWMS, refer to the WorkSafe fact sheet: Safe Work Method Statements (SWMS) guidance.

https://www.worksafe.vic.gov.au/resources/safe-work-method-statements-guidance

SITE SURVEY

A site survey should be undertaken prior to the supply of material to site and an assembly layout prepared.

This layout should include but not be limited to:

- Location of doorways;
- Location of building columns;
- Location of any firefighting or electrical equipment;
- Floor type, flatness and any drainage or joint locations; and
- Headroom clearance and any obstructions.

EQUIPMENT

The following is a guide only on the equipment required to facilitate the safe assembly of the structure.

Equipment may include, but not be limited to:

- Hand pallet trucks;
- Surveying equipment;
- Access towers;
- Forklift trucks;
- Hand tools;
- Trolleys;
- Power tools; and
- Scissor lifts.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal Protective Equipment should be worn to ensure personal safety during assembly.

Personal protective equipment may include but not be limited to:

- Hard hat;
- Safety boots or shoes;
- Rigger gloves;
- High-Visibility vest;
- Ear defenders;
- Work wear;
- Safety harness; and
- Safety goggles.

HEIGHT OF FIRST AND SECOND BEAMS AND BEAM SPACING

To ensure the safety and efficiency of your pallet racking, it's essential to provide the specifications for the first and second beam levels, as well as the spacing between beams to your APEX representative before receiving any load signage. If you have any questions, feel free to reach out to your APEX representative for assistance.

ASSEMBLY GUIDE

Note: THIS IS A GUIDE ONLY. It is always recommended that you use a pallet racking install contractor whom may use different methods, however the below will assist in self-installation. Please independently refer to AS4084:2023, other relevant standards and the building codes of Australia for further necessary information prior to installation to ensure compliance.

WARNING: Check your states legislation as you may require a building license to install pallet racking, such as a QBCC license in Queensland. It is upon the installer/self-installer to ensure compliance with state and local authority regulations.

1. Measure and mark out the location of the proposed pallet racking prior to the assembly of the rack, making sure that the bays of racking will end up square and running in a straight line. This can be achieved by marking out a simple 3,4,5 right-angled triangle on the ground.
Each frame location should be clearly marked on the ground, and it's level taken to find the highest point under the rack.
The remainder of the assembly will have their frames packed with shim plates to level up to this highest point.
Ensure aisles or access to emergency escape routes or fire equipment is not blocked by the assembly of the rack. You may need to refer to Australian Building codes to ensure appropriate clearances and fire egress requirements.

2. Stand two frames for the starter bay. Your frame must be stood in place with the lowest node point facing the direction of the forklift entry (as per Appendix A - Correct Installation Direction of Frames).
Fit the first beam at the specified height for your racking configuration. If you do not have a specified height please make note of the height and contact your APEX representative to find out the overall capacities of your configuration. Be aware of any fire sprinkler clearances that are required for your site to ensure compliance.

3. Secure the beam safety clips or safety pins to either end of the beam. Locking pins MUST be fully engaged in the upright slots when installing beams. These pins help to prevent the beam from being dislodged in the case of accidental impact.

4. Fit the remaining front and back beam levels. Repeat the steps 2 & 3 as necessary to install adjoining bays. ALWAYS remembering to secure the beams with the beam locking clips as you go.

5. If you have "back-to-back racking" or a "stand-off post" you will need to refer to your specific design from your APEX representative to correctly locate and install your row spacers or standoffs as these may affect the engineering and loadings of the racking.

6. To level the rack, fit the appropriate number of shim plates under each footplate which is attached to the bottom of each post.
As a check to make sure the racks are true & plumb to the vertical, a spirit level should be used to measure the "out of plumb" on the front face of the frame uprights, adding or subtracting shim plates as required. It should be noted that taller racks may require other more accurate methods to measure the "out of plumb".

7. All footplates attached to frames must be anchored to the floor to resist any lateral movement or uplift of the racking system. Secure each footplate to the floor using the anchors and anchoring depth specified by your local APEX representative. In most situations this will be two (2) seismic rated M12 stud or seismic rated M10 screw anchors, however other options and quantities may be necessary to achieve required load ratings.

8. To comply with the installation requirements of AS4084:2023, you are required to have your APEX Selective Pallet Racking installed to the requirements of the standards and to have a appropriately filled in Safe Working Load (SWL) Sign fitted to a highly visible location in the racking area at approximately 2000mm above floor level. It is recommended that the Safe Working Load (SWL) Sign is fixed to the end of the rack (if appropriately visible) using M10 nuts & bolts.

9. A Safe Working Load (SWL) Sign details the heights of the first and/or second beam level heights as well as the maximum capacity of the bay and the maximum capacity of each beam. There is also other information required to be on the load sign to be compliant with AS4084:2023.
Although each beam has been engineered to take a certain maximum UDL, it should be noted that depending on the configuration, the load capacity detailed on the load sign may be less than this to ensure that the maximum capacity of the bay is not exceeded.
This calculation is done by taking into account a number of factors including but not limited to, the thickness of steel used, the beam section, the size of the post, the height of the first and second consecutive beam levels as well as the presence and specification of any splicing in the system. If installing your APEX Selective Pallet Racking yourself, please contact your local APEX representative for information on load signage.

10. Visually inspect your APEX Selective Pallet Racking at least monthly to ensure that all beams and frames are in good condition and all beam locking clips are in place. We recommend a constant safety first approach with pallet racking and recommend that any issues spotted at any time are quarantined and attended to immediately.
This includes replacing any missing beam clips or damaged beams/frames immediately.

11. You are required to have a formal audit of your racking at least every 12 months as per AS4084:2023. This must be done by an appropriately qualified individual as per the description in the standard. Please discuss with your local APEX representative for further information.

SECTION 2

SAFE USE & MAINTENANCE GUIDE

Information has been adapted from the following sources:

WorkSafe Victoria Guidance Note - Pallet Racking Operation and Maintenance:
https://www.worksafe.vic.gov.au/pallet-racking-operation-and-maintenance

AS4084.1:2023 & AS4084.2:2023 - Australian standards for pallet racking

- These are available for purchase from Standards Australia

RACKING DESIGN & LAYOUT

Any pallet racking should be designed specifically for the size, shape and weight of the products or pallets being stored. It is also important that all APEX Selective Pallet Racking is set-up and maintained as per our instructions contained in this user guide or by a competent pallet racking installer according to the guidelines in both parts of AS4084:2023.

The layout of the racking should be compatible with the materials handling equipment used in that particular workplace (whether forklifts, walkie stackers or manual stackers) and should take into account, but not limited to the turning circle of the materials handling equipment, the lift height capability of the equipment and any additional clearance requirements of the specific equipment used.

Emergency access, adequate lighting and safe clearance for employees doing manual handling or picking activities should also be factored into the layout design.

Appendices A, D, E, F & G provide some assistance in understanding some of the critical parts of the design.

RATED CAPCACITY

There are three critical rating capacities related to racking and should never be exceeded.

They are:

- Maximum unit load;
- Maximum shelf load; and
- Maximum total capacity of each bay.

DEFINITIONS

- UNIT LOAD:
  - A single retrievable item such as a pallet of 1000kgs that may be retrieved in one single manual handling operation.

- SHELF LOAD:
  - The maximum weight that a level can take as the sum of the unit loads (i..e 2 pallets at 1000kgs each is a total shelf load of 2000kgs).

- MAXIMUM BAY LOAD:
  - The maximum weight that the total sum of the unit loads can safely be stored into the bay (being the beams hung between two frames).

This information is to be displayed on the APEX Pallet Racking Load Sign affixed to the end of the pallet racking 2000mmH from the ground. If you do not have a pallet racking load sign we recommend contacting your local APEX representative to enquire about the procedure for getting one as they are a requirement as per AS4084.2:2023.

MODIFICATIONS TO RACKING DESIGN OR COMPONENTS

If modifications are carried out, working load limits, safety-related information and SWL signage shall be updated to reflect the updated configuration.

SINGLE DEPTH RACKING NOT ON A WALL

In situations where pedestrians can access the back of the racking structure opposite the forklift entry point, rear protection such as safety mesh backing stand-offs is highly recommended to prevent loads from falling out the back of the racking onto pedestrians.

(See APPENDIX G - Safety Mesh Backing)

OPERATING INSTRUCTIONS

Procedures should be put in place by the client to ensure operations are performed safely with regards to the racking design, the load and capability of lifting equipment. As a minimum these should include:

- Correct use of the handing equipment (see manufacturers manual for the specific equipment);
- Rated capacities of the racking (load signage);
- Prohibitions on unauthorized alterations to the rack design;
- A clear process for reporting any damage as soon as it occurs.

SELECTION OF PALLETS AND GOODS ON PALLETS

Pallet racking should take into account the nature of the goods in the unit load. An assessment of any change to the pallet racking design should be done by a competent person to prevent problems arising. Examples include:

- Changing from timber pallets to post pallets/stillages may apply concentrated loads on racking beams and the pallets may no longer waterfall/key into place with the beams;
- Using pallets larger or deeper than the racking design can overlap pallets behind or even push them off the pallet racking entirely;
- Using pallets smaller or shallower than the racking design can cause them to drop through; and
- Using skid pallets in racking without mesh decks, chipboard decks, pallet supports or fork entry bars may lead to the pallet dropping through.

Potential problems that may require changes to the racking design include:

- Boxes, cartons and other items overhanging the pallet they are stored on.
- Falling items from boxes, cartons and other loose loads stored on upper levels.

If you are experiencing either of these issues, we recommend contacting your local APEX representative so that we may assist you in finding a suitable change to your racking design.

Please do not forget that pallets are NOT worldwide standard. APEX Selective Pallet Racking is generally designed to suit Australian standard 1165 x 1165 square pallets. Other suitable racking designs can be achieved, including but not limited to Euro Pallets - after consulting with your APEX representative.

COLLISION PROTECTION - MOBILE PLANT

Occupational Health & Safety legislation requires the client to ensure that they have an appropriate management plan in place for the safe operation of forklifts and other mobile plant equipment. It is highly recommended that suitable rack protection is included in the design. At minimum, end of rack protection such as corner guards or end row wrap barriers must be included where racking aisles and gangways intersect as per AS4084.1:2023, however, column guards and pallet deflectors are also recommended extras to minimise the potential for a catastrophic failure caused by a hard forklift strike with pallet racking.

REPORTING UNSAFE SITUATIONS AND DAMAGE

It is recommended that the “Traffic Light” safety approach is taken with pallet racking. The diagram in Appendix C from NSW WorkCover demonstrates the method by which damaged racking should be approached.

SAFE WORKING LOAD (SWL) SIGNAGE

Safe Working Load (SWL) signs must be clearly display the storage limits for:

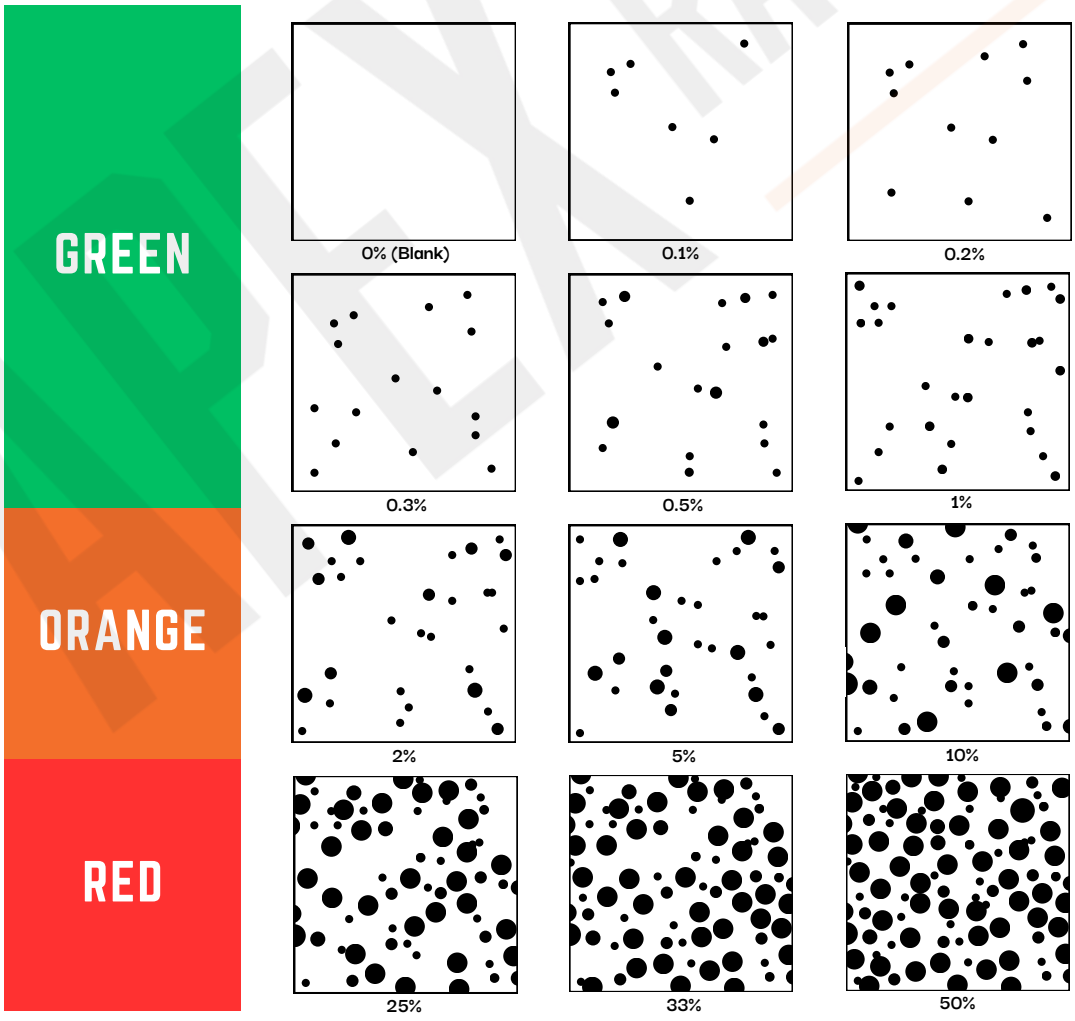
- Unit loads;
- Shelf loads; and
- Bay loads;

Deviations to existing racking configurations may require alterations to signs.

SWL signs must be positioned in one or more highly visible locations on or adjacent to the storage equipment area at approximately 2000mm above floor level. It is recommended that the Safe Working Load (SWL) Sign is fixed to the end of the rack (if appropriately visible) using M10 nuts & bolts.

CORROSION

Visual inspections of corrosion should use the drawing below as a rating guide.
Corrosion to racking components should be assessed in accordance with AS 2312.1 and AS/NZS 2312.2 using a tool such as an ultrasonic thickness gauge,



INSPECTIONS

AS4084.2:2023 provides guidance on how pallet racking should be inspected. Pallet racking must be formally inspected by a competent person at least every 12 months. This is usually performed by an outside entity. Beyond this, APEX recommends at least a monthly informal in-house inspection regime and also a safety culture that encourages constant vigilance on all the following points.

1. ARE THE BEAMS OVERLOADED?

If the deflection in a beam exceeds 1mm down over 180mm long then the beam is overloaded according to the AS4084.1:2023. The common beam length of 2591mmL may not deflect more than 14mm. Overloading may occur either by weight or by not enough support points for the unit load. Contact your APEX representative if you are unsure of the reason for your deflection.

2. ARE THE BEAMS OR THE WELDS DAMAGED?

Check for obvious signs of beams being hit by a pallet or forklift. Damaged beams should be replaced. If a beam has been hit and is only showing minor damage, ensure welds are checked for cracks by a competent person.

3. ARE THE BEAM CONNECTORS OR SAFETY CLIPS MISSING?

Examine beams for damage and replace missing clips. The design of the replacements must be approved by the racking manufacturer. If clips are regularly being dislodged, contact the manufacturer or installer to determine why and take the necessary action to fix it.

4. HAS A BEAM POPPED OUT OF IT'S UPRIGHT?

If a beam has popped out this will mean it is only suspended on one end connector and could collapse.

5. ARE THE ANCHOR BOLTS THAT SECURE THE RACKING TO THE GROUND LOOSE?

Inspect anchor bolts regularly to ensure they are appropriately tightened. Adjust as required.

6. ARE RACK LOAD SIGNS LEGIBLE?

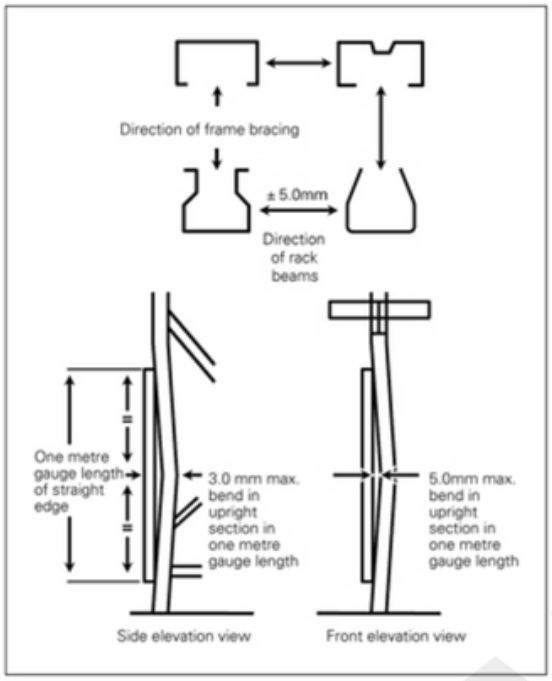
To ensure load signs are legible, check that:

- Markings/load signs displaying the rated capacities can be seen by workers.
- Rack configurations have not been altered.

7. ARE UPRIGHTS DAMAGED?

If an upright shows damage, is twisted or contains splits or cracks, replace it or splice in a new section. Splicing should only be done with the written approval of your APEX manufacturer.

Replace any damaged uprights and footplates.



8. ARE SPLICES IN GOOD CONDITION?

Check the condition of all splices. They should be above the first beam level, not below 1500mmH from the ground and no more than one splice should be between any two adjacent beam levels.

9. IS THE RACKING VERTICAL?

Out of plumb racking is usually caused by incorrect installation but can also be the result of impact, overloading or settling of the floor slab. If your racking is out of plumb, contact your local APEX representative to assist you in finding a solution.

10. ARE RACKING BRACES DAMAGED?

Replace bent frame bracing. For bracing, the member deviation from a 1m long straight edge in either plane should not exceed 10mm.

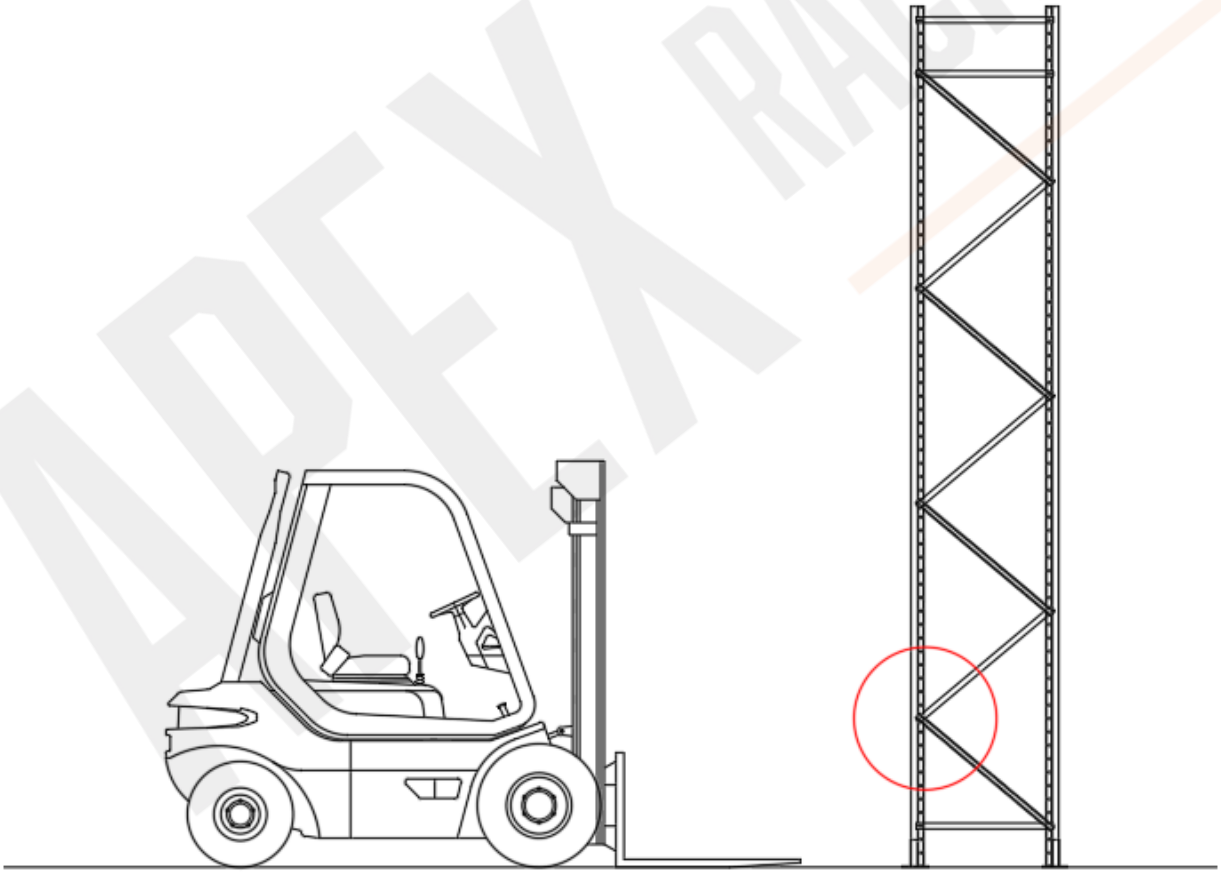
11. ARE FLOOR FIXINGS INSTALLED?

Check floor fixings are installed and undamaged. If damaged, replace it and the footplate. At least two anchors are required in each footplate of APEX Selective Pallet Racking.

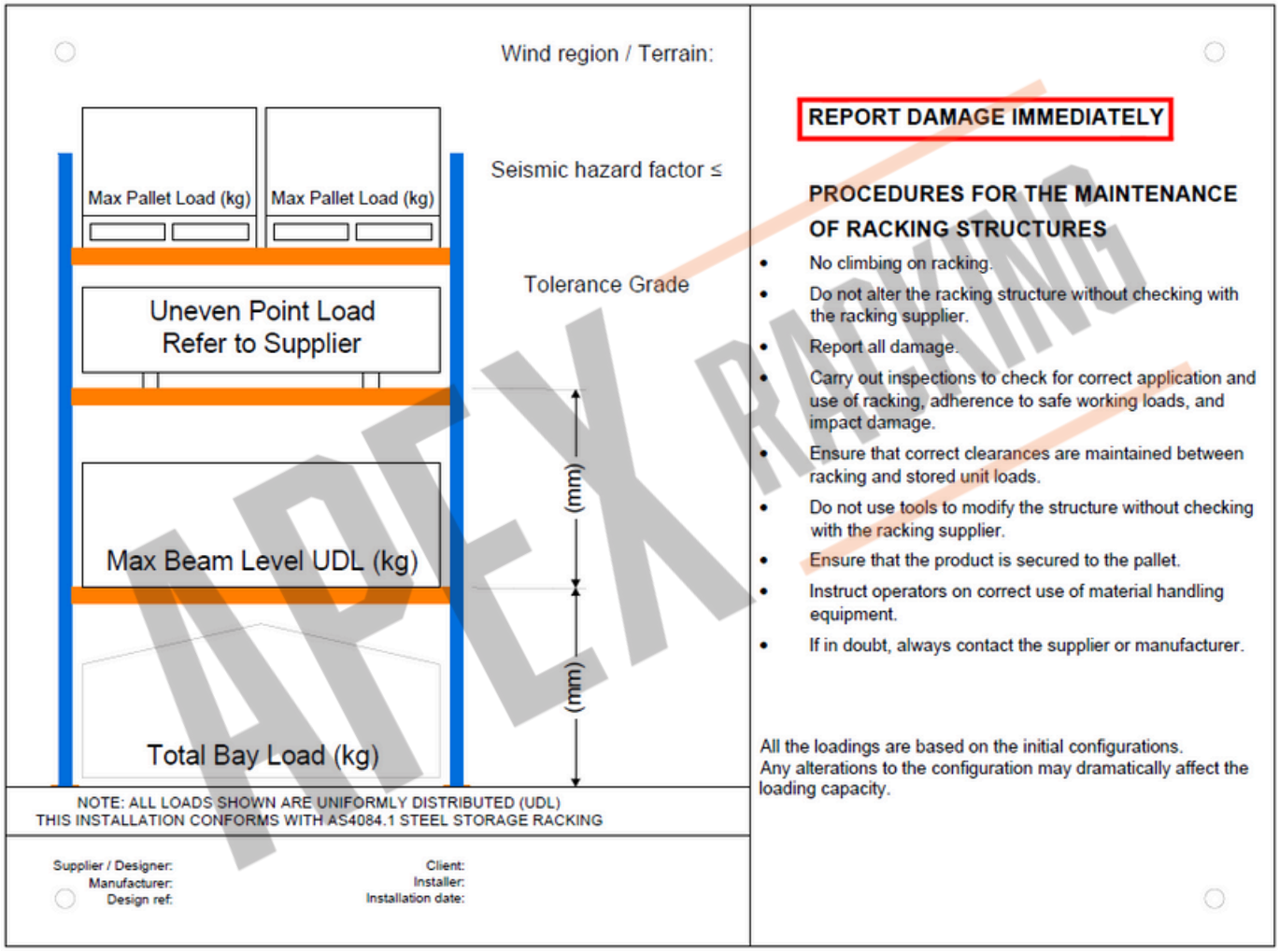
|SECTION 3|

APPENDICES

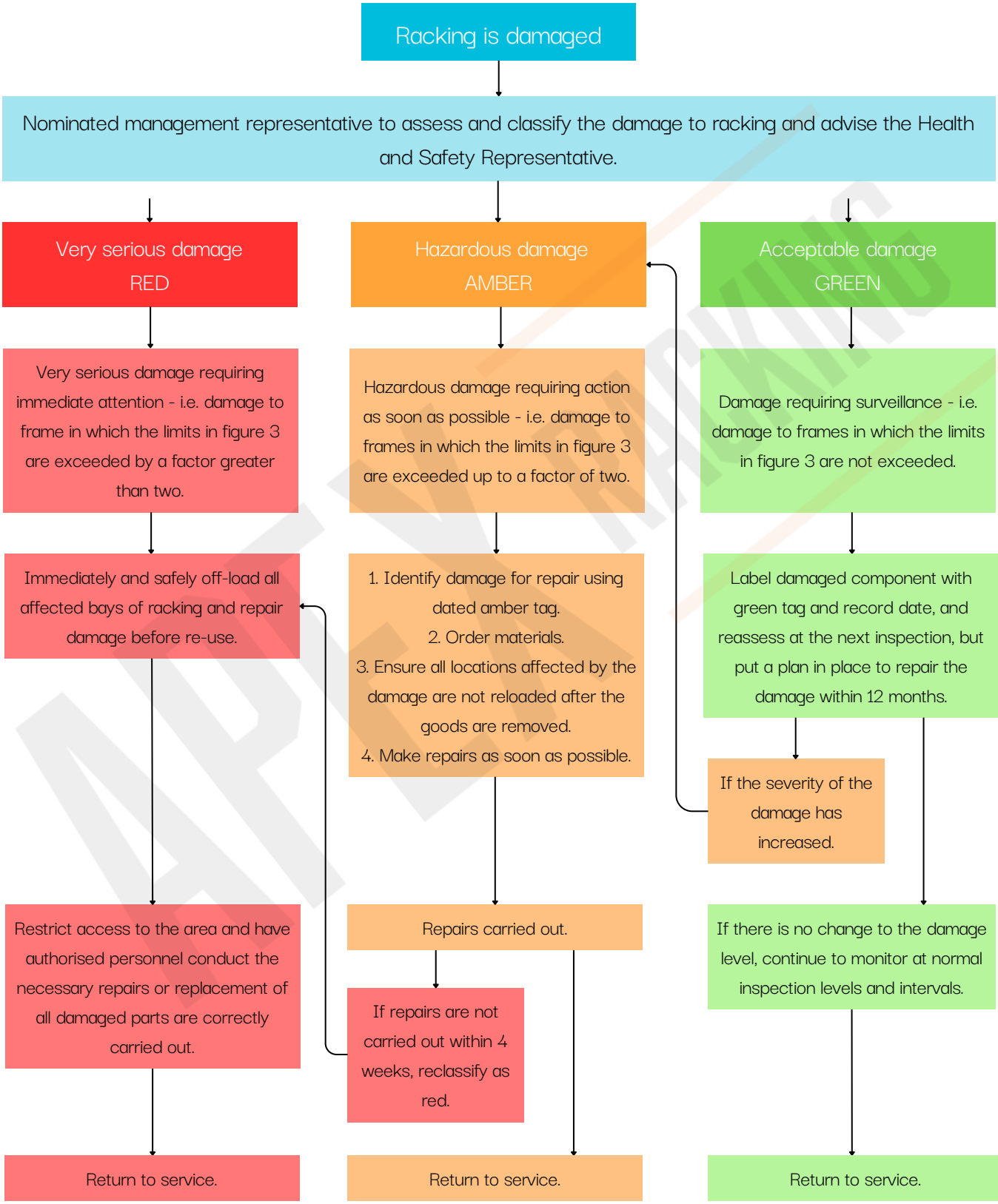
APPENDIX A - CORRECT INSTALLATION DIRECTION OF FRAMES



APPENDIX B - APEX LOAD SIGN



APPENDIX C - TRAFFIC LIGHT SYSTEM FOR MAINTENANCE OF PALLET RACKING



APPENDIX D - IDEAL PALLET RACKING LOAD CLEARANCES

There must be a minimum horizontal clearance of:

(a) 75mm between the unit load and the frame upright; and

(b) 100mm between adjacent unit loads on the same beam pair.

- A unit load may be a pallet of goods.

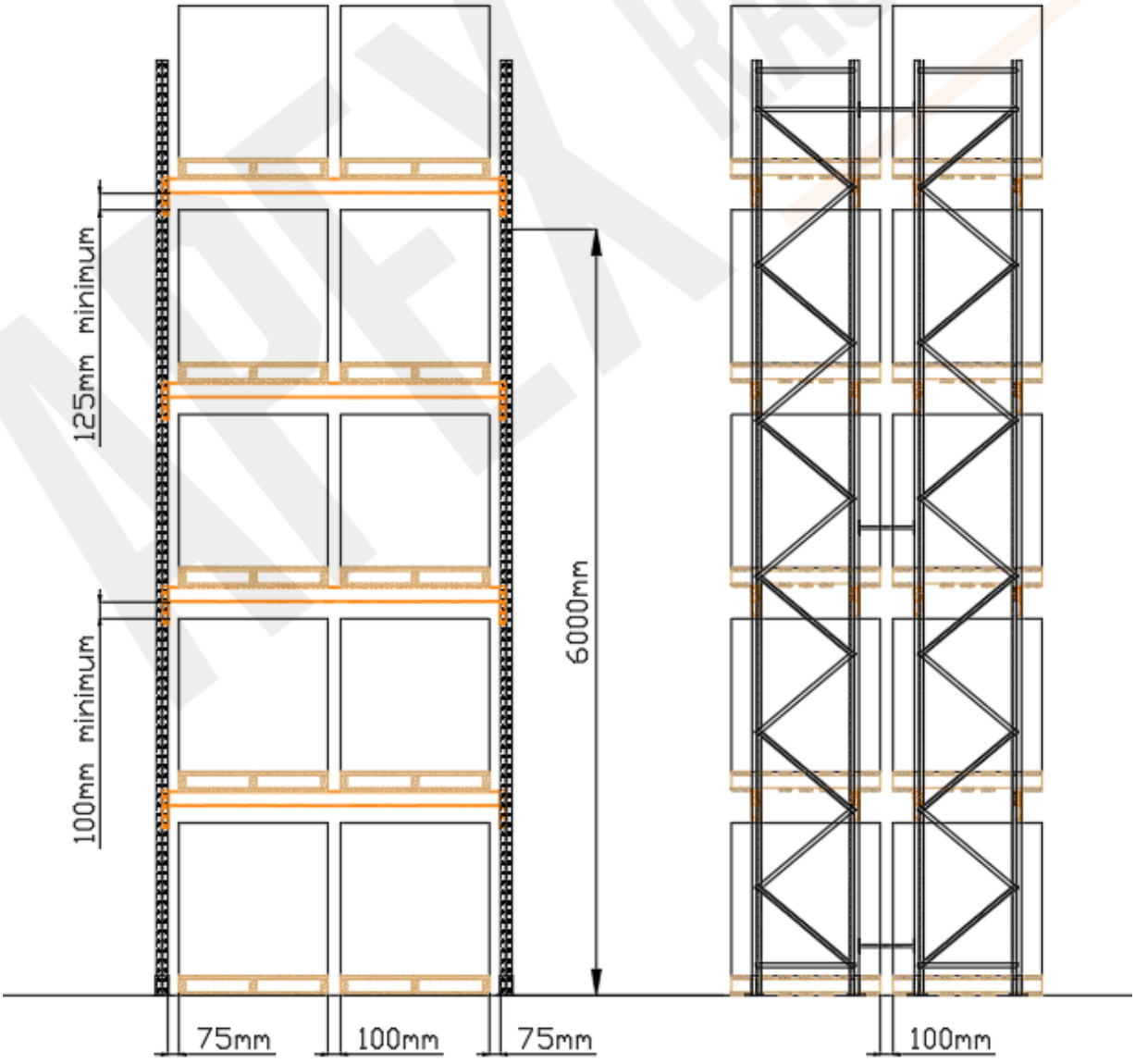
The following vertical clearances must be maintained between the top of the unit load and the beam level above:

(i) Where the equipment operator is at ground level and the top of the unit load is:

(a) Below 6m in height - 100mm; or

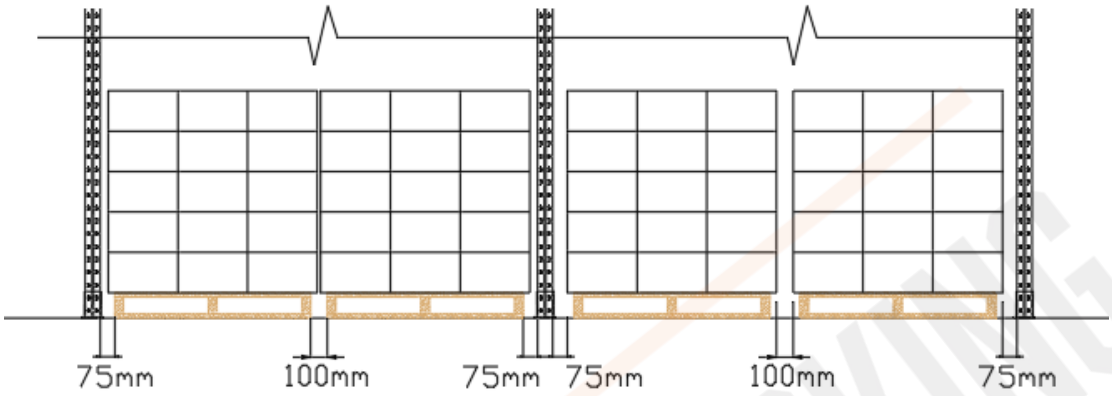
(b) Equal to or above 6m in their - 125mm.

(ii) Where the equipment operator is elevated to the storage level - 100mm.



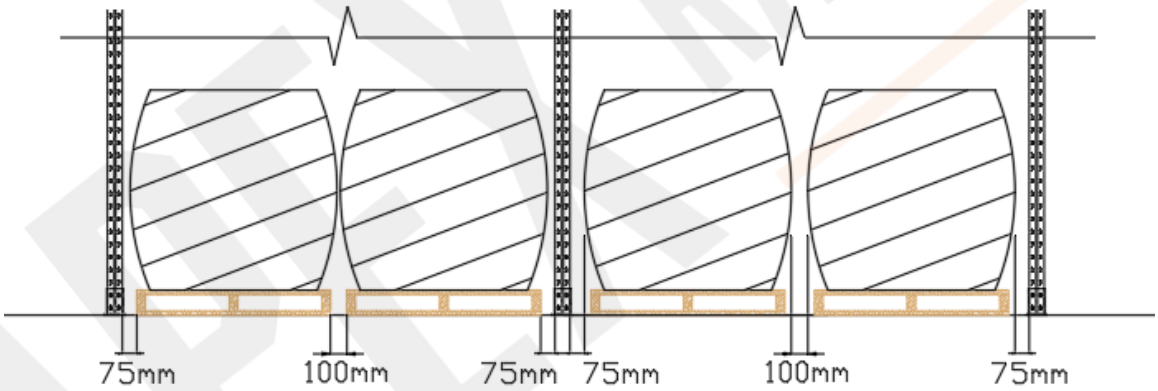
Sometimes, items may overhang beyond the pallets they're stored on. To help you maintain the right clearances, we've included some examples below. In certain cases, you might need a longer beam to achieve the necessary space.

OVERHANGING



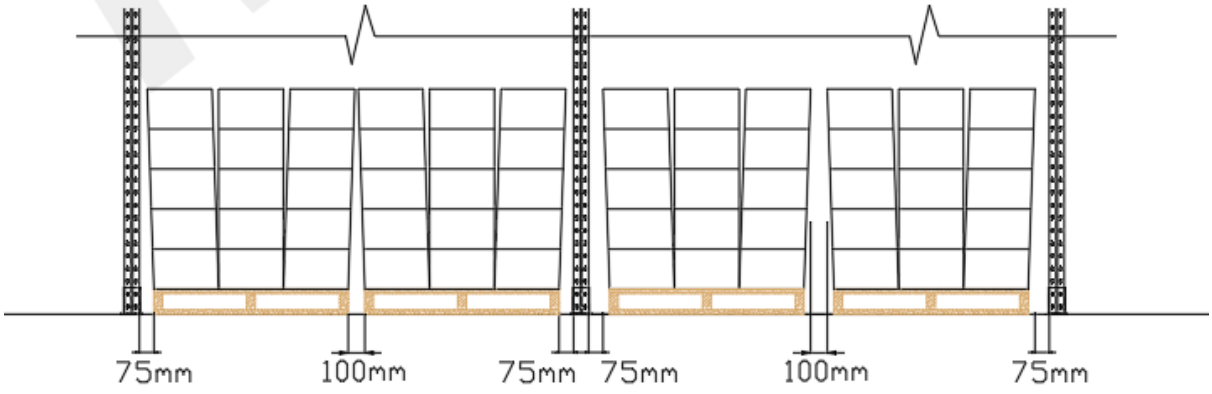
✗ DON'T DO THIS ✓ DO THIS

BULGING



✗ DON'T DO THIS ✓ DO THIS

FANNING



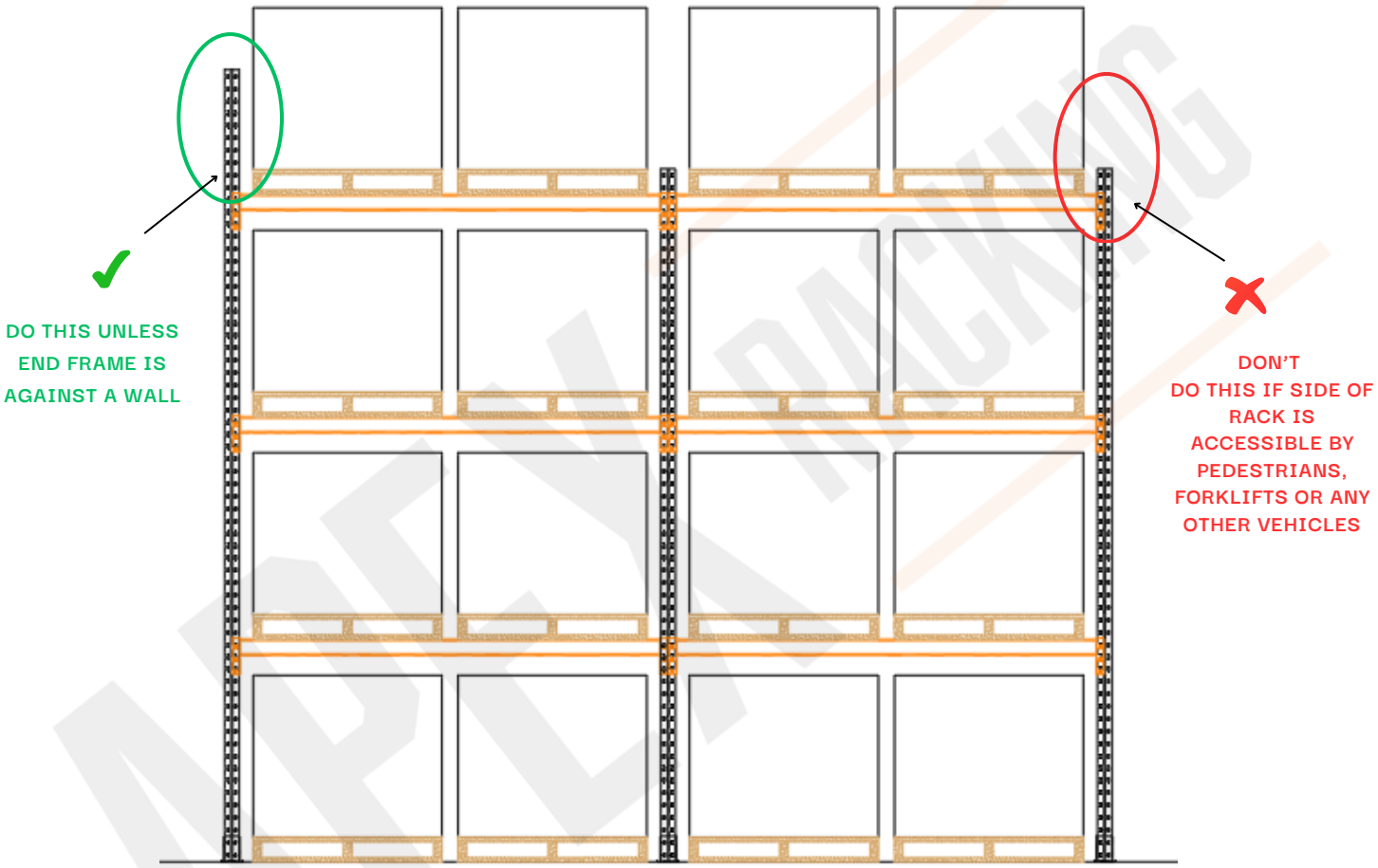
✗ DON'T DO THIS ✓ DO THIS

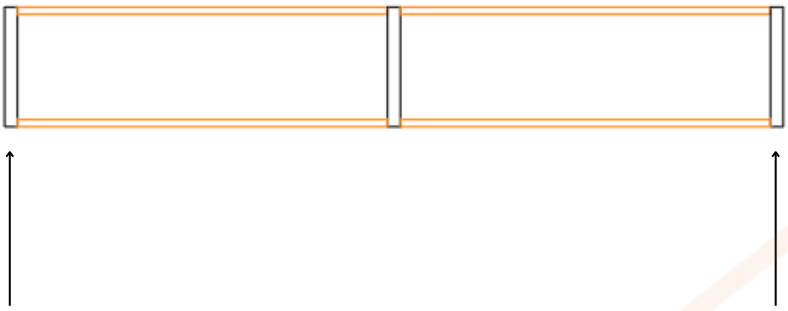
APPENDIX E - END FRAME EXTENSIONS

End frame extensions should be installed where the end frame is adjacent to a trafficable aisle (by pedestrians, forklifts or any other vehicles).

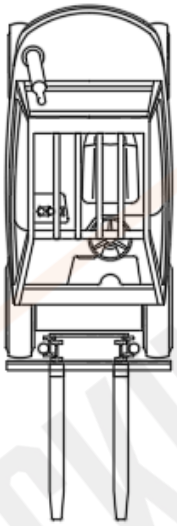
Where required, the frame extension **must** be minimum 50% of the height of the top pallet.

In Appendix F we show some examples of how this can be achieved in a run of bays joined together.





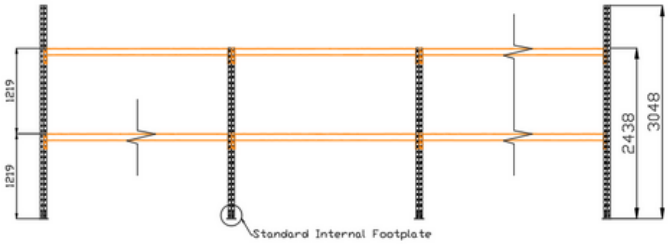
A shorter end frame here is okay as it is adjacent to a wall.



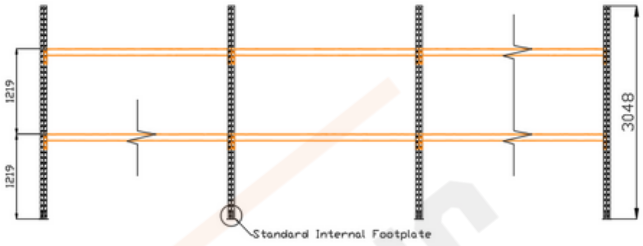
A shorter end frame here is **NOT** okay as the side of the rack is accessible by pedestrians, forklifts or other vehicles.

APPENDIX F - SOME COMMON PALLET RACKING RUN EXAMPLES

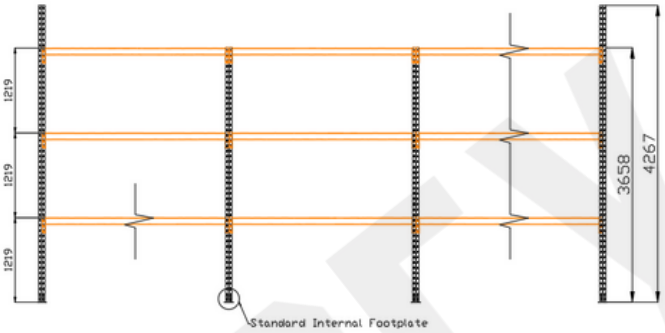
1219mm BEAM INTERVALS



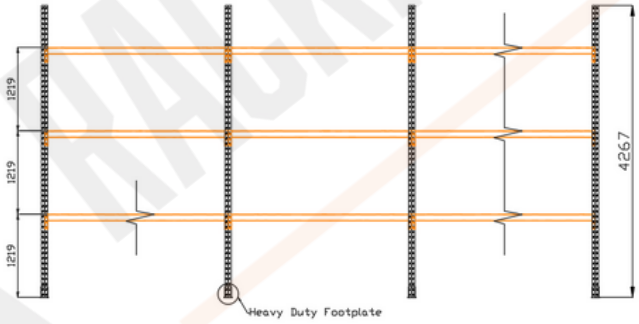
1 run of 3 bays - standard internal footplates
3048H end frames with 2438H mid frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH



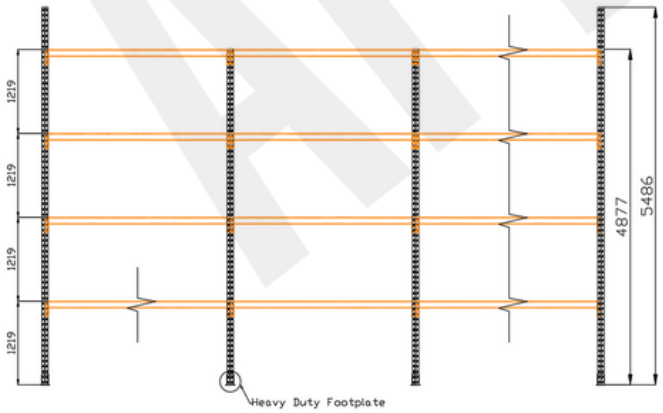
1 run of 3 bays - standard internal footplates
3048H frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH



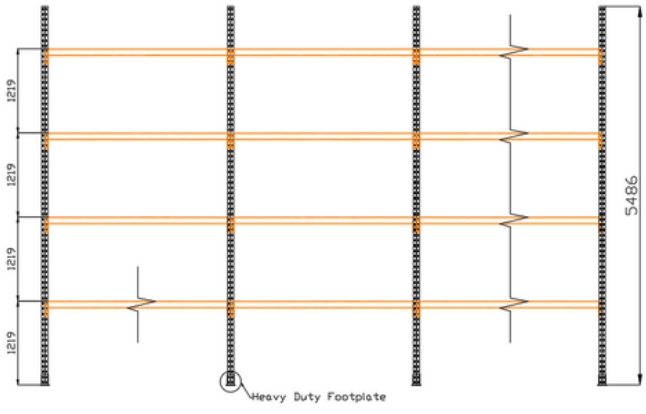
1 run of 3 bays - standard internal footplates
4267H end frames with 3658H mid frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH



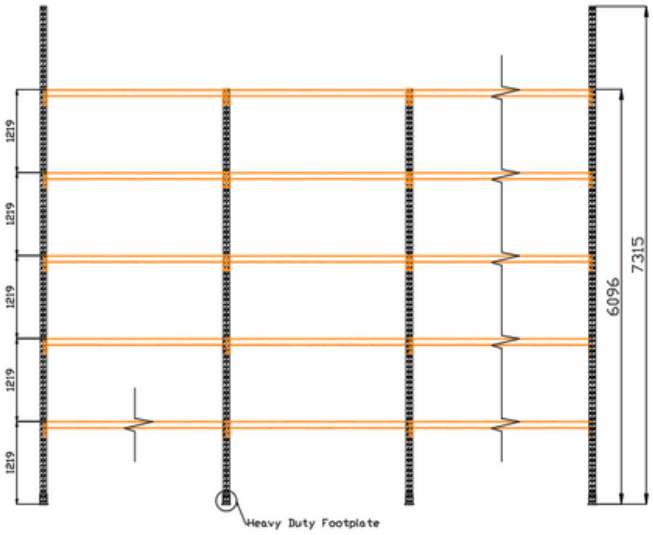
1 run of 3 bays - heavy duty footplates
4267H frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH



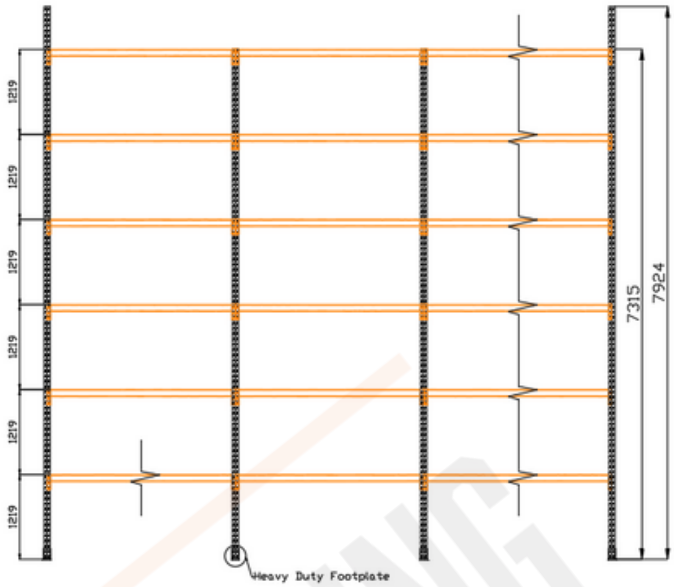
1 run of 3 bays - heavy duty footplates
5486H end frames with 4877H mid frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH
4th beam level @ +1219mmH



1 run of 3 bays - heavy duty footplates
5486H frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH
4th beam level @ +1219mmH

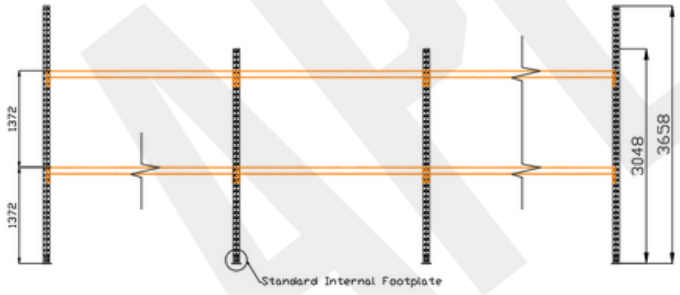


1 run of 3 bays - heavy duty footplates
7315H end frames with 6096H mid frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH
4th beam level @ +1219mmH
5th beam level @ +1219mmH

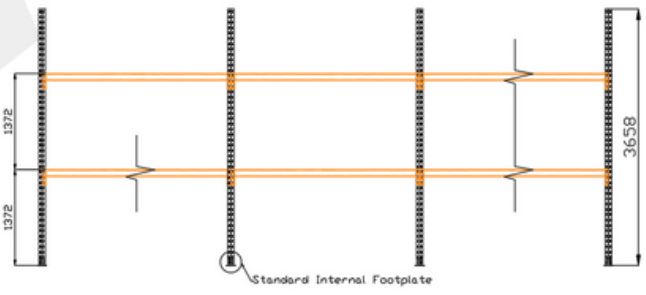


1 run of 3 bays - heavy duty footplates
7924H end frames with 7315H mid frames
1st beam level @ 1219mmH
2nd beam level @ +1219mmH
3rd beam level @ +1219mmH
4th beam level @ +1219mmH
5th beam level @ +1219mmH
6th beam level @ +1219mmH

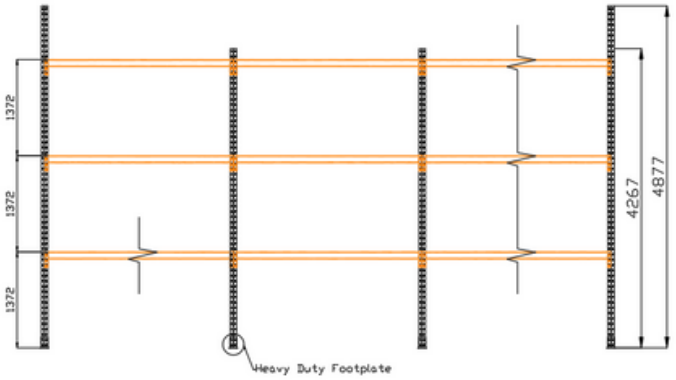
1372mm BEAM INTERVALS



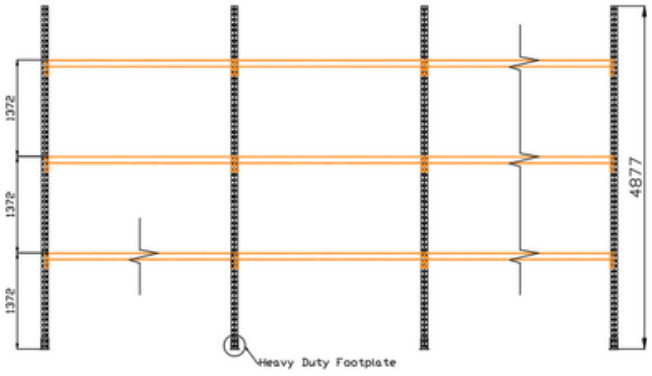
1 run of 3 bays - standard internal footplates
3658H end frames with 3048H mid frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH



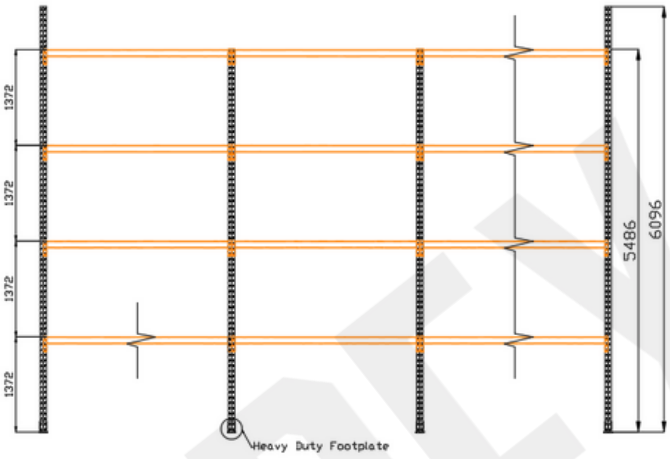
1 run of 3 bays - standard internal footplates
3658H frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH



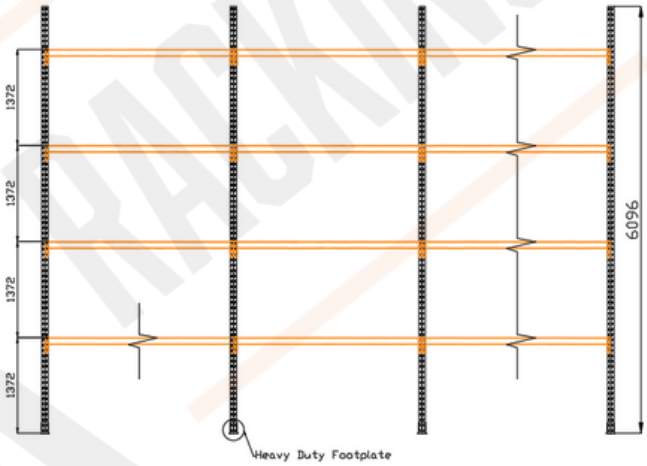
1 run of 3 bays - heavy duty footplates
4877H end frames with 4267H mid frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH
3rd beam level @ +1372mmH



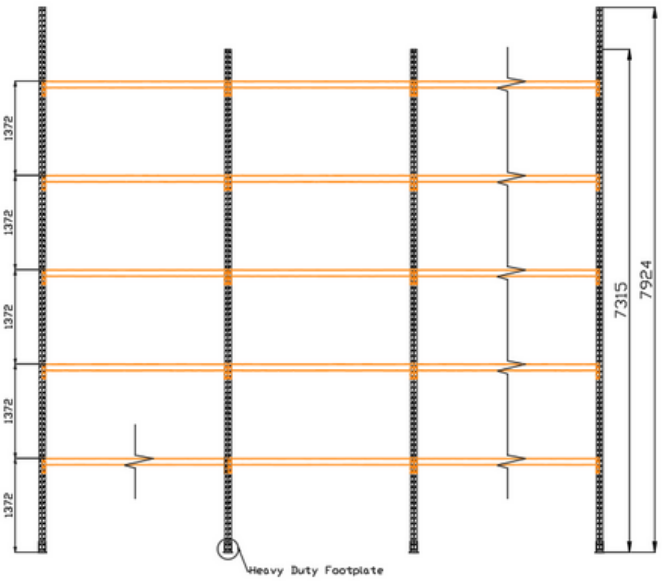
1 run of 3 bays - heavy duty footplates
4877H frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH
3rd beam level @ +1372mmH



1 run of 3 bays - heavy duty footplates
6096H end frames with 5486H mid frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH
3rd beam level @ +1372mmH
4th beam level @ +1372mmH

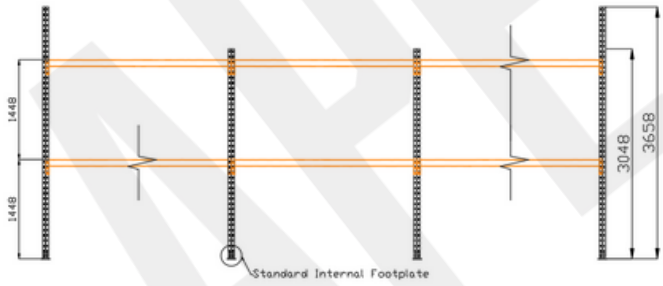


1 run of 3 bays - heavy duty footplates
6096H frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH
3rd beam level @ +1372mmH
4th beam level @ +1372mmH

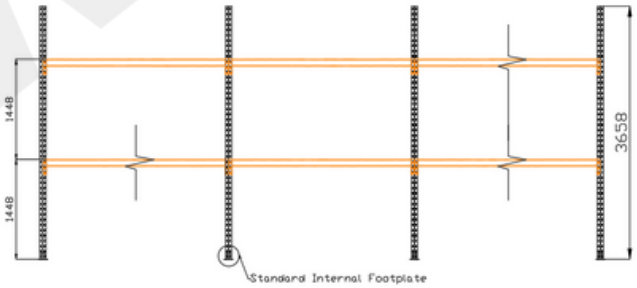


1 run of 3 bays - heavy duty footplates
7924H end frames with 7315H mid frames
1st beam level @ 1372mmH
2nd beam level @ +1372mmH
3rd beam level @ +1372mmH
4th beam level @ +1372mmH
5th beam level @ +1372mmH

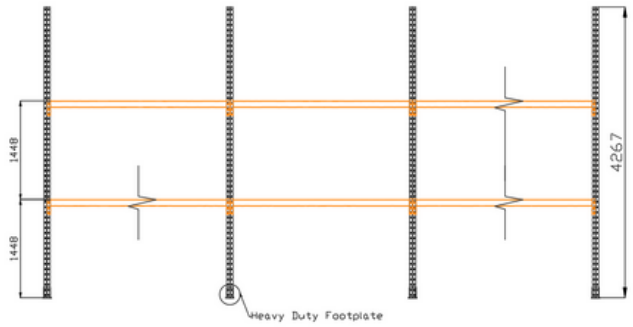
1448mm BEAM INTERVALS



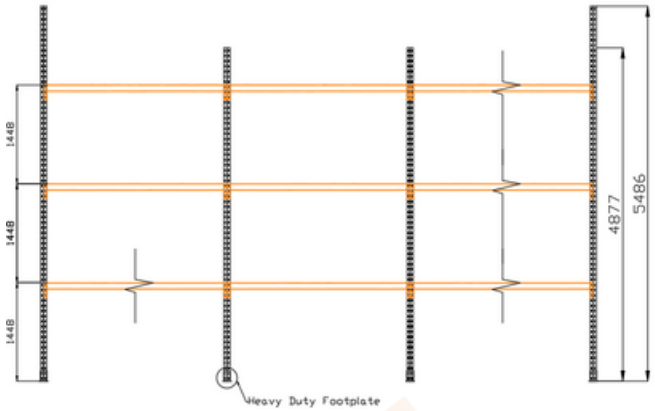
1 run of 3 bays - standard footplates
3658H end frames with 3048H mid frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH



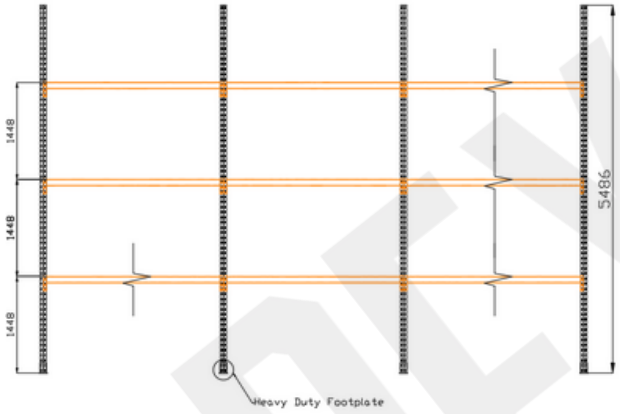
1 run of 3 bays - standard footplates
3658H frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH



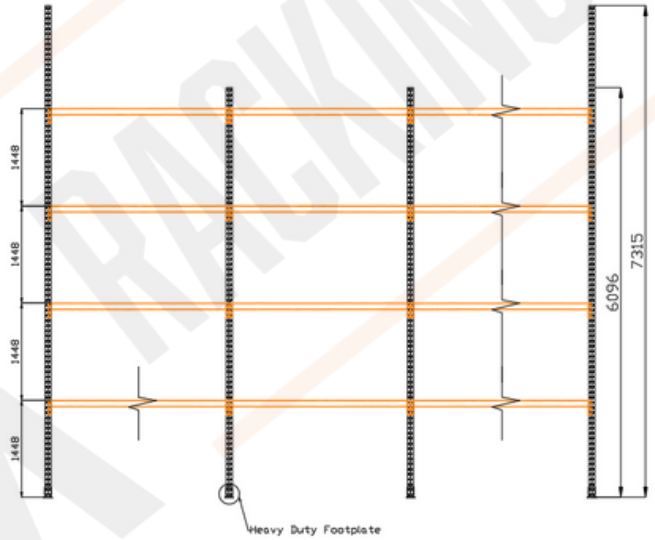
1 run of 3 bays - heavy duty footplates
4267H frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH



1 run of 3 bays - heavy duty footplates
5486H end frames with 4877H mid frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH
3rd beam level @ +1448mmH

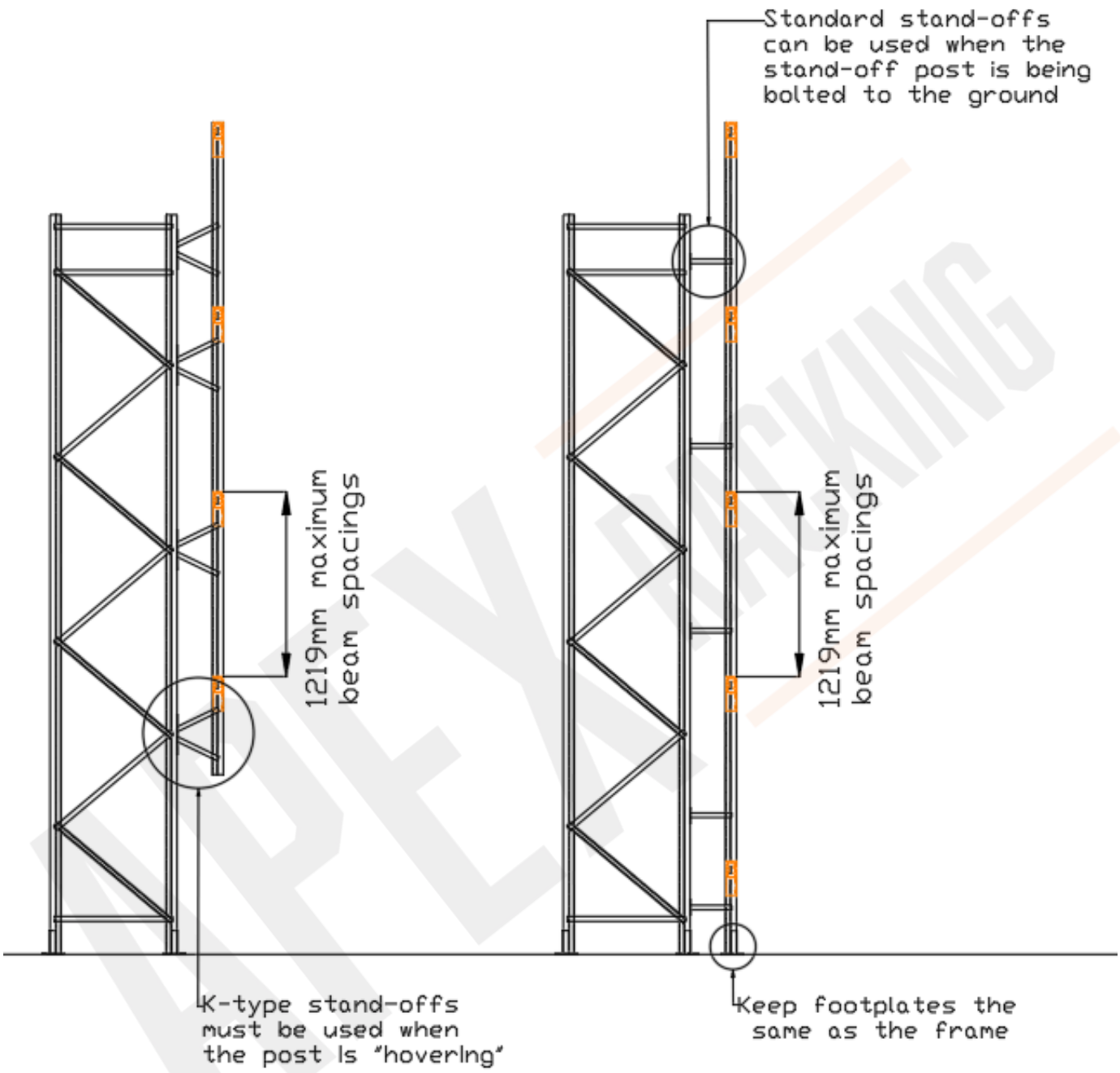


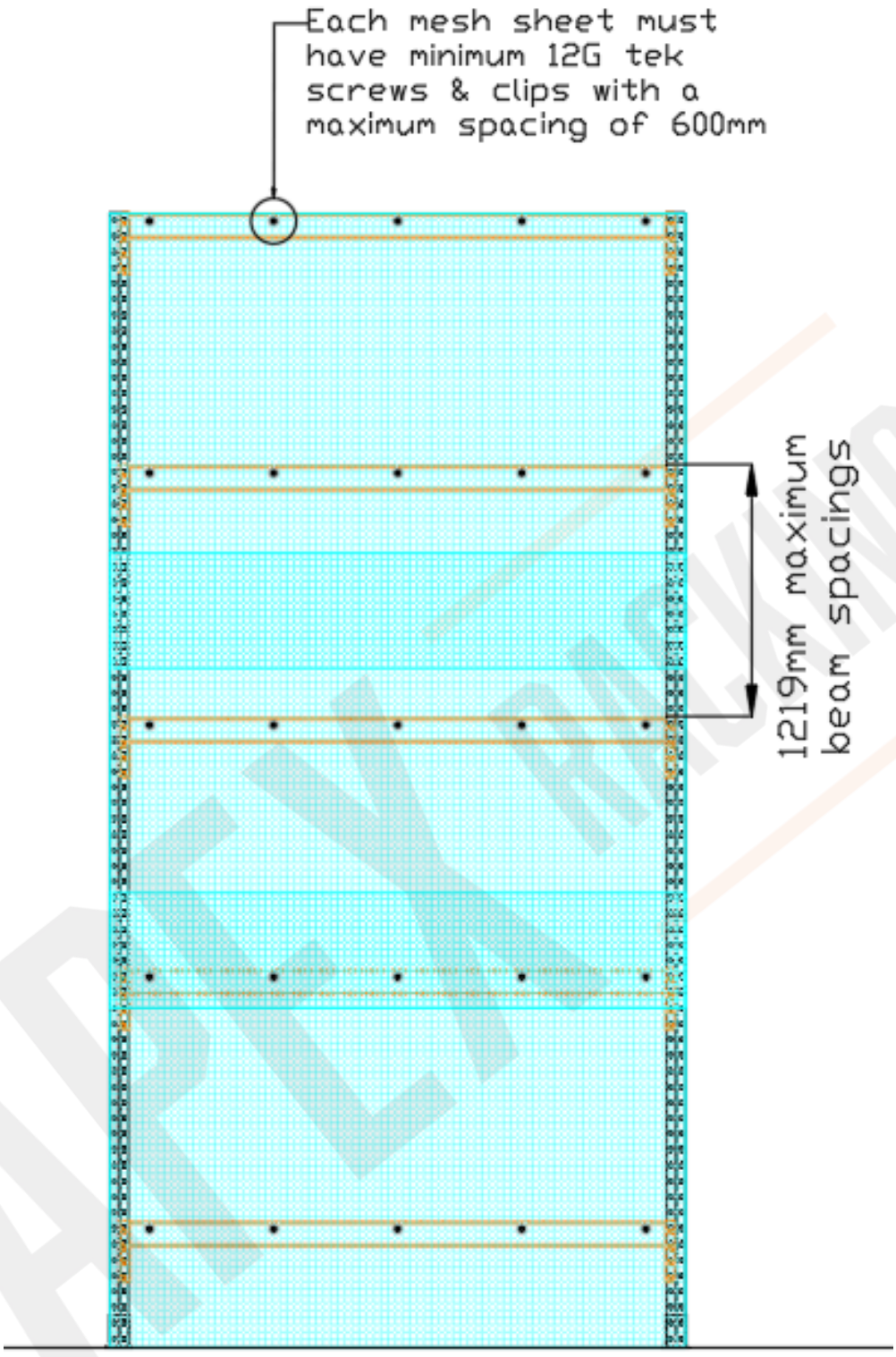
1 run of 3 bays - heavy duty footplates
5486H frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH
3rd beam level @ +1448mmH



1 run of 3 bays - heavy duty footplates
7315H end frames with 6096H mid frames
1st beam level @ 1448mmH
2nd beam level @ +1448mmH
3rd beam level @ +1448mmH
4th beam level @ +1448mmH

APPENDIX G - SAFETY MESH BACKING




Each mesh sheet must have minimum 12G tek screws & clips with a maximum spacing of 600mm
1219mm maximum beam spacings

APEX RACKING

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