

## QMN Procedure: Storage Systems (Selection, installation, use and maintenance)

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### 1. PURPOSE

This procedure details the selection, installation, use and maintenance of storage systems used for the storage of collection items across the Queensland Museum Network (QMN).

### 2. SCOPE

This procedure applies to all staff responsible for the management of collection storage.

### 3. DEFINITIONS

**Beams** come in many forms. **Step beams** are roll formed members with a step along the top inside edge. This step is used to hold any load support components such as pallet supports, shelves or wire decks. **Box beams** have no inset step; instead have four flat sides like a box. All beams typically mount onto an upright frame column with clips or hooks. Some systems utilize an extra clip or bolt to lock the beam to the upright.

**Column protectors**, also known as **post protectors**, are protective shields that can be installed around the base of pallet racking uprights to minimize damage where forklifts might hit the upright. Damage to the base of a column can weaken the entire frame and could cause it to collapse. Column protectors are made of various us materials such as polyethylene, ductile iron casting, and other durable materials.

**Compactus storage systems** is a material handling storage system which allows for high density storage, comprising of shelving or cabinets placed on a mobile base which run on tracks either in the floor or along the ceiling. They can be manual ('push /pull' systems using body weight to open and close them), mechanical (operated with the use of a winder), or electronic (operated by computer).

**Competent person** under WHS legislation *competent person* is one who has acquired through training, qualifications or experience the knowledge and skills to carry out the task.

**Footplates**, also known as **footpads** or **baseplates**, are at the base of upright columns and serve as anchors to give the storage system more stability: anchor bolts are inserted through the baseplate's holes to attach the column to the concrete floor. Footpads increase the pallet rack's overall stability and weight-bearing capacity.

**Long span** or **Open shelving** is a material handling storage system similar in appearance to pallet racking (generally being comprised of uprights, beams and shelves) except objects can be stored directly on shelves rather than needing to be placed on pallets. Shelves can have spans of 900mm to 3800mm, with bay heights from 1800mm to 3400mm. The units can support a range of weights from 100kg -340kg per shelf, to heavy loads over 400kgs,

depending on their construction. They have adjustable shelf heights to accommodate a wide variety of object types. Shelves can be made of low emissions MDF, laminex, mesh or powder coated steel.

**Pallet** is a raised platform, usually constructed of wooden slats but can be plastic or metal, used to support a load. It has a gap underneath in order to allow it to be picked up and moved by a forklift or pallet jack. A standard pallet is approximately 120cm square, but can be made to any dimensions and can take a load capacity from 300kgs to 2000kg depending on its construction.

**Pallet rack** is a material handling storage system designed to store materials on pallets. Although there are many varieties of pallet racking, all types allow for the storage of palletized materials in horizontal rows with multiple levels. Forklift trucks or pallet stackers are required to place the loaded pallets onto the racks for storage.

**Pallet supports** are roll formed channels that are placed front to back between pallet racking beams to support pallets.

**Row spacers** are sometimes used if pallet racking or long span shelving are arranged in back-to-back rows; the spacers are mounted between adjacent columns to ensure that the rows are kept straight and to give the storage system even more strength and stability.

**Upright frames** (also called **upright columns** or **uprights**) vary in size and design depending on load requirements, and styles. Holes or slots are punched during manufacturing up and down the column at standard intervals so that the beams can be mounted into the upright columns. Diagonal braces and horizontal braces commonly referred to as upright frame lacing is usually welded between two upright columns to form upright frames. The lacing may be bolted to the columns in some cases.

**Wire decking or mesh** is commonly used as a safety measure on pallet racking and long span shelving to prevent pallets or the products stored on them from falling through the shelving structure. Wire mesh decking comes in various thicknesses and mesh dimensions.

**Uniformly distributed load** (or **UDL**) is when a load is evenly spread along the length of a beam or shelf rather than being concentrated in one spot.

## 4. ACTIONS

### 4.1 Selection of storage systems

The site or campus planning to acquire new, replacement or additions to an existing storage system, should select the most appropriate system for the intended use by first determining what type of material needs to be stored (size, weight, media), how often it is accessed and by whom, what equipment is currently available to assist with access and the available budget. In addition, if high density systems are being considered, it is important to be aware of any load limits which might apply to the floor of the storage area.

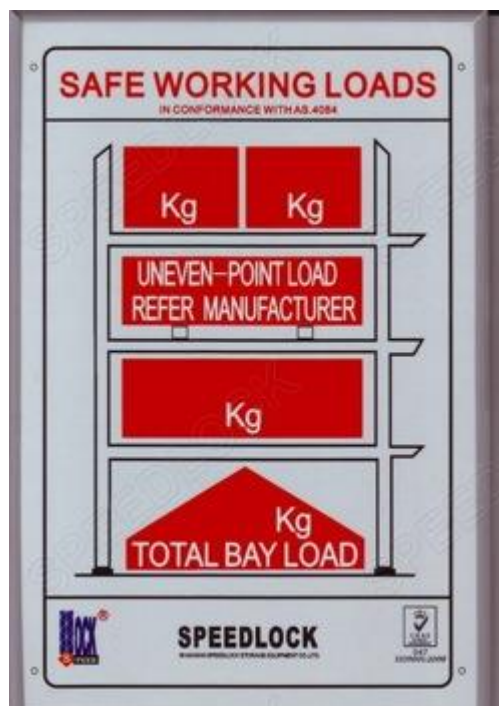
When selecting a storage system, staff must ensure that the supplier can verify that their system complies with *Australian Standard 4084-2012 Steel Storage Racking*, *Australian Standard 2143-1978 Industrial and Commercial Steel Shelving* or an equivalent standard.

## 4.2 Installation of storage systems

If contractors are being appointed to install storage systems they must be able to demonstrate appropriate insurance cover (e.g. Workers Compensation and Public Liability) by supplying certificates of currency on request. They must also hold and maintain any requisite licences and permits required for operating equipment utilised for the installation process, such as a forklift licence.

In addition, to ensure the optimal functionality of the storage system and to minimise any potential WHS issues, the following points should be checked at the time the contractor installs the system:

- In the case of pallet racking, installation of the bottom beam must be high enough to allow for clearance of lifting equipment.
- In the case of long span shelving, the bottom beam should be high enough to allow for cleaning underneath and as a preventive measure in the event of minor flooding (a minimum of 10cm).
- All hardware securing the rack, shelving unit or compactus to the floor and/or walls must be properly fitted and tightened.
- Where applicable, all safety clips or shelf supports must be operational and fully engaged.
- All racks, shelving units or compactus must be plumb, level, and square.
- There should be no dents, kinks, or otherwise damaged components.
- Signage outlining load limits or *Safe Working Loads* should be attached to the storage system, and should match the original specifications. For example in the case of pallet racking the following type of signage should be used:



### 4.3 Addressing storage systems

A standard method of addressing / labelling storage systems within a given storage area must be observed when installing new storage systems or inserting additional levels to an existing storage system.

Usually storage systems are addressed / labelled sequentially from left to right and from top to bottom (although this may vary depending on the specific location of the store and collection material; but whatever method has been employed previously, the new addressing / labelling must be consistent with the system already in place in the storage area and consistent with the nomenclature used in the Vernon database).

Compactus systems are comprised of a number of horizontal units each referred to as a 'Row' (some of which can be 'back to back' where two rows are joined together and move as one or 'stand alone' where they are single units – often these form the 'static' ends to the mobile section, which moves in between the two static ends). Each row is made up of a number of vertical units referred to as 'Bays'. Within each bay there are different levels which can be shelves or drawers or a combination of the two – each of these 'levels' (regardless of whether a drawer or shelf) is given an individual number in a single sequence. For example:

Compactus V – Plan view of Row 1 (single stand alone row)

Bay 1	Bay 2	Bay 3	Bay 4	Bay 5
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Compactus V – Front elevation view of Row 1

Bay 1.....Bay 2.....Bay 3.....Bay 4.....Bay 5

Bay 1 / Level 1				
Bay 1 / Level 2				
<b>Bay 1 / Level 3</b>				
Bay 1 / Level 4				
Bay 1 / Level 5				

The highlighted location would be recorded in Vernon as: QMSB/Anth/V/1/1/3. (This refers to the Anthropology store located at South Bank, Compactus V, Row 1, Bay 1, Level 3 - which may be a shelf or a drawer).

Pallet racking also comprises of a number of horizontal units each referred to as a 'Row' (some of which can be 'back to back' where two rows are butted together or 'stand alone' single units). Each row is made up of a number of vertical units referred to as 'Bays'. Within each bay there are different levels designated by where the beams have been inserted to support pallets – each of these 'levels' is given an individual number in sequence. For example:

Hendra/FurnitureSt/OS/1/2/3

This location address refers to the Furniture store located at Hendra, Open shelf (pallet racking) Row 1, Bay 2, Level 3.

This process of location addressing can be applied to any type of storage system – it is always hierarchical and in a numerical (or alphabetically) sequence.

In the case where you may need to insert an additional 'level' into an existing unit which alters the existing sequence (e.g. inserting an extra level between existing levels 1 and 2) all the labels on the original levels and location addresses in Vernon will need to be updated to ensure the sequence is maintained and information accurately reflects where objects are now located.

#### **4.4 Use of Storage systems**

##### **Pallet racking and long span shelving**

The most important issue relating to pallet racking and long span shelving is to ensure the systems are not overloaded. Determining load capacity is a complex process, upright frames have a total load capacity - this refers to the maximum load capacity for the entire bay of racking or shelving irrespective of the number of levels or beams. So the total load per beam is based on the frame limit divided by the number of levels – adding or subtracting beams or levels will affect the load capacity of the remaining beams. In addition, the load capacity of the beams can be further affected by the following:

- Type of construction of the beam,
- Height of the *profile* (this is the height of the beam as you look directly at it),
- Number of connectors (the hooks that lock into the upright),
- Beam length - the longer the beam, the lower the load capacity, conversely smaller beams have larger capacities,
- Whether the load is uniformly distributed or not.

For newly installed racking or shelving (post January 2012), the supplier is required to provide a weight load capacity for the type of system purchased. This will assist staff to determine how to load the system safely; even if modifications are required to the number of levels or beams subsequent to the initial installation.

For pre-existing racking or shelving, it may be necessary to seek assistance from a racking supplier to establish safe parameters for weight load capacity.

In addition, the following issues need to be taken into account specifically with reference to pallet racking:

- Pallets should only be used if they are of the best quality and appropriate load capacity for the objects being stored. (Broken or cracked boards, protruding nails, and other deficiencies can cause palletized loads to fall from racks).
- Wherever possible objects should be secured to the pallets with strapping, tie downs or other appropriate fixings (ensuring protection material is used between the strapping and the object to avoid potential damage from abrasion).
- Forklift operators should be trained to avoid "impact loading" (dropping loads onto the rack), and how to position loads for even distribution of load weight.
- Barriers such as post or column protectors should be used to protect uprights from potential damage.
- Lifting equipment should be maintained in safe working order.
- Good housekeeping practices should be mandatory. Aisles should be kept clear of litter or obstructions; and they should not be used for floor stacking of pallets.
- If an object is larger than a single pallet, where possible any overhang should occur at the side of the pallet not the front or back. (Overhangs at the back or front can affect safe access – when pallets are moved up and down aisles, or on and off the pallet racking.)
- Each pallet should have a pallet label attached to the front (including information such as registration number, object description, packing unit number etc.), in order to enable easy verification of pallet contents once the pallets have been loaded on to the racking.
- All pallets should be weighed, and the weight of the pallet should be written on the front to allow for easy determination of weight load limits.
- A minimum clearance should be allowed between the top of an object and the underside of a beam, at least 10cm, to allow for the pallet to be easily taken on or off the pallet racking.

### **Compactus Storage Systems**

Compactus systems also have a set load capacity limit per base, which will be dependant on the type of storage system used on the base (e.g. long span shelving, cabinets etc) and the type of compactus mode of operation (e.g. manual, mechanical or electrical). Generally speaking electrical units can move greater weights than manual systems. Safe working limits will be predetermined by the supplier, and must be adhered to during operation of the unit.

In addition, the following issues need to be taken into account:

- All staff must be trained in the safe operation of the system.
- Bays must be kept clear of obstructions.
- With reference to manual or mechanical systems, only 1 bay should be moved at a time.
- If objects are stored on high shelves, appropriate manual handling equipment should be used to access them.

#### **4.5 Maintenance of storage systems**

In order to ensure storage systems continue to meet WHS requirements and perform to optimal standards for collection storage, they need to be maintained on a regular basis.

Structural integrity, compliance issues and ensuring the systems are being utilised correctly need to be assessed at least every 12 months by a competent person; either a QMN staff member or through a storage system supply company (via a maintenance contract).

Some of the issues which should be assessed include the following.

##### **Checklist for pallet racking / long span shelving maintenance:**

- Ensure the system is still securely attached to the wall / floor.
- Ensure safe working loads have being adhered to by comparing the total weight of pallets in a bay compared with the specified weight load capacity.
- Ensure there are no missing safety clips or shelf supports – replace any which are missing.

##### **Checklist for compactus maintenance:**

- Ensure the system is still operating correctly – that units run smoothly on the tracks without bumping, grinding or 'stop/start' issues.
- Check there are no missing safety clips or shelf supports – replace any which are missing.
- Ensure safe working loads are being adhered to by comparing the total weight of objects on a shelf compared with the specified weight load capacity.

Any issues regarding potential risks to staff or collections due to lack of appropriate maintenance or incorrect operation of storage systems should be reported to the appropriate staff member: Program Head, campus WHS Adviser or Building Facility Manager.

## 5. RESPONSIBILITIES

- Program Heads are responsible for ensuring sufficient budget to cover costs associated with purchase of new or additional storage systems and annual maintenance within their own storage areas.
- Program Heads are responsible for ensuring all relevant staff are trained in and follow this procedure.
- All Program staff are responsible for following this procedure.

## 6. POLICY BASE

*QM15 – QM Policy: Work Health and Safety*

## 7. DOCUMENT HISTORY

Version	Date	Amendment
1.0	April 2013	Draft
1.1	June 2013	Changes made after circulation to strategic staff.
1.2	October 2014	Reviewed and updated
1.3	September 2015	Minor changes to take into account Transitional realignment
1.4	May 2016	Minor change to incorporate clarification on addressing storage systems.

## 8. AUTHORISATION

<b>Approved by:</b>	Suzanne Miller
<b>Title:</b>	CEO
<b>Approval date:</b>	15 <sup>th</sup> March 2015
<b>Signature:</b>	

## 9. MORE INFORMATION

<b>Policy owner / creator:</b>	Head, Collection Services
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## 10. REVIEW PROCESS

This document will be reviewed every 2 years and at other times if any significant new information or legislative or organisational change warrants a change to this document.

*Once printed this document is no longer a controlled document.*