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Less risk, safe people, better business

IMPAC REPORT

RACKING COLLAPSE

Prepared For: **ICAM Project Assessment**
Lead consultant: **Tony Putter**
Peer Review: **Dan Davis**
Status: **Draft**

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Date of report: 9.08.2021

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1. ICAM Investigation Details

Title:	Racking Collapse
Type of event:	Serious loss of material and a harmful incident at the workplace
Event date:	11/02/2015 (Sunday)
Event location:	Trafalgar Distribution (Warehouse)
Background:	An 'Incident Cause Analysis' (ICAM) investigation was conducted after a major racking collapse at the warehouse which resulted in the following; ✓ employee sustained a fractured arm, ✓ significant stock loss, ✓ racking loss, and ✓ business disruption
Scope of Project:	The preliminary investigation has been conducted and outlines the immediate causes. The following information (broad data) was received: ✓ Incident Report. ✓ Photograph of aftermath inside the warehouse. ✓ Video footage of incident. ✓ Interview transcripts of manager and forklift operators involved. ✓ Vehicle maintenance log - dated 01/04/2014. ✓ Training records - dated 15/2/2014. ✓ Extract from health and safety manual – Section 1.4. Traffic management. ✓ Extract from management team minutes - dated June 2005 ✓ Extract from booking procedure - v2 of 2006. The project involves a detailed investigation including a formal causal analysis report which will assist your organisation in the following: ✓ Understanding how and why the adverse outcome occurred. ✓ Identifying the root causes of the serious incident. ✓ Introducing possible corrective and preventive measures which address both local hazard defences and underlying organisational issues.
Review Team:	➢ Dan Davis (Impac) ➢ Tony Putter (Impac)
Methodology:	The information (broad data) received is filtered into the following layers, using the ICAM Investigation Model: ✓ Absent/Failed defences *(Hierarchy of Hazard & Risk Control)* ✓ Individual/Team actions *(Immediate Cause)* ✓ Task/Environmental conditions *(Underlying Cause)* ✓ Organisational factors *(Root Cause)* The ICAM model is based on the 'swiss cheese' model of causation. The above identified layers may have weaknesses. These weaknesses are identified by using the ICAM analysis and may elucidate latent systems conditions within the organisation.

2. Executive Summary

This report details a 'racking collapse' incident which resulted in serious harm to an employee and stock loss.

The incident occurred approximately 2:35 pm on Wednesday the 11th of February 2015, whilst clearing some space in the warehouse, preparing for a delivery to arrive first thing the next morning.

The incident occurred when a forklift operator contacted the racking with a forklift whilst moving a package of timber.

The timber contacted the racking and the entire racking unit collapsed. The forklift operator jumped out of the forklift's cab to escape but material fell on him and broke his arm.

The 'Incident Cause Analysis Method' (ICAM) methodology was used to reconstruct the incident's trajectory, allowed by possible weaknesses within the organisation's protective layers.

The investigation found the following key contributing factors:

- Absent and failed defences included a deficiency in the awareness of actual risks associated with overloaded racking, inadequate standard operating procedures, no awareness of racking load limits, absent forklift proximity detections and absence of racking impact barriers.

- Individual and team actions are part of the incident and are associated with 'human failures' and identified as 'unsafe acts'. 'Human failures' transpire from actions or inactions which result in errors or violations. The errors occurred from the lack of awareness of the increased risk when loading the racking. Also, applying a learned solution when manoeuvring a forklift through constricted areas. Violations became routine due to external pressure to bend informal procedures.

- Task and environmental conditions which formed the context of the incident include workplace factors such as reliance on undocumented knowledge and violations normalized. The human factors that could have contributed is the perceptual set from previous outcomes.

- The organisational factors at the root of the incident were found to include the conflict between incompatible goals of safety, and customer satisfaction, as well as inadequacies in risk management and the organisational culture.

3. Recommendations

The following recommendations are based on the findings of the investigation and are aimed at embedding learning from this event

3.1. Absent/failed defences

3.1.1. Ensure the safe working load signs and maximum load limit informaton of racking is displayed conspicuously. This includes the maximum allowance for bay load and beam load with materials uniformaly distributed upon the beam. Unit loads of material should also be displayed with packaging.

3.1.2. All forklifts should be fitted with proximity sensors, all sensors should be tested and inspected frequently by an approved technician. Forklift Proximity Systems are designed to prevent collisions and are better known as PAS (Pedestrian Alarm System). Forklift operators should be aware that proximity system alarms are used to warn forklift drivers when pedestrians or other forklifts are nearby, out of sight, or in danger of collisions.

3.1.3. Warehousing 'Standard Operating Procedures' (SOP) must be part of the health and safety management system and should be implemented and communicated to all staff members. The SOP should demonstrate a realistic inventory control model. The SOP should ensure performance according to a plan and a predetermined inventory allowance level.

3.1.4. Ensure racking impact/crash protection barriers are installed at intervals, especially at structural columns.

3.2. Organisational factors

3.2.1. Formalise a risk management process and procedures for operating forklifts with different safety features in the warehouse. This should mitigate the negative transfer between tasks and promote a safe system of operating a forklift defensively. Also, formalise a risk management process per regulatory standards for the increasing load of materials from customers.

3.2.2. Promote safety leadership through a series of team meetings with worker representatives, site (warehouse) visits, publications and self-evaluation. Also, promote a culture-change by creating balance between customer satisfaction and safety. Opportunities should be created to model proper conduct, clarify and negotiate differences. Where there is a settlement or disagreement, they should be negotiated along clear lines.

3.2.3. The real consequence of cost implication outweighs the short-term savings of not installing racking impact/crash barriers. It is 'good practice' for the organisation to engage with health and safety representatives and promote participation and representation with health and safety decision making.

4. Event details

Date:	11/02/20125
Time:	2:35 pm
Business Unit:	Warehouse
Site:	Trafalgar Distribution
Location of event	Inside the warehouse
Personnel injured/affected if applicable:	Horation (Forklift Operator)
Other persons involved:	Nelson (Forklift Operator) Hardy (Manager)
Responsible manager:	Hardy (Manager)
Date investigated:	20/02/2017
Event summary:	A forklift operator moved timber to clear some space. He attempted to manoeuvre the forklift through an opening between stacked material and racking. The timber contacted the racking column, and the racking subsequently collapsed. This incident resulted in the following; ✓ employee with fractured arm, ✓ significant stock loss, ✓ racking loss, and ✓ business disruption.

5. Event description

5.1. Background

Trafalgar Distribution serves as a warehouse solution for various clients and specialises in bulk packing, loading and storing of materials. Forklift operators are expected to unload and stack deliveries received from clients.

5.2. The event

Trafalgar Distribution's warehouse manager and the two forklift operators started their normal shift at 06:00 am on Wednesday the 11th of February 2015. The shift was to end at 3:00pm the same day.

Three incoming goods deliveries arrived at the same time. The forklift operators were busy during the day unloading and stacking the delivered material.

The warehouse manager received a call from a client approximately 2:20 pm, informing him that another delivery was to arrive early the following day.

The warehouse manager accepted the delivery and approximately 2:30 pm asked the forklift operators to clear some space for the delivery the following day.

One of the forklift operators prepared to end their shift approximately 2:30 pm. The other forklift operator acknowledged to clear some space and used his colleague's forklift (Victory Mark IV) approximately 2:32 pm and loaded a package of timber which needed to be moved.

Approximately 2:35 pm the forklift operator attempted to manoeuvre the forklift through an opening between stacked material and racking. The timber contacted the racking column, and the racking subsequently collapsed.

The forklift operator leaped out of the forklift's cab but material from the racking dropped on him and he sustained a broken arm.

5.3. Post-event

First aid was administered until the ambulance arrived approximately 3:00 pm. The injured employee was taken to hospital.

6. Analysis

6.1. Absent or failed defences

Code	Absent/ failed	Sub-category	Description
DF1 Awareness	☒Absent ☐Failed	Appreciation of risk	Provision of load limit information and maximum allowance for bay load and beam load on racking.
DF2 Detection	☒Absent ☐Failed	Automatic warning mechanism	Forklift (Victory Mark IV) has no proximity sensor fitted.
DF1 Awareness	☐Absent ☒Failed	Communication	Informal warehouse operating procedures are not clearly communicated to all staff members and ensuring conformance to an inventory allowance level.
DF4 Protection and Containment	☒Absent ☐Failed	Other	Racking impact/crash protection barriers not installed at structural columns.

6.2. Individual/team actions

Error/Violation	Error/Violation type	Description
Error	Choose an item. Knowledge-based Mistake	Forklift operators overloaded the racking. Operators were unfamiliar with increased risk of overloading as no information was available or communicated.
Error	Choose an item. Rule-based Mistake	Forklift operator's actions were based on applying a remembered rule with forklift (Victory Mark V) when manoeuvring through narrow areas, without detecting a covariation with forklift (Victory Mark IV).
Violation	Routine Choose an item.	The warehouse was already overstretched with their inventory capacity level but the warehouse manager accepted a stock delivery from a client to arrive early the next morning. Breaking the informal rule/procedure has become a normal way of working within the group.

6.3. Task/environmental conditions

6.3.1. Human factors

Human factors	Promotes error, violation or both	Description
Perceptual set	Error	There is no specification for operating forklifts with different safety features and therefore the Victory Mark IV & V had different safety features. Thusly, the forklift operator's expectation was based on prior experience when manoeuvring the forklift through constricted areas.
Violations normalised	Violation	The warehouse manager was under pressure to keep the client satisfied and therefore informal rules/procedures were no longer valid. Accepting orders from clients became a normal way of operating.

6.3.2. Workplace factors

Workplace factors	Promotes error, violation or both	Description
Reliance on undocumented knowledge	Error	Forklift operators are not aware of the gradual increased risk of overloading the racking and racking already overloaded.

6.4. Organisational factors

Code	Organisational factor	Root cause	Description
HW	Hardware	☐YES	
TR	Training	☐YES	
OR	Organisation	☐YES	
CO	Communication	☐YES	
IG	Incompatible goals	☒YES	Conflict between client satisfaction and warehouse rule/procedure resulted in operating outside normal control limits. Manager under pressure to “never say no” to the request of important clients.
MC	Management of change	☐YES	
PR	Procedures	☐YES	
MM	Maintenance mgmt	☐YES	
RM	Risk management	☒YES	The organisation never assessed the risk of increasing loads from clients as materials/stock from clients had changed a few years ago. The organisation never assessed the risk of allowing a forklift with different safety features to operate in the same area/warehouse.
DE	Design	☐YES	
CM	Contractor management	☐YES	
OC	Organisational culture	☒YES	Management shared the belief that the impact barriers were too expensive and not compulsory under regulatory requirements in 2005. – Organisational culture was not supportive to the safest way of operating.
RI	Regulatory influence	☐YES	
OL	Organisational learning	☐YES	
VM	Vehicle managament.	☐YES	
MS	Management systems	☐YES	

6.5. ICAM Model

Organisational Factors	Task / Environmental Conditions	Individual /Team Actions	Absent or Failed Defences	Incident
(RM) Risk Management The organisation never assessed the risk of increasing loads from clients.	**Workplace Factor/Reliance on undocumented knowledge** Forklift operators are not aware of the gradual increased risk of overloading the racking and racking already overloaded	**Error / KBM** Forklift operators overloaded the racking.	**Absent 'Soft' Defence/Awareness** No Load Limit Information for Racking.	Racking collapse, causing broken arm to employee, significant stock loss, racking loss, and business disruption.
(RM) Risk Management The organisation never assessed the risk of allowing forklift with different safety features to operate in the same area/warehouse	**Human Factor/ Perceptual set** There is no specification for operating forklifts with different safety features and therefore the Victory Mark IV & V has different safety features. Therefore, the forklift operator's expectation was based on prior experience	**Error / RBM** Forklift operator kept going through the gap, relying on the proximity alarm.	**Absent Hard' Defence/Detection** No 'forklift proximity sensor on Victory Mark IV.	

(IG) Incompatible Goals Conflict between client satisfaction and warehouse rule/procedure resulted in operating outside normal control limits.	**Human Factor / Violaton normalised** The warehouse manager under pressure to keep the client satisfied	**Violation / Routine** Warehouse manager accepted a request for a stock delivery from a client to arrive early the next morning.	**Failed 'Soft' Defence/ Awareness** Informal warehouse operating procedures are not clearly communicated to all staff members and ensuring conformance to an inventory allowance level.	Racking collapse, causing broken arm to employee, significant stock loss, racking loss, and business disruption.
(OC) Organisational Culture Management shared belief the impact barriers are too expensive and not compulsory under regulatory requirements in 2005.	N/A	N/A	**Absent 'Hard 'Defences/ Protection & Containment** No Impact/Crash Barriers for Racking	

7. Conclusions

7.1 Absent/failed defences

A wide range of defences were absent or inadequate to prevent harm from occurring on the day of the incident. The defences that were absent on the day of the event were the awareness of racking load limit, detection of 'treacherous manoeuvre' and protection of racking columns.

The defence that was inadequate and not clearly communicated on the day of the event was the awareness and application of an informal rule/procedure of conforming to the warehouse's inventory allowance level.

7.2 Individual/team action

The violations and errors that contributed to this incident originated from the deficiency in the awareness of racking load limit, forklifts with different safety features and communicating warehouse procedures to all employees.

None of the warehouse employees involved in the incident were aware of the risks of overloading the racking.

The employee directly involved in the incident was not aware of the increased risk when applying a known rule (relying on the proximity sensor) when manoeuvring the forklift between the stacked material and the racking. No proximity sensor is fitted on the Victory Mark IV and the forklift operator did not notice the covariation between the Victory Mark IV and V pertaining to the proximity alarm and acted per his daily consistency, manoeuvring through narrow areas. .

It appears, per the warehouse volume capacity, it is unusual to accept three orders to be delivered on the same day. However, the warehouse manager accepted another order from an important client to arrive the next morning. The manager broke the informal rule by accepting another delivery from the client. Per the conditions identified, the warehouse was already extended beyond its inventory capacity, providing limited space for manoeuvring with a forklift and racking was already overloaded.

7.3 Task/environmental conditions

7.3.1 Human factors

The warehouse manager's disposition of pleasing the customer's request created a conflict between applying a rule/procedure or getting the job done. Breaking the rule became the normal way of completing the task because staff were not allowed to refuse the request of important clients.

No specification exists for the procurement of forklifts and therefore forklifts with different safety features are in use at the warehouse. The operator perceived the 'problem solving manoeuvre' of relying on the 'proximity alarm' which was not on the Victory Mark V. This was based on his prior experience, because of the safety features (proximity alarm) on the Victory Mark IV. This condition contributed to the human factor prone to increase errors, known as perceptual set.

7.3.2 Workplace factors

The increased risk of overloading the racking was never documented, discussed or disseminated. Therefore, the forklift drivers operated with incomplete knowledge and had no awareness of overloading the racking because no racking load limit information was available. This includes a condition of 'reliance on undocumented knowledge'.

7.4 Organisational factors

There are a range of organisational factors identified as the root causes of the incident. These root causes are the underlying weaknesses within the organisation. It is highly probable that these identified organisational factors have led to the occurrence of serious harm/damage and must be corrected to prevent recurrence of similar future incidents.

Risk Management – The product volume and packaging size and weight from clients has changed knowingly since 2005. There is no formal risk management process for the increasing loads on the racking. This has resulted in a lack of awareness at the organisational level about the hazards and risks associated with the risk of racking about to collapse.

Organisation did not assess the risk of operating forklifts with different safety features as this may have had a significant influence on the 'outcome perception' of the operators, creating conflict between the task imagined (safe) and the task in reality (unsafe).

Incompatible goals – The conflict between putting the customer first and the warehouse inventory allowance resulted in operating outside normal control limits and warehouse capacity. This resulted in decisions being made that put the safety of employees at risk.

Conflict between the organisational goals such as safety and keeping the customer satisfied resulted in placing managers under pressure to never say no to customers, breaching important safety protocols pertaining to operating procedures.

Organisational culture – The culture could have been more supportive towards the short-term savings by deciding not to install the racking impact/crash barriers. Instead a 'good practice' for the organisation would have been to consider the safest way to operate the warehouse and include the participation of the workgroup representatives during decision making.

8. Corrective Actions

8.1. Action plan: Absent/failed defences

Number	Action	Responsible Department	Responsible Person	Completion Date	Monitoring
1	Racking systems standards must conform to the NZS 1170.5 – structural design actions, NZS 3404.1 - steel structures, NZS 4104 – frequent and occupied areas. Palletised goods should be restrained to prevent them from creeping and falling from the racking system. This includes the load bearing information to be clearly displayed and training provided to all staff members regarding stacking and storage.	OHSQ & HR	OHSQ & HR Manager	30/03/2015	H&S Committee
2	Forklift Proximity Systems should be installed on all warehouse forklifts. However, it should be noted that proximity alert system for forklifts are designed to warn forklift drivers of nearby pedestrians, better known as PAS (Pedestrian Alarm System). PAS is not meant to rely on when manoeuvring through narrow areas. Forklift operators should be aware that proximity system alarms are used to warn forklift drivers when pedestrians are nearby, out of sight, or in danger of collisions.	OHSQ & HR	OHSQ & HR Manager	30/03/2015	H&S Committee
3	Create a warehousing 'Standard Operating Procedures' (SOP) which is part of the health	OHSQ & HR	OHSQ & HR Manager	30/03/2015	H&S Committee

	and safety management system and is to be implemented and communicated to all staff members. The SOP should demonstrate a realistic inventory control model. All staff members must be informed and trained and should conform to the SOP.				
4	Installation of crash barriers at racking columns and post protectors as advised by a certified shelving technician.	OHSQ & HR	OHSQ & HR Manager	30/03/2015	H&S Committee

8.2. Action plan: Organisational factors

5	Formalise risk management process for the increasing loads of materials from clients. Implementation of safety system code, with some reference to the ISO 8456:1985 / BS 6989:1989 - Storage equipment for loose bulk materials.	OHSQ & HR	OHSQ & HR Manager	3/08/2015	Strategic Management Board
6	Formalise risk management process for forklifts safety standards, based on the New Zealand Standard NZS/ASME/ANSI B56.1. The training programme for operators should also cover the above 'Approved Code of Practice' (ACOP).	OHSQ & HR	OHSQ & HR Manager	29/06/2015	Strategic Management Board
7	Establish definite control limits within the organisation, setting clear guidelines for managers dealing with potential opposition or incompatibility between safety and customer priority. Also, establish a conflict resolution procedure to be communicated to all managers.	OHSQ & HR	OHSQ & HR Manager	30/03/2015	Strategic Management Board
8	Formalise a programme for promoting safety leadership through series of team meetings, site visits, publications and self-evaluation. Create/update the safety policy, creating a model for proper conduct and clarity.	OHSQ & HR	OHSQ & HR Manager	30/03/2015	Strategic Management Board

9. Management Review and Sign-off

9.1. Sign-off

Manager Acceptance and Comments:		
Action plans supported in full.		
Name: Hardy	**Signature:**	**Date:** 28/02/2015

Involved Person Acceptance and Comments:		
Action plans supported in full.		
Name: Horatio	**Signature:**	**Date:** 28/02/2015

Involved Person Acceptance and Comments:		
Action plans supported in full.		
Name: Nelson	**Signature:**	**Date:** 28/02/2015

Employee Safety Representative Acceptance and Comments:		
Action plans supported in full.		
Name: Click here to enter text.	**Signature:**	**Date:** 28/02/2015

Department Manager Acceptance and Comments:		
Action plans supported in full.		
Name: Click here to enter text.	**Signature:**	**Date:** 28/02/2015

H&S Department Acceptance and Comments:		
Action plans supported in full.		
Serious Harm Reporting Requirements Yes		**Completed** Yes
Corrective Action Review		
Required? Yes	Mechanism: OHS Commitee	If you selected other please specify: Click here to enter text.
Review date: 10/08/2015		
General Comments		
This comprehensive investigation of causations has highlighted the relevant key organisational learnings we must take notice of, and improve in our H&S performance.		
Name: Click here to enter text.	**Signature:**	**Date:** 28/02/2015

General Manager Acceptance and Comments		
Actions plans supported in full.		
Name: Joe Blogs	**Signature:**	**Date:** 28/02/2015

9.2. Distribution

This report will be distributed throughout all divisions of Trafalgar Distribution

9.3. Monitoring of implementation

The Chief Executive Officer is ultimately accountable for monitoring the implementation of the agreed corrective actions as set out in the action plans.

9.4. Analysis of effectiveness

A full review and analysis of effectiveness or corrective actions will be conducted by the appointed external auditor and accompanied by the OHS committee member designated before the 10th of August 2015 and feedback will be provided to the Management Board members on the 10th of August 2015. Any further actions identified will be implemented along with the actions that have been identified through the investigation.

9.5. Document archival

This document will be archived in the corporate system in the administration office.

10. Appendices

Photographs (CCTV)

Interview Transcripts

Records

PLEASE NOTE: ***This report is subject to change, should new information arrise related to this report. While the information contained herein may be used for planning. Process or quality purposes and changes must be co-ordinated with the investigation team and Trafalgar Distribution's management team.***