

Oakdale DG Review

- NW00163 – DG Review- RPT Final- Rev 1
- 30th June, 2010



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EXECUTIVE SUMMARY

Sinclair Knight Merz (SKM) undertook a dangerous goods review of flammable liquids storage arrangements proposed by Prime Construction (Prime) for the proposed warehouse and bulk goods facility at Oakdale.

This report, findings and recommendations provide Prime with a checklist of remaining necessary actions to address the engineering design and safety issues raised as a result of the dangerous goods risk review.

All action items are intended to reduce the risks identified by the addition of appropriate controls as listed in the review report. All actions items are to be addressed by Prime as part of the risk review and design process.

The operation of the proposal will include appropriate safety features, including all requirements of WORKCOVER and the relevant Australian Standards, and FM Global Standards. These features should ensure minimum risk to adjacent landowners and the environment.

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1. INTRODUCTION

This dangerous goods risk review has been conducted at the request of Mr Paul Christopher, of Prime Constructions, who has engaged the services of SKM to undertake the Dangerous Goods Risk Review.

2. Purpose

The purpose of this report is to assess the adequacy of proposed flammable liquids storage systems against;

1. AS 1940 – 2004 “ The Storage and Handling of Flammable and Combustible Liquids”
2. FM Global standards.
3. NFPA 30- 2008 - Flammable and Combustible Liquids Code
4. The new Dangerous Goods Regulations 2005

Under the new regulations, employers and controllers of dangerous goods in the workplace have additional responsibilities. Key responsibilities, amongst others, are to apply hazard identification and risk assessment techniques to better control risks.

3. SCOPE and LIMITATIONS

3.1. SCOPE

The scope of this assessment is limited to the design documentation referenced in the appendices to this report.

The scope of this dangerous goods assessment is to provide a risk review of proposed dangerous goods storage systems and procedures against the relevant Australian Standards, and to outline the NSW Occupational Health & Safety (Dangerous Goods) Regulations 2005 requirements relevant to the proposal.

3.2. LIMITATIONS

The following limitations apply to the assessment:

- The Dangerous Goods review considers only the Class 3 Dangerous Goods store.
- The assessment does not consider the requirements of legislation other than the nominated sections of the OH&S (Dangerous Goods) Regulations 2005
- The assessment does not incorporate the detailed requirements of Australian Standards, other than those mentioned in this report;
- Generally the assessment does not incorporate the detailed requirements of the Building Code of Australia (these are assumed to be addressed at Construction Certificate (CC) stage);
- Certain action items listed in this report, for example, the production of Workplace Activity Statements, are outside the scope of this review.

However, SKM can assist in the implementation of the action items on a fee-for-service- basis if required.

- The assessment does not cover the operational and organisational safety controls, such as staff safety training, emergency planning etc as these are to be covered by DHL (building tenant) OH&S systems.

4. Statutory Framework

The new OH&S (Dangerous Goods) Regulations 2005 are called up by the Occupational Health & Safety Act 2000. Section 6A comprises the new operational and organisational safety requirements that will generally cover;

- Occupiers to obtain MSDS for all dangerous goods
- Occupiers to undertake risk assessments and record safe work procedures/practices
- Containing spills
- Training of personnel
- Planning for emergencies, etc

From 1st September, 2006 these requirements apply to all workplaces that use, handle or store dangerous goods. In this regard once the facility is commissioned SKM would be well placed to assist the DHL in any review of operational and organisational OH&S systems.

5. METHODOLOGY

5.1. PROCESS ADOPTED

The following method of assessment has been used in the preparation of this report: -

- 1) Discussions held with the Mr Paul Christopher of Prime constructions.
- 2) A DG review against Australian Standard AS 1940:2004 – The Storage and Handling of Flammable and Combustible Liquids.
- 3) Reference was made to the relevant Australian and FM Global Standards to provide a checklist for the proposed dangerous goods storage facility.

6. ASSESSMENT DATA

The information collected for this assessment was limited to:

- (i) Discussions held with the Mr Paul Christopher of Prime constructions.
- (ii) Background notes & documents provided by Mr Paul Christopher of Prime constructions
- (iii) Check of Fairfield Council DCP and LEP requirements for Industrial developments - as such there are no requirements for underground containment systems for spills or firewater containment.
- (iv) The relevant Standards, including:
 - AS 1940:-2004 “The Storage & Handling of Flammable and Combustible Liquids”.
 - FM Global Standards namely, 7-29, & 7-3.

6.1. Hazardous Nature and Quantity of Dangerous Goods Stored

The initial data provided by Prime yielded the list of dangerous goods, their type and quantity stored is provided in Appendix A.

Table 6.1 – Dangerous Goods Storage summarises the Dangerous Goods type, package size, location, class and maximum inventory required, and whether Notification or licensing is required under current NSW Workcover requirements.

Based on the proposed list of material stored, a summary table of material properties, potential environmental hazards and suggested safeguards employed are given in Table 6.2 – Hazards of materials.

Table 6.1 – Dangerous Goods Storage

DG Name/ Description	DG Depot Number	DG Store Type	UN No.	Material Stored	DG Class/ (DG sub- class)	Inventory proposed typical / max	NSW WORK COVER Placard Qty	NSW WORK COVER Manifest Qty	Conclusion / Determination
Class 2.1 flammable gases such as hydrocarbon propellant in aerosol cans. – 10,000 kg	1	Caged Enclosure within store	1001	Butane	2.1	10,000	500 kg	5000 kg	Notification and licensing required. Must also comply with Section 6A.3 Obligations of Occupier / or Employer.
					Sub-Total	10,000 kg			
Class 3 Flammable Liquids Note: All goods are manufactured goods, stored in containers of 1 litre or less, and are for retail sale.	1	Main Store	various	Ethanol,	3 PG I,II, and III.	190,000 kg	1,000 kg	10,000 kg	Notification and licensing required. Must also comply with Section 6A.3 Obligations of Occupier / or Employer.
					Sub-Total	200,000 kg			
				Grand Total		200,000 kg			

Table 6.2 – Hazardous Nature of Materials

MATERIAL/ QUANTITY	HEALTH HAZARD AND PHYSICAL PROPERTIES	SAFEGUARDS
Butane / 10000 kgs	<p>Class 2.1 Compressed Gas.</p> <p>Acetylene is carried in cylinders containing a solvent, usually acetone, and a porous mass.</p> <p>Flammable limits in air 2.5 – 15.0%.</p> <p>Relative Density: 0.906 (Vapours are lighter than air. Vapours may explode if ignited in an enclosed area)</p> <p>High concentration of vapours causes dizziness, nausea and vomiting.</p>	<p>Aerosol cans should be stored below 45 C in a secure area and upright to prevent cylinders from falling. Cylinders should also be stored in a dry, well ventilated area constructed of non-combustible material. The area is to be “caged” with wire mesh to contain exploding cans in case of fire.</p> <p>Note: If the aerosol cans are to be stored within the DG store then the aerosol storage area is to be “caged” with wire mesh to contain exploding cans in case of fire, and self closing access doors.</p> <p>See Clause 3.6 - AS 1940 Aerosols of Classes 2.1 and 2.2 may be stored in a store for Class 3 dangerous goods if projectile protection (e.g. cages) is provided.</p> <p>Fire protection requirements are as per FM Global Data Sheet 7-31 – Storage of Aerosol Products. And basically follow Scheme A & Figure 16c as shown in Appendix B.</p>
Ethanol / 190,000 kgs	<p>Class 3 Flammable Liquids</p> <p>Asphyxiant gas. Symptoms of exposure are directly related to displacement of oxygen from air.</p> <p>Relative Density: 1.38</p>	Refer detailed DG review.

7. Australian Standard Requirements for DG Stores for Flammable Liquids

The following section of the report presents a summary of the Dangerous Goods obligations for Prime generally based on the relevant Australian standards for flammable liquid storages. However, the attached table is not exhaustive and reference should also be made to the NSW WorkCovers' Code of Practice for the storage and handling of Dangerous Goods 2005 for completeness (See Reference 4).

Signage and Notices

As a general point signage for all stores are required to AS 1319. Class labels are a minimum 250 mm square.

At the entrance to any storage area greater than minor storage, the following signs shall be displayed:

- (a) A DANGER—NO SMOKING, NO NAKED FLAMES sign for all Class 3 stores;
- (b) For flammable liquids, a Class label and Subsidiary risk label (if any).
- (c) For combustible liquids, a COMBUSTIBLE LIQUID sign.

The following signs should be placed at the entrance(s) to the premises:

- (i) A WARNING—RESTRICTED AREA, AUTHORIZED PERSONNEL ONLY sign.
- (ii) A sign listing the emergency contact names, titles and phone numbers relevant to the installation.
- (iii) The name, address and phone number of the occupier.
- (iv) A layout diagram showing the location of fixed fire protection facilities (where installed), the drainage system and the 'Emergency Stop' switch.

Where two or more points of access are adjacent to each other so that a single set of signs and notices are clearly readable from each point of access, duplicate signs and notices are not required. Signs shall comply with AS 1319. Class labels shall conform to AS 1216 and be a minimum of 250 mm square. Other signs shall have lettering at least 50 mm high.

Note 1 : Composite signs or pictographs complying with the above requirements may be used.

Note 2 : Further details of class labels and placards can be obtained from Setons at

http://www.seton.net.au/templates/hazardous_placards.cfm

7.1. Flammable Liquid Storage

The Design requirements and safeguards required are covered in AS 1940-2004, Chapters 3,4 and 11 and the relevant FM Global datasheets. Prime will provide the more stringent of each, as summarised in the final column of Table 7.1 as follows;

Issue / Clause	Description	AS 1940-2008 Requirement	FM Global requirement	Comment / Minimum requirements
Design & Construction	Any installation intended for storage of flammable liquids shall be designed and constructed so that it is safe and suitable.	<p>Clause 3.2.1 - Any installation intended for the storage and handling of flammable or combustible liquids shall be designed and constructed so that it is safe and suitable for the conditions of use. Factors that need to be considered include the following:</p> <ul style="list-style-type: none"> (a) Working pressures and structural stresses. (b) Heat, corrosion, or attack by the liquid being handled. (c) Site conditions such as topography, usage of adjoining areas, or the risk of natural disasters, e.g. flood, earthquake, lightning strikes. (d) Design of plant, equipment, and operating methods, so as to minimize fire and accident risks and the possibility of errors or misunderstanding by staff. (e) Specific design for emergencies (see Clause 3.2.2 and Section 10), particularly firefighting facilities. (f) The identification of the function of every valve, switch or control actuator, including any remote switches or actuators. (g) Safe access to and egress from all working locations. (h) Avoidance of ignition sources. (i) Ventilation for vapour dispersal, taking into account the possible effect of nearby structures, excavations, embankments, and the like. (j) Separation of potential hazards, including areas where activities cannot be controlled. (k) Points of vapour relief. (l) Spill control measures to avoid contamination of soil and water. 	Refer FM Global Datasheets.	This clause is a catch-all. Items will be dealt with individually as we move through the Australian standard.

Issue / Clause	Description	AS 1940-2008 Requirement	FM Global requirement	Comment / Minimum requirements
Emergency Response Plan (ERP)	Elements to be considered in any ERP	Covered in Section 10. Emergency Management.	Refer FM Global Datasheet 7-29.	Not in Prime scope.
Separation Distance	Distance to boundary	Clause 3.2.5.2 – Table 4.1 & 4.2 - Minimum distance to public places (property boundary) – not less than 15m. For flammable liquids (as some products are PG II as is the case at Oakdale).	No details	Distance to boundary from store approx 24m. Complies.
Electrical Installations and Equipment	Hazardous zones apply. Zone 2 in this case to the entire DG store.	All electrical systems and lighting to be rated for hazardous zones under AS/NZS 2430 and in Compliance with AS /NZS 3000.	Zone 2	Zone 2 electrics required. And suitable fork-lifts classified for entry into areas classified Zone 2.
Lighting levels		Clause 3.5 - During the hours of operation, lighting shall be sufficient to provide safe working conditions that include, but are not limited to, clear visibility of all markings on packages, signs, instruments and other necessary items. NOTE: A minimum value of 50 lx is recommended.	No details.	Lighting to be 50 lx minimum. All lights to be rated for Zone 2 hazards and to AS 3000.
Wall Construction details	All firewalls (in this case as the DG store forms an internal store)	Clause 3.7.2 - A firewall shall comply with the following requirements: (a) The fire resistance level shall be at least 240/240/240. (b) The firewall shall be impervious to vapour apart from around fire doors or other protected openings.	Table 1 - Construction of Flammable Storage Buildings, requires only Non Combustible construction.	The fire resistance level shall be at least 240/240/240.

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
Fire doors	There are 3 access doors provided into the warehouse.	All fire doors require minimum FRL of -/240/30.	No details in FM Global but under NFPA 30 - require 3 hr FRL.	Minimum FRL of -/240/30 required for all fire doors.
	Two sliding fire doors are also provided at either end of the Dangerous goods store	Any sliding fire door must comply AS/NZS 1905.1, and fitted with a thermal-release device. And have a min FRL of -/180/30.	Protect necessary interior openings with an normally closed automatic closing fire door. The fire door should be located on the storage side of the wall.	Any sliding fire door must comply AS/NZS 1905.1, and fitted with a thermal-release device. And have a min FRL of -/180/30. Note: BCA may require differing FRL's for fire doors depending on occupancy.
DG store floor and roof	Internal DG store	Clause 4.4.2 (c) - The floor and roof of the store shall be of reinforced concrete having an FRL of at least 180/180/180	Table 1 - Construction of Flammable Storage Buildings, requires only Non Combustible construction.	The floor and roof of the store shall be of reinforced concrete having a minimum FRL of at least 180/180/180
Wall penetrations	Ay duct work passing through the wall (e.g., vents)	Clause 4.4.2 (d) Any duct that passes through a storage area shall be constructed of or protected by material having an FRL of at least -/180/180.	No details.	All ductwork to have FRL of -/180/180.

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
Spillage containment – floor treatment	DG store drainage and containment systems	Clause 4.4.3 - (a) A spillage containment compound shall be sufficiently impervious to retain spillage and to enable recovery of any such spillage. The compound shall be chemically resistant and fire resistant as far as is necessary to fulfil its functions.	Refer FM Global Data Sheet 7-83 – Drainage Systems for Flammable Liquids. 2.2.2.2 Use watertight floors in flammable liquid areas to prevent leakage to unsafe areas. (See Data Sheet 1-24, <i>Protection Against Liquid Damage</i> , for design information.)	Internal concrete floor to be made water tight (i.e. coated with 2 part epoxy chemical resistant coating) or similar.
		Clause 4.4.3 (b) Pipework that is intended to convey any spilt liquid to a remote holding tank or compound shall be resistant to fire. Flashback into the store or flashover between storage compartments shall be prevented.	2.2.1.3 Arrange emergency drainage systems to discharge to a storage location for recovery of flammable liquids and waste water treatment. At medium-to-large facilities, installation of a separator tank to remove flammable liquids, where permitted by local authorities, or impounding basins to collect flammable liquids may be practical.	Impounding basin Acceptable under both FM Global and AS 1940.

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
		<p>Clause 4.4.3 (d) (e) and (f) The capacity of the spillage containment compound shall be at least 100% of the volume of the largest package plus 25% of the storage capacity up to 10 000 L, together with 10% of the storage capacity between 10 000 L and 100 000 L, and 5% above 100 000 L.</p> <p>Also, If a water-based automatic or manual fire suppression system is installed, the compound capacity shall be increased by a volume equal to the output of the system over 20 min.</p> <p>For sprinkler systems this is 20 mins at the design density discharge.</p>	<p>2.2.1.4 Size emergency drainage system impounding basins or collection facilities to hold the total drainage system discharge for the duration of the sprinkler operation, plus other liquids normally stored in the collection facility.</p> <p>2.2.1.7 Drainage system piping should preferably be of steel, concrete, or tile.</p> <p>2.2.2.4 Construct a ramp or curb, as specified in Section 2.2.3.1, across all interior doorways from the flammable liquid room to prevent flow into adjacent areas.</p>	<p>Under FM Containment systems & NFPA 30 volume is dependent on numerous factors, including local codes and regs.</p> <p>Under AS containment is 16.5 m³ + 20 mins of sprinkler discharge & hose reels discharge (ie 16.5 + 68 m³ x 1.1 = 93 m³).</p> <p>Hence AS volumes selected and must be allowed for. A sprinkler system based on FM Global requirements is also allowed for.</p> <p>Provide kerbs or ramps on all interior doorways to prevent flow to adjacent areas.</p>

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
Mechanical Ventilation	Mechanical ventilation systems required for the internal store.	<p>Clause 4.5.5 (a) The termination points within the room for both the fresh air supply and the draw-off ducts shall be—</p> <p>(i) immediately above the upper limit of the spillage compound; and</p> <p>(ii) on opposite walls.</p> <p>The distance between any two inlets or any two outlets shall not exceed 5 m.</p> <p>NOTES:</p> <p>1 It is recommended that the outlets be located along the longest side of the building for optimum effect.</p> <p>2 If a single fan system is adopted, the fan should be in the exhaust duct.</p> <p>3 The air supply may be in the form of natural ventilation in an external wall at low level, as described in Clause 4.5.4.1.</p>		
		<p>Clause 4.5.5 (b) If the ventilation system incorporates fans on both the supply and exhaust ducts, the capacities of the fans shall be so adjusted that the room is under negative pressure.</p> <p>NOTE: The capacities of the fans on the exhaust ducts should be greater than those on the supply ducts.</p>		
	DG Store floor area approximately 54 x 6 = 324 m ²	<p>Clause 4.5.5 (c) The system shall be capable of exhausting 0.3 m³ per square metre of floor area per minute or 5 m³/min, whichever is the greater, and the air velocity at the air supply outlet shall exceed 300 m/min.</p> <p>i.e., 97 m³ / min.</p> <p>NOTE: Vapours from flammable liquids are heavier than air, so the ventilation system should be designed to scavenge vapours from the lower parts of the store.</p>	For flammable liquids (where the lowest flashpoint material is ethanol FP 33 deg C, th ventilation rate is 0.15 m ³ /min/ m ² or 48.6 m ³ / min.	Mech ventilation system must draw a min of 97 m ³ / m ³ of air.

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
		Clause 4.5.5 (d) The system shall be provided with an airflow failure-warning device.		Provide an airflow failure-warning device.
		Clause 4.5.5 (e) Any intake or exhaust duct shall terminate in open air at least 2 m from any opening into a building, or 4 m from the outlet of any chimney or flue and 3 m above the ground. The external termination of any inlet duct shall be at least 5 m from the external termination of any exhaust duct.		
		Clause 4.5.5 (f) Any duct that passes through a building other than the storage area shall be constructed of or protected by material having an FRL of at least -/180/180. NOTE: A common enclosure may be used for both intake and exhaust ducts.		
		Clause 4.5.5 (g) The system shall be designed so that it operates— (i) continuously; or (ii) whenever work is being carried out in the store; or (iii) whenever a person is in the store.		

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
		<p>Clause 4.5.5 (g) Fans shall be suitable for hazardous areas. Relevant potential ignition sources, e.g. frictional sparking, static electricity and hot spots, shall be taken into account when selecting and installing fans (see also AS/NZS 2381.1, AS/NZS 1020 and AS/NZS 2430 series). Fan blades and nearby components shall be made of materials that have minimal potential for giving off sparks when struck.</p> <p>NOTE: Materials known to be unsatisfactory are steel with steel, or steel with aluminium or aluminium-magnesium alloys.</p>	<p>c) Provide Class 1 Division 2 rated electrical equipment inside exhaust ducts. Use Table 5 to determine the needed electrical rating for electrical equipment that is located outside the exhaust ducts but inside the storage room or building.</p> <p>Electrical equipment that is located outside the exhaust ducts and outside the storage room or building does not need to be hazardous area rated.</p>	<p>All electrical fans must be suitable for Class 1 Division 2 or Zone 2 areas.</p>

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
Fire Protection Requirements	<p>The DG store will have dexion style racking on either side. Allowing forklift access along the centre lane of the store. DG store;</p> <p>-Area 324 m2</p> <p>-Qty 200 m3</p>	<p>Table 11.3 requires the following fire protections systems; Unit 2,3 ,5,7 comprising, extinguishers , hose reels and hydrants as describe below.</p> <p>Note: AS do not require an automatic sprinkler system. This is an FM requirement.</p>	<p>Refer FM Global Data Sheet 7-29 - Provide Automatic Sprinkler Protection.</p> <p>Design system to Scheme A requirements for Group 2 – Water Miscible Liquids.</p> <p>Details in Appendix B.</p>	Provide Automatic Sprinkler Protection.
	Extinguishers	Unit 2: One powder-type extinguisher located at each doorway to the storage area. + Additional Unit 3: Powder-type extinguishers internally positioned to achieve a 15 m maximum travel distance.		Provide dry powder extinguishers (min 4)
	Hose Reels	Unit 5: Hose reel(s) with foam capabilities (see Clause 11.5.3), able to reach all parts of the storage (a hydrant with 38 mm hoses and equivalent foam-making facilities is an acceptable alternative for a hose reel provided personnel are trained in their use).		Provide hose reels (or 1 internal hydrant) . Either system to have foam capabilities and at least 20 mins of foam stocks.
	Hydrants	Unit 7: Unequipped hydrant(s) external to the storage provided in accordance with AS 2419.1.		Provide external hydrant(s) to AS 2419.1.

Issue	Description	AS 1940-2008 Requirement	FM Global requirement	Minimum requirements
Firewater and spillage Containment for DG Store	Provide containment systems for spillage and firewater.	Clause 4.4.3 (d) - The capacity of the spillage containment compound shall be at least 100% of the volume of the largest package plus 25% of the storage capacity up to 10 000 L, together with 10% of the storage capacity between 10 000 L and 100 000 L, and 5% above 100 000 L.	Covered in FM Datasheet 7 -83 Drainage Systems for Flammable Liquids. No specified time period – use AS requirements.	16.5 m3
		Containment provisions will need to include provision for containing firewater as per clause 4.4.3 Spillage Containment (e) of AS 1940 – 2004, for a period of 20 minutes. If a water-based automatic or manual fire suppression system is installed, the compound capacity shall be increased by a volume equal to the output of the system over 20 min.	20 mins of sprinkler discharge & hose reels discharge = 68 m3 . (see appendix B)	68 m3
			Sub -TOTAL	84.5 m3
			Add 10%	8.5
			TOTAL Containment Provision	94 m3



8. CONCLUSION & Recommendations

Sinclair Knight Merz (SKM) undertook a dangerous goods review of flammable liquids storage arrangements proposed by Prime Construction (Prime) for the proposed warehouse and bulk goods facility at Oakdale.

This report, findings and recommendations provide Prime with a checklist of remaining necessary actions to address the engineering design and safety issues raised as a result of the dangerous goods risk review.

For details refer to Table 7.1 – Flammable Liquid Store Requirements.

All action items are intended to reduce the risks identified by the addition of appropriate controls as listed in the review report. All actions items are to be addressed by Prime as part of the risk review and design process.

The operation of the proposal will include appropriate safety features, including all requirements of WORKCOVER and the relevant Australian Standards, and FM Global Standards. These features should ensure minimum risk to adjacent landowners and the environment.



9. Codes & References

1. Australian Standard AS 4332 : 2004 " The Storage & Handling of Gases in Cylinders"
2. The OH&S Act 2000, and Regulations (Dangerous Goods) 2005
3. Storage and Handling of dangerous Goods – Code of Practice, WorkCover NSW 2005



10. APPENDIX A – Dangerous Goods Storage

JJP SKUs and Volumes at DHL Walters Road

Chris Hudson of JJP Comments on growth, new SKUs and obsolescence as at Feb 22 2009

No plans to kill any of these immediately but no sign of them growing hugely either.

There will be a steady trickle of new sun screen aerosols each season and the odd toner but these seem to be at the expense of the ones launched last season so pretty much one in one out.

DB SKU	SKU description	DG Class	Quantity cases	Pallets	Size (ml or g)	Size Desc	Size (litres, KG)	Units per case	Total Volume (litres / kg)
3360335106	C&C OCFoner 125ml (AU 0802)	3	1595	9	125	ml	0.125	24	4785
33607032	C&C Blackhead Clearing Toner 200ml	3	0	0	200	ml	0.2	24	0
27303038	NEUTROGENA Ultra Sheer Moist SPF30+ 140g	2	0	0	140	g	0.14	12	0
43702038	Womens Regaine Regular 3 month	3	302	4	30	g	0.030	6	64.36
43701047	Mens Regaine Reg 3 Month	3	573	7	30	g	0.030	6	103.14
43701044	Mens Regaine ES 3 Month	3	563	5	30	g	0.030	6	60.54
43701045	Mens Regaine ES 3 Month	3	588	5	30	g	0.030	6	105.84
47212041	DAKTARIN SPRAY POWDER 100G	2	1052	5	100	g	0.100	12	1252.4
4721204101	DAKTARIN SPRAY POWDER 100G NZ	2	0	0	100	g	0.100	12	0
43612044	PURELL ALOE VERA 240ML	3	12440	60	240	ml	0.240	12	35827.2
43612048	PURELL VITAMIN E 240ML	3	16250	82	240	ml	0.240	12	46826.8
433010340	LISTERINE GOLD 1LT PLUS BRUSH	3	0	0	1000	ml	1.000	6	0
43301035	LISTERINE 1000ML	3	5133	53	1000	ml	1.000	6	30798
433010330	LISTERINE 1000ML	3	0	0	1000	ml	1.000	4	0
4330103511	LISTERINE GOLD 1L Ex IDS	3	7049	47	1000	ml	1.000	4	28196
4330103510	LISTERINE GOLD 1L + 80ML BONUS	3	0	0	1060	ml	1.060	6	0
433010318	LISTERINE 1500ML	3	0	0	1500	ml	1.500	6	0
43301037	LISTERINE 250ML	3	72	1	250	ml	0.250	8	144
4330103701	LISTERINE GOLD 250ML Ex IDS	3	4779	22	250	ml	0.250	8	9558
433010326	LISTERINE 250ML	3	2208	11	250	ml	0.250	8	4416
43301038	LISTERINE 500ML	3	13	1	500	ml	0.500	8	39
4330103809	LISTERINE GOLD 500ML Ex IDS	3	6296	43	500	ml	0.500	8	18836
433010322	LISTERINE 500ML	3	2504	16	500	ml	0.500	6	6912
43405031	BANLICE MOUSSE 200GM	2	4190	24	200	g	0.200	12	10056
Total			66406	395					196070

sku	description	cases	pallets	Size (ml or g)	Size Desc	Size (litres)	Units per case	Total Volume (litres)
19602583	JB Oil Reg 50ml (MAS,SG)	848	3	50	ml	0.050	24	1,018
19604587	JB Oil Aloe Vera & Vit E CRC 500ml	1558	35	500	ml	0.500	24	18,696
19601570	JB Light Massage Oil CRC 125ml	755	10	125	ml	0.125	48	4,530
19617579	JB Bedtime Oil Child Resistant Cap 125ml	856	12	125	ml	0.125	40	5,136
19602581	JB Oil Reg 125ml (IH)	886	7	125	ml	0.125	24	2,658
		4903	67					32,038



Appendix B – Scheme A – Sprinkler System Specs

D.2.2 Fire Protection Schemes

D.2.2.1 Fire Protection Scheme A

1. Provide plywood, minimum $\frac{3}{8}$ in. (1 cm), or sheet metal, minimum 22 ga. (0.7 mm), barriers and in-rack sprinklers installed in accordance with Figures 13c - in this case (as recd by FM Global report # AUK036.00-01).
2. Install Approved large orifice, 165°F (74°C) rated, quick response in-rack sprinklers below each barrier level. Design the in-rack sprinklers to provide a minimum end head pressure of 50 psig (3.5 barg) out of the hydraulically most remote six (6) sprinklers (three on two lines) if one barrier level or the most remote eight (8) sprinklers (four on two lines) if two or more barrier levels are provided.
3. If there are adjacent bays of rack arrays not dedicated to liquid storage, extend the barrier and in-rack sprinkler protection at least one rack bay, approximately 8 ft (2.4 m) beyond the liquid storage.
4. Ceiling sprinkler demand does not need to be included in the hydraulic calculations for in-rack sprinklers. Calculate the water demand at point of supply separately for in-rack and ceiling sprinklers. Provide a 500 gpm (1890 l/min) hose stream allowance in the hydraulic calculations for the in-rack sprinkler protection. Provide the combined fire protection water demand for a 2-hour duration.
5. Design ceiling sprinklers to protect the surrounding occupancy. A minimum ceiling sprinkler design of not less than 0.20 gpm/ft² (8 mm/min) over 2000 ft² (186 m²) is required if standard spray sprinklers are provided. If the liquid storage does not extend to the full height of the rack, protect the other commodities stored above the barrier in accordance with appropriate standards as if the entire rack height was filled with that commodity. If in-rack sprinklers are required for the other commodities, each level of barrier and in-rack sprinklers can be given credit as a level of in-rack sprinklers.

Hence minimum water supply requirement = 8 mm/min x 186 m² = 1488 litres / min for sprinklers + 1 hose stream (1890 litres / min) = 3378 litres / min for 2 hr (120 min) = 405 m³ supply + 10% = say 450 m³.

Note1: Containment provisions will need to include provision for containing firewater as per clause 4.4.3 Spillage Conatnment (e) of AS 1940 – 2004, for a period of 20 minutes. This equates to 3378 x 20 = 68 m³ + spill containment and a 10% allowance – See Table 7.1 for full detail.



Appendix C – Scheme A – Section through racking

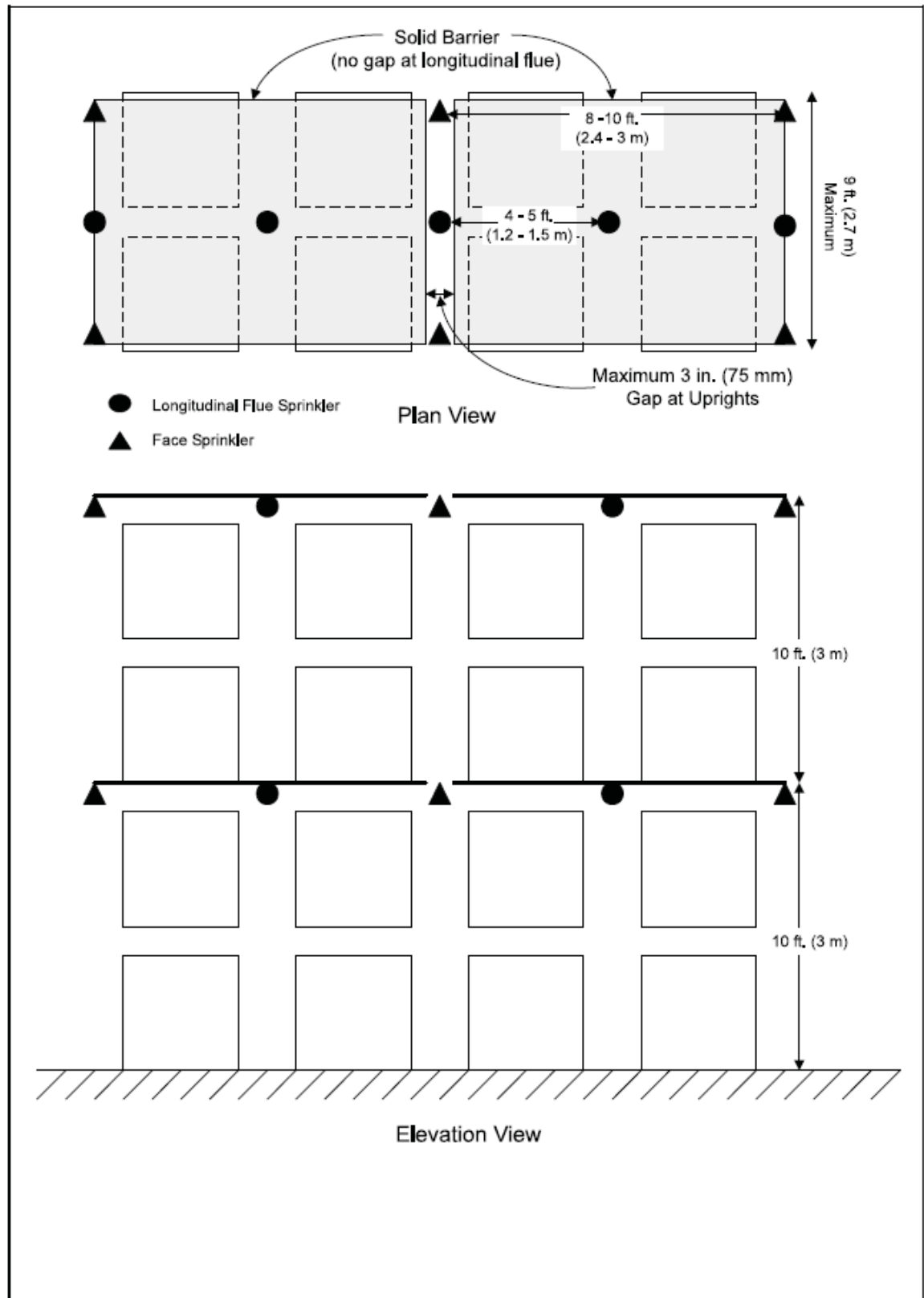


Fig. 13c. Double row rack sprinkler layout — fire protection scheme A.