Appendix D

AS2187 Assessment

TOCUMWAL EXPLOSIVES RESERVE MAGAZINE REPLACEMENT PROJECT

AS2187 CLAUSE BY CLAUSE COMPLIANCE

JANUARY 2024

Tocumwal New Magazines

AS2187.1 - 1998 Clause by Clause Compliance Statement

Disclaimer – This document is to support the compliance of the design of the proposed new magazines for the Orica Tocumwal NSW Explosive Reserve. The following Clause by Clause and other statements below only address the clauses of AS2187.1 1998 Explosives – Storage, Transport and Use, Part 1: Storage that pertain to the design of these proposed magazines which will be "Fixed Permanent Above Ground" magazines when they are built. The clauses of the standard that do not apply to the design of this style of magazine are not addressed in this document.

AS2187 Clause Number	AS2187 Clause Content	Compliance Rationale	Drawing Number	Comments
2.1.1.5 - Fencing	Where required all external magazines shall be fenced in accordance with the guidelines of Appendix C.	After each new magazine is built it will be surrounded by a fence that complies with Appendix C.	84859	Orica Site Plan shows fence around magazine at 3 metres from the extremities of the magazine building.
2.1.3 - Marking (a) (ii)	The word 'EXPLOSIVES' or 'DETONATORS', as appropriate, shall be displayed in red lettered characters on a white background, of height as follows: For magazines of design capacity greater than 500 kg, not less than 100 mm high.	The doors of the new magazines will have signage that complies with this clause.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS	

2.1.4 - Lighting	Lighting in magazines may be either natural or artificial. Electrical fittings and wiring shall comply with AS 3000 for electrical equipment in hazardous locations and satisfy the requirements of the Hazardous Zone Classification specified in Section 2 of OSC(E)81/1.	Orica is planning to install electrically powered lights inside these new magazines because the buildings are quite large and operation commence early in the mornings. All the explosives that are planned to be stored in these proposed new magazines are contained within sealed packages. At no time will there be any explosives that "Sublime" be stored. Orica has therefore determined that the interior of the magazines at Tocumwal are classified as Non Hazardous areas. Regardless of this Orica will ensure that any electrical installation within the magazines is installed with a very high Ingress Protection (IP) rating to enhance the safety of the electrical installation.		
2.1.5 - Lightning Protection	Lightning protection shall be provided and maintained in accordance with the requirements of AS 1768 relating to the protection of structures with explosive contents.	The steel roof of the new magazines will be equipotentially bonded to the structural roof support system which is in turn bonded to the security mesh under the roof which is in turn bonded to the security mesh within the pre-cast concrete wall panels which is in turn bonded to the reinforcing mesh in the concrete floor. The pre-cast wall panels each have a cast in earthing stud which is bonded to the internal security mesh. These earthing studs are then bonded to earthing rods and a ring of bare copper buried around the walls of the magazine.	23-0434 E001-P2-Legend & Notes, 23-0434 E020-P2-Electrical Details & 23-0434 E500-P2-Lightning Protection Layout	The entire building will be the lightning rod. In the case of a strike the current will be carried through the building structure to the ring style earthing system surrounding the building.

		No lightning rods will be used because the entire steel roof structure is bonded to the underground earthing system.		
2.1.10 - Locks	The door(s) or lid(s) of every magazine shall be fitted with a six lever 'safe lock'	The proposed pedestrian doors for these new magazines will have six point locking (3 x locking tabs on each vertical side). The 2 x large sliding door leafs will have 3 x steel tabs on the top edge that lock over the internal lip of the cast in door frame and 3 x steel drop/ slide bolt tangs that lock into holes in the concrete floor when the doors are closed and locked. Each door leaf will have six pint locking.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.1.11 - Door and Lid Restraint	Every magazine door and lid shall be fitted with a restraint device for securing the door or lid in the fully open position	The pedestrian doors will be able to be locked in the open position at the 150 degree swing point by latching onto a concrete filled bollard outside the doors. The large sliding door leafs will be able to be locked in the open position by using the same method that are locked closed. The locking slide bolts will be able to be lowered into extra cast in holes in the floor under the door.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.3.2.4 - Doors	Outer doors shall comply with the following: (a) Steel or concrete magazines: (i) The doors shall be fabricated from steel plate with a 10 mm minimum thickness to provide a maximum clearance of 3 mm all round from the frame to the door.	Clause (i) – all doors will have a 10mm steel plate front face with 3mm side top and bottom clearances. Clause (ii) – the door frames will meet the requirements of clause 2.3.2.2 (a)	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	

	(ii) Doors shall be hung from a structural steel frame at least equal to the requirements of Clause 2.3.2.2(a). They shall be built in to the masonry, concrete or steel structure surrounding them. (iii) The door hinges shall be external lug and pin type, bronze bushed and attached either by dowelling and screwing or by continuous welding. (iv) Hinge blocks and sockets shall be of not less than 25 mm square bar for magazines of capacity up to 500 kg, and not less than 38 mm square bar for magazines of capacity 1000 kg and over with a hole drilled and threaded in the side and through the bronze bush of both upper and lower hinge blocks to take a grease nipple. (v) The doors shall swing outwards through at least 150° moving freely without binding. They shall close parallel with the frame, finishing with a recess of 5 mm min below the face of the door frame when closed.	Clause (iii) & (iv) – the hinges on both pedestrian swinging doors will be brass bushed made from 39 x 39mm and fitted with a grease nipple Clause (v) – Both pedestrian doors will be open to swing open to 150 degree where they can be locked onto a concrete filled bollard		
2.3.3.1 - Ventilation General	With the door(s) of the magazine closed, the ventilation system shall be adequate to— (a) ensure that there is no build-up of hazardous or dangerous vapours or fumes; and (b) minimize temperature cycling damage to the stored products. With the door(s) of the magazine open, the ventilation system shall have a capacity, at a wind velocity of 4 km/h, of not less than 15 air changes per hour for nitroglycerine or other preparations which produce hazardous fumes and no less than 5 air changes per hour or other products.	The new magazines will be fitted with compliant wall vents. 2 vents near the ground end base of each of the 3 metre wide pre-cast concrete wall panels. In addition to the numerous wall vents there will be 12 x roof mounted rotary ventilators fitted with security compliant ducting and fire ember blocking meshes	S2223404-B09-A-WALL VENT DETAILS, S2223404-B11-B-ROOF PLAN, S2223404-B10-A-REFLECTED CEILING PLAN, S2223404-B03-A-ELEVATIONS, S2223404-B05-A-DETAILS,	

			S2223404-B02-A-FLOOR PLAN, S2223404-B06-A-WALL AND FLOOR FINISHES LAYOUT	
2.3.3.2 - Weather shields for Openings	Weather shields for ventilation openings shall comply with the following: (a) Side openings shall— (i) be shrouded externally with closed side weather shields fabricated from5 mm thick steel plate extending 25 mm below the bottom of the vent; (ii) have a minimum open area in the horizontal plane of 375 mm × 100 mm; (iii) be welded to the case; and (iv) consist of 5 mm thick steel plate perforated with holes that do not occupy more than 45% of the gross area and are not larger than 25 mm diameter. (b) The roof ventilation duct shall be a steel channel 200 mm × 100 mm × 6 mm or equivalent, stitch welded across the top of the magazine to protect the vertical steel vent pipe.	All wall vents will be fitted with complying weather shields. The weather shields will be made from 5mm thick mild steel plate.	S2223404-B09-A-WALL VENT DETAILS	
2.3.3.3 - Screens for Openings	Ventilation openings shall have a screen fitted internally to prevent the ingress of insects and other foreign matter. NOTE: Screens may be made of— (a) wire gauze of stainless steel wire with 1.6 mm aperture and 0.45 mm diameter; or (b) steel plate 1 mm thick perforated with holes that do not occupy more than 45% of the gross area and are not larger than 3.0 mm in diameter.	All wall and roof vents will be fitted with complying screens. The inside screens will be stainless steel wire mesh in accordance with Note (a). The bottom of the weather shield will be covered by a mild steel perforated mesh in accordance with Note (b) In addition, a bushfire ember prevention mesh will be installed that covers the outer hole in the vent.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

2.3.3.4 – Passages to Inner Openings	Internal passages to ventilation openings shall comply with the following: (a) Side openings, which shall— (i) be formed from 1.6 mm steel sheet fabricated into a box section; (ii) be staggered to provide a minimum clear distance of 300 mm between the inner and outer vents; (iii) be the same size as the outer vents; (iv) have two timber blocks vertically fitted to prevent blockage, with one on each side of the inner passages with minimum dimensions for— (A) magazines of up to 100 kg design capacity, 400 mm × 50 mm × 25 mm; or (B) magazines over 100 kg design capacity, 600 mm × 50 mm × 25 mm; and (v) be fitted with a screen (see Clause 2.3.3.3). (b) Top openings into the roof ventilation duct shall be vertical steel pipe, 100 mm diameter 3 mm thick, fully welded to the top plate of the magazine and protruding not less than 25 mm above the bottom plate and below the inner lining. The top of the vent shall be fitted with a screen in accordance with Clause 2.3.3.3.	All wall and roof vents will be designed and built in accordance with this clause. See details in drawings listed.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

2.3.3.5 Rotary Type Roof Ventilators	Except where permitted below, where rotary-type roof ventilators are installed, the internal opening shall be covered with timber and be fitted with 'T'-shaped metal duct formed from 1.6 mm thick steel or aluminium sheet, having a closed base and screened side openings in accordance with the Note to Clause 2.3.3.3. Alternatively, rotary-type roof ventilators may be fitted to the top of an external weather-shield channel (see Clause 2.3.3.2(b)).	The new magazines will each be fitted with 12 x Rotary Type ventilation units. The ventilators will be fitted with ember mesh in the above roof section, have a compliant steel security mesh under the roof section and a "T" shaped duct section below the roof level made from 1.6mm steel sheet. The end openings of the "T duct will be covered with stainless steel ember mesh. The physical security of the rotary ventilators will be very high.	S2223404-B05-A-DETAILS & S2223404-B11-B-ROOF PLAN	
2.3.4.1 Locking Devices - Standard	Locking devices for doors shall comply with the following: (a) In addition to lugs, doors shall be provided with steel sliding bolts on the opening side of minimum size 55 mm × 10 mm, as follows: (i) For magazine capacities up to and including 200 kg, two bolts shall be provided. (ii) For magazine capacities greater than 200 kg, three bolts shall be provided. (b) The sliding bolts shall be welded to a steel angle frame, and shall be retained and guided by neat slots in 64 mm × 64 mm × 10 mm steel angle welded continuously on both of its sides to the door, as close as possible to the door edge and over its full height. The bolt frame shall be operated by a peg-and-lever, socketed for a square-shank key. The bolt frame shall be locked by a 6-lever lock screwed to a steel mounting plate welded continuously to the inside face of the door. A cover of minimum 10 mm square or 25 mm × 6 mm steel bar shall be placed over and close to the rear of the lock and	Both the 2 x pedestrian doors and the double sliding doors for the new magazines have been designed with 3 x lug and 3 x sliding bolt locking mechanisms. The rear pedestrian door and the sliding doors will only be able to be opened from inside the magazine. The front pedestrian door will be able to be opened from the outside using a square shank key which is captive when the door is unlocked. All doors will comply with the dimensional details for the security structure of their locking mechanisms. See drawings listed for details.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	

	be secured by welding continuously to the mounting plate or the inside face of the door, to prevent dislodgment of the lock by punching, in such manner that the lock can be removed sideways for maintenance. An alternative anti-punch arrangement may be installed if it will give equivalent protection or an improved level of protection. The key for the lock shall not be able to be withdrawn there from unless the sliding bolts are fully engaged and locked. NOTE: The bolt frame of one door only needs to be provided with a lock and peg-and-lever operating mechanism provided that the bolt frame opening mechanism of the second door is accessible only when the first door (fitted with the lock) is open. (c) In addition to sliding bars, the doors shall be secured by steel fixed lugs of minimum dimensions 55 mm × 10 mm, as follows: (i) For magazine capacities up to and including 200 kg, two lugs shall be fitted. (ii) For magazine capacities greater than 200 kg, three lugs shall be fitted. (d) The fixed lugs shall be welded to the door on the hinged side and into closed slots, in a single length of 64 mm × 64 mm × 10 mm steel angle welded continuously on both of its sides to the door, as close as possible to the door edge and over its full height. (e) Where two fixed lugs or sliding bolts are used, the distance from the centre of each lug or bolt to the adjacent horizontal edge of the door shall be 25% of the door height. Where three fixed lugs or sliding bolts are used, the distance shall be one sixth of the door height.			

	(f) The lever-lock keyhole through the door plate shall be accurately formed with a snug fit to the shape of the key. The keyhole for the square-shank key shall be circular with minimum clearance for the key. Tubular steel pipe extensions of a minimum length of 65 mm, shall be welded to the door face around entries for both keys. (g) All bolts and lugs shall be free from misalignment or binding and shall engage with minimum clearance to an adequate depth in or behind the frame of the door opening. Sliding bolts when operated by a square-shank key shall move freely and easily. (h) For double opening doors, it is necessary that the bolt frame of one door only be provided with a lock and peg-and-lever operating mechanism, provided that the bolt frame opening mechanism of the second door is accessible only when the first door fitted with the lock is open. The opening mechanism on the second door shall have an over centre pivot lock arrangement.			
2.4.1 Fixed or Permanent Magazines – Above Ground - General	Fixed or permanent (non-relocatable) magazines located above ground shall be constructed from brick, concrete, steel, stone or equivalent and designed for the appropriate loads as specified in AS 1170 (all Parts).	The new magazines will be constructed from pre-cast concrete tilt up walls, secured to a concrete slab and supporting a steel framed roof structure clad in colourbond steel sheet roofing.	S2223404-B03-A-ELEVATIONS, S2223404-B11-B-ROOF PLAN, S2223404-B05-A-DETAILS, S2223404-B02-A-FLOOR PLAN	
2.4.2 - Construction	Permanent magazines shall comply with the BCA and the following: (a) Floors shall be of concrete.	Clause (a) – The floors of the new magazines will be concrete slabs. The slabs will be reinforced with steel	S2223404-B03-A-ELEVATIONS,	

	(b) Walls shall be constructed from 5 mm mild steel, double brick, concrete block, concrete or equivalent. A steel mesh enclosure of Grade 450 steel or better shall be incorporated in the structure of the concrete, block or brick walls. For double brick walls size F81 galvanized steel mesh shall be used and located within the cavity. For concrete block walls 10 mm diameter reinforcing bars shall be used at 200 mm centres vertically and between courses horizontally to form a 200 mm square grid. The cavity in the blocks shall be filled with 25 MPa concrete. For reinforced concrete walls the minimum reinforcement shall be F81 mesh. Laps in the mesh shall be 200 mm and adjacent verticals shall be joined by a 6 mm fillet weld 50 mm long. When galvanized mesh or bars are used welds shall be cleaned of slag and treated with a suitable galvanizing paint. The security mesh wall shall be secured to the reinforcing mesh in the concrete floors and roof or ceiling by a lap weld as before. (c) Structural steel frames, if used, shall comply with AS 1170 (all Parts), AS 3679.2 and AS 1538. The steel mesh security enclosure shall be welded to the frames to provide electrical continuity. The surfaces shall be suitably treated to protect against corrosion. (d) Where a wall lining is used, the material shall be non-sparking and may be plywood, aluminium or a suitable synthetic formulation (see Clause 2.3.2.3). (e) Roofs shall be either metal sheeting or reinforced concrete. A non-combustible	reinforcing plus security mesh. This security mesh in the slab and the steel reinforcing will be equipotentially bonded to the steel security mesh in the pre-cast wall panels. Clause (b) – The walls of the new magazines will be pre-cast tilt up concrete panels. Each panel will have a security mesh encased inside the concrete panel. These security meshes in each panel will have an electrical equipotential bonding earth stud welded to the mesh. This stud will protrude on the outside of each panel. The mesh will also be welded to a steel top plate on each panel. The steel top plate of each panel will have the security mesh that is installed under the roof structure welded to it The earth studs will allow each panel to have its security mesh electrically bonded to the panel on either side and also to the reinforcing mesh inside the concrete slab. Clause (c) – The roof of the new magazines will be supported by a structural steel frame. All sections of this frame will be equipotentially bonded to each other by cables between welded on earthing studs. Clause (d) – there will be no interior wall linings inside the new magazines	S2223404-S01-A-NOTES, S2223404-S03-A-PRECAST CONCRETE WALL PANEL LAYOUT AND DETAILS, S2223404-S04-A-PRECAST CONCRETE WALL PANEL ELEVATIONS, S2223404-S02-A-FOOTING AND FLOOR SLAB LAYOUT, S2223404-B02-A-FLOOR PLAN, S2223404-B05-A-DETAILS	

	insulation shall be provided under metal roofs and the roof space shall be well ventilated. Eaves projecting at least 500 mm from the wall should be incorporated in the design. The use of gutters should be avoided. F81, Grade 450 security mesh shall be included in the roof section and welded to the security mesh or reinforcing bars in the walls as described. Flashings shall be installed to ensure the structure is weatherproof and restricts entry of birds and vermin. (f) Ceilings may be provided if so required. If provided, a ceiling shall be of timber or plywood installed below the security mesh. Where the ceiling is insulated, it is not necessary to provide insulation directly below the metal roof.	Clause (e) – The roofs of the new magazines will be colourbond steel sheeting. Fully insulated non combustible sarking will be installed under the steel roof sheets. The roofs will have eaves that project 600mm from the wall and that are enclosed by Lysaght steel Multiclad Soffit cladding on their under sides. The roofs will have gutters fitted along their full length. These gutters will be fitted with stainless steel fire ember mesh and will be drained by steel downpipes to a single dispersion point that will be plumbed to empty into the surrounding paddocks. Clause (f) – No ceilings will be installed		
2.4.3 Dimensions	The dimensions of the magazine shall be such that there is at least 2 m2 of internal floor space for every tonne of explosives stored.	Each new magazine has a floor area of 664.7 square metres. Each magazine will have a capacity of 250 tonnes.	S2223404-B02-A-FLOOR PLAN	
2.4.4 Doors	The doorframe, door and door hardware shall comply with Clauses 2.3.2.2(a)(ii), 2.3.2.4 and 2.3.4. The steel mesh security enclosure shall be welded to the doorframes.	The doors and doorframes will be in accordance with Clauses 2.3.2.2 (a)(ii), 2.3.2.4 and 2.3.4 See above comments for Clause 2.3.2.2 (a)(ii), 2.3.2.4 and 2.3.4	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.4.5 Ventilation	The construction, dimensions, weather shields and number of vents, together with the timber blocks required on the inside of the vent openings, shall be in accordance with Clause 2.3.3.	The vents in the new magazines will be in accordance with Clause 2.3.3. See comments for Clause 2.3.3 above.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

2.4.6 Lightning Protection	Lightning protection shall be in accordance with Clause 2.1.5.	The lightning protection system will be in accordance with Clause 2.1.5. See comments for Clause 2.1.5 above	23-0434 E001-P2-Legend & Notes, 23-0434 E020-P2-Electrical Details & 23-0434 E500-P2-Lightning Protection Layout	
2.4.7 Lighting	Artificial lighting shall be in accordance with Clause 2.1.4. Where windows are installed, they shall be steel framed and the glazing shall be 6 mm minimum perspex or similar. A 5 mm hinged steel plate shutter with internal bolts shall be fitted to the inside of each window. This shall be 50 mm larger than the window all round and have suitable supports. Windows shall be provided with steel bars, 19 mm diameter at 100 mm centres. Skylights shall be protected by additional steel grid mesh, welded to the security mesh (at all points of contact on the perimeter) and located between the skylight and the mesh. The mesh needs to have a clearance of at least 250 mm on all sides of the skylight. NOTE: A 5 mm grid mesh is suitable for a skylight when laid over the security mesh.	Artificial lighting will be installed in accordance with Clause 2.1.4. See comments above for Clause 2.1.4. The new magazines will not be fitted with windows. The new magazines will also be fitted with 12 x skylights double glazed with reinforced and hardened glass in them. These skylights will have and extra layer of security mesh installed under them that is fully welded to the supporting structure for the skylights to enhance security per this Clause 2.4.7	S2223404-B05-A-DETAILS	
2.4.8 Marking	The magazine shall be marked in accordance with Clause 2.1.3.	The new magazine doors will be marked in accordance with Clause 2.1.3. See comments above for Clause 2.1.3	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS	