

Pole Switchboard Electrical Design

APAM Apron High-Mast Floodlight Replacement

Design basis, protection and control philosophy, load and capacity, and the per-pole schedule for the load-centre retrofit of the in-scope apron high-mast floodlight switchboards (CP24163). Prepared by Empower3D as Stream B (electrical design) and issued to APAM via Optimise Energy Solutions. The per-board single-line diagrams follow as the next deliverable.

PREPARED FOR



Optimise Energy Solutions (OES) · APAM Melbourne Airport
Report prepared by Empower3D Pty Ltd as Stream B (electrical)

Document control

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Stream	Stream B, Electrical design	Issued	10 Aug 2026
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Design at a glance

IN-SCOPE POLES	NEW LUMINAIRES	LUMINAIRE	CONNECTED LOAD
64	314	600 W	≈188 kW

1.0 Background and basis of design

SECTION 1 OF 8

The CP24163 project replaces the apron high-mast floodlights at Melbourne Airport with new LED luminaires. Empower3D is engaged as Stream B to design the electrical alterations to the pole switchboards that supply and control those luminaires.

Each in-scope high-mast has an existing outdoor switchboard at its base. The design is a like-for-function retrofit within that existing enclosure. It **retains** the enclosure, the incoming supplies (essential and non-essential) up to the new main isolators, and the existing lighting-control scheme. It **renews** the power distribution from the main switch outward: main isolation, final subcircuit protection, surge protection, the earth and neutral bars (part of the new load-centre assembly), the luminaire drivers (relocated into the board), and all downstream cabling, and it replaces the switching contactors. The luminaires and poles themselves, the upstream supply network, and civil works are outside this design.

Basis of design

The design is developed to the current AS/NZS suite on a retrofit basis within each existing pole switchboard. Pole quantities and per-pole luminaire counts are taken from the reconciled apron lighting design schedule ([E3D-APAM-RPT-003](#)), which reconciles to the drawing Scope of Works at 314 luminaires.

Standing note

1.1 Design standards

The design references the following standards. No separate proprietary client build specification applies to this design.

Standard	What it covers, and where it applies in this design
AS/NZS 3000	Electrical installations (the Wiring Rules): the governing installation standard for the whole works.
AS/NZS 3008.1.1	Electrical installations, selection of cables: current-carrying capacity and voltage drop. Applied to the submains and the DC riser sizing.
AS/NZS 61439	Low-voltage switchgear and controlgear assemblies. Applies to the new Acti9 load-centre assembly.
AS/NZS 61643	Low-voltage surge protective devices (SPDs). Applies to the Type 1+2 SPD fitted at each supply section.
AS/NZS 61008 & 61009	Residual current operated circuit-breakers, without (RCCB, 61008) and with (RCBO, 61009) integral overcurrent protection. Applies to the per-luminaire Type A RCBOs.
AS/NZS 60947	Low-voltage switchgear and controlgear. Applies to the switch-disconnectors (main isolators) and the contactors.
NCC 2022	National Construction Code. The governing building code for works on the airport site. The electrical requirements applicable to this design are met through the AS/NZS standards listed above.

PROJECT CP24163, APAM Apron HM Floodlight Replacement	EMPOWER3D SCOPE Stream B: electrical design of the pole switchboards
RETAINED Existing enclosure, incoming supply, control scheme	RENEWED Isolation, protection, SPD, earth and neutral bars, contactors, drivers, downstream cabling
SYSTEM 400 V / 230 V, 3-phase 4-wire (single-phase on the smaller poles), 50 Hz, MEN	OUT OF SCOPE Luminaires, poles, upstream network, civil, site installation

Upstream supply, verification status

APAM to close · records

Upstream supply detail is verified only at the three site-accessible supply rooms: Sub 42 (8 Delta masts, C63A 3-pole per feed), DB-CCE (6 Echo masts, B40 3-pole) and DB-CCC (11 Charlie masts, B40 3-pole), all on 25 mm² 4C+E submains. The remaining supply rooms were not accessible at the time of survey (for example the Foxtrot supply in Sub 40 was locked; Bravo Switchboard Room 27, Sub 18 / 18A, Northern Apron, Sub 43, Western Apron MSB, DB Gate 28 and the Zone 8 / 9 sources were not opened), so for those 39 boards the upstream circuit-breaker rating and submain cable size are not recorded from site. This does not affect the capacity conclusion in Section 4, which rests on the load not increasing at any pole. APAM is to provide photographs of the upstream circuit breaker and sub-main termination at the remaining supply rooms so the board schedule, E3D-APAM-DES-002, can be completed as a full asset record. This is a records item, not a hold point for the design or the works.

2.0 Luminaire and driver

SECTION 2 OF 8

A single luminaire type is used across the apron: the Schröder Raptor 4 600W, in four optic variants (A0, A1, A2, A3) that are electrically identical. The driver is the Inventronics NFS-600S210BC.

The electrical characteristics below govern the protection, control and cabling design. Figures are from the Raptor 4 600W installation instructions (RevB) and the Inventronics NFS-600SxxxBC datasheet (RevC).

Parameter	Value
Luminaire and codes	Schröder Raptor 4 600W · SR1A0/A1/A2/A3 G4-740
Class and IP	Class I, IP66
Circuit wattage	600 W per luminaire
Driver	Inventronics NFS-600S210BC (non-isolated, programmable, IP66)
AC input current	≈3.0 A at 230 V (3.47 A max at 200 V)
Power factor / THD	0.99 typical at 230 V (0.90 min), THD ≤ 10%

Parameter	Value
Inrush current	8.75 A peak at 220 V, I ² t 1.69 A ² s (low inrush)
Earth leakage	≤ 0.70 mA per driver
Mains surge immunity (integral)	10 kV differential mode, 10 kV common mode
DC output to LED module	176 to 500 V DC, 2.1 A
Driver to module remote distance	Up to 300 m (a 30 m mast is well within limit)
Rated life	102,000 h (L90)

3.0 Design philosophy

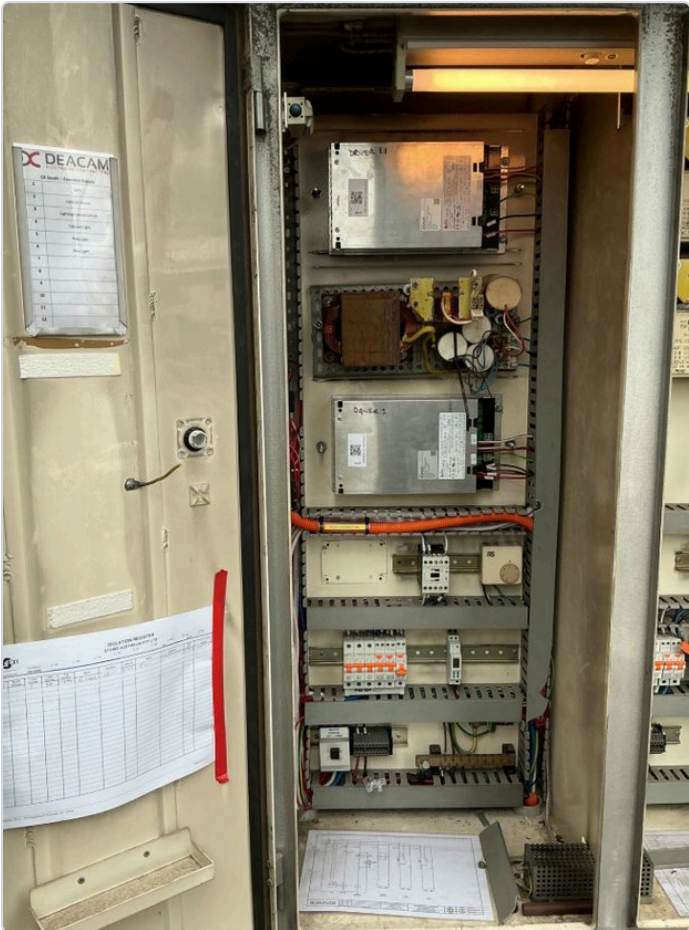
SECTION 3 OF 8

The internal fit-out of each pole switchboard is renewed as a DIN-rail load-centre assembly, with individual protection per luminaire, dedicated surge protection, the existing photoelectric and time control retained, and the drivers relocated into the board. The new load-centre switchgear is the Schneider Acti9 range.

3.1 Load-centre retrofit

The existing main isolator and circuit-protection bank are removed and replaced by a new load-centre assembly fitted to the existing DIN rail or chassis space, and the switching contactors are replaced. The assembly is built and wired off site as a drop-in unit. The existing cabinet, incoming supply and lighting-control scheme remain; the earth and neutral bars are part of the new load-centre assembly. This keeps site work to isolation, removal and re-connection, and standardises the design across the fleet.

BEFORE — TYPICAL EXISTING SECTION



AFTER — TYPICAL NEW LOAD-CENTRE SECTION



Figure 3.1 — typical existing pole switchboard section (before) and the new load-centre section fitted within the same enclosure (after).

3.2 Circuit protection: one RCBO per luminaire

Each luminaire is protected by its own **1P+N RCBO, Type A, C-curve 10 A, 30 mA**. Individual protection gives per-luminaire isolation for maintenance and fault-finding, and keeps earth-leakage well within limits (each driver leaks no more than 0.70 mA). Type A is required for the driver DC leakage component. A C10 rides the single-driver inrush of 8.75 A with large margin, and is well within thermal rating at the 3 A load.

3.3 Surge protection

Surge protection is provided in two coordinated tiers. **Primary protection is integral to each driver:** the Inventronics driver is qualified to withstand **10 kV differential and common mode on its AC input**, one driver per luminaire, and both the driver datasheet and the manufacturer's non-isolated-driver guidance treat that integral protection as self-sufficient for the driver. No external surge device is therefore fitted at each luminaire, and none is mounted up the mast. As **board-level good practice, a Type 1+2 SPD** (Acti9 iPRF1 12.5r, to AS/NZS 61643) is fitted at each incoming supply section, downstream of that section's main isolator, to divert conducted transients on the sub-main and to provide a partial-lightning-current path at the mast base, a real exposure for 30 m masts on an open apron. Because the driver is non-isolated, the residual surge energy reaching the LED module is governed by the driver's own let-through characteristic, a luminaire-design matter for the manufacturer, not by board switchgear.

3.4 Lighting control

Floodlights are controlled by a photoelectric cell with an astronomical time switch as a backstop, through a control relay to the switching contactors, with an external Hand-Off-Auto selector and an override switch for manual operation. This existing control scheme is **retained in place**; only the switching contactors are replaced, at **one contactor pole per luminaire circuit**. As each board is dual-fed, the two sections are switched independently, so each section carries the ceiling of (its luminaires divided by four) four-pole contactors. Because the driver inrush is low, standard lighting-duty contactors are adequate and no inrush current limiter is required. The drivers support native DALI-2, so future DALI integration is achievable.

3.5 Driver location and cabling

The luminaire drivers are **mounted inside the pole switchboard** at the base, rather than at the mast head. Each RCBO feeds its driver over a short internal run; the driver DC output then runs up the mast to the LED module (the light-to-driver cabling). The driver is rated for remote mounting up to 300 m, so a 30 m mast is well within limit. The existing luminaire cabling is fully removed and replaced, not partially reused: a new DC riser runs from the board up the mast to each luminaire in **2.5 mm² 3C+E copper, X-90 (90°C XLPE)**, its three cores allocated V+, V– and the driver over-temperature sense, plus a separate earth. The riser is **carried on a catenary wire rated for the full cable weight over the mast height**. Each luminaire riser **lands on a dedicated set of labelled terminals inside the pole board**, and the driver connects to the riser through those terminals; the terminals are the demarcation and disconnection point, so there is no direct driver-to-luminaire connection. All connections are made on labelled terminals. Mounting the drivers in the board brings all electronics to ground level for maintenance and protects them from the mast-head environment.

Non-isolated driver: treat the output as live

Inventronics

The selected driver is **non-isolated**: its DC output is not separated from the mains supply. The driver output, the DC riser up the mast, and the LED module are therefore **not SELV and are treated as live** at the full system voltage. Class I earthing and the integrity of the module and mast earth bond are safety-critical, and the DC-side cabling and connectors are rated to the full system voltage. These requirements are carried into the design and the installation and maintenance instructions.

3.6 Equipment schedule

The load centre renews the power distribution (main isolation, per-luminaire protection and surge protection), and the switching contactors are replaced. The existing lighting-control scheme (photoelectric cell, time switch, control relay and selector) is **retained in place** and re-terminated to the new gear.

Function	Device
Main isolator	Acti9 iSW switch-disconnector, 4-pole (2-pole single-phase), lockable, typically 40 A, one per supply section (ESS and NE)
Final subcircuit protection	Acti9 iC60 RCBO, 1P+N, Type A, C10, 30 mA, one per luminaire
Surge protection	Acti9 iPRF1 12.5r, Type 1+2, one per supply section (two per board, ESS and NE)
Contactor	New 4-pole modular lighting contactor (Acti9 iCT or equal), replacing the existing contactor
Timer	Existing astronomical time switch, retained
Photoelectric control	Existing photoelectric controller and light-sensitive cell, retained
Control relay	Existing interposing control relay, retained

Function	Device
Control supply	Existing control-supply protection, retained
Selector and override	Existing HOA selector and override switch, door mounted, retained
Maintenance GPO	Acti9 iC60 RCBO, 1P+N, C16, 30 mA, to a double GPO (retained existing circuit)
Cabinet heater	Anti-condensation heater with thermostat, on Acti9 iC60 MCB C6 (retained existing circuit)
Cabinet light	Internal luminaire with door switch, on Acti9 iC60 MCB C6, one per section (retained existing circuit)

To reduce exposed live terminals, the new contactors are either housed within the load-centre body behind the escutcheon, or fitted with the manufacturer terminal shroud kits, achieving IP2X (finger-safe) internally with the escutcheon removed.

3.7 Retained existing circuits

Each existing board feeds more than the pole lights. The site schedule cards show a standard auxiliary set on every board, retained and re-fed by the new load centre: a **maintenance GPO**, an **anti-condensation cabinet heater** with thermostat, a **cabinet light**, and the **lighting control** circuit (per section). A number of boards also carry **board-specific loads** recorded on the cards, including emergency call points (D10E, D12E, D12S) and a push-back beacon (D2E); these are identified per board in the schedule and retained. The existing floodlights being replaced are 1000 W high-pressure sodium on the concourses and 400 W on the GSE gate masts, a substantial connected-load reduction under the LED replacement.

4.0 Load and capacity

Each luminaire presents about 600 W and 3 A at 230 V. Most boards are **dual-fed**, with the luminaires apportioned between an essential (ESS) and non-essential (NE) section per the existing schedule-card arrangement; the six GSE gate boards (Zones 8 and 9) are **single-supply**. On three-phase boards each section is balanced across its phases. The largest board carries 10 luminaires (6.0 kW); split across its sections, no section exceeds about 6 A per phase and every section sits well within a 40 A main isolator. Lighting load is taken at diversity 1.0 (all fittings on together). The existing sub-mains have capacity for the new load. The LED replacement does not increase the connected lighting load at any pole: each new luminaire presents about 600 W against the HID gear it replaces, so the load presented to each existing sub-main is the same or lower than the load that sub-main already carries. Capacity is confirmed on that basis, and does not depend on the upstream rating recorded at any individual board. Across the 64 boards the design provides **314 luminaire RCBOS**, **122 four-pole contactors**, **122 main isolators** and **122 Type 1+2 SPDs**, plus the retained existing auxiliary circuits (GPO, cabinet heater, cabinet light and lighting control) on every board.

Board size band	Luminaires	Connected	Max phase current	Contactors (4-pole)	Main switch
Small	2 to 4	≤ 2.4 kW	≤ 6 A	2	2 × 40 A
Medium	5 to 8	≤ 4.8 kW	≤ 9 A	2	2 × 40 A
Large	9 to 10	≤ 6.0 kW	≤ 12 A	4	2 × 40 A

Figures are per board. Most boards are dual-fed (ESS and NE), carrying two main isolators and two Type 1+2 SPDs; the six GSE gate boards are single-supply. The four-pole contactor count is the sum of the ceiling of (section luminaires / 4) for each section. Connected load and maximum phase current are whole-board bounds. Actual per-board luminaire counts, ESS/NE splits, supply type and retained auxiliary circuits are listed in the board schedule (Section 5) and its underlying single source of truth.

5.0 Board schedule

One load centre per pole, carrying the new lighting **and the retained existing circuits**. Most boards are dual-fed, with an essential (**ESS**) and non-essential (**NE**) section, each with its own main isolator and Type 1+2 SPD; the six GSE gate boards (Zones 8 and 9) are single-supply. The new luminaires are apportioned between the sections **following the existing schedule-card arrangement** recovered from the site audit (even split only where no card was legible), and each section carries the ceiling of (its luminaires / 4) four-pole contactors. The schedule lists, per board, the new luminaires and their E/NE split and the contactor count; the retained auxiliary circuits (GPO, cabinet heater, cabinet light, lighting control) and any board-specific extra loads are detailed in the master board schedule (E3D-APAM-DES-002). Supplies marked "confirm" are to be verified by Empower3D against the supply register and site.

Pole	Zone	Mount ht	Incoming supply	Phases	New luminaires (E / NE)	Contactors
BRAVO CONCOURSE · 10 POLES						
B21N	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	5 (3 / 2)	2
B21S	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	3 (2 / 1)	2
B22S	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	3 (2 / 1)	2
B23N	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	4 (2 / 2)	2
B24S	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	4 (2 / 2)	2
B25N	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	5 (3 / 2)	2
B26S	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	6 (3 / 3)	2
B27N	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	5 (3 / 2)	2
B28E	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	4 (2 / 2)	2
B30N	Bravo	30 m	ESS NE Switchboard Room 27 (confirm)	3-ph	4 (2 / 2)	2
CHARLIE CONCOURSE · 11 POLES						
C1S	Charlie	30 m	ESS NE DB-CCC, Sub 19	1-ph	3 (2 / 1)	2
C3S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	5 (3 / 2)	2
C4S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (2 / 2)	2
C6S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (3 / 1)	2
C7S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	6 (3 / 3)	2
C8S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (2 / 2)	2
C9S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (2 / 2)	2
C10N	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (2 / 2)	2
C10S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	4 (2 / 2)	2
C11S	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	6 (3 / 3)	2
C12E	Charlie	30 m	ESS NE DB-CCC, Sub 19	3-ph	6 (3 / 3)	2
DELTA CONCOURSE · 19 POLES						
D2E	Delta	30 m	ESS NE Sub 18 (confirm)	1-ph	2 (1 / 1)	2
64 poles (58 dual, 6 single)					314	122

Pole	Zone	Mount ht	Incoming supply		Phases	New luminaires (E / NE)	Contactors
D2W	Delta	30 m	ESS	NE Sub 18 (confirm)	3-ph	5 (3 / 2)	2
D3N	Delta	30 m	ESS	NE Sub 18 (confirm)	3-ph	6 (3 / 3)	2
D3S	Delta	30 m	ESS	NE Sub 18 (confirm)	1-ph	3 (2 / 1)	2
D4W	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D6W	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D7E	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D7W	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D8N	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D9E	Delta	30 m	ESS	NE Sub 42	3-ph	5 (3 / 2)	2
D10E	Delta	30 m	ESS	NE Sub 42	3-ph	8 (4 / 4)	2
D10W	Delta	30 m	ESS	NE Confirm	3-ph	6 (3 / 3)	2
D11E	Delta	30 m	ESS	NE Sub 42	3-ph	6 (3 / 3)	2
D12E	Delta	30 m	ESS	NE Confirm	3-ph	6 (4 / 2)	2
D12S	Delta	30 m	ESS	NE Confirm	3-ph	5 (4 / 1)	2
D13W	Delta	30 m	ESS	NE Confirm	3-ph	5 (3 / 2)	2
D15W	Delta	30 m	ESS	NE Confirm	3-ph	10 (5 / 5)	4
D17W	Delta	30 m	ESS	NE Confirm	3-ph	8 (4 / 4)	2
D19E	Delta	30 m	ESS	NE Confirm	3-ph	5 (3 / 2)	2
NORTHERN APRON · 4 POLES							
D14N	Northern Apron	30 m	ESS	NE Confirm	3-ph	8 (4 / 4)	2
D16N	Northern Apron	30 m	ESS	NE Confirm	3-ph	8 (4 / 4)	2
D18N	Northern Apron	30 m	ESS	NE Confirm	3-ph	8 (4 / 4)	2
D20N	Northern Apron	30 m	ESS	NE Confirm	3-ph	4 (2 / 2)	2
ECHO CONCOURSE · 6 POLES							
E1E	Echo	30 m	ESS	NE DB-CCE, Sub 17A	1-ph	3 (2 / 1)	2
E3E	Echo	30 m	ESS	NE DB-CCE, Sub 17A	3-ph	4 (2 / 2)	2
E5E	Echo	30 m	ESS	NE DB-CCE, Sub 17A	3-ph	4 (2 / 2)	2
E7E	Echo	30 m	ESS	NE DB-CCE, Sub 17A	3-ph	4 (4 / 0)	1
E9E	Echo	30 m	ESS	NE DB-CCE, Sub 17A	3-ph	4 (4 / 0)	1
64 poles (58 dual, 6 single)						314	122

Pole	Zone	Mount ht	Incoming supply			Phases	New luminaires (E / NE)	Contactors
E9W	Echo	30 m	ESS	NE	DB-CCE, Sub 17A	3-ph	4 (2 / 2)	2
FOXTROT CONCOURSE · 8 POLES								
F11E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	1-ph	3 (2 / 1)	2
F13E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	4 (2 / 2)	2
F14E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	4 (2 / 2)	2
F14W	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	6 (3 / 3)	2
F15E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	4 (2 / 2)	2
F17E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	4 (2 / 2)	2
F18W	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	6 (3 / 3)	2
F19E	Foxtrot	30 m	ESS	NE	Sub 40 (confirm)	3-ph	5 (3 / 2)	2
ZONE 8 (JGSE) · 4 POLES								
JGSENE	Zone 8	15 m	SINGLE		DB Gate 28	3-ph	4 (4 (1×))	1
JGSENW	Zone 8	15 m	SINGLE		DB Gate 28	3-ph	4 (4 (1×))	1
JGSESE	Zone 8	15 m	SINGLE		DB Gate 28	3-ph	4 (4 (1×))	1
JGSESW	Zone 8	15 m	SINGLE		DB Gate 28	3-ph	4 (4 (1×))	1
ZONE 9 (SGSE) · 2 POLES								
SGSEE	Zone 9	25 m	SINGLE		GSE LCC01 DB1	3-ph	4 (4 (1×))	1
SGSEW	Zone 9	25 m	SINGLE		GSE LCC01 DB1	3-ph	4 (4 (1×))	1
64 poles (58 dual, 6 single)							314	122

6.0 Single-line diagrams

SECTION 6 OF 8

Each in-scope pole is issued its **own single-line diagram**, drawn to that board's actual luminaire count and its retained auxiliary circuits, rather than a single typical re-used across the fleet. The one part carried as a **typical** is the lighting control: the essential (ESS) and non-essential (NE) control arrangements are drawn once as typicals and referenced by every board single-line, since the retained control scheme is common across the fleet.

Each single-line shows the incoming supply and new main isolator, the Type 1+2 SPD, the per-luminaire RCBOs, the in-board drivers, the DC risers to the mast-head LED modules, and the retained existing auxiliary circuits (GPO, cabinet heater, cabinet light, lighting control, and any board-specific loads such as emergency call points or push-back beacons), with device ratings and cable sizes annotated. The control chain (photoelectric cell, timer, relay, the replaced contactors, and the external Hand-Off-Auto and override switches) is shown on the ESS and NE control typicals and cross-referenced from each board sheet.

The single-line set is numbered in the **1001xx block (drawings 100101 to 100164)**, one number per in-scope pole, with the **1000xx block reserved for front matter** (title sheet, drawing register, legend, general notes, the ESS and NE control typicals and the board schedule). Drawing notes on each sheet are limited to **AS/NZS 3000 and AS/NZS 3008**. For the four boards flagged for replacement (D13W, D15W, D17W, D19E), the sheet is issued as a note-only stub that reserves the drawing number and records the board as a prerequisite replacement, to be developed once the replacement board is installed and confirmed.

7.0 Existing board condition and certification

SECTION 7 OF 8

The retrofit is installed into existing pole switchboards, some of which carry pre-existing conditions that affect what can be delivered and certified. These are identified here for APAM direction. None is a design hold point, but each needs a decision before or during construction.

7.1 Boards to be replaced before the lighting works (D13W, D15W, D17W, D19E)

These four Delta-west poles are served by the existing Northern Apron floodlighting distribution boards, built on an obsolete Terasaki Safe-T chassis whose circuit protection (Safe-T SRCB2030 MCB/RCD and TH-5-SE control CBs) can no longer be procured. Because the chassis is obsolete and its circuit protection can no longer be purchased, these boards cannot be re-protected or maintained for the new works, and a partial refurbishment is not possible. Full replacement of these four boards by APAM is therefore required to facilitate the electrical installation (see the condition report, E3D-APAM-RPT-002), and is to be completed before the lighting works proceed at these poles. The single-line sheets for these poles are issued as note-only stubs that reserve the drawing number until the replacement board is installed and confirmed.

7.2 Switchboard access and egress clearances (AS/NZS 3000 Clause 2.10)

Twenty-eight of the existing pole switchboards do not meet the switchboard access and egress clearances of AS/NZS 3000 Clause 2.10, illustrated in Figure 2.20. Two dimensions are not achieved: the arc of the switchboard door does not have the required **0.6 m clearance** to the adjacent structure, and in most cases the space in front of the new load centre does not achieve the **1.0 m clearance** for access and egress. These are dimensional constraints set by the siting of the existing enclosure at the pole base: the door swings into a narrow access way bounded by the mast, the plinth and adjacent structures. They are not created by the lighting retrofit and cannot be resolved by the internal fit-out, and securing the door in the open position (Clause 2.10.2.2.3) does not create the missing clearance. Each affected board is identified at survey and recorded in the condition report (E3D-APAM-RPT-002). This does not stop the lighting works: the retrofit is installed into the enclosure as it stands, with the clearance non-compliance recorded against the board and referred to APAM for direction (see 7.3).

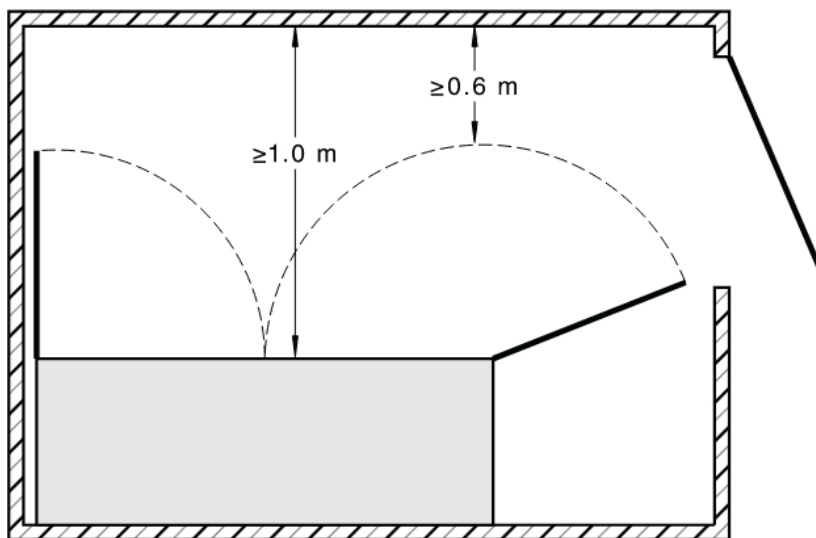


FIGURE 2.20 ACCESS TO SWITCHBOARDS—
SWITCHBOARD IN CORNER POSITION

Figure 7.1 — AS/NZS 3000 Figure 2.20: switchboard access and egress clearances (switchboard in corner position). The 1.0 m egress path and 0.6 m access clearance apply at each in-scope pole switchboard.



Figure 7.2 — DB-C4S, a representative case: the switchboard door opens into a narrow access way between the mast base and the adjacent cabinet (left); the clearance to the adjacent structure, measured on site (right).

7.3 Certification of the completed installation

The switchboard access and egress clearances in 7.2 are a technical non-compliance of the existing installation. The shortfall is dimensional: the 0.6 m door-arc clearance and the 1.0 m clearance in front of the load centre are not present, so it cannot be closed by the electrical works or a door stay. Full compliance can require relocating the board, modifying the plinth or structure, or replacing the enclosure, well beyond this retrofit, and lower-cost measures carry their own risk, such as a trip or slip hazard at the plinth if a board is re-oriented to clear the access way. The direction rests with APAM as the asset owner: for each affected board, either **(i)** remediate the siting to comply, or **(ii)** formally accept it as a managed non-conformance supported by a risk assessment and interim controls. APAM's direction for each affected board is required in writing before the lighting works proceed at that board. Where a direction has not been given, the works proceed and the board is handed over with the non-conformance open and recorded against APAM as asset owner. This does not stop the lighting retrofit proceeding at any board. Empower3D can deliver the electrical component of whichever path APAM chooses.

7.4 Scope of certification

Empower3D certifies the new electrical design described in this report: the new circuit protection and sub-circuit cabling at each in-scope pole, and confirmation that these are suitable for the LED drivers and luminaires they supply. Empower3D further confirms that the existing supply to each pole has capacity for the new load, on the basis set out in Section 4.

That certification is limited to the new work. It does not extend to the compliance or condition of the existing installation into which the new work is placed, including the switchboard access and egress clearances described in 7.2, which are pre-existing, cannot be closed by the electrical works, and are recorded for APAM's direction. The condition of the existing installation is recorded in the condition report, E3D-APAM-RPT-002.

Certification of the completed installation, including workmanship, testing and commissioning, is the responsibility of the installing electrical contractor.

8.0 Assumptions

- 1

Luminaire quantities are taken from the OES apron lighting drawings.
- 2

Supply arrangement. 58 boards are dual-fed (ESS and NE) and the six GSE gate boards (Zones 8 and 9) are single-supply, as confirmed from the site schedule cards. Boards whose schedule cards were not legible or unavailable (B26S, B27N, B28E, D15W, D17W, D19E) use an even ESS/NE split, confirmed on site.
- 3

Essential and non-essential split. The new luminaires follow the existing schedule-card apportionment per board, with an even ESS/NE split assumed only where no legible card was available; the as-built split is confirmed on site.
- 4

Non-isolated driver. The DC output, mast riser and LED module are treated as live (non-SELV); Class I earthing and module and mast bond integrity are verified, and the DC-side cabling and connectors are rated to the full system voltage.
- 5

Upstream supply records are taken from site at three supply rooms (Sub 42, DB-CCE, DB-CCC, 25 boards: upstream CB C63A or B40 3-pole on 25 mm² 4C+E). The supply rooms serving the other 39 boards were not accessible (Foxtrot / Sub 40 locked, Bravo Switchboard Room 27, Sub 18 / 18A, Northern Apron, Sub 43, Western Apron MSB, DB Gate 28, Zones 8 / 9). This does not affect the capacity conclusion in Section 4, which rests on the load not increasing at any pole. APAM is to provide photographs of the upstream circuit breaker and sub-main termination at the remaining supply rooms so the board schedule, E3D-APAM-DES-002, can be completed as a full asset record. This is a records item, not a hold point for the design or the works.
- 6

Enclosure space is suitable for mounting the new in-board drivers, including at the 8 to 10 luminaire poles where the driver count is highest.
- 7

Prospective short-circuit current at the pole boards is taken as a maximum of 6 kA; equipment is rated accordingly.
- 8

Retained existing circuits. Each board re-feeds its existing auxiliary circuits (GPO, cabinet heater, cabinet light, lighting control) and any board-specific loads recorded on the schedule cards, for example emergency call points (D10E, D12E, D12S) and a push-back beacon (D2E). These are carried on the new load centre and add to the enclosure fit-out.