

Manual

**Traffic and Road Use Management
Volume 4 – Intelligent Transport Systems and Electrical Technology**

**Part 9: Temporary Use Electrical Generators for Traffic
Signals**

November 2017

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1 Background

When electrical supply to traffic signals is disrupted either due to unplanned outage or planned electrical works by Transport and Main Roads or the power supply authority, the road environment must remain safe. Consequently, maintenance crews must implement measures to ensure a safe environment for all road users.

In the event of planned outages affecting traffic signals, it is the responsibility of the proponent who is disrupting the power supply to liaise with the relevant departmental district office so that the appropriate option for traffic control is applied. The options available include:

- a) implementing manual traffic control
- b) installing a portable traffic signal, or
- c) energizing the existing signals via an alternative source.

This manual prescribes minimum installation requirements when the third option is deemed the most viable. The department has identified transportable generators as a viable alternative source of supply to traffic signals in the event of mains power disruptions.

The selection of the appropriate generator to be used in traffic signal installations shall be in accordance with MRTS259 *Transportable Generator*.

2 Scope

This manual prescribes minimum installation requirements for portable generators, in the event of unplanned outage or planned electrical works by the department or the power supply authority, for use on traffic signal sites only.

The portable generator covered under this guide must comply with the requirements of MRTS259.

In general, a traffic signal controller is expected to be equipped with a standby generator connection and a switch (see Figure 6.1.1). For other traffic signal controllers not equipped with a changeover switch, an acceptable connection point to manufacturer's specifications must be assessed before retro-fitting. Details of acceptable generator connection kits for retrofitting traffic controllers are provided in Appendices A to D.

ITS and Road lighting switchboards are not equipped with changeover switches to enable generator connection and therefore not covered under this document.

3 Referenced documents

- MRTS259 *Transportable Generator*
- AS/NZS 3000:2007 *Electrical Installations (the Wiring Rules)*
- AS/NZS 3010:2017 *Electrical Installations – Generating sets*
- *Electrical Safety Act 2002*
- *Electrical Safety Regulation 2013*
- *TRUM Volume 4, Part 3 Electrical Design for Roadside Devices*

4 Specific requirements

In the event of planned outage, the principal applicant is required to contact the relevant departmental district office with a notice of intent no less than 20 days before the intended date of works.

The connection of electricity supply, by generator, to installation wiring must be carried out by an eligible person as defined in the Electrical safety regulation and is deemed to be 'Electrical Work' as defined by the *Electrical Safety Act 2002*.

A portable generator must be an isolated winding generator as per AS/NZS 3010:2017 *Electrical Installations – Generating sets*

Electrical protective device/s are not to include a Residual Current Device (RCD) or device with an integrated RCD, for example Residual Current Operated Circuit-breakers (RCBOs).

Traffic signal controllers have MEN links downstream the generator connection point, which would render an in-built RCD ineffective.

The generator is to supply power to the intended traffic signal installation only and not to other equipment. Under fault conditions the generator must clear the fault in accordance with AS/NZS 3000:2007.

5 Overcurrent protection unit (terminal box) – O.P.U

The O.P.U is to be used alongside portable generators to provide independent overcurrent protection for LED traffic signal intersections. The O.P.U is a protection device that has been designed to safely disconnect a load within 400 ms in the event of a short circuit fault. In addition, the unit shall only be used if all of the requirements under Clause 5 have been met.

The O.P.U unit has been designed to ensure the electrical safety of Traffic signal intersections when operating with smaller portable generators.

5.1 Requirements

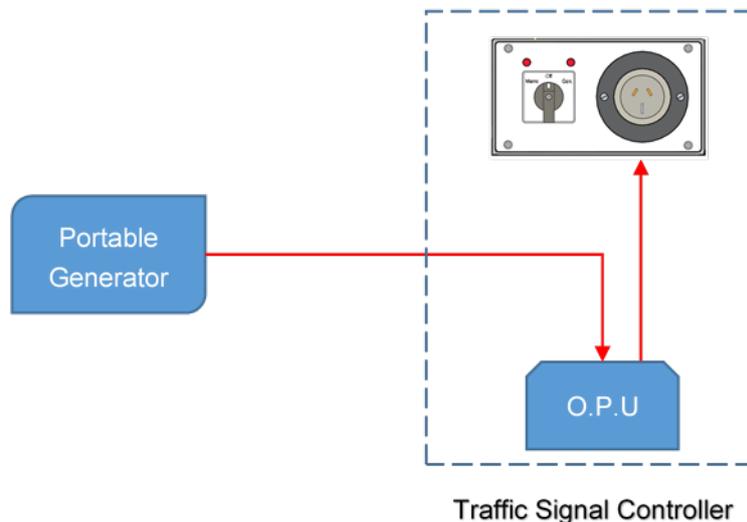
The overcurrent protection unit has been designed to provide fault protection under the following conditions:

- a) The nominal load of a Traffic Signal Intersection shall not exceed 6A.
- b) The O.P.U shall only be used on intersections with LED lanterns.
- c) Incandescent and quartz-halogen traffic lanterns shall not be used with the O.P.U.
- d) EFLI shall be in accordance with the TRUM Volume 4, Part 3 *Electrical Design for Roadside Devices*.
- e) The Generator must be an inverter generator type.
- f) The minimum rated power of the generator shall be capable of sustaining a 1600VA normal running load.
- g) Intersection between 5 AMPS – 6 AMPS (nominal load) shall use generators capable of sustaining a 2000VA normal running load.

- h) Traffic signal intersections shall have a power generation facility switch installed before the O.P.U is connected. See Figure 6.1.1.
- i) Portable generators must be maintained installed and operated as per manufacturer instructions to ensure reliable operation.
- j) Refer to Transport and Main Roads website for a full list of type approval approved Generators and O.P.U suppliers.

5.2 Connection to a Traffic Signal Controller

Figure 5.2 – Connection to a Traffic Signal Controller



The portable generator is to be connected directly to the O.P.U via the 15A 3pin socket

5.3 Generators tested

The following generator models have been tested and trialed to work correctly under short circuit fault conditions.

- Yamaha EF2800i (2.5 KVA normal running load)
- Yamaha ES2000iS (1.6 KVA normal running load)
- Ryobi 2Kva RYi2000T (1.6 KVA normal running load)

Generators must only be used in full compliance with Clause 5.1.

Note: If using generators other than the ones listed above, the district will be responsible for determining correct operation.

6 Operation

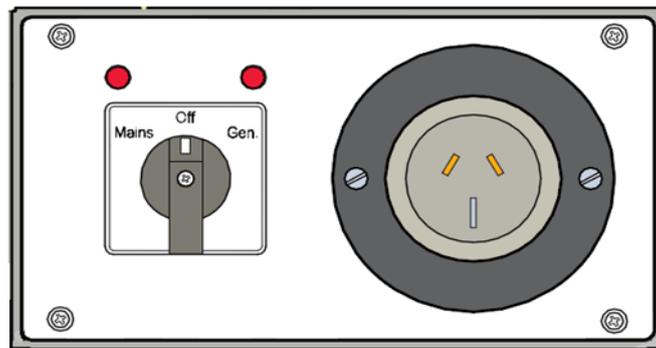
6.1 Operational procedure

6.1.1 Preparation

Prior to energising a traffic signal controller (TSC) from a portable generator, the operator must ensure:

- a) all crew have read and understood the Job Safety and Environmental Analysis (JSEA) and Work Method Statements (WMS) relevant to the site.
- b) all crew are familiar with the site risks (Clause 6.2).
- c) availability of a fit-for purpose, adequately fuelled generator for the load and duration of the operation.
- d) availability of serviceable extension leads rated at 15A.
- e) that the cabling from the generator is suitably protected against mechanical damage and as a possible tripping hazard.
- f) that a generator connection and change-over switch is present at the controller (Figure 6.1.1 as an example).
- g) availability of “Overcurrent Protection Unit” (O.P.U)
- h) compliance with requirements under Clause 5

Figure 6.1.1 – 15A connection and changeover switch for a TSC



6.1.2 Connecting generator to controller

Once on site:

- a) Connect the generator to the controller / O.P.U using the extension lead.
- b) The connection must be inspected by a licenced electrical inspector before generator is operated.
- c) Start the generator for a few seconds before switching the changeover switch to GEN, thus connecting the TSC load onto the generator.

6.1.3 Disconnecting generator from controller

To disconnect the generator from the controller:

- a) Switch from generator mode to OFF mode or Mains mode using the changeover switch.

NB: If power is present at both sources and the switch is operated quickly, the controller and signals may continue to operate normally, depending on the controller design, otherwise a restart sequence will commence.

- b) Switch off the generator.
- c) Disconnect the generator / O.P.U from the TSC.
- d) Clear site to resume normal operation.

6.2 Risk analysis

6.2.1 Site Hazard identification

To ensure safe installation of generators, the hazards associated with the site must be clearly identified before attempting to connect a transportable generator to a traffic signal controller. Hazards are site specific and operators must ensure they cover all possible hazards associated with a particular site. Below is a non-exhaustive list of hazards that may apply to most sites, pertaining to transportable generators:

- a) theft, vandalism and arson
- b) electric shock
- c) generator being hit by an errant vehicle
- d) generator catching or starting fire
- e) injury resulting from manual handling of the generator
- f) smoke inhalation due to dangerous concentration of exhaust gases, smoke, fumes and so on.

Each captured hazard must be controlled by effective risk management as detailed below, prior to commencing installation.

6.2.2 Risk characterisation

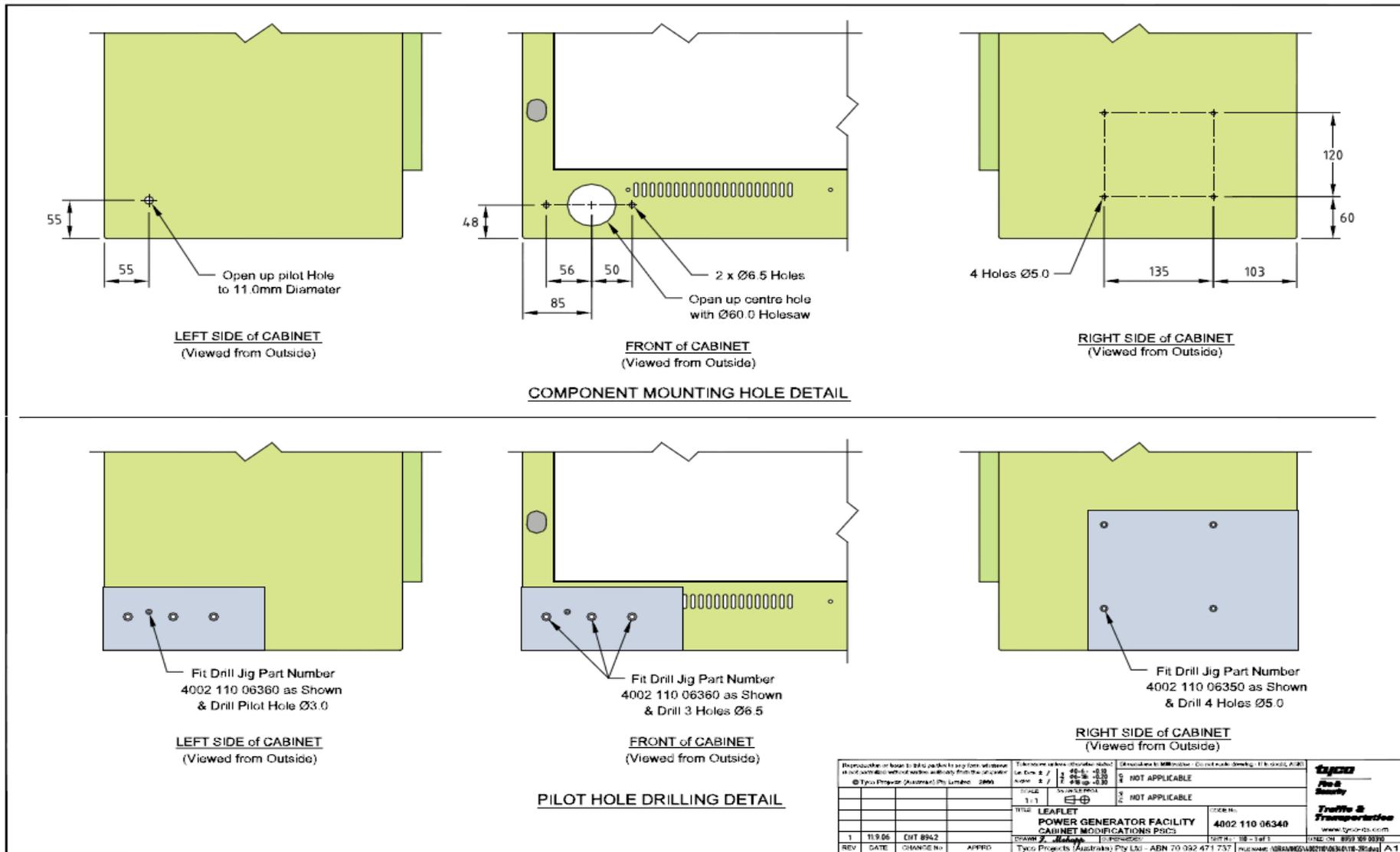
The Transport and Main Roads risk matrix shall be used for the risk analysis of the above hazards. Each of the above non-exhaustive list of identified hazard in Clause 6.2.1 is analysed for possible risk mitigation as shown in Table 6.2.2. The operator should include additional hazards as each site demands.

A likelihood and a consequence is allocated for each hazard item as per the TMR risk matrix. In the absence of any controls, the risks may be either “Extreme” or “High”. The aim is to introduce controls such that the risk is reduced to the acceptable level of either “Medium” or “Low” before connecting the generator.

Table 6.2.2 – Risk Mitigation Strategy

Hazard	INITIAL RISK			Suggested Mitigation Measures	✕ ✓	Revised Risk		
	Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
Theft, Vandalism, Arson				Use generator with anti-vandal, anti-theft features (e.g. GPS locator)				
				A dedicated person to watch over the generator while in operation				
				Caging the generator to prevent public access				
				Bolting the generator to the floor for the duration of the operation				
Electrocution				Ensure electrical safety kit available on site				
				At least two persons on site while connecting or disconnecting generator				
				A dedicated person to watch over the generator while in operation				
				Caging the generator to prevent public access				
Hit by errant car				Place generator behind a barrier where possible				
				Place generator behind the signal controller, shielded from traffic				
				Traffic management plan				
Fire				Suitable Fire extinguisher on site				
				Electrical/Fire safety kit available on site				
				Ensure generator is not prone to fuel leakage				
				Avoid vicinity of high temperature surfaces which leaking fuel may ignite				
				Avoid equipment that may emit arcs, sparks or hot particles				
Injury from handling				Ensure no moving parts are exposed				
				Proper manual handling procedures are used				
Smoke Inhalation				Ensure adequate ventilation				
				Ensure work is done away from direction of exhaust fumes				

Appendix A – PSC3 Power Generation Facility – Cabinet Modifications



Appendix B – PSC3 Power Generation Facility – Installation Instructions

LEFT SIDE VIEW
(Viewed From Inside Housing)

FRONT VIEW

RIGHT SIDE VIEW
(Viewed From Inside Housing)

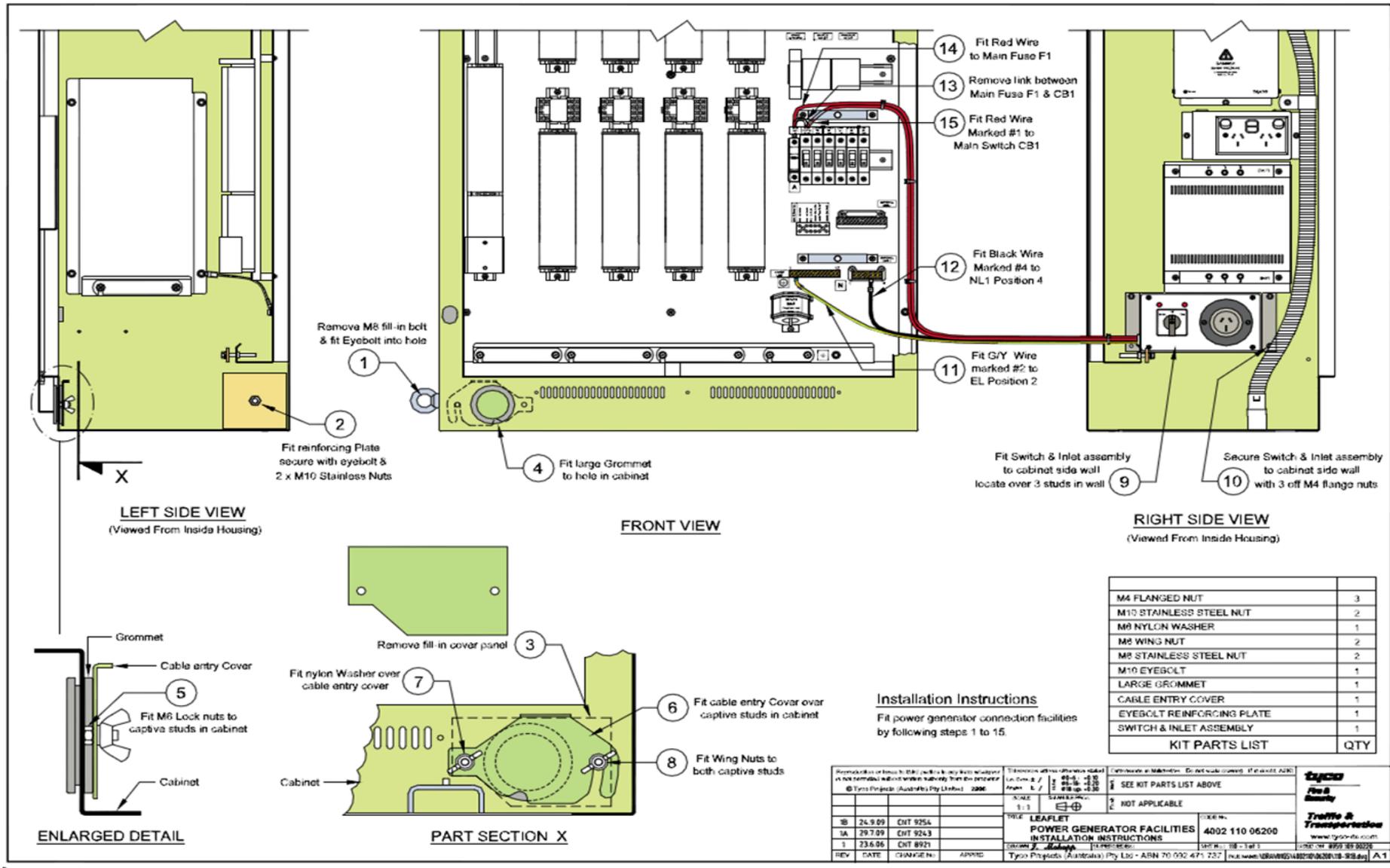
PART SECTION X

Installation Instructions
Fit power generator connection facilities by following steps 1 to 16.

ITEM	KIT PARTS LIST	QTY
1	Switch & Inlet Assembly	1
2	M4 x 12 Bolt Head Stainless Steel Screw	4
3	M4 Flat Stainless Steel Washer	4
4	M4 Nylock Stainless Steel Nut	4
5	Cable Entry Cover	1
6	Large Grommet	1
7	M6 x 25 Pan Head Stainless Steel Screw	2
8	M6 Stainless Steel Nut	2
9	M6 Wing Nut	2
10	M6 Nylon Washer	1
11	M10 Eyebolt	1
12	Eyebolt Reinforcing Plate	1
13	M10 Stainless Steel Lock Nut	2

REV	DATE	CHANGE No	APPROV	TITLE	SCALE	DATE	BY	CHKD	APPD
1B	19.11.10	CNT 934.0		POWER GENERATOR FACILITY	1:1				
1A	29.7.09	CNT 924.3		INSTALLATION INSTRUCTIONS PSC3					
1	8.9.06	CNT 894.2							

Appendix C – Eclipse Power Generation Facility – Installation Instructions



Appendix D – Eclipse Generator Connection Kit – 15A (EC1)

