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Specification – Metering MV CT-VT Units

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Author	Name: Paul Savig Position: Senior Standards Engineer	
Reviewed By	Name: Kai Chong Jee Position: Senior Standards Engineer	
Endorsed By	Name: Johnathan Choi Position: Plant and Standards Manager	
Approved By *	Name: Victor Cheng Position: Snr. Manager Engineering and Project Services	
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Manager Systems & Network Planning	Manager Assets Services
Senior Manager Safety, Health and Wellbeing	

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1 SCOPE

This Specification sets out the technical (electrical and mechanical) requirements for the performance, testing and supply of medium-voltage overhead and ground mounted energy metering CTVT Units used on AC systems up to and including 33 kV.

Approval in terms of this specification shall be obtained by one or a combination of the following:

- a) successful completion of the appropriate tests required by this specification by an independent and accredited test authority.
- b) provision of test certificates from an independent and accredited test authority based upon an alternative specification, with test requirements at least equivalent to this specification.

NOTE: Verification of accreditation of the test authority shall be provided by NATA (National Association of Testing Authorities) accredited test house or by a test house possessing accreditation from a NATA MRA (Mutual Recognition Agreement) partner.

Tenderers must state any non-compliance with the specification in any tender submission and any alternative offers must be submitted in full and separately from any main offer.

2 NORMATIVE REFERENCES

2.1 Standards

2.1.1 Horizon Power Standards

- [1]. *Horizon Power Environmental Conditions*, standard number HPC-9EJ-01-0001-2013, available at <http://horizonpower.com.au/contractors-suppliers/contractors/manuals-and-standards/> under the 'Standards' heading.
- [2]. *Technical Rules HPC-9DJ-01-0001-2012*, available at <http://horizonpower.com.au/contractors-suppliers/contractors/manuals-and-standards/> under the 'Technical Rules' heading.

2.1.2 Australian Standards

The following standards are available at <http://www.saiglobal.com>.

- [3]. *AS 1833, Guide to maintenance and supervision of insulating oils in service*, Standards Australia, 2014
- [4]. *AS/NZS 2312.1, Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Paint coatings*, Standards Australia, 2014
- [5]. *AS/NZS 2312.2, Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Hot dip galvanizing*, Standards Australia, 2014
- [6]. *AS 2629, Separable Insulated Connectors for Power Distribution Systems above 1 kV*, Standards Australia, 2008 (R2019)

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- [7]. *AS 2700, Colour Standards for General Purposes*, Standards Australia, 2011 (R2022)
- [8]. *AS/NZS 3000, Electrical Installations (known as Australian/New Zealand Wiring Rules)*, Standards Australia, 2018 (Amdt 2:2021)
- [9]. *AS/NZS 4680, Hot dip galvanised (zinc) coatings on fabricated ferrous articles*, Standards Australia, 2006
- [10]. *AS/NZS 60137, Insulated Bushings for AC Voltages above 1000 V*, Standards Australia, 2020
- [11]. *AS 60296, Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear*, Standards Australia, 2017
- [12]. *AS/NZS 60529, Degrees of protection provided by enclosures (IP Code)*, Standards Australia, 2004
- [13]. *AS 61869.1, Instrument transformers – Part 1: General rules*, Standards Australia, 2021
- [14]. *AS 61869.2, Instrument transformers – Part 2: Additional requirements for current transformers*, Standards Australia, 2021
- [15]. *AS 61869.3, Instrument transformers – Part 3: Additional requirements for voltage transformers*, Standards Australia, 2021
- [16]. *AS 61869.4, Instrument transformers – Part 4: Additional requirements for combined transformers*, Standards Australia, 2021
- [17]. *AS 62271.301, High voltage switchgear and control gear – Dimensional standardisation of terminals*, Standards Australia, 2011

2.1.3 International Standards

The following standards are available at <http://www.saiglobal.com>.

- [18]. *EN 50180.1, Bushings above 1 kV up to 52 kV and from 250 A to 3.15 kA for liquid filled transformers – Part 1: General requirements for bushings*, European Standard, 2015
- [19]. *IEC 60060.1, High-voltage test techniques – Part 1: General definitions and test requirements*, International Electrotechnical Commission, 2010
- [20]. *IEC 60812, Failure modes and effects analysis (FMEA and FMECA)*, International Electrotechnical Commission, 2018
- [21]. *IEC 61099, Insulating liquids – Specifications for unused synthetic organic esters for electrical purposes*, International Electrotechnical Commission, 2010

2.1.4 Compliance with Standards

Various Standards are referenced in this Specification. The Standards have reference to the year they were published. If over the life of the Tender the Standards change, the Vendor is required to conform to the new edition of the Standard.

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Unless otherwise specified herein, the *Equipment* shall be designed, manufactured and type and routine tested in accordance with the referenced Australian Standards, including all amendments. Where there is no Australian Standard equivalent, International Standards or Codes as defined in this specification shall be used. The specified documents contain provisions that, through reference in the text, constitute requirements of this Specification. At the time of publication of this Specification, the editions indicated were valid. Information on currently valid national and international standards may be obtained from the Australian Standards website. <http://saiglobal.com>.

2.2 Definitions and Abbreviations

For the purposes of this specification, definitions shall apply as in the relevant Australian Standards (AS 61869.1 [13]) with the addition of a few general definitions listed below in alphabetical order.

Aerial: The method of MV and LV termination of the *Equipment* to an overhead distribution system

Air-filled enclosure: A metallic enclosure designed to protect the ends of the cables and bushings, providing a weatherproof enclosure with a minimum rating of IP 54

CTVT: Current Transformer & Voltage Transformer in a single housing

Equipment: Medium Voltage Instrument Current and Voltage Transformer combination

2.3 Drawings

The drawings listed below, are provided for information purposes, and forms part of this specification, see Appendix F:

- 1) HPA-SD-E-00030-01 (Aerial Connection 3 phase)
- 2) HPA-SD-E-01020-01 (Pad-Mount 3 phase)
- 3) HPA-SD-E-01020-02 (Pad-Mount 3 phase internals)
- 4) HPA-SD-E-01020-03 (Pad-Mount 3 phase wiring)
- 5) HPA-SD-E-01020-04 (Pad-Mount termination board)
- 6) HPA-SD-S-00001-01 (Bracket and Clamp for Aerial Mounting)

3 REQUIREMENTS

3.1 Power System Particulars

3.1.1 Rated Voltages

The rated voltages considered in this specification are:

- 1) 6.38-11 kV (three phase)
- 2) 22 kV (3 phase)
- 3) 33 kV (3 phase)

3.1.2 Fault Rating

The *Equipment* must meet the requirements of HP's Technical Rules [2] and be rated to withstand:

- 1) 21.9 kA rms for one second, for 6.6 kV
- 2) 25.0 kA rms for one second, for 11 kV
- 3) 16.0 kA rms for one second, for 22 kV
- 4) 13.1 kA rms for one second, for 33 kV

3.1.3 Nominal System Frequency

The nominal system frequency is 50 Hz.

3.1.4 System Insulation Levels

The required withstand voltages as specified in Table 2 of AS 61869.1 [13] are as follows:

Table 1: System Insulation Levels

Nominal System Voltage (kV _{rms})	Highest Voltage for <i>Equipment</i> U _m (kV _{peak})	Lightning impulse withstand Voltage (kV _{peak})	Short duration power frequency withstand Voltage (kV _{rms})
6.6	7.2	60	20
11.0	12.0	75	28
22.0	24.0	125	50
33.0	36.0	170	70

3.1.5 Pollution Performance

Notwithstanding the nominal system's withstand voltages at each distribution level, the minimum system design level for insulation creepage length is 31 mm/kV as specified in AS/NZS 60137 [10] for Very Heavy pollution areas.

3.2 Service Conditions

3.2.1 Environmental Conditions

The performance of the *Equipment* must meet the requirements set out in Section 4.1 of the *Horizon Power Environmental Conditions* [1].

3.2.2 Service Requirements

The *Equipment* shall be suitable for use throughout Horizon Power's distribution network systems in terms of dimensions, mass and connection. The *Equipment* shall be designed/configured to suit existing limitations and standard practices for electrical terminations and personnel access.

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Accordingly all *Equipment* shall:

- 1) fall within the length, width and height limitations;
- 2) be of equivalent mass; and
- 3) adhere to the existing termination arrangements and positions

as shown on the reference drawings listed in Section 2.3.

While the offered *Equipment* may vary in terms of dimensions and mass from those currently procured by Horizon Power, any proposed changes in the physical characteristics should be identified in Appendix E, Departures from Specifications. All material changes should also be noted where they may affect other equipment and/or an overall life cycle evaluation.

3.2.3 Safety

Vendors shall provide information on the inherently safety of the *Equipment* for the conditions under which it will be used, accessed and maintained.

4 DESIGN AND CONSTRUCTION

4.1 General

The *Equipment* shall be adequately braced to withstand all mechanical shocks which may occur under working conditions including those produced by short circuits and also stress resulting from transport, lifting by slings and forces arising from the connection of cables and overhead conductors.

All sharp points on the *Equipment* exterior surfaces will be removed to prevent injury. All fixings shall conform to Australian metric standards and shall be galvanised mild steel unless otherwise specified. Compatible materials shall be used for all fixings to prevent corrosion.

Reference drawings of of the *Equipment* are listed in Section 2.3.

4.2 Tank

The internal tank of the *Equipment* and all parts shall be designed to eliminate air pockets whilst the outside surfaces shall be designed to prevent the accumulation of water.

The tank shall be filled with an oil insulating medium and be oil tight.

External surface welding of horizontal and vertical joints shall be on both sides of the joint and in all cases shall be continuous.

All metal work will be electrically bonded to the tank to permit earthing by the Purchaser. If a part cannot be adequately bonded it will be constructed from a suitable insulating material instead of metal.

For pole top tanks, a stiffening bar shall be welded to the kick plate.

4.3 Bushings

Bushings supplied with the *Equipment* shall comply with AS/NZS 60137 [10].

For pole mounted units, the bushings shall be porcelain and must be capable of operating under high levels of salt, dust and industrial pollution.

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Wildlife covers shall be provided for HV bushing. The Vendor shall submit samples of the wildlife cover for approval by Horizon Power.

For ground mounted units, separable insulated connectors that comply with AS 2629 [6] and EN 50180 [18], interface C Non-Load Break. Horizon Power's preference is Elasticmold/Euromold, however an equivalent may be accepted.

Where medium voltage bushings are supplied with a higher impulse level than the windings of the voltage transformers, arc-gaps should be used to protect the windings and the gap setting should be stated.

4.4 Joints and Gaskets

All joints shall be oil tight. Holes shall not be punched through dovetail joints in gaskets. Joints in gaskets shall not occur at bolt holes.

All gaskets/seals shall be designed to last the intended life of the *Equipment*.

All bolted joints shall be rendered oil tight by the use of neoprene cork gaskets or other sealing methods. Where tank covers are bolted rather than fully welded, the sealing method must be submitted to Horizon Power for review.

4.5 Insulating Medium

The *Equipment*, both pole top and ground mounted, shall use fire safe biodegradable synthetic ester insulating fluid complying with IEC 61099 [21].

The *Equipment* shall be delivered filled with insulating fluid.

The moisture content of the fluid shall not exceed the values stated in AS 1883 [3].

The minimum breakdown voltage of the fluid shall be 50 kV.

4.6 Housing and Corrosion Protection

All internal and external surfaces be protected against corrosion. All exposed metal surfaces shall be protected by the application of a painting system at least equivalent to ISO 9223 Category C4-C5 in Table B1 and suitable for severe marine environments as specified in AS/NZS 2312.1 [4].

Colours shall be to AS 2700 [7] or equivalent as detailed below:

4.6.1 Aerial *Equipment*

The Vendor shall provide two options concerning the protection of the exterior surfaces for the *Aerial Equipment*:

- 1) Hot-dip Galvanising of the tank as per AS/NZS 2312.2 [5]; or
- 2) Painting of tank with Paint Colours:
 - a) 11-6.6 kV – N42 Storm Grey;
 - b) 22 kV – N42 Storm Grey;
 - c) 33 kV – G33 Lettuce;

4.6.2 Ground-mounted *Equipment*

The colour of the exterior of the *Equipment* shall be G11 Bottle Green as per AS 2700 [7].

4.7 Equipment Fittings

4.7.1 Rating Plates

Equipment shall be provided with a nameplate incorporating details in accordance with clause 6.13 of AS 61869.1 [13] and clause 6.13 of AS 61869.4 [16]. These details shall be stamped on laser etched stainless steel plate and attached to each tank as indicated on the appropriate Drawings listed in Section 2.3.

All rating plates shall incorporate a diagram of connections and shall provide details of the voltage and current transformers.

The details shall be clearly visible and preferably marked on the housing. The marking shall be permanent, weatherproof and corrosion proof.

The following minimum information shall be provided:

- 1) Manufacturer's name or trademark, type, and identification;
- 2) Type designation and arrangement;
- 3) Serial number and year of manufacture;
- 4) Rated primary current and short time thermal current;
- 5) Rated primary and secondary voltage;
- 6) Rated frequency;
- 7) Rated insulation level;
- 8) Creepage distance (optional);
- 9) Secondary winding details, ratio, rated output and corresponding accuracy class;
- 10) Rated insulation level;
- 11) Rated voltage factor and corresponding rated time;
- 12) Temperature range (optional);
- 13) Oil type (if applicable)
- 14) Total weight & oil weight (if applicable)
- 15) Standard edition (year); and

On *Equipment* with more than one secondary winding, the use of each winding and its corresponding terminals.

4.7.2 Terminal Markings

- 1) The medium voltage terminals shall have the following markings punched or otherwise indelibly marked on the terminals. These terminal markings shall be painted on the tank adjacent to the medium voltage bushings in letter sizes not less than 50 mm in height.

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Table 2: MV Terminal Markings

Marking	Red Phase	White Phase	Blue Phase	Neutral Phase
MV Terminal (Voltage and Current) - Start	A1	B1	C1	N
MV Terminal (Current) - Finish	A2	B2	C2	

2) The low voltage terminals are to be legibly and indelibly marked or engraved.

Table 3: LV Terminal Markings

Marking	Red Phase	White Phase	Blue Phase	Neutral Phase
LV Terminal (Voltage)	a	b	c	n
LV Terminal (Current) - Start	as1	bs1	cs1	
LV Terminal (Current) – First Tapping	as2	bs2	cs2	
LV Terminal (Current) – Second Tapping	as3	bs3	cs3	
Any further LV current tapings would continue with markings 4, 5, etc.				

The terminal markings shall be so applied that at the instant when current through the primary winding is from A1 to A2 the direction of the secondary current through the external circuit providing the burden is from as1 to as2.

NOTE: Where 3 x single-phase electromagnetic VT's are star-connected the terminals A1, B1, C1 and a1, b1, c1 form the primary and secondary star points.

4.7.3 Earthing Bracket

A corrosion-resistant bare metal earthing bracket, sized at least 50 x 40 x 5 mm with an M14 hole drilled near the centre of the bracket, shall be provided near the bottom of the tank, as close as practicable vertically below the LV neutral terminal.

The bracket shall be fitted with an M12 x 40 mm Grade 316 Stainless Steel bolt, nut, locknut and two flat washers. The earth bracket shall be fully welded along one of the 40 x 5 mm sides directly to the tank, i.e. there are to be no bolted connections in the electrical path between the bracket and the tank.

4.7.4 External Markings

In addition to nameplate markings, the Purchaser's identification number shall be stencilled in black numerals onto the tank where it can be easily seen from the ground. Each numeral shall be 75 mm high and have a body width of not less than 12 mm.

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DANGER signs as per AS/NZS 3000 [8] shall be fixed to the MV and LV panels of all *Equipment* which can provide access to high voltage parts. Wording on signs at these locations shall consist of letters not less than 12 mm high and shall contain the words '**DANGER — HIGH VOLTAGE**'.



Picture 1 – 'DANGER HIGH VOLTAGE' sign

4.8 Electrical Requirements

4.8.1 General

The *Equipment* shall have a continuous primary rating of:

- 1) 630 A for 11 kV & 6.6 kV; or
- 2) 400 A for 33 kV & 22 kV

and be equipped as detailed in sub-clauses set out below, be wired with ferrules numbered in accordance with the drawings listed in Section 2.3.

Dimensioned outline drawings, schematic circuit, layout and wiring diagrams for shall be submitted for approval by Horizon Power.

4.8.2 Tap Switch (where specified)

Where specified, for dual ratio *Equipment*, the voltage change from nominal to a second primary voltage shall be facilitated by the provision of an externally operated, standard 2 position, "Off-Circuit" tap-changing switch with a tap position indicator.

The switch mechanism shall be positive in action such that it cannot be maintained midway between full step positions. The operating handle shall be mounted in a position as shown on the appropriate drawing listed in Section 2.3 and shall be capable of being locked in any position.

A sealing gland shall be provided on the switch operating shaft where it passes through the tank to prevent "breathing" or "leaking" along the shaft.

4.8.3 Earthing

The metallic sub-frame of the *Equipment* shall be welded to the tank.

The core of the voltage and current transformers shall be effectively bonded to the tank, unless the current transformers are of toroidal form, in which case they shall be effectively insulated.

An earthing terminal or terminals shall be provided within the terminal box of the *Equipment*.

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Removable links shall be provided to connect the White phase of the secondary winding of the voltage transformer (terminal b) and the starts (terminals as1, bs1 and cs1), of the Red, White and Blue phases of the secondary windings of the current transformers to the earthing terminal or terminals within the terminal box of the *Equipment*.

4.8.4 Internal CT & VT Core and Primaries

The Vendor shall provide information as to the quality of steel laminations used in the cores of the current and voltage transformers to maintain the initial accuracy and performance of the *Equipment*.

The medium voltage windings of the voltage transformers shall be insulated from the tank with the winding ends brought out to MV terminal bushings.

The medium voltage windings of the voltage transformers shall be star connected and brought out to a neutral bushing and connected to the earth terminal with an earth link.

The phase end of the medium voltage winding of the red phase voltage transformer shall be brought out to the same terminal bushing as the start end of the medium voltage winding of the red phase current transformer.

The phase end of the medium voltage winding of the white phase voltage transformer shall be brought out to the same terminal bushing as the start end of the medium voltage winding of the white phase current transformer.

The phase end of the medium voltage winding of the blue phase voltage transformer shall be brought out to the same terminal bushing as the start end of the medium voltage winding of the blue phase current transformer.

4.8.4.1 Current Transformer

The current transformer shall meet the requirements of AS 61869.1 [13], and AS 61869.2 [14].

1) Secondary Windings

The secondary windings of the current transformers including the tapped connections shall be brought out through oil-tight fittings to terminal bushings which comply with AS 60137 [10].

2) Class

In accordance with AS 61869.2 [14] Part 1 and the Electricity Industry Metering Code, the current transformers shall be Class 0.5 to suit the Type 3 Metering.

3) Rating

The current transformers shall be:

- a) 100-200/1 A ratio
- b) rated at 15 ohms per phase
- c) rated output of 15 VA
- d) rated short time current of 25 kA for 1 second
- e) have a thermal limit current of not less than 200% of rated current, and

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- f) have the current ratio change by tapped secondary with all ratios brought out to terminals within the terminal box

4.8.4.2 Voltage Transformer

The voltage transformer shall meet the requirements of AS 61869.1 [13] and AS 61869.3 [15].

1) Secondary Windings

The low voltage windings of the voltage transformers shall be star connected inside the tank with the phase ends and neutral brought out through oil-tight fittings to terminal bushings which comply with AS 60137 [10]. The star point (neutral) shall be insulated from the tank and connected to a separate neutral terminal.

2) Class

In accordance with AS 61869.3 [15] Part 2 and the Electricity Industry Metering Code, the voltage transformers shall be Class 0.5 to suit Type 3 Metering.

3) Rating

The voltage transformers shall be:

- a) secondary output of $110/\sqrt{3}$ Volts (i.e. 63.5 V per phase)
- b) rated at 48 milli-siemens per phase;
- c) rated output of 200 VA per phase;
- d) voltage factor of 1.5; and
- e) uniformly insulated.

5 AERIAL EQUIPMENT REQUIREMENTS

5.1 General

The aerial *Equipment* shall be so designed and constructed that it suitable outdoor operation, either pad-mounted or on a cross-arm fitted to a single pole (refer to Section 2.3 for list of applicable drawings), where all similar parts are interchangeable.

5.2 Lifting Lugs/Eyes

Rated and tested lifting lugs shall be provided to safely secure for transport, lifting, disassembly and shall be positioned so that the lifting slings do not foul bushings or fittings.

Any specific lifting instructions shall be clearly marked on the *Equipment* adjacent to the lifting points.

Lifting lugs shall accommodate a 60 x 40 mm hole. There shall be 2 lifting points.

Lugs shall be positioned so that they are suitable for connection to lifting beams and attaching slings.

5.3 **Equipment Mounting Brackets**

The *Equipment* shall be equipped with standard-pole-mounting brackets welded to the rear wall of the tank. It shall be possible to pass a body belt between the pole and the tank.

The brackets and tank wall shall be of adequate strength to limit distortion to 3%, when mounted in the service position. Both the top and bottom brackets shall be able to carry the total weight of the *Equipment* separately.

In addition, two clamps and four threaded rods (M20 x 250 mm) shall be supplied. Each threaded rod shall be supplied with two nuts, two flat washers and one spring washer. The clamps, threaded rods, flat washers, spring washers and nuts shall be hot dipped galvanised in accordance with AS/NZS 4680 [9].

Configurations and dimensions of relevant drawings are listed in Section 2.3.

5.4 **Surge Arrestor Brackets**

Brackets shall be attached adjacent to each MV bushing to enable the Horizon Power to mount surge arresters. The surge arrester brackets shall be used as the connection point for the arrester earth. The brackets shall have a corrosion-resistant, bare metal connecting zone which has the capability to conduct fault current through the surge arrester.

The brackets shall be constructed to accommodate the mounting of polymeric surge arresters, fitted with an M12 earthing stud with a minimum exposed stud length of 45 mm. The arresters shall be mounted onto the bracket either directly or via their integral insulating bracket.

Mounting details shall be as shown on the applicable drawings listed in Section 2.3. The mounting bracket shall have a length of 200 mm with the mounting hole located 20 mm from the outer end of the bracket. The mounting arrangements shall be shown in dotted lines on typical general arrangement drawing submitted with the tender.

5.5 **Secondary Cable**

The *Equipment* shall be fitted with a suitable secondary cable that meets the following criteria:

- 1) 15 (fifteen) meter length of 12 core secondary cable to bring all connections to the meter foot panel with spade or crimp lug terminations.
- 2) cores of the cable will have a minimum conductor size of 4 mm².
- 3) each core will be individually numbered to identify the connection within the terminal box of the metering tank.
- 4) UV stabilised double insulated PVC/PVC insulation.
- 5) terminated at the metering tank by a suitable weatherproof cable gland.

5.6 **Terminal Box**

A terminal box rated at IP 54 as per AS/NZS 60529 [12] shall be provided on a vertical side of the tank which is not intended to be mounted against a pole or which has the medium voltage bushings on it.

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The secondary terminals of the voltage and current transformers are to be housed in the terminal box.

The entry hole for the external cable shall be on the lower side of the terminal box and suitable for a 32 mm diameter cable gland.

6 GROUND MOUNTED *EQUIPMENT* REQUIREMENTS

6.1 General

The termination of cables shall be facilitated by the provision of conically shaped bushings (preferably to DIN 47636 or equivalent), enabling the use of dead-break plug-in and disconnectable (fixed by screws/bolts) elbow or straight connectors as per AS 2629 [6]. The cable sealing end arrangement on the fused tee-off circuit may also be in the form of a slip-on termination kit within a track-proof fuse encapsulated plug-in connector system.

It is essential that the cable terminating arrangement on all circuits provides for a fully insulated design, with no exposed live parts.

6.2 Lifting Lugs/Eyes

Rated and tested lifting lugs shall be provided to safely secure for transport, lifting, disassembly of heavy items and shall be positioned so that lifting slings do not damage the doors and fittings.

Lifting lugs shall accommodate a 60 x 4 mm hole. There shall be up to lifting points.

6.3 MV/LV Cubicle

The cubicles box shall be rated for IP 54 as per AS/NZS 60529 [11] with a provision for sealing facilities and house the following:

- 1) MV Compartment:
 - a) Three Universal Bushing Wells for connection to the incoming line;
 - b) Three Universal Bushing Wells for connection to the outgoing circuit;
 - c) Oil Level Gauge; and
 - d) MV Earth Bar (minimum of 16 holes)
- 2) LV Compartment
 - a) CT and VT secondary terminations;
 - b) Marshalling terminals of a universal type that will accommodate a wire size up to 6 mm² and provided with test plug sockets and short-circuit plugs for the CT's secondary taps;
 - c) VT fuse arrangement;
 - d) Eight 6 mm studs with nuts suitably placed to mount the metering mounting board (to be supplied by Horizon Power). The layout of the mounting board shall be as shown in Drawing HPA-SD-E-01020-03 shown in Appendix G and listed in Section 2.3; and
 - e) LV Earth Bar.

The LV Cubicle shall be so located that:

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- I. It is accessible at all times with the Unit in operation; and
- II. It is between 1000 mm and 1500 mm above ground level for easy access to secondary terminals.

The LV Cubicle shall not contain any such ancillary equipment such as wiring and fusing for panel heaters, etc.

6.4 Secondary Wiring

All wiring within the *Equipment* shall be 4 mm² of stranding 7/0.85 mm, so laid and restrained as per AS/NZS 3000 [8] Clause 3.9.8.3, that there is no possibility of it coming into contact with any live apparatus.

CT and VT secondary terminations shall be wired out from their respective terminal boxes to the marshalling enclosure, with all CT taps being brought out.

Terminals or intermediate connectors between CT's/VT's terminal boxes and marshalling shall not be used.

Insulated crimp type lugs/connectors are **NOT TO** be used in any of the CTVT secondary wiring terminations, non-insulated crimp connectors are permissible.

CT terminals as1, bs1 and cs1 shall be earthed, wired up to the LV Earth Bar.

7 PACKAGING REQUIREMENTS

The *Equipment* shall be suitably packaged, such that it is "fit for use" at any location in Horizon Power's operational area and specifically include all accessories needed. Packaging shall be capable of preventing damage whilst in storage and during transit to remote locations.

Each package is to have an identifying bar code and number which identifies as a minimum the:

- Manufacturer's part number;
- Manufacturer;
- Factory of manufacture; and
- Month and year of manufacture.

8 STORAGE

The Equipment shall be capable of being stored without deterioration within the temperature range of -10 °C to +45 °C for no less than 24 months.

9 RELIABILITY

Vendors shall provide information on the reliability of the *Equipment* and the performance of the materials offered over an **operational life of 45 years** under the specified field of application and conditions of service.

Information provided shall evidence the claimed reliability and performance for the *Equipment* offered, including details on Failure Mode and Effect Analysis, carried out in accordance with IEC 60812 [20]. Failure modes should be described; taking cantilever mechanical failure as an example, the failure may be excessive deflection, or brittle fracture. Electrical failure may be material damage such as puncture, polymer degradation, carbonisation, loss of hydrophobicity, etc.

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Vendors may offer their standard *Equipment* but any variation to the foregoing standards must be clearly stated in writing at the time of the proposal. The products offered in the standing offer should be equal to or better in quality and performance than the existing items as listed under this Specification.

10 SAFETY

Material Safety Data Sheets (MSDS) applicable for each different *Equipment* or chemical ingredient in the *Equipment* which is considered harmful to personnel or environment in any manner, shall be supplied with the Proposal.

11 ENVIRONMENTAL CONSIDERATIONS

Vendors are required to provide information on the environmental soundness of the design and the materials used in the manufacture of the items offered. In addition, provide a detailed outline of the steps that have been put in place to fulfil any obligations that may be required pursuant to the *Waste Avoidance and Resource Recovery Act 2001* and any amendments. In particular:

- a) Management of waste reduction;
- b) The use of re-usable packing; and
- c) Extended producer responsibility for the safe disposal of materials at the end of their life.

12 TESTS

12.1 Test Requirements

The Vendor shall prior to first delivery, complete the design, type, routine, sample and special tests and inspections as required by the relevant Australian or IEC standard.

The passing of such tests does not prejudice the right of Horizon Power to reject the *Equipment* or fitting if it does not comply with this Specification when installed.

Note: A condition of acceptance on imported products shall be completed to perform landing routine and sample tests completed in Australia on each batch imported. In these cases, each batch must obtain a passed landing test in order that the batch acceptance will be reflected on an acceptance list.

12.2 Test Certificates

At the time of submitting the offer on the tender, single copies of test certificates, in English, shall be provided and shall be clearly marked and contain a reference number. If all the required test certificates are not submitted the tender will be rated incomplete and may not be considered.

Electronic copies of type test certificates shall be arranged in the order set out in this Specification and shall be marked clearly with the identifier and description in the contents Section. Any extra test certificates shall be marked with "extra tests" and kept separate from the required test certificates.

All tests required by the relevant Australian or International standards shall be carried out. Test certificates shall be submitted in electronic format and shall be in Adobe Acrobat (.pdf) format.

12.3 Type Tests

The tests are intended to verify the main characteristics and suitability of the design, dimensions, materials, and method of manufacture (technology).

Certified type test results shall be submitted with the Proposal, these type tests shall include those outlined in AS 61869.1 [13], AS 61869.2 [14], AS 61869.3 [15] and AS 61869.4 [16]. The Vendor shall, in their evaluation submission, state which tests the *Equipment* have passed.

Table 1: Type Tests

Description	Standard
	AS 61869-1/-2/-3/-4 (Clause/s)
Temperature-rise tests	All (7.2.2)
Impulse voltage test on primary terminals	All (7.2.3)
Wet test ¹	-1 (7.2.4)
Electromagnetic Compatibility tests	-1 (7.2.5)
Accuracy tests	-2 / -3 / -4 (7.2.6)
Verification of the degree of protection by enclosure	-1 (7.2.7)
Enclosure tightness test at ambient temperature	-1 (7.2.8)
Pressure test for enclosure	-1 (7.2.9)
Short-time current test	-2 (7.2.201) / -3 (7.2.301)

12.4 Routine Tests

Routine tests are intended to eliminate defective units and shall be carried out during the manufacturing process. Routine tests shall be carried out on every *Equipment* and should not consist of visual examination only, these routine tests shall include those outlined in AS 61869.1 [13], AS 61869.2 [14], AS 61869.3 [15] and AS 61869.4 [16].

The Vendor shall supply duly certified copies of the routine tests performed on the *Equipment* to Horizon Power, either prior to or upon delivery.

¹ The test shall be performed in accordance with IEC 60060.1 [19]

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Table 2: Routine Tests

Description	Standard
	AS 61869-1/-2/-3/-4 (Clause/s)
Power-frequency voltage withstand on primary terminals	All (7.3.1)
Partial discharge measurement	-1 / -3 (7.3.2)
Power-frequency voltage withstand between sections	-1 (7.3.3)
Power-frequency voltage withstand on secondary terminals	-1 (7.3.4)
Test for accuracy	-2 / -3 / -4 (7.3.5)
Verification of terminal markings	-1 (7.3.6)
Enclosure tightness test at ambient temperature	-1 (7.3.7)
Pressure test for enclosure	-1 (7.2.9)
Determination of the secondary winding resistance	-2 (7.3.201)
Determination of the secondary loop time constant	-2 (7.3.202)
Test for rated knee point E.M.F. and exciting current	-2 (7.3.203)
Inter-turn overvoltage test	-2 (7.3.204)
Visual Inspection	“Manufacturer’s Standard”

13 DOCUMENTATION AND SAMPLES

13.1 General

All drawings, manuals and other documents supplied by the Vendor shall have the following information:

- a) Horizon Power Standard Number
- b) Horizon Power item number
- c) Horizon Power Stock Code

All documents are to be in English.

The first order of each item must be supplied with a General Technical Particular’s sheet.

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The Vendor shall propose a document transmittal to enable both parties to track Horizon Power's receipt of the design.

13.2 Drawings

The Vendor shall submit the following CAD drawings (in DGN and PDF format) and any relevant engineering calculations, for review and approval before the first order is made:

- a) General Arrangement
 - I. Centrelines and centre of gravity
 - II. Overall external dimensions
 - III. Three-dimensional isomeric general arrangement
 - IV. Front, HV side, LV side and plan elevations (with doors open for ground mounted units)
 - V. Electrical clearances
 - VI. Lifting and maximum sling angles
 - VII. Bushing and cable termination details
 - VIII. State on the drawing the Standards, the design and manufacturing of the *Equipment* is complying with
- b) Rating Plate
- c) Schematics
- d) Termination Diagram

13.3 Operation and Maintenance Manual

Horizon Power must obtain from the *Equipment* manufacturer and be able to provide to any persons purchasing its *Equipment* an Installation, Operation and Maintenance Manual.

One manual that includes each item shall be submitted both in electronic (pdf).

A draft manual shall be submitted after the contract award for review by Horizon Power and is subject to approval.

The manuals shall include the conditions necessary to ensure that the *Equipment* is without risks to health and safety when used for a purpose which it was designed, for or when carrying out any activity that it may be used by at a workplace, including storage, all reasonably foreseeable activities in relation to assembly of the *Equipment*, operation, maintenance, decommissioning, dismantling and disposal. The same information shall be provided for any effected persons in the vicinity of the workplace where the *Equipment* is used. As a minimum the manuals shall include the following:

- a) A concise description of each item of *Equipment* and the purpose for which it was designed and manufactured.
- b) The function and operation of each part and any tool or accessory needed for its operation that is supplied by the Vendor.
- c) Detailed installation procedures and instructions and pre-commissioning testing program.

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- d) Operating instructions and any PPE that should be worn whilst operating the *Equipment* based on its imitations.
- e) Instructions on how to adjust any of the parts.
- f) The manual shall contain a list of drawing numbers and data sheets, in the form of manufacturers document numbers, applicable to the *Equipment*.
- g) Recommended comprehensive routine maintenance, parts replacement schedule.
- h) Any special precautions to be taken in replacement or adjustment of any items including detailed Materials Safety Data Sheet (MSDS) documentation.
- i) Adequate information about the features of the *Equipment* that eliminate or minimise the need for any hazardous manual task to be carried out in connection with the *Equipment*.
- j) The fault-finding procedure including a table listing fault indication, possible cause and remedy.
- k) The manuals shall be prepared specifically for the *Equipment* delivered.
- l) Recommended method of disposal at end-of-life cycle.

13.4 Documentation to be provided with Proposals

Submitted proposals shall provide all documentation and information as requested in this specification, including any further relevant information on the *Equipment* offered. The proposal must be complete in all respects. Failure to comply may cause the proposal to be considered incomplete and hence informal.

The Vendor shall provide an electronic version of all documents in Adobe Acrobat (.pdf) format containing the information detailed below with their offer:

- 1) Any non-compliance of the Specification shall be detailed in the Technical Deviation schedule;
- 2) All information provided in Technical Requirements shall be in English and measurement units shall be in metric units;
- 3) Material Safety Data Sheets;
- 4) CAD drawings (Micro station preferred DGN format) of all Equipment showing all critical dimensions;
- 5) Equipment data sheets showing the weight, material type, protective coatings, mechanical & electrical properties (Combined Load Charts shall be included);
- 6) Installation instructions included in the packaging; and
- 7) A copy of the Vendor's current Quality Assurance accreditation and category.

Should the preferred Vendor submit drawings for approval by Horizon Power, this will in no way exonerate it from being responsible for the correct and proper function of the *Equipment*.

13.5 Service History

Vendors shall state:

- Other Australian electricity supply authorities who have a service history of the items offered; and
- Contact details of those supply authorities who can verify the service performance claimed.

13.6 Training Materials

Training material in the form of drawings, instructions and/or audio-visuals must be provided for the items accepted under the offer.

Vendors shall state the availability of training materials which could include but is not limited to the following topics:

- Handling and storage;
- Application (particularly in areas of heavy coastal pollution);
- Installation;
- Maintenance;
- Environmental performance;
- Electrical performance;
- Mechanical performance;
- Disposal at the end of service life; and
- Production process and testing.

14 EQUIPMENT LIST AND DESCRIPTION

Table 6: Standard Equipment list and descriptions

ITEM	DESCRIPTION	DISTRIBUTION STANDARD DRAWING
1	Aerial CT-VT Unit	
1.1	Short Description: METERING UNIT, 6.6-11KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 6.6-11KV; 3PH; 50/100 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
1.2	Short Description: METERING UNIT, 6.6-11KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 6.6-11KV; 3PH; 100/200 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
1.3	Short Description: METERING UNIT, 22KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 22KV; 3PH; 50/100 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
1.4	Short Description: METERING UNIT, 22KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 22KV; 3PH; 100/200 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
1.5	Short Description: METERING UNIT, 33KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 33KV; 3PH; 50/100 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
1.6	Short Description: METERING UNIT, 33KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 33KV; 3PH; 100/200 1A; 4WIRE AERIAL CONN; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-00030-01
2	Ground-mount CT-VT Unit	
2.1	Short Description: METERING UNIT, 6.6-11KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 6.6-11KV; 3PH; 50/100 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01
2.2	Short Description: METERING UNIT, 6.6-11KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 6.6-11KV; 3PH; 100/200 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01
2.3	Short Description: METERING UNIT, 22KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 22KV; 3PH; 50/100 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01
2.4	Short Description: METERING UNIT, 22KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 22KV; 3PH; 100/200 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01

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ITEM	DESCRIPTION	DISTRIBUTION STANDARD DRAWING
2.5	Short Description: METERING UNIT, 33KV; 3PH; 50/100 1A; 4WIRE Technical Description: METERING UNIT, 33KV; 3PH; 50/100 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01
2.6	Short Description: METERING UNIT, 33KV; 3PH; 100/200 1A; 4WIRE Technical Description: METERING UNIT, 33KV; 3PH; 100/200 1A; 4WIRE PAD-MNT; 110V/SEC; CLASS ME2; ACCURACY RT6	HPA-SD-E-01020-01

APPENDIX A REVISION INFORMATION

(Informative) Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification of errors or queries.


Each Standard makes use of its own comment sheet which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet found in **DM# 3676809** can be used to record any errors or queries found in or pertaining to this standard. This comment sheet will be referred to each time the standard is updated.

Date	Rev No.	Notes
27/09/2013	0	Initial Document Creation
25/05/2023	1	Reformat document and update standards

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APPENDIX B QUALITY ASSURANCE (TO BE COMPLETED BY STORES)

DOCUMENT NUMBER		HPC-8DJ-16-0002-2013					QUALITY ASSURANCE		DM NUMBER	
DEVICE DESCRIPTION		LABEL MATERIAL NO.					EQUIPMENT PURCHASE			ASSET OWNER
		ASSET ID/ STOCK NO		MANUFACTURER		DIMENSION				
ITEM	OPERATION/EQUIPMENT/FACILITY		DOCUMENT REF.	WHO CHECKS	INITIAL	DATE/ TIME	QUALITY ASSURANCE CRITERIA	PASS Y/N	COMMENTS	
1										
1.1	Name of Manufacturer						*****			
1.2	Week & Year of Manufacture						*****			
1.3	Horizon Power Order Number						*****			
1.4	Horizon Power Stock Number						*****			
1.5	Name Plate						*****			
1.6	Physical Appearance									
1.6.1	Paint Colour/Galvanising						Aerial – Galvanised or N42 Storm Grey (11 & 22 kV), G33 Lettuce (33 kV) Ground Mount – Bottle Green See Section 4.6			
1.6.2	Paint/Galvanising Chips						*****			

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1.6.3	Physical Damage (dents, corrosion, cracks in welding, etc.)					*****		
1.6.4	Oil Leaks					*****		
1.6.5	Oil Level (if applicable)					Full		
1.6.6	Bushings (chips, hairline cracks, oil leaks, etc.)					*****		
1.6.7	Door Appearance (if applicable)					*****		
1.7	Earth Stud (not painted)					Stainless steel M12 bolt, nut, lock nut and two flat washers		
1.8	Mounting Brackets on Aerial Transformer (damaged, bent, etc.)					Two clamps and four threaded rods (M20 x 250 mm). Each threaded rod shall have two nuts, two flat washers and one spring washer.		
1.9	Packaging							
1.9.1	Aerial Transformers					Box Crated on pallet with plastic stretch wrap covering		
1.9.2	Ground Mounted					Plastic stretch wrap covering and pallet (if required)		
1.10	Batch Number					*****		
2	DOCUMENTATION							
2.1	Material Safety Data Sheets					Clear, Legible and in English		
2.2	Transformer Documentation & Drawings					Clear, Legible and in English		
2.3	Safety Instructions					Clear, Legible and in English		
2.5	Test and Inspection Reports					Clear, Legible and in English		

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SYMBOLS AND ABBREVIATIONS								
H = HOLD POINT	S = SUPERVISOR							
W = WITNESS POINT	T = TECHNICIAN, EL = ELECTRICIAN	REVISION						
V = VERIFICATION POINT	E = ENGINEER	DATE						
S/C = SUBCONTRACTOR	PM = PROJECT MANAGER	APPROVED BY						

APPENDIX C SCHEDULES A & B: ENQUIRY DOCUMENT

C1 Technical Schedules

Completion of the listed schedules below by the Vendor shall indicate the product offered is fully compliant with the nominated Clauses in this specification. All information provided shall be in English and measurement units shall be in metric units.


Any deviation from the specification shall be listed on the “Technical Deviation Schedule C”, provided in Appendix D with motivation to Horizon Power for consideration and written approval.

C2 Technical Requirements

Schedule A: Purchaser’s specific requirements.

Schedule B: Particulars of *Equipment* to be supplied.

C2.1 Technical Schedules A and B for Aerial CTVT Units

	SPECIFICATION ENQUIRY	HPC-8DJ-16-0002-2013
	VENDOR’S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 1: Aerial CT-VT Unit

VOLTAGE	6.6-11 kV	6.6-11 kV	22 kV	22 kV	33 kV	33 kV	
ITEM	1.1	1.2	1.3	1.4	1.5	1.6	
SIZE	50-100 1A	100-200 1A	50-100 1A	100-200 1A	50-100 1A	100-200 1A	

SCHEDULE A: Horizon Power’s specific requirements

SCHEDULE B: Particulars of *Equipment* to be supplied (to be completed by Vendor)

Item	Sub-clause	Description	Schedule A	Schedule B
1.		Manufacturer/ Vendor of CTVT	xxxxxx	
2.		Manufacturer’s/ Vendor’s catalogue number	xxxxxx	
3.		Manufacturer’s/ Vendor’s drawing number	xxxxxx	
4		Dimensions		
4.1		Length mm	xxxxxx	
4.2		Width mm	xxxxxx	
4.3		Height mm	xxxxxx	
4.4		Mass (excluding Oil) kg	xxxxxx	
4.5		Mass Oil (if applicable) kg	xxxxxx	
4.6		Mass Total kg	xxxxxx	
4.7		Terminal arrangements and positions (Yes/No)	xxxxxx	
5		Design and Construction		
5.1	4.1	Tank Bracing(Yes/No)	xxxxxx	
5.2	4.2	Tank	xxxxxx	


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Item	Sub-clause	Description	Schedule A	Schedule B
5.3	4.3	Bushings	xxxxxx	xxxxxx
5.3.1		Profile	xxxxxx	
5.3.2		Bushing Material	xxxxxx	
5.3.3		Creepage mm/kV	xxxxxx	
5.3.4		Stem Diameter	xxxxxx	
5.3.5		Stem Type		
5.3.6		Stem Material		
5.3.7		Manufacture	xxxxxx	
5.4	4.5	Insulating Medium	Oil	
5.5	4.6.1	Housing and Corrosion Protection	xxxxxx	
6		Configuration Detail		
6.1		Configuration	3 Phase - 4 Wire	
6.2		Primary Star Point Earthing	Yes-external	
6.3		Secondary Star Point Earthing	Yes-external	
6.4	4.8.4.1	Current Transformer	xxxxxx	xxxxxx
6.4.1		Type	xxxxxx	
6.4.2		Accuracy	xxxxxx	xxxxxx
6.4.3		50-100/1 A Class	0.5	xxxxxx
6.4.4		100-200/1 A Class	0.2	xxxxxx
6.4.5		Burden VA	7.5	xxxxxx
6.4.6		Short time current withstand level for 1 sec. kV	xxxxxx	
6.5	4.8.4.2	Voltage Transformer	xxxxxx	xxxxxx
6.5.1		Primary Voltage kV	xxxxxx	
6.5.2		Secondary Voltage V	110	xxxxxx
6.5.3		Accuracy Class	0.2	xxxxxx
6.5.4		Burden VA	50	xxxxxx
6.5.5		Insulation Levels	xxxxxx	xxxxxx
6.5.6		Lightning Impulse peak kV	xxxxxx	
6.5.7		Rated short duration 60 sec. kV	xxxxxx	
6.5.8		Rated Voltage Factor	xxxxxx	xxxxxx
6.5.9		Continuous kV	1.2 X U _n	xxxxxx
6.5.10		30 seconds kV	1.9 X U _n	xxxxxx
7		Terminal Box and Cable		

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Item	Sub-clause	Description	Schedule A	Schedule B
7.1	5.6	Terminal box rated to IP 54 (Yes/No)	xxxxxx	
7.2	5.5	Cable	xxxxxx	xxxxxx
7.2.1		Size mm ²	xxxxxx	
7.2.2		Cores	12	xxxxxx
7.2.3		Length m	>15	xxxxxx

C2.2 Technical Schedules A and B for Ground-mounted CTVT Units

	SPECIFICATION ENQUIRY	HPC-8DJ-16-0002-2013
	VENDOR'S NAME	
	DATE	

TECHNICAL SCHEDULES A & B

ITEM 2: Ground-mounted CT-VT Unit

VOLTAGE	6.6-11 kV	6.6-11 kV	22 kV	22 kV	33 kV	33 kV	
ITEM	2.1	2.2	2.3	2.4	2.5	2.6	
SIZE	50-100 1A	100-200 1A	50-100 1A	100-200 1A	50-100 1A	100-200 1A	

SCHEDULE A: Horizon Power's specific requirements

SCHEDULE B: Particulars of Equipment to be supplied (to be completed by Vendor)

Item	Sub-clause	Description	Schedule A	Schedule B
1.		Manufacturer/ Vendor of CTVT	xxxxxx	
2.		Manufacturer's/ Vendor's catalogue number	xxxxxx	
3.		Manufacturer's/ Vendor's drawing number	xxxxxx	
4.		Dimensions		
4.1		Length mm	xxxxxx	
4.2		Width mm	xxxxxx	
4.3		Height mm	xxxxxx	
4.4		Mass (excluding Oil) kg	xxxxxx	
4.5		Mass Oil (if applicable) kg	xxxxxx	
4.6		Mass Total kg	xxxxxx	
4.7		Terminal arrangements and positions (Yes/No)	xxxxxx	
5.		Design and Construction		
5.1	4.1	Tank Bracing(Yes/No)	xxxxxx	
5.2	4.2	Tank	xxxxxx	
5.3	4.3	Bushings	xxxxxx	xxxxxx
5.3.1		Profile	xxxxxx	

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Item	Sub-clause	Description	Schedule A	Schedule B
5.3.2		Bushing Material	xxxxxx	
5.3.3		Creepage mm/kV	xxxxxx	
5.3.4		Stem Diameter	xxxxxx	
5.3.5		Stem Type		
5.3.6		Stem Material		
5.3.7		Manufacture	xxxxxx	
5.4	4.5	Insulating Medium	Oil	
5.5	4.6.2	Housing and Corrosion Protection	xxxxxx	
6		Configuration Detail		
6.1		Configuration	3 Phase - 4 Wire	
6.2		Primary Star Point Earthing	Yes-external	
6.3		Secondary Star Point Earthing	Yes-external	
6.4	4.8.4.1	Current Transformer	xxxxxx	xxxxxx
6.4.1		Type	xxxxxx	
6.4.2		Accuracy	xxxxxx	xxxxxx
6.4.3		50-100/1 A Class	0.5	xxxxxx
6.4.4		100-200/1 A Class	0.2	xxxxxx
6.4.5		Burden VA	7.5	xxxxxx
6.4.6		Short time current withstand level for 1 sec. kV	xxxxxx	
6.5	4.8.4.2	Voltage Transformer	xxxxxx	xxxxxx
6.5.1		Primary Voltage kV	xxxxxx	
6.5.2		Secondary Voltage V	110	xxxxxx
6.5.3		Accuracy Class	0.2	xxxxxx
6.5.4		Burden VA	50	xxxxxx
6.5.5		Insulation Levels	xxxxxx	xxxxxx
6.5.6		Lightning Impulse peak kV	xxxxxx	
6.5.7		Rated short duration 60 sec. kV	xxxxxx	
6.5.8		Rated Voltage Factor	xxxxxx	xxxxxx
6.5.9		Continuous kV	1.2 X U _n	xxxxxx
6.5.10		30 seconds kV	1.9 X U _n	xxxxxx
7	6.3	MV/LV Cubicle rated to IP 54 (Yes/No)	xxxxxx	

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APPENDIX D TECHNICAL SCHEDULE C: COMPLIANCE DOCUMENT

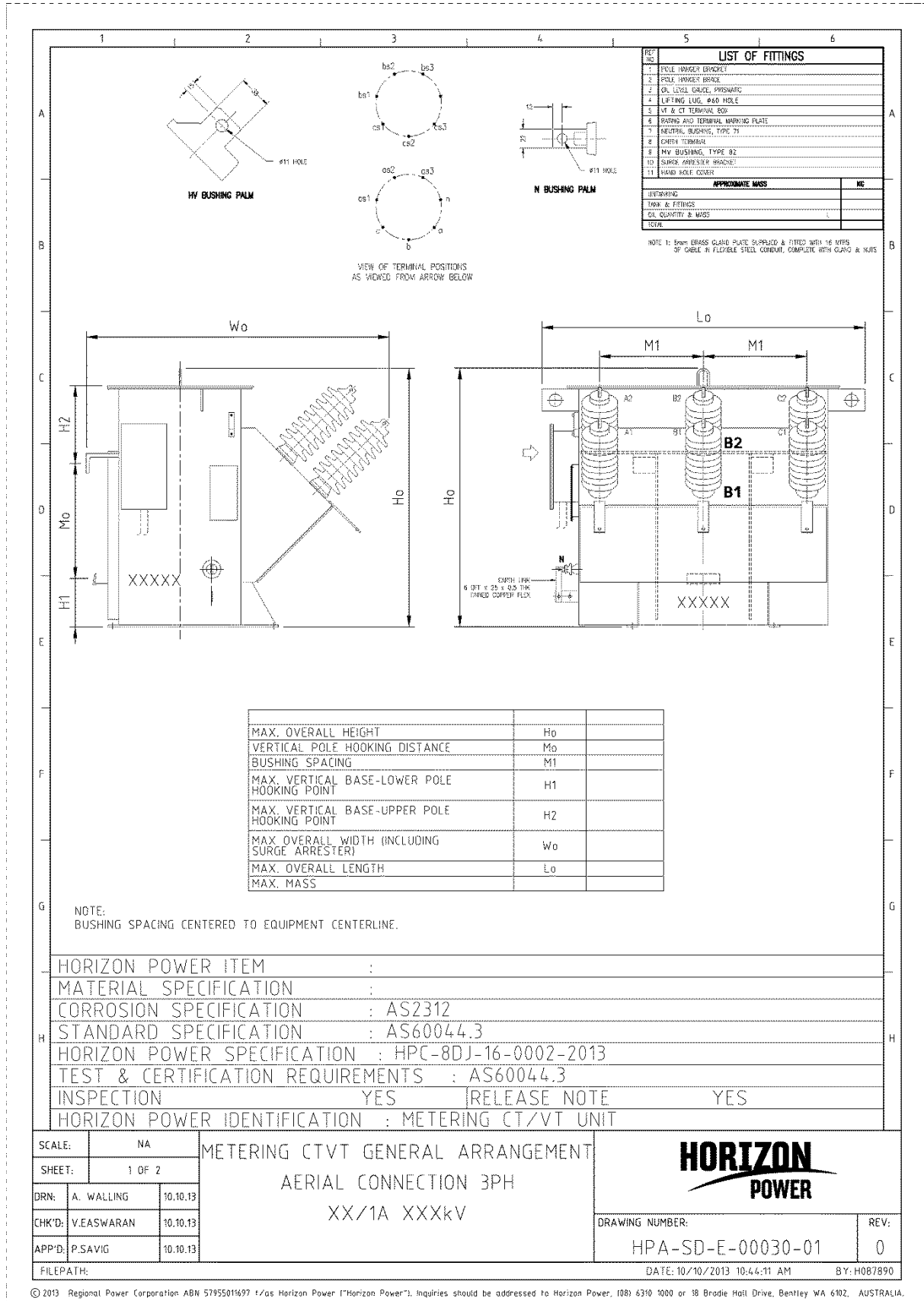
The Vendor shall indicate below whether this offer is fully compliant with the nominated clause in this Specification. A YES shall ONLY be indicated if the offer is 100% compliant with the relevant Clause. If NO is indicated and supporting documents are submitted, then mark the ATT box with the attachment number. Details of departure shall be provided in Schedule D Appendix E.

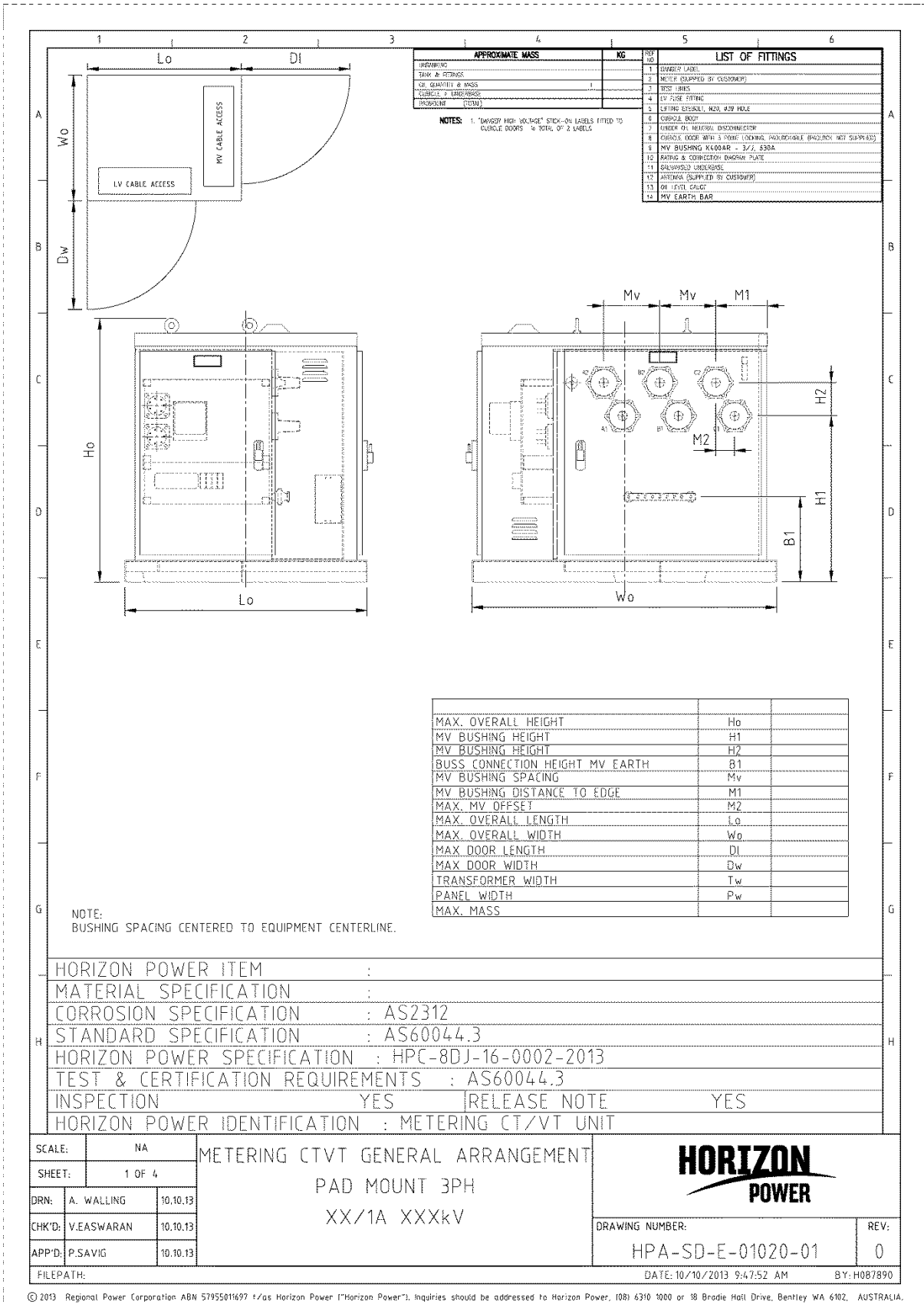
CLAUSE NUMBER		YES	NO	ATT.
3	Requirements			
3.1	Power System Particulars			
3.1.1	<i>Rated Voltages</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.1.2	<i>Fault Rating</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.1.3	<i>Nominal System Frequency</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.1.4	<i>System Insulation Levels</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.1.5	<i>Pollution Performance</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.2	Service Conditions			
3.2.1	<i>Environmental Conditions</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.2.2	<i>Service Requirements</i>	<input type="checkbox"/>	<input type="checkbox"/>	
3.2.3	<i>Safety</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4	Design and Construction			
4.1	General	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	Tank	<input type="checkbox"/>	<input type="checkbox"/>	
4.3	Bushings	<input type="checkbox"/>	<input type="checkbox"/>	
4.4	Joints and Gaskets	<input type="checkbox"/>	<input type="checkbox"/>	
4.5	Insulation Medium	<input type="checkbox"/>	<input type="checkbox"/>	
4.6	Housing and Corrosion Protection	<input type="checkbox"/>	<input type="checkbox"/>	
4.6.1	<i>Aerial Equipment</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.6.2	<i>Ground-mounted Equipment</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.7	<i>Equipment Fittings</i>			
4.7.1	<i>Rating Plates</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.7.2	<i>Terminal Markings</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.7.3	<i>Earthing Bracket</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.7.4	<i>External Markings</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.8	Electrical Requirements			
4.8.1	<i>General</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.8.2	<i>Tap Switch (where specified)</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.8.3	<i>Earthing</i>			

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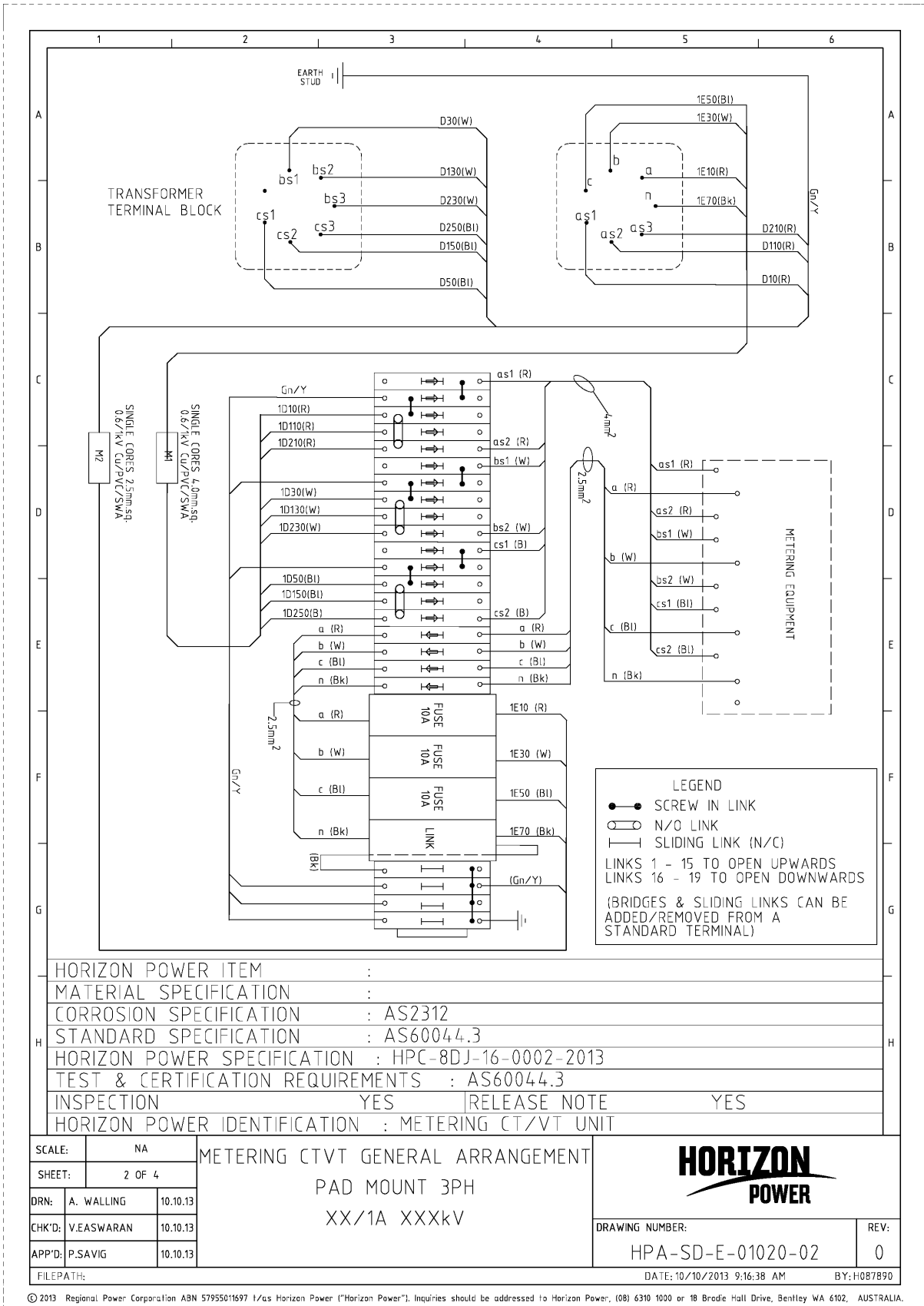
CLAUSE NUMBER		YES	NO	ATT.
4.8.4	<i>Internal CT & VT Core and Primaries</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.8.4.1	<i>Current Transformer</i>	<input type="checkbox"/>	<input type="checkbox"/>	
4.8.4.2	<i>Voltage Transformer</i>	<input type="checkbox"/>	<input type="checkbox"/>	
5	<i>Aerial Equipment Requirements</i>			
5.1	General	<input type="checkbox"/>	<input type="checkbox"/>	
5.2	Lifting Lugs/Eyes	<input type="checkbox"/>	<input type="checkbox"/>	
5.3	<i>Equipment Mounting Brackets</i>	<input type="checkbox"/>	<input type="checkbox"/>	
5.4	Surge Arrestor Brackets	<input type="checkbox"/>	<input type="checkbox"/>	
5.5	Secondary Cable	<input type="checkbox"/>	<input type="checkbox"/>	
5.6	Terminal Box	<input type="checkbox"/>	<input type="checkbox"/>	
6	<i>Ground Mounted Equipment Requirements</i>			
6.1	General	<input type="checkbox"/>	<input type="checkbox"/>	
6.2	Lifting Lugs/Eyes	<input type="checkbox"/>	<input type="checkbox"/>	
6.3	MV/LV Cubicle	<input type="checkbox"/>	<input type="checkbox"/>	
6.4	Secondary Wiring	<input type="checkbox"/>	<input type="checkbox"/>	
7	<i>Packaging Requirements</i>	<input type="checkbox"/>	<input type="checkbox"/>	
8	Storage	<input type="checkbox"/>	<input type="checkbox"/>	
9	Reliability	<input type="checkbox"/>	<input type="checkbox"/>	
10	Safety	<input type="checkbox"/>	<input type="checkbox"/>	
11	<i>Environmental Considerations</i>	<input type="checkbox"/>	<input type="checkbox"/>	
12	<i>Tests</i>			
12.1	Test Requirements	<input type="checkbox"/>	<input type="checkbox"/>	
12.2	Test Certificates	<input type="checkbox"/>	<input type="checkbox"/>	
12.3	Type Tests	<input type="checkbox"/>	<input type="checkbox"/>	
12.4	Routine Tests	<input type="checkbox"/>	<input type="checkbox"/>	
13	<i>Documentation and Samples</i>			
13.1	General	<input type="checkbox"/>	<input type="checkbox"/>	
13.2	Drawings	<input type="checkbox"/>	<input type="checkbox"/>	
13.3	Operation and Maintenance Manual	<input type="checkbox"/>	<input type="checkbox"/>	
13.4	Documentation to be provided with Proposals	<input type="checkbox"/>	<input type="checkbox"/>	
13.5	Service history	<input type="checkbox"/>	<input type="checkbox"/>	
13.6	Training Materials	<input type="checkbox"/>	<input type="checkbox"/>	

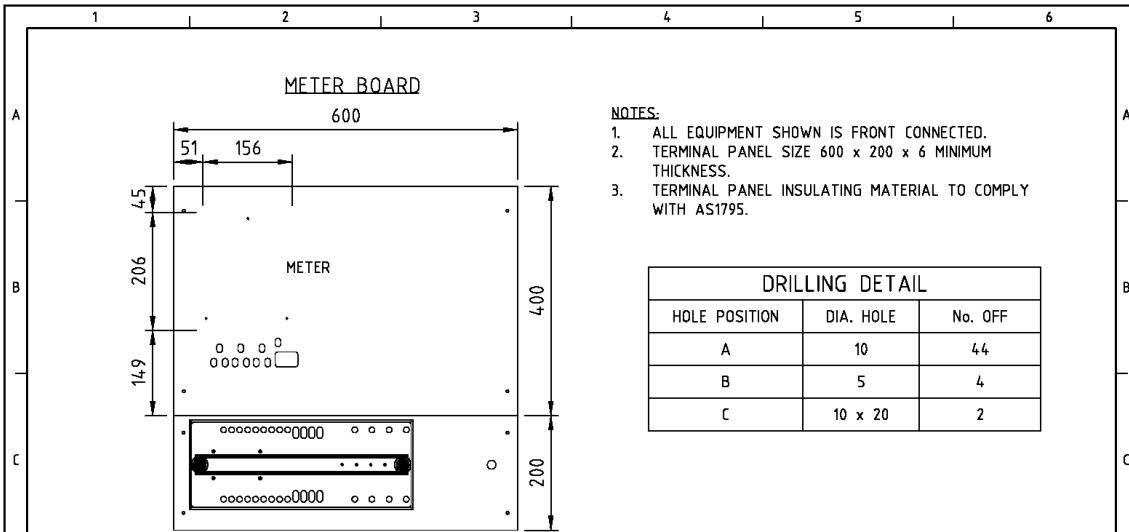
APPENDIX F SPECIFICATION DRAWINGS





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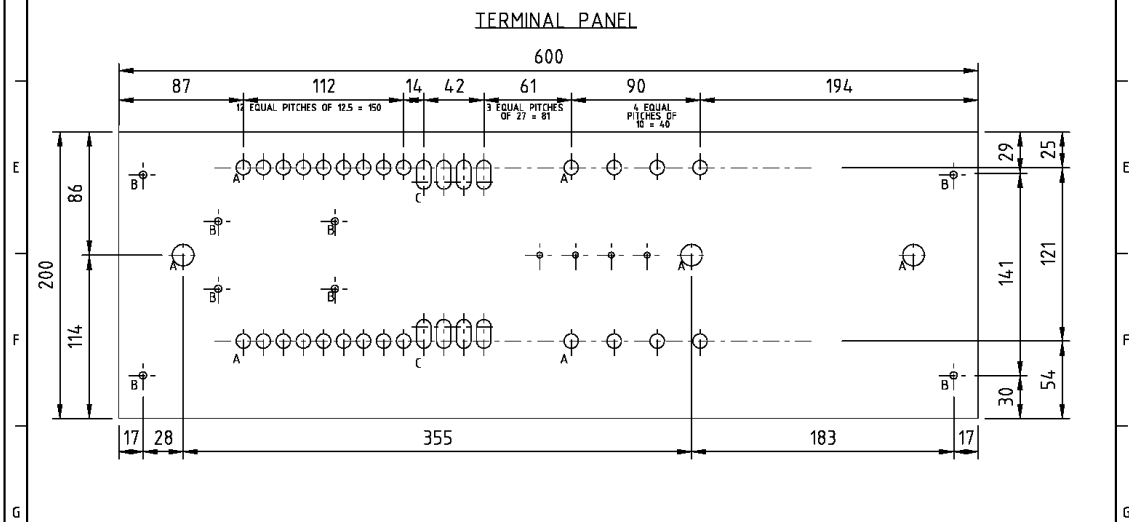




NOTES:

1. ALL EQUIPMENT SHOWN IS FRONT CONNECTED.
2. TERMINAL PANEL SIZE 600 x 200 x 6 MINIMUM THICKNESS.
3. TERMINAL PANEL INSULATING MATERIAL TO COMPLY WITH AS1795.

DRILLING DETAIL		
HOLE POSITION	DIA. HOLE	No. OFF
A	10	44
B	5	4
C	10 x 20	2

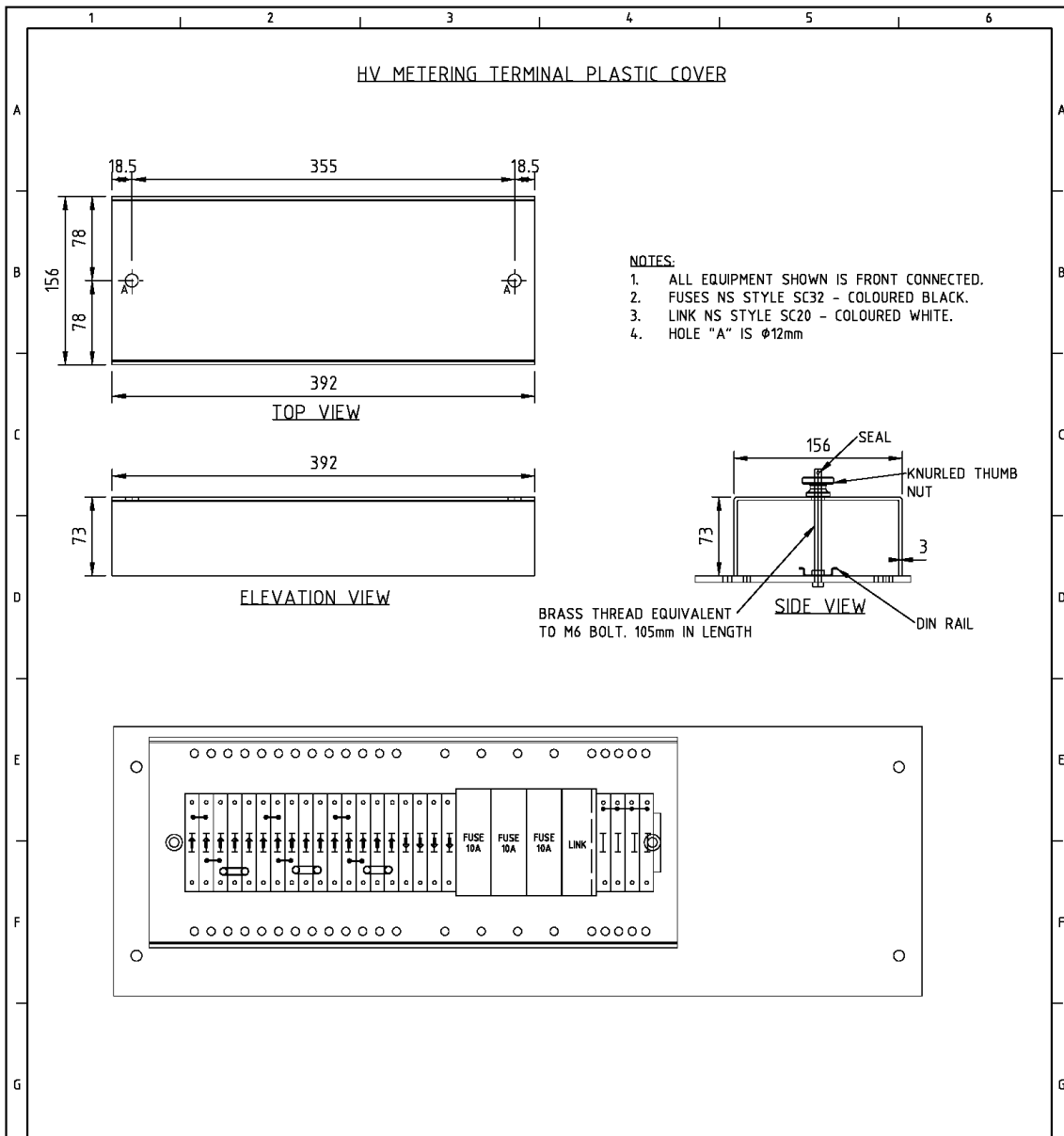


HORIZON POWER ITEM	:	
MATERIAL SPECIFICATION	:	
CORROSION SPECIFICATION	:	AS2312
STANDARD SPECIFICATION	:	AS6004.3
HORIZON POWER SPECIFICATION	:	HPC-8DJ-16-0002-2013
TEST & CERTIFICATION REQUIREMENTS	:	AS6004.3
INSPECTION	YES	RELEASE NOTE YES
HORIZON POWER IDENTIFICATION	:	METERING CT/VT UNIT

SCALE:	NA	METERING CT/VT GENERAL ARRANGEMENT PAD MOUNT 3PH XX/1A XXXkV	HORIZON POWER
SHEET:	3 OF 4		
DRN:	A. WALLING	10.10.13	DRAWING NUMBER: HPA-SD-E-01020-03
CHK'D:	V.EASWARAN	10.10.13	
APP'D:	P.SAVIG	10.10.13	
FILEPATH:			DATE: 10/10/2013 9:45:03 AM BY: H087890

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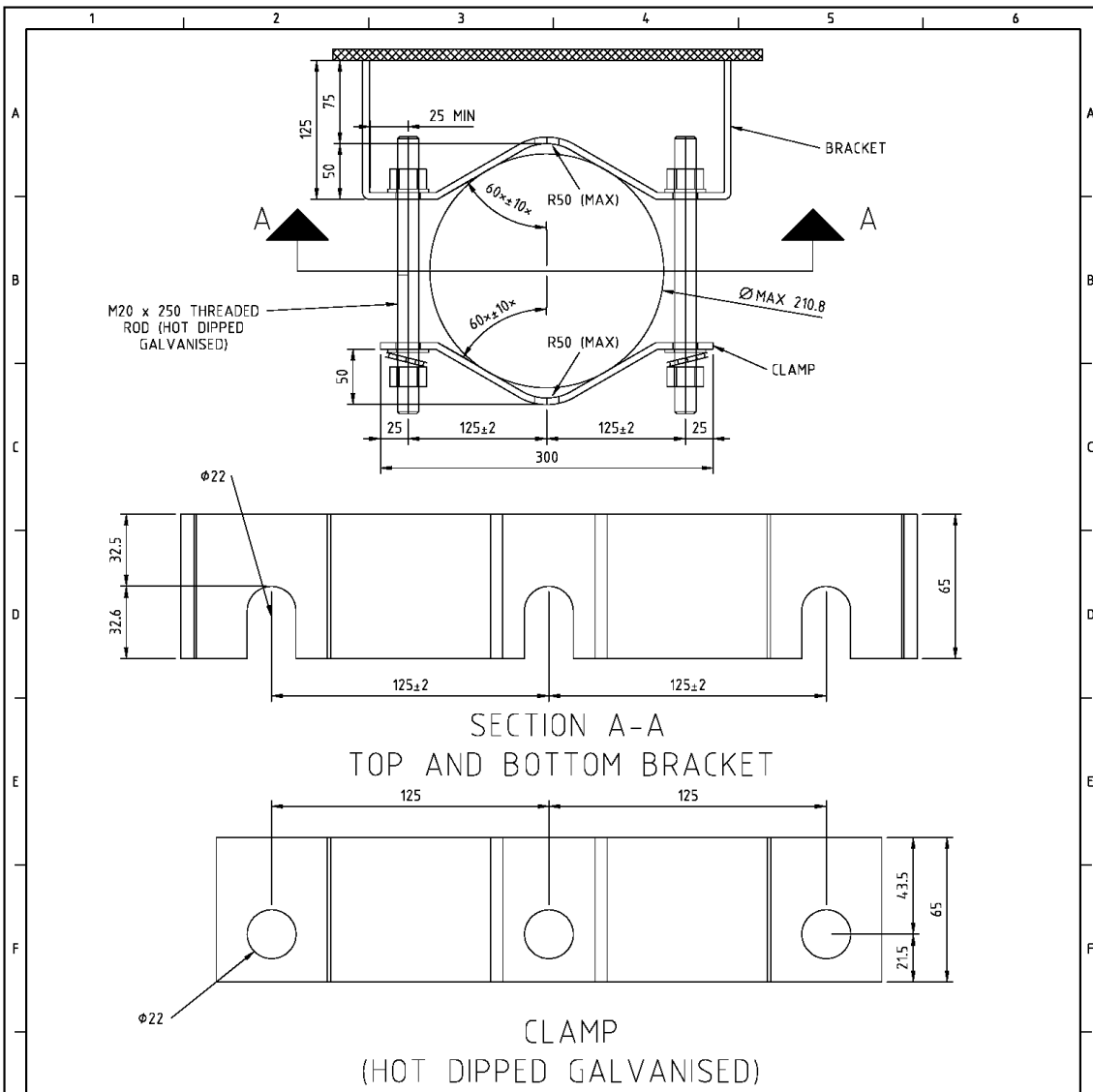
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HORIZON POWER ITEM	:	
MATERIAL SPECIFICATION	:	
CORROSION SPECIFICATION	:	AS2312
STANDARD SPECIFICATION	:	AS60044.3
HORIZON POWER SPECIFICATION	:	HPC-8DJ-16-0002-2013
TEST & CERTIFICATION REQUIREMENTS	:	AS60044.3
INSPECTION	YES	RELEASE NOTE YES
HORIZON POWER IDENTIFICATION	:	METERING CT/VT UNIT

SCALE:	NA	METERING CTVT GENERAL ARRANGEMENT PAD MOUNT 3PH XX/1A XXXkV	
SHEET:	4 OF 4		
DRN:	A. WALLING	10.10.13	DRAWING NUMBER: HPA-SD-E-01020-04
CHK'D:	V.EASWARAN	10.10.13	
APP'D:	P.SAVIG	10.10.13	
FILEPATH:			DATE: 10/10/2013 9:22:22 AM BY: H087890

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NOTE:
DIMENSIONS ARE SUBJECT TO A TOLERANCE OF ±1mm UNLESS OTHERWISE STATED.

HORIZON POWER ITEM	:	
MATERIAL SPECIFICATION	:	
CORROSION SPECIFICATION	:	AS2312
STANDARD SPECIFICATION	:	
HORIZON POWER SPECIFICATION	:	
TEST & CERTIFICATION REQUIREMENTS	:	
INSPECTION	YES	RELEASE NOTE YES
HORIZON POWER IDENTIFICATION : BRACKET, MOUNTING POLE		

SCALE:	1:25	BRACKET & CLAMP ARRANGEMENT AERIAL MOUNTING	
SHEET:	1 OF 2		
DRN:	A. WALLING	10.10.13	DRAWING NUMBER: HPA-SD-S-00001-01
CHK'D:	V.EASWARAN	10.10.13	
APP'D:	P. SAVIG	10.10.13	
FILEPATH:			DATE: 10/10/2013 9:46:18 AM BY: H087890