

Master Specification

Part RD-ITS-S3

ITS Enclosures

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RD-ITS-S3 ITS Enclosures

1 General

- a) This Master Specification Part sets out the requirements for the design, manufacture, supply and, where specified by the Contract Documents, the installation and commissioning of ITS enclosures (including telecommunications field cabinets but excluding cabinets within Tunnels) and associated equipment, including:
 - i) the documentation requirements, as set out in section 2;
 - ii) the ITS enclosure requirements, as set out in section 3;
 - iii) the ITS enclosure internal operating environment requirements, as set out in section 4;
 - iv) the mounting requirements, as set out in section 5;
 - v) the testing and acceptance requirements, as set out in section 6; and
 - vi) the warranty requirements, as set out in section 7.
- b) This Master Specification Part applies only to the design, manufacture, supply and installation of ITS enclosures which are located on open roads (i.e. not within Tunnels). TUN-ME-DC4 "Tunnel Equipment Cabinets" applies to ITS enclosures which are located within Tunnels.
- c) References to "ITS enclosures" in this Master Specification Part do not refer to ITS enclosures located within Tunnels.
- d) The design, manufacture, supply, installation and commissioning of ITS enclosures must comply with the Reference Documents, including:
 - i) AS 1319 Safety signs for the occupational environment;
 - ii) AS 1627 Metal finishing - Preparation and pretreatment of surfaces;
 - iii) AS 2700 Colour standards for general purposes;
 - iv) AS 3990 Mechanical equipment - Steelwork;
 - v) AS 4100 Steel structures;
 - vi) AS 4852.1 Variable message signs, Part 1: Fixed signs;
 - vii) AS 60529 Degrees of protection provided by enclosures (IP Code);
 - viii) AS/CA S009 Installation requirements for customer cabling (Wiring Rules);
 - ix) AS/NZS 1170 Structural design actions;
 - x) AS/NZS 1664 Aluminium structures;
 - xi) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);
 - xii) AS/NZS ISO 9001 Quality management systems - Requirements; and
 - xiii) ISO 16890-1 Air filters for general ventilation - Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM).

2 Documentation

2.1 Design Documentation

In addition to the requirements of PC-EDM1 "Design Management", the Design Documentation must include:

- a) all design documentation and information required by RD-ITS-D1 “Design for Intelligent Transport Systems (ITS)” (as it relates to the ITS enclosures);
- b) for each type of ITS enclosure:
 - i) manufacturer’s specifications;
 - ii) Design Drawings showing the generic equipment layout; and
 - iii) ITS enclosure Design Drawings;
- c) for each ITS enclosure, Design Drawings detailing:
 - i) the layout and mounting arrangement of equipment housed within the ITS enclosure;
 - ii) cable management, cable and connection paths;
 - iii) power single line diagram;
 - iv) communications interconnection diagram; and
 - v) ITS enclosure asset identification labelling;
- d) specifications for equipment associated with the ITS enclosures, including:
 - i) cables;
 - ii) cable management;
 - iii) terminals and fittings; and
 - iv) security mechanisms, including locking mechanisms, door monitoring, keys (including both mechanical and electronic locking, where relevant);
- e) ITS enclosure cable labelling scheme which complies with the requirements of:
 - i) RD-ITS-C1 “Installation and Integration of ITS Equipment”;
 - ii) RD-ITS-C3 “Telecommunications Cabling”; and
 - iii) PC-CN2 “Asset Handover”; and
- f) a list of ITS enclosure doors which are required to incorporate electronic locks, as required by section 3.5c).

2.2 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) drawings, manufacturer’s specifications, and diagrams of each type of ITS enclosure supplied by the Contractor, including equipment layout and wiring; and
- b) where cooling systems are included in ITS enclosures supplied by the Contractor, the FAT Plan required by PC-CN1 “Testing and Commissioning”, and Factory Acceptance Testing results for that cooling system.

2.3 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

- a) Shop Drawings for each type of ITS enclosure; and
- b) As-Built Records for each ITS enclosure detailing:
 - i) equipment layouts;
 - ii) wiring schematics;

- iii) cable schedules; and
- iv) bill of materials for each ITS enclosure including installed equipment.

3 ITS enclosure requirements

3.1 General

- a) The Contractor must ensure that all ITS enclosures are designed, manufactured, supplied and, where the Contract Documents specify, installed and commissioned:
 - i) so as to present a neat and consistent appearance of all ITS enclosures across the Project;
 - ii) so that equipment layout within ITS enclosures follows a logical design, and allows for adequate electrical segregation, ventilation and air movement between and around equipment, supported by heat load calculations per ITS enclosure type;
 - iii) so that wind, traffic or other induced forces or vibrations do not impair the performance of any ITS enclosure nor the equipment it houses;
 - iv) so that each ITS enclosure complies with the weather resistance requirements of section 3.6;
 - v) so as to include drain holes in the bottom corners of all ITS enclosures or any place where water could be dammed by framing members (unless drain holes compromise the specified ingress protection (IP) rating of the ITS enclosure); and
 - vi) so as to prevent the entry of vermin.
- b) With respect to design of the ITS enclosures, the Contractor must ensure:
 - i) that aluminium ITS enclosures are designed to meet the requirements of AS/NZS 1664 Aluminium structures;
 - ii) metallic ITS enclosures (other than aluminium ITS enclosures) are designed to meet the requirements of:
 - A. AS 4100 Steel structures; and
 - B. AS 3990 Mechanical equipment - Steelwork; and
 - iii) that the design loads of the ITS enclosures satisfy the requirements of AS/NZS 1170 Structural design actions.

3.2 Dimensions

The Contractor must ensure that the ITS enclosures satisfy the following requirements:

- a) each ITS enclosure must be of a size and dimension that allows the equipment it houses to operate, and be maintained, in situ within the ITS enclosure;
- b) each ITS enclosure must provide sufficient cable management to ensure that during normal operation or whilst undertaking maintenance activities, all cables:
 - i) are adequately supported;
 - ii) are not subject to stress, including compliance with cable manufacturer minimum bending radii; and
 - iii) cannot detach from their associated terminals or plugs or sockets;
- c) loose coiling of cables in ITS enclosures must not be adopted;
- d) each ITS enclosure must provide sufficient space to ensure that cable and equipment access, management and termination can be undertaken neatly, efficiently and without impairment during both installation and operation;

- e) a clear buffer space of at least 80 mm must be provided between all equipment and equipment mounting arrangements housed within the ITS enclosure and the ITS enclosure walls and access covers or doors;
- f) equipment housed within the ITS enclosure must not be greater than 1800 mm above the standing surface of the ITS enclosure to allow for access by maintenance personnel;
- g) a 2 rack unit (RU) gap must exist between each rack mounted device within the ITS enclosure;
- h) a minimum 300 mm gap must exist at the bottom of each ITS enclosure to allow for cable management;
- i) a minimum of 4 spare RUs exist in each ITS enclosure;
- j) equipment housed within ground mounted ITS enclosures must be located a minimum of 200 mm above the finished ground level; and
- k) standard width and double-door width ITS enclosures must be provided with a telescopic shelf on the communications side of the cabinet (left-hand side facing the front of the cabinet) which is:
 - i) 450 mm deep;
 - ii) rated to 45 kg evenly distributed load; and
 - iii) installed at a height between 1,000 mm and 1,100 mm above the base of the cabinet.

3.3 Lifting and transportation points

- a) The Contractor must ensure that, where the fitted-out ITS enclosure (including all operational equipment housed within the ITS enclosure) cannot be safely manually lifted and held by a single person during installation of the ITS enclosure (in accordance with the requirements of the Contract Documents), lifting anchors must be provided by the Contractor.
- b) Where lifting anchors must be provided pursuant to section 3.3a), or where transportation anchor points are required, the Contractor must ensure that the lifting anchors and transportation anchors:
 - i) are capable of supporting the fitted-out ITS enclosure (complete with all operational equipment housed within the ITS enclosure);
 - ii) are integral with the ITS enclosure;
 - iii) prevent moisture ingress to the ITS enclosure so that the ITS enclosure achieves the required IP rating; and
 - iv) do not include seals around the lifting anchor or transportation anchor.

3.4 ITS enclosure access points

- a) The Contractor must ensure that the design and layout of each ITS enclosure enables full and safe access to the ITS enclosure and the equipment installed within it by a single technician to allow:
 - i) removal or replacement of any of the equipment housed in the ITS enclosure; and
 - ii) installation, testing or maintenance to be undertaken.
- b) The Contractor must ensure that ITS enclosure access points are located:
 - i) to enable full and safe access to the ITS enclosure by a single technician; and
 - ii) at a height that allows easy access for maintenance personnel when standing adjacent to the ITS enclosure.
- c) The Contractor must ensure that all ITS enclosures comply with the following:
 - i) doors must be provided on all ITS enclosures;

- ii) folding doors must not be used on the ITS enclosures;
 - iii) ITS enclosure doors must be hinged in the vertical plane using concealed hinges. The Contractor must ensure that the hinges are of a design such that the hinge pins cannot be removed;
 - iv) ITS enclosure doors must not exceed 900 mm in width and must extend as far as practicable to the extremities of the ITS enclosure;
 - v) ITS enclosure doors must be of the same material and finish as the ITS enclosure;
 - vi) seals on the outer-most doors of the ITS enclosure must close against the folded edge of a self-draining channel to ensure that water does not collect around the seal;
 - vii) ITS enclosure doors must be able to be secured in the open position at 140° from their closed position, with a captive non-sliding mechanism; and
 - viii) ITS enclosure access covers, doors, and fixings must be of sufficient strength, stiffness, and design to prevent unauthorised entry.
- d) If the ITS enclosure design includes cover plates (flush removeable panels):
- i) cover plate fixings must be captive with the cover when the cover is removed; and
 - ii) cover plates must be of sufficient strength, stiffness, and design to prevent unauthorised entry.

3.5 Locks

- a) Each ITS enclosure door must include locks which comply with the following:
- i) the lock incorporates:
 - A. a Euro Profile locking cylinder (DIN 18254), or equivalent, with restricted keying;
 - B. a Lowe and Fletcher Barrel No. 380, Part No. A/CR32/01 WI3 lock or equivalent; or
 - C. a ABUS 83/50 lock or equivalent, with restricted keying, for where padlocks are required; and
 - ii) 2 keys (keyed to one of the requirements in section 3.5a)i), as advised by the Principal) must be supplied by the Contractor to the Principal for each lock.
- b) Unless the Contract Documents specify that electronic locks are not to be used, each ITS enclosure must include electronic locks which comply with the following:
- i) all standard single width and double-door width ITS enclosure front and rear doors must incorporate electronic lock barrels which are compatible with the Principal's electronic lock management system as specified in the Contract Documents;
 - ii) the Principal will supply programmed electronic lock barrels to the Contractor. The Contractor must ensure that it satisfies the Principal's requirements in relation to the Principal's required timing for procurement, programming and provision of electronic locks as specified in Contract Documents, or if not specified, a minimum of 10 weeks must be allowed for by the Contractor; and
 - iii) the Contractor must install and test the electronic locks (to the programmed destination of each ITS enclosure) prior to, or immediately after, Site Acceptance Testing as required by RD-ITS-C1 "Installation and Integration of ITS Equipment" and PC-CN1 "Testing and Commissioning".
- c) The Design Documentation must include a detailed list of ITS enclosure doors which are required to incorporate electronic locks, including the ITS enclosure identification number, in order for the electronic lock barrels to be purchased and programmed.
- d) The locking and unlocking of each ITS enclosure door must be effected by single key operation.

- e) The ITS enclosure door lock must operate a 3 point latching mechanism with pins extending from the top, centre and bottom of the non-hinged side of the ITS enclosure door.
- f) The ITS enclosure doors must house a flush mounting, ergonomic handle capable of accepting the locks required by this section 3.5.

3.6 Weather resistance

- a) The Contractor must ensure that:
 - i) the ITS enclosure is designed to drain water away from all seals; and
 - ii) all doors and access points are provided with a durable, resilient weatherproof, neoprene seal that maintains its elasticity and memory over the Design Life of the ITS enclosure as specified in RD-ITS-D1 "Design of Intelligent Transport Systems (ITS)" in its operating environment.
- b) The Contractor must ensure that all ITS enclosures are designed and constructed such that:
 - i) formation of condensation inside the ITS enclosure is minimised, and that any condensation forming on internal surfaces of the ITS enclosure drains from the internal surfaces without dripping on equipment housed inside the ITS enclosure;
 - ii) all equipment housed within the ITS enclosure is protected from moisture (including condensation inside the ITS enclosure), dust, dirt, and corrosion; and
 - iii) the ITS enclosures achieve an IP55 rating (or such higher IP rating required by the Contract Documents) in accordance with AS 60529 Degrees of protection provided by enclosures (IP Code).

3.7 Construction

- a) The Contractor must ensure that the construction of all ITS enclosures complies with the following:
 - i) ITS enclosures and internal structure frameworks must be constructed from steel or marine grade aluminium sheeting;
 - ii) all steelwork and fixings (except aluminium and stainless steel) must be hot dip galvanized;
 - iii) the internal framework must be contained entirely within the external sheeting;
 - iv) all external seams must have a continuous weld;
 - v) the external sheeting must be stitch welded to the internal structural frame;
 - vi) welded steel joints must be primed with zinc-rich primer;
 - vii) internal structural members must be manufactured from the same material as the ITS enclosure;
 - viii) the alloy and temper of the aluminium must be suitable for the application;
 - ix) contact between dissimilar metals must comply with the requirements of AS/NZS 1664 Aluminium structures; and
 - x) suitable washers and fixtures must be used to prevent damage and corrosion to all ITS enclosure surfaces and surface treatments that may be applied to the ITS enclosure.
- b) The ITS enclosure may be of either single or twin wall construction.
- c) Equipment located inside the ITS enclosure must be securely mounted via industry standard methods such as DIN rail or 19" rack.
- d) Equipment located inside the ITS enclosures must not be loosely mounted or placed on shelves or racks (other than 19" racks permitted by section 3.7c)).

3.8 Storage pocket

- a) The Contractor must provide a metal pocket on the inside lower half of each ITS enclosure access door to provide space for the storage of small equipment and site documentation.
- b) The Contractor must ensure that the metal pockets contemplated by section 3.8a) comply with the following:
 - i) each pocket must be at least 85 mm deep and sized to completely shroud unfolded, laminated A3 sized drawings with the long edge in the horizontal plane;
 - ii) each pocket must include at least 2 equi-spaced finger slots from within the bottom of the pocket to 50 mm from its top to assist in the removal of contents from the pocket; and
 - iii) each pocket must be self-draining.

3.9 Surface finish of ITS enclosures

- a) The Contractor must ensure that the surface of the ITS enclosures and associated mounting structures have a durable finish to meet the required Design Life specified in RD-ITS-D1 "Design of Intelligent Transport Systems (ITS)", which must be achieved by either:
 - i) the application of a surface treatment; or
 - ii) the use of appropriate material for the ITS enclosure.
- b) Where the ITS enclosure material (or the associated mounting structure material, as applicable) does not require the application of a surface treatment to achieve the durability requirements of this Master Specification Part, the Contractor must ensure that the ITS enclosure material allows for an additional finish to be applied to the surface in the field without the need for special preparation.
- c) Where an applied surface treatment is to be applied pursuant to section 3.9a)i) the Contractor must ensure that:
 - i) the ITS enclosure material (or the mounting structure material, as applicable) is treated with the appropriate surface or primer preparation for the material of construction, in accordance with the manufacturer's specifications, prior to application of the surface treatment;
 - ii) the surface treatment or primer required by section 3.9c)i) must comply with the following:
 - A. where the surface treatment is being applied to a surface other than aluminium, it must consist of a zinc-rich primer applied to clean surfaces; and
 - B. where the surface treatment is being applied to an aluminium surface, it must be treated in the manner required by:
 - I. AS/NZS 1664 Aluminium structures; and
 - II. AS 1627 Metal finishing - Preparation and pretreatment of surfaces, with chromate conversion applied prior to the application of the finish;
 - iii) all fabrication, including welds, cuts, folds, drilling and the like is completed prior to surface preparation;
 - iv) all paintwork of the ITS enclosures and associated mounting structures must be a ripple-free finish of minimum 100 µm thickness, excluding surface preparations or primers; and
 - v) the paintwork required by section 3.9c)iv) is:
 - A. of a colour as defined in AS 2700 Colour standards for general purposes:
 - I. exterior colour: smoke blue (T33); and

- II. interior colour: smoke blue (T33);
 - B. is powder coat type for installations that are difficult to reach for surface maintenance, e.g. ITS enclosures mounted on a gantry or pole; and
 - C. is powder coat type or wet paint type for all other areas.
- d) The Contractor must ensure that damage to any surface treatments applied to the ITS enclosure or associated mounting structures is avoided during manufacture, transport and installation.
 - e) The Contractor must ensure that any deterioration to the surface finish of ITS enclosures and associated mounting structures due to atmospheric conditions or local environmental conditions does not affect the structural integrity or visual appearance of the finished ITS enclosure (or mounting structure, as applicable), for the Design Life specified in RD-ITS-D1 "Design of Intelligent Transport Systems (ITS)".

3.10 Cable management system

- a) The Contractor must provide a full width horizontal and full height vertical, electrically-insulated, cable management system within each ITS enclosure which:
 - i) is capable of housing a 50 mm diameter cable loom as a minimum;
 - ii) does not interfere with any internal equipment or racking system;
 - iii) enables cables to be installed, secured and augmented, or replaced in a neat and easy manner without damaging or replacing cable fixings;
 - iv) enables electrical segregation to be maintained;
 - v) ensures that cables are prevented from contact with sharp edges, or any surfaces that may cause damage to the cable;
 - vi) allows cable entry to the ITS enclosure from the underside of the ITS enclosure through proprietary cable glands; and
 - vii) must not be filled in excess of 50% capacity when wiring of all equipment in the ITS enclosure is completed.
- b) The Contractor must ensure that:
 - i) labels are not affixed to the cable management system within the ITS enclosures; and
 - ii) conduits are arranged to allow direct cable entry into the ITS enclosure.

3.11 Gland plates

The Contractor must ensure that cable gland plates are provided at the base of the ITS enclosure which:

- a) are divided into 3 sections running front to rear with one plate used for power, one for communications and one to be left unused as a spare gland plate;
- b) are removable;
- c) have gland plate fixings which are captive with either the gland plate or the ITS enclosure;
- d) are easy to manoeuvre with only one hand with all cables installed in cable glands;
- e) are not drilled or punched while they are located in the ITS enclosure;
- f) have a minimum of 2 RU clear space above and below the gland plate; and
- g) seal the base of the ITS enclosure to prevent the entry of insects and vermin.

3.12 Danger signs

- a) Where a LV power source is connected or terminated within an ITS enclosure, the Contractor must affix a danger sign on the inside of the ITS enclosure access door.
- b) Where dual supply power sources provide power to an ITS enclosure (e.g. grid and UPS), the Contractor must affix a dual supply warning sign on the inside of the ITS enclosure access door.
- c) Both the danger sign required by section 3.12a) and the dual supply warning sign required by section 3.12b) must meet the requirements of AS1319 Safety signs for the occupational environment.

3.13 Telecommunications

The Contractor must ensure that ITS enclosures that incorporate conduits for entry of telecommunication cables:

- a) comply with the requirements of the AS/CA S009 Installation requirements for customer cabling (Wiring Rules); and
- b) comply with the requirements of RD-ITS-C3 "Telecommunications Cabling".

3.14 Electrical requirements

- a) The Contractor must ensure that all ITS enclosures:
 - i) allow for adequate electrical segregation;
 - ii) are bonded to earth in accordance with the requirements of AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules); and
 - iii) include protection for live terminal blocks and switchboard components to a minimum degree of IP2X in accordance with AS 60529 Degrees of protection provided by enclosures (IP Code).
- b) The Contractor must ensure that ITS enclosures (excluding "single use purpose" enclosures such as pole mounted CCTV control enclosures) comply with the following electrical requirements:
 - i) 20A nominal load extra power capacity from ITS enclosures where ITS enclosures are more than 500 m from an ITS or lighting electrical supply point;
 - ii) 10A nominal load extra power capacity from ITS enclosures where ITS enclosures are less than 500 m from an ITS or lighting electrical supply point; and
 - iii) one single socket residual current device (RCD) protected general power outlet must be provided within each ITS enclosure for maintenance purposes:
 - A. the outlet may be current limited to a minimum of 3 amps to minimise maximum demand requirements for the ITS enclosure; and
 - B. if the outlet is current limited, it must be appropriately labelled as a current limited outlet, stating the maximum current available.
- c) The Contractor must ensure that "single use" cabinets (e.g. pole mounted CCTV enclosures and small single device only ITS enclosures):
 - i) have a spare power capacity of calculated load plus 2 amps; and
 - ii) are not more than 60% populated by usable space.

3.15 Enclosure lighting

- a) The Contractor must ensure that each ITS enclosure is provided with internal LED lighting suitable for performing maintenance activities within the ITS enclosure without the need for additional lighting.

- b) The Contractor must ensure that:
 - i) illumination is:
 - A. from above each access door opening of the ITS enclosure;
 - B. also from the sides of the enclosure if top mounted lighting cannot adequately illuminate the entire ITS enclosure contents;
 - C. located or aimed so that light spill from within the ITS enclosure is minimised; and
 - D. where the ITS enclosure is supported by a backup power supply (e.g. a UPS), that the ITS enclosure lighting is also supported by the backup power supply;
 - ii) luminaires must be:
 - A. minimum L70 rating = 25,000 hours;
 - B. minimum 500 lumens with 120° beam angle;
 - C. hard wired to the lighting sub-circuit; and
 - D. automatically operated in conjunction with the respective access doors;
 - iii) luminaires are mounted such that they do not interfere with equipment racking, cabling or maintenance activities; and
 - iv) lighting door switches:
 - A. are fitted to all doors;
 - B. achieves an IP rating of IP55 in accordance with AS 60529 Degrees of protection provided by enclosures (IP Code); and
 - C. have 2 sets of contacts and a minimum mean time between failures of 10,000 switching operations.

3.16 Security - door switches

- a) The Contractor must ensure that each ITS enclosure door is provided with a door switch which:
 - i) is of weatherproof construction;
 - ii) achieves an IP rating of IP55 in accordance with AS 60529 Degrees of protection provided by enclosures (IP Code);
 - iii) has 2 sets of contacts and a minimum mean time between failures of 10,000 switching operations; and
 - iv) is wired in normally closed (i.e. zero ohms when door is closed) configuration to a zero volt termination point.
- b) Where ITS enclosures have multiple doors, the Contractor must ensure that the door switches are wired in series so that the opening of one or more doors will open the electrical circuit.
- c) The Contractor must ensure that ITS enclosure door switches are monitored and door opening is reported via STREAMS as required by RD-ITS-D1 "Design of Intelligent Transport Systems (ITS)".
- d) The functions of the door switch and the ITS enclosure lighting switch may be provided in one switch assembly, provided that all of the requirements of each switch type in this Master Specification Part are satisfied.

3.17 External facility switch

- a) Subject to section 3.17b), where specified in the Contract Documents, the Contractor must ensure that ITS enclosures that are required to incorporate an external facility switch comply with the following:

- i) the facility switch must be positioned to allow access without opening the ITS enclosure and without compromising the ingress protection code rating of the ITS enclosure;
 - ii) the Contractor must provide the Principal with 2 keys for each facility switch; and
 - iii) a label indicating the effect of each facility switch position must be affixed adjacent to the facility switch, such that the information aligns with the apex of the facility switch shaft for each available switch position.
- b) Section 3.17a) does not apply in circumstances where ITS equipment (such as VMS signs) includes facility switches that are mounted internally within an ITS enclosure. Where particular ITS equipment includes internally mounted facility switches, the Contractor must ensure that it complies with all requirements of the Master Specification applicable to that type of ITS equipment and its facility switches.

3.18 Labels

The Contractor must ensure that:

- a) external asset identification labels are provided and affixed to all ITS enclosures in accordance with the requirements of RD-ITS-C1 "Installation and Integration of ITS Equipment"; and
- b) labels provided for ITS enclosures for other purposes (i.e. other than external asset identification labels) must comply with the following:
 - i) labels must laminated plastic or brushed aluminium;
 - ii) labels must be permanently affixed with either:
 - A. an adhesive suitable for the application; or
 - B. screws or rivets which do not affect the IP rating of the ITS enclosure;
 - iii) for eternally affixed labels the labels and method of mounting are vandal resistant;
 - iv) labels must be coloured as follows:
 - A. warning notices: white letters on red background; and
 - B. labels other than warning notices: black letters on white background; and
 - v) except in cases where statutory regulations require specific warning label sizes and colours, label lettering must comply with the heights outlined in Table RD-ITS-S3 3-1.

Table RD-ITS-S3 3-1 Label lettering height

Label	Lettering height (mm)
Name of ITS enclosure	15
Equipment labels (for equipment housed within ITS enclosures)	6
Warning notices for ITS enclosures or the equipment housed within the ITS enclosures (noting the requirements of section 3.18b)v))	4

4 ITS enclosure internal operating environment

4.1 General

The Contractor must ensure that the:

- a) ITS enclosure design is capable of maintaining the internal operating environment inside the ITS enclosure to within the rated operating conditions of the equipment it houses, in all weather conditions and ambient temperatures likely to be experienced in the installed location;
- b) ITS enclosures include internal temperature monitoring and an alarm output if ITS enclosure internal temperatures exceed 70°C (noting that this requirement may be filled by equipment to be housed within the ITS enclosure, if this equipment has the capability to do so); and

- c) layout of the equipment housed within each ITS enclosure maximises the cooling capabilities of each item of equipment.

4.2 Air exchange cooling

Where air exchange cooling is used with an ITS enclosure, the Contractor must ensure that the cooling system provides positive pressure within the ITS enclosure, and uses a filtered, forced air system which complies with the following:

- a) fans and filters must be Readily Accessible and replaced without disturbing other equipment housed within the ITS enclosure;
- b) filters must be:
 - i) replaceable without opening the ITS enclosure;
 - ii) vandal resistant; and
 - iii) of a type, to allow normal operation of the equipment housed within the ITS enclosure while undertaking filter cleaning or replacement;
- c) at least one filtered inlet vent must be provided on opposite, fixed sides of the ITS enclosure at a minimum of 300 mm above ground level;
- d) at least one filtered outlet vent must be provided on opposite, fixed sides of the ITS enclosure at a maximum of 150 mm from the top of the ITS enclosure; and
- e) fans must be installed adjacent to the inlet vents.

4.3 Equipment requirements

- a) With respect to the internal operating environment of the ITS enclosures, the Contractor must ensure that:
 - i) thermostats:
 - A. are suitable to support the electrical loads of the supplied cooling system used within the ITS enclosure;
 - B. measure the internal ambient temperature of the ITS enclosure 100 mm from the top of the ITS enclosure;
 - C. have a set point range of at least 10°C to 50°C in increments of at least 5°C with a default installed setting of 50°C; and
 - D. operate the connected cooling devices within the ITS enclosure once the internal ambient temperature reaches the set point;
 - ii) filter material:
 - A. is classified EU4 in accordance with ISO 16890-1 Air filters for general ventilation - Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM); and
 - B. meets the following requirements:
 - I. filter material density: 350 g/m²; and
 - II. filtration efficiency of at least 88%;
 - iii) inlet and outlet vents are sized to allow filters to have a minimum time between replacement of 12 months when operating in a roadside environment; and
 - iv) with respect to fan motors:
 - A. the fan motors are:

- I. of a construction that exhibits minimal amount of electrical noise output; and
 - II. electromagnetically shielded to prevent interference with electronic equipment and components housed within the ITS enclosure;
 - B. the fan motor and bearings have a mean time between failures of 45,000 hours based on intended use, at a 90% running duty cycle; and
 - C. the fan motors are of ball-bearing type.
- b) The Contractor must ensure that all ITS enclosures and cooling systems are subjected to Factory Acceptance Testing in accordance with RD-ITS-C1 "Installation and Integration of ITS Equipment" and PC-CN1 "Testing and Commissioning" to demonstrate compliance with the requirements of this Master Specification Part.

5 Mounting requirements

- a) The Contractor must ensure that ground mounted ITS enclosures:
- i) up to and including a size equivalent to a traffic signal controller cabinet, are suitable for mounting onto a plinth having 4 mounting studs arranged in accordance with a traffic signal controller; and
 - ii) which are larger than a traffic signal controller cabinet, must be provided with a suitable, custom made plinth and fixing arrangement.
- b) The Contractor must ensure that, with respect to all ITS enclosures:
- i) all mounting studs are located within the ITS enclosure to provide protection from vandalism; and
 - ii) all ground mounted ITS enclosures are mounted on a concrete plinth so as to be a minimum of 75 mm above the surrounding concrete working area as specified in RD-ITS-C1 "Installation and Integration of ITS Equipment".

6 Testing and acceptance

Testing and commissioning procedures and documentation must comply with the requirements of:

- a) PC-CN1 "Testing and Commissioning";
- b) where the Contract Documents do not require installation of the ITS enclosures, RD-ITS-S1 "General Requirements for the Supply of ITS Equipment"; and
- c) where the Contract Documents do require installation of the ITS enclosures, RD-ITS-C1 "Installation and Integration of ITS Equipment".

7 Warranty

For the purposes of PC-CN3 "Construction Management" the Contractor must obtain a manufacturer's warranty for all supplied ITS enclosures:

- a) where the Contract Documents do not require installation of the ITS enclosures, for that period set out in the Contract Documents or RD-ITS-S1 "General Requirements for the Supply of ITS Equipment", whichever is the greater; and
- b) where the Contract Documents do require installation of the ITS enclosures, for that period set out in the Contract Document or RD-ITS-C1 "Installation and Integration of ITS Equipment", whichever is the greater,

which satisfy the requirements of PC-CN3 "Construction Management".