

## SECTION 732 - ITS AND ELECTRICAL DEVICES INSTALLATION

##This section cross-references Sections 610, 611, 614, 731, 733, 734, 735 and 736.

If any of the above sections are relevant, they should be included in the specification.

If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent:

##Sections 731, 733, 734, 735 and 736 should be included in the specification:

### 732.01 GENERAL

#### (a) Scope

This section covers the requirements for the installation of ITS Devices and other 'on-road' electrical devices within the state of Victoria for works supervised by VicRoads. This document shall be read in conjunction with VicRoads TCS series specifications, TC series Standard Drawings and individual contract documents.

For the purpose of this specification, ITS devices and 'on-road' electrical devices shall include:

- (i) traffic signals
- (ii) road lighting
- (iii) ramp control/metering signs
- (iv) variable message signs
- (v) electronic speed limit signs
- (vi) ice warning stations
- (vii) electrical distribution cabinet
- (viii) freeway data station
- (ix) lane use signs
- (x) ITS field cabinets
- (xi) UPS
- (xii) freeway ramp signals
- (xiii) digital CCTV
- (xiv) over height detection systems
- (xv) Bluetooth data stations
- (xvi) travel time signs
- (xvii) side road activated speed systems

#### (b) General requirements

The Contractor shall be responsible for the installation and commissioning of all devices covered under this specification in accordance with individual contract documents.

#### (c) Prequalified contractor

All works associated with the installation and commissioning of all devices covered under this specification shall be undertaken by contractors that are appropriately prequalified as detailed in Table 732.011 below.

**Table 732.011 Contractor prequalification level requirements**

Conduits and pits for:	Prequalification level
Works on or associated with traffic signals	STS1
All other on-road electrical works	STCE
Works associated with VicRoads owned communications networks	STCE
Works associated with CCTV or telecommunications carrier networks	SCTV (must hold AMCA license)
Works associated with 'in-pavement detector installation (includes inductive loops and wireless in-pavement vehicle sensors)	SVDL

Subcontractors undertaking works covered under this specification shall be prequalified at the appropriate level under the VicRoads contractor prequalification scheme, in the subcontractors own right.

**732.02 REFERENCED AND RELATED SPECIFICATIONS, STANDARDS AND DRAWINGS**

All works associated with the installation and commissioning of all devices covered under this specification shall conform to all relevant VicRoads specifications, VicRoads standard contract sections and Australian Standards.

All works associated with the installation and commissioning of all devices covered under this specification shall conform to the general requirements of:

- (a) VicRoads 'TCS' series specifications
- (b) VicRoads 'TC' series standard drawings
- (c) AS/NZS 3000 Wiring Rules
- (d) Victorian Service and Installation Rules.

The individual requirements of the Victorian Electricity Supply Industry (VESI) and the local electricity distribution business shall apply for matters relating to the provision of mains power.

Australian Standards referred to in this section are listed in Table 732.021 below.

**Table 732.021 List of Australian Standards**

Australian Standard	Title
AS/NZS 3000	Wiring Rules

VicRoads Specifications and Technical Notes referred to in this section are listed in Table 732.022 below.

**Table 732.022 List of specifications and Technical Notes**

Specification number	Title
TCS 003	Supply of Ramp Control / Metering Signs
TCS 015	Variable Message Signs
TCS 037	Electronic Speed Limit Signs
TCS 039	Ice Warning Stations
TCS 043	The Supply of Electrical Distribution Cabinets
TCS 048	Freeway Data Stations
TCS 056	Lane Use Signs
TCS 057	Active Advanced Warning System for Railway Level Crossings
TCS 058	UPS for traffic signals
TCS 061	ITS Field Cabinet
TCS 063	Installation of Freeway Ramp Signals
TCS 067	Digital CCTV Camera
TCS 068	Over-height Detection System
TCS 069	Supply and Installation of Bluetooth Data Stations
TCS 070	Travel Time Signs
TCS 071	The Supply and Installation of Side Road Activated Speeds (SRAS)

VicRoads standard sections referred to in this section are listed in Table 732.023 below.

**Table 732.023 List of standard sections**

Standard section	Title
610	Structural concrete
611	Steel reinforcement
614	Formwork
730	Traffic Signal Installation
731	Road Lighting Installation
733	Conduits and Pits for Underground Wiring and Cabling
734	Electrical Network Installation
735	Communications Network Installation
736	ITS Device Testing and Integration

VicRoads Standard Drawings referred to in this section are listed each device specific clause within this section.

*NOTE: VicRoads Standard Drawings, specifications and guidelines are available for downloading from VicRoads website*

### **732.03 GENERAL REQUIREMENTS**

- (a) The installation of new ITS devices or additional works at an existing ITS installation by the Contractor shall include:
- (i) supply and installation of civil works including, but not limited to, trenching, under road bores, draw strings, slabs, distribution cabinet foundations, and pole foundations
  - (ii) supply and installation of all electrical works including, but not limited to, conduits, conduit bends, cable pits and lids
  - (iii) liaison with the local power distribution company and relevant authorities for the installation of the works, and the obtaining of all necessary approvals and permits from the relevant authorities
  - (iv) supply, installation and connection of all hardware, equipment and materials including, but not limited to, the distribution Board, circuit breakers, poles, brackets, ITS devices, electrical cables, cable guards, fuses, fittings and all materials and equipment necessary to complete and commission the installation
  - (v) testing and integration of all installed devices in accordance with Section 736
  - (vi) reinstatement of all works.
- (b) The Contractor shall be responsible for ensuring the availability of all existing assets. The Contractor shall:
- (i) take into account the existing ITS infrastructure including ITS devices and network infrastructure and seek approval/permission from DOT before making any changes that could adversely impact the business service continuity or availability of existing ITS infrastructure and services.
  - (ii) shall be liable and responsible to fix/repair any damage caused during project works to existing ITS devices or network related infrastructure in accordance with DOT's existing Service Level Targets with its contractors.

#### **732.04 ASSET OWNERSHIP**

The Principal will retain ownership of the ITS installation. The Contractor is not authorised to sign any document with any party which transfers ownership of the installation to any other party.

Furthermore, the Contractor is not authorised to sign or enter into any agreement with any electricity distribution business, electricity retailer or other party on behalf of the Principal for supply of power to the installation.

#### **732.05 PITS AND CONDUITS**

(a) General

Pits and conduits shall be installed in accordance with Section 733 and individual contract documents.

Separate power and communications conduits shall be used to connect to all ITS devices.

(b) Managed motorways

Trunk conduit networks for managed motorways shall be installed in accordance with relevant standard drawings and individual contract documents.

As a minimum, the number of conduits shall be 2 x 100 mm electrical conduits and 2 x 100 mm communications conduits on both sides of the freeway.

(c) Arterial roads

Conduit networks for arterial roads shall be installed in accordance with relevant standard drawings and individual contract documents.

As a minimum, the number of conduits shall be 1 x 100 mm electrical conduit and 1 x 100 mm communications conduit on one side of the roadway.

#### **732.06 FOUNDATIONS**

Standard foundations shall comply with all relevant standard drawings and, where required, approved engineering drawings.

Where required, non-standard foundation designs for ITS device support structures shall be proof engineered and approved by the superintendent.

The location of all existing underground and above ground services shall be proven and confirmed on site by the Contractor before commencement of any works.

#### **732.07 CABLING**

(a) Cabling for mains power

All mains power cabling shall be fully compliant with the Wiring Rules and Section 734.

The specific requirements for mains power cabling and architecture shall be detailed in individual contract documents.

(b) Communications cabling

All communications cabling shall comply with Section 735.

The specific requirements for communications cabling and architecture shall be detailed in individual contract documents.

#### **732.08 TRAFFIC SIGNALS**

The Contractor shall supply and install traffic signals in accordance with Section 730.

### 732.09 ROAD LIGHTING

The Contractor shall supply and install road lighting in accordance with Section 731.

Where an existing lighting scheme is being added to, or upgraded, all existing circuits that do not meet the current requirements of Section 731 or the current version of AS/NZS 3000, shall be decommissioned and replaced or upgraded to current standards.

In addition to the requirements of Section 731, where a lighting pole is installed within a barrier (e.g. a concrete or steel barrier) an additional in-line fuse shall be installed in the cable located behind the poles access door.

### 732.10 RAMP CONTROL / METERING SIGNS

(a) Sign requirements

The Contractor shall only supply and install VicRoads Type Approved Ramp Control/Metering Signs.

The installation of the signs shall comply with the installation requirements of TCS 003 and the following.

(b) Foundations

Foundations shall comply with the following standard drawings;

**Table 732.101 Standard drawings for RC3 /TT3 foundations**

Drawing number	Title
TC-2223	RC3 Pole – Typical Arrangement
TC-2235	RC3 Pole Spread Foundation Type 1 – Typical Arrangement
TC-2236	RC3 Pole Spread Foundation Type 2 – Typical Arrangement

**HP No concrete shall be poured for any foundation before inspection and approval by the superintendent.**

(c) Mounting

RC signs shall be mounted on the nominated pole type unless approved by the Superintendent.

A typical mounting arrangement for an RC3 sign is shown in the following standard drawing.

**Table 732.102 Standard drawings for RC3/TT3 pole**

Drawing number	Title
TC-2224	RC3 / TT3 Pole Mounting Arrangement – Typical Arrangement

Under no circumstances shall the following poles be used to mount any RC signs:

- slip base street lighting poles
- impact absorbing poles
- mid-hinge poles.

Sign positions shall be nominated in individual contract documents.

## (d) Connection to power

The connection to power shall be nominated in individual contract documents.

Unless otherwise specified in individual contract documents, the connection to power for each RC sign type shall be as per Table 732.103 below.

**Table 732.103 Point of supply requirements**

Sign type	Point of supply
RC1-A	Where associated with a traffic signal installation, the power shall be from the associated traffic signal controller.  <b>Under no circumstances</b> shall the sign be powered from a separate point of supply when installed on a traffic signal pedestal.  Where no traffic signals exist, a new or other existing point of supply shall be used.
RC2-A	The associated freeway ramp signal controller
RC2-C	The associated freeway ramp signal controller
RC3-A	The associated traffic signal controller or a new point of supply as specified in individual contract documents.
RC3-C	As specified in individual contract documents

### 732.11 VARIABLE MESSAGE SIGNS

## (a) Sign requirements

The Contractor shall only supply and install VicRoads Approved VMS in accordance with any relevant sign requirements as specified in TCS 015.

Sign positions shall be nominated in individual contract documents.

## (b) Mounting structure

The type of mounting structure shall be detailed in individual contract documents.

Where required, the mounting structure shall be designed and proof engineered to suit the VMS and any other assets being installed on the structure.

Typical arrangements for the VMS attached to an accessible gantry are shown in the following standard drawings.

**Table 732.111 Standard drawings for VMS on accessible gantry**

Drawing number	Title
TC-2270	Typical Arrangement
TC-2273	Typical Conduit Route – Sheet 1 of 6
TC-2274	Typical Conduit Route – Sheet 2 of 6
TC-2275	Typical Conduit Route – Sheet 3 of 6
TC-2276	Typical Conduit Route – Sheet 4 of 6
TC-2277	Typical Conduit Route – Sheet 5 of 6
TC-2278	Typical Conduit Route – Sheet 6 of 6

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**Table 732.111 Standard drawings for VMS on accessible gantry** (continued from previous page)

Drawing number	Title
TC-2279	Typical Gantry Leg Cabinet Details
TC-2280	Access Ladder and Cage Details
TC-2281	Access Walkway and Handrail – 1 of 4
TC-2282	Access Walkway and Handrail – 2 of 4
TC-2283	Access Walkway and Handrail – 3 of 4
TC-2284	Access Walkway and Handrail – 4 of 4
TC-2285	Cladding Details
TC-2286	Foundation Conduit Details
TC-2287	Typical Gantry Earthing Arrangement
TC-2288	Electrical and Communications Cable Connections Details
TC-2289	Leg Security Mesh – Typical Arrangement

## (c) Foundations

The foundations shall be designed and proof engineered to suit the mounting structure being installed.

## (d) Sign alignment

VMS shall be aligned such that the active displays are clearly visible to approaching traffic in 100 m to 300 m.

## (e) Connection to power

The connection to power shall be nominated in individual contract documents.

**732.12 ELECTRONIC SPEED LIMIT SIGNS**

## (a) Sign requirements

The Contractor shall only supply and install VicRoads Type Approved ESLS.

The installation of the signs shall comply with the installation requirements of TCS 037 and the following.

The type and size of ESLS shall be specified in individual contract documents.

## (b) Poles

The pole shall be designed and engineered to support the sign and, where required, a solar panel and associated control equipment and batteries.

Poles on managed motorways shall be designed in accordance with standard drawing TC-2220.

## (c) Foundations

- (i) Foundations on managed motorways shall be designed in accordance with standard drawing TC-2233. ESLS on managed motorways shall be a LUS in accordance with clause 732.16.
- (ii) Foundations on other roads shall be designed according to sign size and other attached equipment.

**HP No concrete shall be poured for any foundation before inspection and approval by the superintendent.**

## (d) Signs

ESLS shall be installed on an approved post.

Sign positions shall be nominated in individual contract documents.

## (e) Connection to power

The connection to power shall be nominated in individual contract documents.

**732.13 ICE WARNING STATIONS**

This clause is currently under review.

**732.14 ELECTRICAL DISTRIBUTION CABINETS**

## (a) Cabinet

The Contractor shall only supply and install VicRoads Type Approved Electrical Distribution Cabinet.

The installation of the DB shall comply with the installation requirements of TCS 043 and the following.

The type of DB required shall be nominated in individual contract documents.

Unless specifically approved by the Superintendent, each site or installation shall include one only distribution cabinet.

Where an existing distribution cabinet does not have sufficient spare capacity for additional assets, a new distribution cabinet with sufficient capacity shall replace the existing distribution cabinet.

Where a new cabinet replaces an existing cabinet, the existing cabinet and foundation shall be decommissioned and removed from site.

## (b) Foundations

Foundations shall comply with the installation requirements of TCS 043 and the standard drawings detailed in Table 732.141 below.

All concrete works shall conform to VicRoads standard drawings and be undertaken in accordance with Sections 610, 611, and 614.

**Table 732.141 Standard drawings for distribution cabinet foundations**

DB Type	Location	Drawing
1	Managed Motorway or Freeway	TC-2231
1	Arterial Road	TC-1062
2	Arterial Road (Not used on managed motorways or Freeways)	TC-1074
3	Managed Motorway or Freeway (Not used on arterial roads)	TC-2232

**HP No concrete shall be poured for any DB foundation or apron before inspection and approval by the Superintendent.**

**732.15 FREEWAY DATA STATIONS**

Freeway data stations shall be installed in accordance with the installation requirements of the device manufacturer.



**732.16 LANE USE SIGNS**

## (a) Sign requirements

The Contractor shall install VicRoads Type Approved LUS. The installation of the signs shall comply with the installation requirements of TCS 056 and the following.

Unless otherwise specified in individual contract documents, all LUS shall be "C" size.

## (b) Non-accessible gantry installation

Signs installed on gantry shall be positioned so that each sign is located directly above each associated lane.

Installation of signs on non-accessible gantries shall be in accordance with the following standard drawings.

**Table 732.161 Standard drawings for LUS on non-accessible gantry**

Drawing number	Title
TC-2260	General Arrangement
TC-2261	Internal Conduiting and Mounting Arrangement
TC-2262	Gantry Leg Cabinet
TC-2263	Column Base Plate Details
TC-2264	Foundation Conduit Details
TC-2265	Typical Gantry Earthing Arrangement
TC-2266	Electrical and Communications Cable Connections Details
TC-2267	Leg Security Mesh – Typical Arrangement
TC-2268	Gantry Leg Access Openings – typical Arrangement

## (c) Accessible gantry installation

Signs installed on gantry shall be positioned so that each sign is located directly above each associated lane.

Installation of signs on accessible gantries shall be in accordance with the following standard drawings.

**Table 732.162 Standard drawings for LUS on accessible gantry**

Drawing number	Title
TC-2270	General Arrangement
TC-2272	LUS Mounting Arrangements
TC-2273	Conduit Route – 1 of 6
TC-2274	Conduit Route – 2 of 6
TC-2275	Conduit Route – 3 of 6
TC-2276	Conduit Route – 4 of 6
TC-2277	Conduit Route – 5 of 6
TC-2278	Conduit Route – 6 of 6
TC-2279	Gantry Leg Cabinet
TC-2280	Access Ladder and Cage Details
TC-2281	Access Walkway and Handrail – 1 of 4
TC-2282	Access Walkway and Handrail – 2 of 4

TC-2283	Access Walkway and Handrail – 3 of 4
TC-2284	Access Walkway and Handrail – 4 of 4
TC-2285	Cladding Details
TC-2286	Foundation Conduit Details
TC-2287	Typical Gantry Earthing Arrangement
TC-2288	Electrical and Communications Cable Connections Details
TC-2289	Leg Security Mesh – Typical Arrangement

## (c) Structure installation

Signs installed on other types of structure such as bridges, shall be positioned so that each sign is located directly above each associated lane.

**HP The proposed attachment method must be approved by VicRoads Structural Design Team and the Superintendent before any associated works commence.**

Installation of signs on structures shall be in accordance with the following standard drawings.

**Table 732.163 Standard drawings for LUS on a structure**

Drawing number	Title
TC-2310	Elevation Typical Arrangement
TC-2311	General Arrangement Layout
TC-2312	Mounting Arrangement Type 1
TC-2313	Mounting Frame Type 1
TC-2314	Mounting Arrangement Type 2
TC-2315	Mounting Frame Type 2
TC-2316	Mounting Arrangement Type 3
TC-2317	Mounting Frame Type 3
TC-22318	Anti-Vandal Cowling
TC-22319	Junction Box, Electrical and Communications Cable Connection Detail

## (d) Post mounted installation

Signs installed on posts or pedestals adjacent to lanes (typically operated as ESLS) shall be installed in accordance with the following standard drawings.

**Table 732.164 Standard drawings for LUS on accessible gantry**

Drawing number	Title
TC-2220	VSLS Pole and Base Plate
TC-2233	VSLS Pole Foundation Concrete
TC-2234	VSLS Pole Spread Footing

## (e) Power

The point of supply (power) shall be from the ITS Field Cabinet housing the LUS Group controller.

### 732.17 ITS FIELD CABINET

## (a) Cabinet

The Contractor shall only supply and install VicRoads Type Approved ITS Field Cabinet.

The installation of the ITS Field Cabinet shall comply with the installation requirements of TCS 061 and the following.

The type of ITS field cabinet required shall be nominated in individual contract documents.

(b) Foundations

Foundations shall comply with the following standard drawings.

**Table 732.171 Standard drawings for ITS field cabinets**

Drawing number	Title
TC-2230	Single ITS Cabinet Foundation - Typical
TC-2237	Site Layout for ITS Field Cabinets Located on Batters
TC-2238	Pedestrian Safety Fence Arrangements for ITS Field Cabinets - Typical Arrangement
TC-2239	Double ITS Cabinet Foundation - Typical
TC-2303	ITS Field Cabinet Access – Typical Arrangement at Gantries

**HP No concrete shall be poured for any ITS field cabinet foundation or apron before inspection and approval by the Superintendent.**

(c) Power

The point of supply (power) shall be from the distribution cabinet nominated in individual contract documents.

**732.18 UNINTERRUPTABLE POWER SUPPLIES**

This clause is currently under review.

**732.19 FREEWAY RAMP SIGNALS**

(a) Signal lanterns

The Contractor shall install VicRoads Type Approved Traffic Signal Lanterns. The installation of the lanterns shall comply with the relevant installation requirements of Section 730, Contract specific requirements and the following standard drawings.

**Table 732.191 Standard drawings for freeway ramp signals**

Drawing number	Title
TC-2250	FRS lantern support structures – Cantilever gantry for 2 lanes metered – Sheet 1 of 2 – Typical arrangement
TC-2252	FRS lantern support structures – Portal gantry for 3 or more lanes metered – Sheet 1 of 3 – Typical arrangement
TC-2256	FRS lantern support structures – Beam mounted signal lantern head support assembly – Typical arrangement
TC-2257	FRS lantern support structures – Beam mounted static sign support assembly
TC-2258	FRS lantern support structures – Column mounted signal lantern head support assembly
TC-2259	FRS lantern support structures – Column mounted static sign support assembly

(b) Ramp signal controller

The Contractor shall install VicRoads Approved Ramp Signal Controller in accordance with the requirements of TCS 063.

(c) Power

The point of supply (power) shall be from the ITS field cabinet housing the ramp signal controller.

### **732.20 DIGITAL CLOSED CIRCUIT TELEVISION CAMERAS**

The Contractor shall only supply and install VicRoads Approved CCTV Cameras.

The installation of CCTV shall comply with the installation requirements of TCS 067 and the following.

(a) CCTV on freeways

CCTV installed on a freeway or managed motorway shall be located as far as is practicable to provide -

- (i) clear and unimpeded view of all areas of the carriageway and surrounding areas
- (ii) clear view of signs (e.g. LUMS) and other roadside infrastructure
- (iii) easy access for maintenance works.

The preferred mounting arrangement for CCTV in order of preference is:

- (iv) on a mid-hinge camera pole
- (v) on a LUMS gantry
- (vi) on other structure approved by the Superintendent.

CCTV cameras shall not be located on any pole, gantry or other support structure located on or within a median barrier separating running lanes (e.g. main line and collector/distributor lanes) that would require multiple lane closures for maintenance access.

(b) CCTV on arterial roads

CCTV cameras installed on arterial roads at signalised intersections shall be located as far as is practicable to provide:

- (i) clear and unimpeded view of all approaches to the intersection
- (ii) easy access for maintenance works.

In some locations, in order to meet the requirements of (i) above, two cameras may be required.

The preferred mounting arrangement for CCTV in order of preference is:

- (iii) on a mid-hinge camera pole
- (iv) on a JUP, JUMA or MA (attached to the vertical column of the pole)
- (v) on a 2B pedestal (attached via a raiser bracket to provide additional height).

CCTV cameras shall not be located on the outreach of a MA or JUMA as this creates access issues for maintenance activities.

### **732.21 OVER-HEIGHT DETECTION SYSTEM**

This clause is currently under review.

**732.22 BLUETOOTH DATA STATIONS**

The Contractor shall only supply and install VicRoads approved Bluetooth Data Stations (BDS).

The installation of the BDS stations shall comply with the installation requirements of TCS 069.

The number of BDS and the installation location(s) shall be specified in individual contract documents.

**732.23 TRAVEL TIME SIGNS**

The Contractor shall only supply and install VicRoads Approved Travel Time Signs.

The installation of the signs shall comply with the installation requirements of TCS 070 and the following.

The type of travel time sign(s), the number of signs and the installation location(s) shall be specified in individual contract documents.

**732.24 SIDE ROAD ACTIVATED SPEEDS**

The Contractor shall only supply and install VicRoads Type Approved SRAS systems.

The installation of the signs shall comply with the installation requirements of TCS 071 and the following.

The number of signs and the installation location(s) shall be specified in individual contract documents.

**732.25 LABELLING OF INSTALLED ASSETS**

The Contractor shall affix labels to all ITS assets installed under this Contract in accordance with this clause and device specific specifications.

The Contractor shall supply all blank self-adhesive base labels and self-adhesive numbers in accordance with this section. The Contractor shall attach all numbers to the base label, in accordance with the correct matching asset records as supplied to the Contractor.

The Contractor shall thoroughly clean the area to be covered by the label prior to attaching the label and if a liquid cleaning solution is used, ensure that the area is completely dry before application. Any labels that delaminate due to insufficient surface preparation shall be rectified by the Contractor.

**732.26 DATA COLLECTION OF ASSETS**

ITS installations shall have all required information recorded and provided as specified below.

All ITS assets shall have their location identified and recorded using GPS co-ordinates. The co-ordinates shall be captured using the World Geodetic System WGS84 in decimal degrees to 6 decimal places.

Details of all installed assets (e.g. ITS field cabinets, pole mounted cabinets, signs, data stations, distribution cabinets, circuits, cabling, pits, etc.) shall be recorded in an Excel spreadsheet.

The following general site information shall be provided for every ITS device installed, as applicable:

- device type (e.g. site number)
- site name
- road
- nearest intersection or interchange
- chainage
- municipality
- VicRoads region
- point of supply (e.g. Distribution cabinet or ITS Field cabinet)
- device GPS co-ordinates
- as-constructed schematic drawings of electrical network and all power circuits
- as-constructed schematic drawings of communications network.

### **732.27 REDUNDANT ASSETS**

All redundant assets, including foundations, poles, cabinets, etc. shall be removed and disposed of as directed by the Superintendent. Any asset that could be re-used may be required to be delivered to a location nominated by the Superintendent and remain VicRoads property.

As existing public lighting assets may be owned by the local power distribution company, the Contractor shall give consideration to the method of removal of redundant lighting assets and, where required, shall deliver such redundant assets to a location specified by that Power Distribution Company within its area.

### **732.28 BACKFILLING, RE-INSTATEMENT AND CLEAN-UP WORKS**

The Contractor shall comply with the requirements of the Road Opening Permit issued by the relevant authority. Where these requirements are silent, the Contractor shall undertake backfilling in accordance with Section 733 Conduits and Pits for Underground Wiring and Cabling, clause 733.06 Backfilling.

On completion of all excavation and reinstatement works, the Contractor is to ensure that all rubble, surplus crushed rock, surplus pavement materials, surplus concrete and all other surplus materials are removed from the site. The Contractor is to leave the work site in a clean and safe condition.

Subject to the requirements of clause 732.27 above, civil hardware and equipment which is not to be reused or salvaged is to be removed from the site and disposed of by the Contractor and the cost of removal and disposal is to be included in the tender price.

### **732.29 COMISSIONING, TESTING AND INTEGRATION**

Commissioning, testing and integration of all ITS assets shall be carried out in accordance with Section 736 and individual contract specific requirements.

### **732.30 AS-CONSTRUCTED PLANS**

The Contractor shall supply to the Superintendent two copies of 'As-constructed' plans along with a USB drive or other approved storage medium containing the CADD/Microstation drawing files, and the same shall be supplied by the Contractor to the local distribution company if appropriate.