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SECTION 16 : LIGHTING

16.1 SCOPE

This section sets out the requirements for the installation of:

- a) Carriageway lighting including underground cabling, LV pillars, columns, consumer services and earthing.
- b) Pedestrian facility lighting including footpath lighting, belisha beacons, flood lights and warning globes.
- c) Installation of lighting cabling, including control methods in accordance to the requirements and specifications of the lines company.

16.2 SPECIFICATIONS, REGULATIONS AND CODES OF PRACTICE

The work shall be undertaken in compliance with all statutory requirements including and not limited to the following: -

- a) Relevant Statutory Acts, Regulations and Bylaws
- b) Health and Safety in Employment Act 1992 and associated regulations
- c) Electricity Regulations 1997, handbook to the electricity regulations
- d) The Electricity Act 1992
- e) Electrical Code of Practices
- f) New Zealand Radio Interference Regulations and Interference Notices
- g) Ministry of Health Code of Practice for the Safe Management of PCBs

The following specifications related to the work involved with road lighting and under verandah lighting: -

NZTA M/19 : 1999	Tubular Steel Lighting Columns
NZTA M/19 : 2002 Notes	Tubular Steel Lighting Columns
NZTA C/24 : 1991	Maintenance of Highway Lighting
NZTA C/24 : 1991 Notes	Maintenance of Highway Lighting
AS/NZS 1158 :	Road Lighting
NZS 6705 : 1986	Luminaires for Road and Street Lighting
NZS 3000 : 1997	Electrical Installations — Buildings, structures and premises
AS/NZS 4676 : 2000	Structural Design requirements for Services Utility Poles
AS/NZS 4677 : 2000	Steel Service Utility Poles
NZS 4203 : 1992	General Structural Design and Design Loadings for Buildings
AS/NZS 2312: 2002	Guide to Protection of Structural Steel against atmospheric corrosion by use of protective coatings

16.3 SAFETY

The maximum safety, consistent with good practice and the Health and Safety Act must be afforded to personnel engaged on construction work.

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All work must be carried out in accordance with the NZ Electricity Regulations. All personnel working on road lighting equipment shall either be registered personnel or covered by an Employer license as defined in the Electricity Act 1992 and have current competency and safety tuition as defined in the Electricity Regulations 1997.

Permission for electricity shutdowns will only be given where the work is otherwise unsafe or not technically feasible. If shutdowns are necessary, at least 7 days notice shall be given and the network owner's requirements fully complied with.

A cable location service is available from WEL Network Ltd at the cost to the developer.

16.4 CIRCUIT CABLING

All new street lights shall be supplied via underground cabling with internally run concealed circuits. Cable routes, conductor sizes, installation of all cabling and wiring, and control methods, shall all be in accordance with the specifications and requirements of the Network Owner. Currently this is contained in the "Design and Construction Manual" of WEL Networks Ltd.

All new installations shall be installed so that the Network Owner's ripple control system activates the lighting circuits. No other system will be considered.

Voltage drops in street lighting circuits shall not exceed the requirements of the Network Owner.

16.5 ROAD LIGHTING EQUIPMENT

Where lighting columns or circuits are being relocated, extended or upgraded, the existing supply, protective devices and switching control may be reused if it is in compliance with this specification.

All materials supplied shall be new. All fittings and materials used shall be consistent through out the installation and where there is an addition to an existing system the new fittings and materials shall match the existing.

16.5.1 Column Supply and Installation

All columns should be of the types and heights as specified and indicated on the drawings.

Unless specified elsewhere, all road lighting columns shall be ground planted, galvanized steel, octagonal section poles (Oclyte or similar), with elliptical out reaches complying with NZTA M19 Specification.

Embedment depths and/or footings shall comply with manufacturer's recommendations, section 6.0 AS/NZS 4676: 2000 and NZTA M/19: 1994. A tolerance of ± 50 mm in embedment depth is allowable. Columns shall be installed so that centreline of the columns is vertical within $\pm 0.5^\circ$ and the outreach arm is perpendicular to the road. The column shall be oriented so that safe and convenient access to the gear access opening is

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available. Column foundation excavation shall be backfilled with suitable material, either in situ or imported. Concrete backfill is not to be used unless specifically approved by the Engineer. If concrete backfill is used a cable duct must be provided to allow cabling to enter the column base. The duct shall be of sufficient diameter to allow for an additional cable.

Columns are to be earthed in accordance with the Network Owner's requirements. A separate earth pin and CAD welded connection with earthing cable is required.

16.5.2 Column and Outreach Specification

- All columns and outreach arms are to be steel or aluminium meeting the requirements of AS/NZS 4676: 2000, AS/NZS 4677: 2000 and NZTA M/19: 1999.
- Seismic resistance (earthquake design) to be in accordance with NZS 4203 : 1992. The complete installation, including all fixings, shall withstand normal operating loads plus acceleration forces of not less than 1.0 g in a horizontal direction and through the centre of gravity of the item fixed.
- The column shall be a 'Importance Class II', as defined in AS/NZS 4676 : 2000 section 1.6.3.
- Ground planted columns shall be further protected to 100 mm above finished level (ground or concrete) with a continuous coating of Altex Devran 201 minimum 50 microns thick and Altex Devthane 379 minimum 125 microns thick. Coating is to extend 300 mm up the inside of the column.
- Steel columns and outreach arms shall be galvanised.
- Decorative paints or coatings shall comply with clause 3.13.4.5 Protection and Coating Systems.
- Columns are to have an opening for access to control gear no smaller than 100x150 mm fitted with a suitable cover or door. The opening shall be positioned 500-1200 mm above ground level. The cover shall be secured by 6 or 8mm tamper proof Allen key bolts or similar. Door bolts are to be coated with long life anti corrosive grease to ensure ease of operation in the future.
- Columns shall be ground planted unless specifically directed otherwise.
- Minimum Lamp mounting height shall be 5.5 m above road surface level.

16.5.3 Location of Lighting Columns

The column placing is to comply with AS/NZS 1158 except where modified below:

- As proposed on the lighting plans
- No closer than 1.0m behind the front face of the kerb.
- No closer than 300mm from the edge of any footpath.
- Columns must be placed so that a minimum corridor width of 1.8m is available for pedestrians between adjacent structures.
- All columns in a street shall be at the same offset from the kerb in order to provide an aesthetically pleasing appearance

The final location of columns must be confirmed with the Engineer, before cabling and trenching is carried out. Where the work is upgrading or extension of existing lighting the column positions shall be pegged in advance of the work and adjacent property owners notified in writing of the proposed works.

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16.5.4 Cables

Underground cable installations shall be provided to all street lighting columns except for lights specified to be installed on existing power poles. Cable route and conductor sizes shall be designed and installed in accordance with the Network Owner's requirements.

All column installations shall be provided with approved internal termination junction boxes for terminating lighting circuits. These are to be located at the gear openings of each column. Under ground tee jointing will not be permitted.

Cables installed vertically on power poles shall be enclosed in high impact PVC conduits from below ground level. Orange high impact conduit is not permitted.

16.5.5 Trenching

All trenching or thrusting shall be carried out in accordance with Clause 13 : Road Openings and Reinstatement.

In existing streets, thrusting must be used under existing carriageways, vehicle entrances, footpaths, etc to minimize the disruption to the public and damage to the road pavement/seal.

Cable routes are to be straight and parallel to the road boundary line, unless obstructions make this impracticable, in which case consent for an alteration must be obtained from the Engineer. In new streets the location of the cables should be as detailed in plan DG 302 (Volume 2 Part 3 of this manual).

Trenching/thrusting for LV cables should be deep enough to provide 600mm cover below final ground level after all cables are installed. Trenching for EHV cables should provide 800mm of cover. Trenches must be sufficiently wide to permit installation, thermal backfill and cable protection as appropriate.

Trenches near walls or embankments should not be deeper than a line projected at 45° from the bottom of the wall or foundation. This is necessary to avoid damage to the structure by movement of the ground caused by the trench excavations.

16.5.6 Luminaires, Lamps and Associated Gearing

Luminaires

All luminaires shall comply with AS/NZS 1158.

The luminaire housing shall be of high-pressure die-cast aluminium only.

High pressure sodium luminaires shall have pulse type/superimposed multi pulse type igniters fitted. Power factor correction shall give a power factor of 0.95 lagging. HRC fuse cartridges of the appropriate size shall be fitted.

A long life identification label that clearly indicates replacement lamp type shall be firmly fixed to the luminaire in a location easily seen from ground level.

Luminaires shall be complete with control gear, comply with NZS 6701 and NZS 6705.2.3: 1986 (or 1158.6 : 2003 Luminaires with Integral control gear) and provide a degree of protection of IP54 or better for the lamps and optics and IP35 for the gear.

All coatings to luminaires are to match those specified for columns.

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Cover bowls shall be acrylic and able to unlatch and swing open leaving the bowl hanging vertically on a hinge from the opposite end of the luminaire to the entry socket. All control gear and lamp housing shall be contained within the entire body of the luminaire.

Lamps

All lamps shall be high pressure sodium unless otherwise specified. Lamps with internal fitted igniters will only be accepted where approved by the Engineer.

Tilt Angle

All luminaires shall be installed with the specified tilt angle. Where existing brackets or outreaches have a different tilt angle to that specified for new lights, suitable tilt wedges shall be installed so that the existing luminaires have the same tilt angle as any new fittings.

Control Gear

One of the following superimposed multi-pulse igniters must be used:
 "Bag-Turgi" model No. MZN 400S, MZN 150 SCM, MZN 70 S(GT)
 "Atco" model No AZRM6ES, AZRM 2 ES
 Other types will be considered for approval.

The control gear shall include a Metway fuse terminal block FTB1 or a "Safeclip" type SC 32/H front wired 32 amp, 415 volt fuse carrier with an appropriately rated HRC fuse link.

Control gear is to be located within the luminaires. The control shall be a modular gear system, which allows for quick replacement suitable for field maintenance purposes.

Wiring

Tough plastic sheathed cable (TPS) stranded 1.5mm² twin earth, complying with NZS 6401:1973 "Specification for PVC Insulated Cables for Electric Power and Lighting" shall be used to connect between fuse panel and each luminaire, be continuous and without joints.

Luminaires Containing PCB's

Existing luminaires shall be checked for materials containing polychlorinated biphenyls (PCB's). Any PCB's found shall be removed safely, stored and disposed of to the full requirements of the Ministry of Health.

Protection and Coating Systems

All columns and luminaires shall have a protective coating system complying with AS/NZS 4677.

They may also have a decorative coating. The decorative coating shall be compatible with the protective coating. Generally galvanised steel components may have a paint based decorative coating and aluminium a powder coated decorative system. The painting system shall comply with the following requirements or an alternative system approved.

Substrate Type	Manufacturer	Specification No:
Galv Steel	Altex	TG-203-0532
Aluminium	Altex	TG-203-0532.1
Cast Steel	Altex	TG-203-532.2

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All coating systems shall be applied in strict accordance with the manufacturer's recommendations.

16.6 PEDESTRIAN FACILITY LIGHTING

16.6.1 General

The general layout of lighting at pedestrian facilities is shown on drawings TS 342 and TS 343. All materials supplied shall be new. All fittings and materials used shall be consistent throughout the installation and where there is an addition to an existing system, the new fittings and materials shall match the existing. The requirements of Clause 16.5 Road Lighting Equipment apply except as follows in this section.

All columns are to be 100mm diameter steel tube with 2mm wall thickness and of the length specified on the drawings. They are to be hot dipped galvanized after fabrication and then polyester powder-coated in the appropriate colour.

All pedestrian lighting poles specified to be 'fold-down' poles shall have the following:

- Hinge located 150mm from existing ground level
- Suitable 'plug' arrangement for the disconnection of the light while knocked down
- Latches and safety catch are to be as per Drawing No TS 381

16.6.2 Pedestrian Crossing Belisha & Floodlights

Columns are to be black with 300mm high intensity white reflective material attached so to create alternate bands of black and white approximately 300mm wide for the full height of the pole.

Floodlights are to be "Coronet" area lighting head CT65/1 modified for reduced side glare on a cast heat sink arm. Lanterns are to be high pressure sodium, with wattage varying with carriageway width, refer to table below.

Carriageway Width	Column Height	Floodlight Wattage
10m	4.0m	70
15m	4.5m	110
20m	5.0m	150

Orange belisha beacons are to be constructed from orange impact resistant polyethylene 300mm in diameter fitted in a "Regency 100" clamping system. The lamp holder is to be an Edison porcelain screw fitted with a 150-watt rough service lamp.

A flasher unit capable of handling 600 watts is to be supplied and wired to all belisha beacons at a site so that they flash in synchronisation. The flashing frequency shall be 40 — 60 flashes per minute.

Where specified, a waterproof "key switch" shall be installed to allow manual daylight operation. The Engineer will confirm this requirement and placement at each site as applicable.

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16.6.3 Warning Globes

Warning globes are generally installed in mid-block pedestrian refuge islands, that do not incorporate a marked pedestrian crossing.

Columns are to be powder-coated white and have a 2.0m high intensity white reflective material stripe as shown on plan TS 343. Column height is to be 4.0m above ground level unless specified otherwise.

White beacons are to be constructed from white impact resistant polyethylene type "Regency" RY25.1.400PE or similar approved. The beacon must be 400mm in diameter with a "Regency 100" clamping system. The lamp is to be a 80 watt mercury vapour complete with gear. The floodlight is to be a Coronet as specified for pedestrian crossing flood lights but fitted with a 80 watt mercury vapour lamp or metal halide lamp or similar approved lamp.

16.7 ALTERNATIVES & PREFERRED SUPPLIERS

Nomination of a particular manufacturer, reference or source of supply shall be taken, (unless specifically noted otherwise) to indicate the type and quality of fittings or materials required.

Alternatives will be considered, at the discretion of the Engineer, which:

1. Improve efficiency of system without significant loss in performance.
2. Reduce ongoing maintenance of the system, both in energy efficiency and physical maintenance.

Application for use of alternative products should be made 2 weeks prior to construction. The submission shall be provided with sufficient information as to the intended performance and benefit of the alternative product or systems.

Consistent use of products is intended to reduce the overall maintenance costs and issues related to street lighting.

An 'Approved Suppliers List' for suppliers of street lighting equipment/hardware is used to ensure the quality, performance of equipment/hardware and consistency of materials and supply.

The list and requirements of the suppliers can be obtained through the Engineer and application made to be added to the listing.

16.8 EXISTING LUMINAIRES, COLUMNS & CONTROL GEAR MADE REDUNDANT

The contractor shall give the current Hamilton City Council Street Light Maintenance contractor an opportunity to acquire any surplus Luminaires, columns and associated spare parts made redundant, for the purpose of utilising them as maintenance spares. Any materials required by the Maintenance Contractor, shall be delivered by the Contractor. The Contractor shall be responsible to dispose of any redundant "not wanted" materials including capacitors containing PCB's. Refer to clause "Luminaires Containing PCB's".

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16.9 INSPECTION, TESTING & COMMISSIONING

All necessary labour, services and facilities are to be arranged and provided for the carrying out of site inspections and tests to demonstrate that any component or system included in the installation meets the specified requirements, including the requirements of the Network owner. In particular voltage readings at a minimum of three circuit end points of the installation shall be taken to verify that the voltage drop does not exceed the set standard.

All such tests may be witnessed and checked by, and may be requested by, the Engineer, who shall be given seven (7) days notice of their taking place.

All instruments used during tests shall be provided by the Contractor and shall be verified as being calibrated or otherwise checked by an approved testing authority prior to the carrying out of the tests or at any other stage during testing as required by the Engineer.

Testing shall be carried out such that it results in no damage to new or existing components. Any non-compliance shall be remedied prior to connection to the network.

16.10 CONNECTING OF SERVICE

Once the new installations are completed, they shall be connected up to the existing system in accordance with the Network Owner's requirements.

16.11 AS BUILT RECORDS

During the progress of the work the contractor shall maintain accurate records of the location and depths of cables and locations of columns.

Immediately following connection of the new lighting system to the network and prior to permanent energizing of the system, as built details shall be supplied as follows.

- A plan showing the size, location and depth of all cables. Cable location accuracy shall be $\pm 200\text{mm}$ in plan and $\pm 100\text{mm}$ in depth.
- Street Light Column location data. Where possible this is to be a CAD drawing in dxf format showing the street light columns and property boundaries. The format is detailed in Volume 4 Part 9 Appendix 7. Otherwise a marked plan showing the column locations is to be provided. Columns shall be located to an accuracy of $\pm 1.0\text{m}$
- Street Light Data Collection Form. This form is Volume 3 Part 3 Appendix 2. One form is required per light type. All details requested must be supplied.

Hamilton City Council will forward relevant data on to the Network Owner.

In the case of new subdivisions this data must be supplied before the 224 C certificate is released and in the case of work contracted by Hamilton City Council final payment will not be released until this data is provided.