



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

The University of Newcastle
Infrastructure and Facilities
Services
Exterior Lighting Specification

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UON-ESS-103

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1. Scope

This Specification covers the general requirements applicable to the design, manufacture, performance and delivery of Exterior Lighting Specification.

It is not the intention to specify details of design and construction except where necessary to establish performance requirements, nor is it the intention to set forth those performance requirements which are adequately specified by the applicable Standards.

This specification shall be read in conjunction with Standard Specification UON-ESS-101 Electrical Design Criteria.

2. Standards, Specifications and Statutory Obligations

All aspects of design, manufacture, testing, supply, plant, equipment, accessories, materials, construction, erection, installation, operation and performance shall comply with this Specification and the current issue of the relevant Australian Standards, the relevant International Standards, the UON Standard Specifications, as well as all Statutory Acts, Codes, Regulations and Requirements of the relevant Authorities having jurisdiction over them unless specified otherwise within this Specification.

These shall include but not be limited to:

Australian/International Standards

| | |
|-----------------|--|
| AS 3000 | Wiring Rules |
| AS 3008 | Electrical installations - Selection of cables |
| AS/NZS 4282 | Control of Obtrusive Effects of Outdoor Lighting |
| AS/NZS 1158 | Lighting for Roads and Public Spaces |
| AS/NZS 1170 | Structural Design Actions |
| AS/NZS 1798 | Streetlight Poles and Outreaches |
| AS/NZS 3600 | Concrete Structures. |
| AS/NZS 4671 | Steel Reinforcing Materials |
| AS/NZS 1214 | Hot-dip galvanised coatings on threaded fasteners |
| AS/NZS 1158.0 | Lighting for Roads and public spaces - Introduction (including all current amendments) |
| AS/NZS 1158.1.1 | Vehicular traffic (Category V) lighting - Performance & installation design requirements (including all current amendments) |
| AS/NZS 1158.1.2 | Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance (including all current amendments) |
| AS/NZS 1158.2 | Computer procedures for the calculation of light technical parameters for Category V Lighting and Category P Lighting (including all current amendments) |
| AS/NZS 1158.3.1 | Pedestrian area (Category P) lighting - Performance and installation design requirements (including all current amendments) |
| AS/NZS 1158.4 | Pedestrian area (Category P) lighting - Performance and design requirements |
| AS/NZS 1158.5 | Tunnels and underpasses (including all current amendments) |
| SA/SNZ 1158.6 | Luminaires (including all current amendments) |
| AS/NZS 1379 | Specification & supply of concrete (including all current amendments) |
| AS/NZS 4680 | Hot-dip galvanized (zinc) coatings on ferrous articles (including all current amendments) |
| AS/NZS 60598 | Series Luminaires (including all current amendments) |

University of Newcastle Standards

UON-ESS-101 General Electrical Specification.

University of Newcastle Preferred Equipment List.

Authorities and Statutory Acts, Codes, Regulations and Requirements

BCA

Worksafe NSW

NSW Electrical Licencing & Regulation

NSW Service and Installation rules.

Where the stipulations of this Specification, the data sheets and the drawings do not comply with the minimum requirements of the Australian Standards and Statutory Regulations, the latter shall prevail.

Where the stipulations of this Specification, the data sheets and the drawings are more exacting than the minimum requirements of the Australian Standards and Statutory Regulations, the former shall prevail in the following order:

- a) Data sheets and detail drawings
- b) Specification and standard drawings.

3. Design

3.1. General

The design for road, walkway and public space lighting schemes should take the following into consideration:

- Facilitation of safe movement of vehicles and people
- Discouragement of illegal acts
- Contributing to the prestige and amenity of an area through increased aesthetic appeal
- Minimum light spill and glare

Exterior lighting design shall be as per AS1158 associated Standards. The following lighting categories shall be used for the purpose of the lighting design.

| Area | Category |
|---------------------------------|-----------------|
| Campus Roads | PR3 |
| Pedestrian Crossings | PX2 |
| Carparks | PC2 |
| Disabled Parking | PCD |
| Walkways | PR2 |
| Areas containing a bus Shelter. | PA3 |

Table1. Area design categories

Poles are to be located to minimise the likelihood of collision with pedestrians, cyclists and motorists. Poles are to be located as per regulatory standards and requirements however the following should be considered the minimum spacing requirements.

Poles located along a straight road, driveway or any other surface primarily used to carry vehicle traffic shall be a minimum of 1 meter from the horizontal driving surface of the road as per the illustration below. Poles on curved road or roundabouts shall have a clearance of 1.5 meters. No pole shall be installed within 1 meter of a driveway or any other area. Pole shall not be installed on an Island without express permission from the UON.

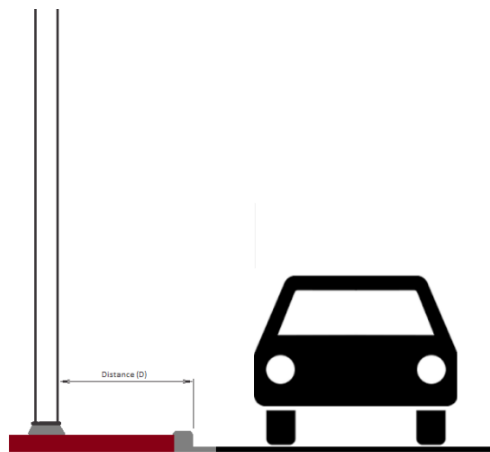


Figure 1. Road clearances

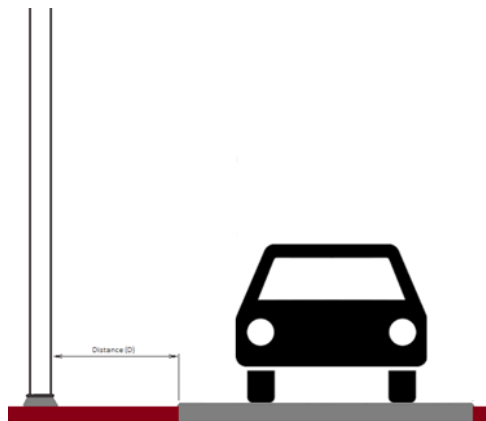


Figure 2. Driveway Clearances

When replacing existing road lighting poles that do not comply with the clearances above, crumple type poles or pole with a shearing base pole shall be installed. This option is only for replacement poles using existing footings, all new installation will comply with previous distance requirements

Poles along cycle ways or footpaths shall have a minimum 500mm clearance between the edge of the path and the pole or footing. See diagram below

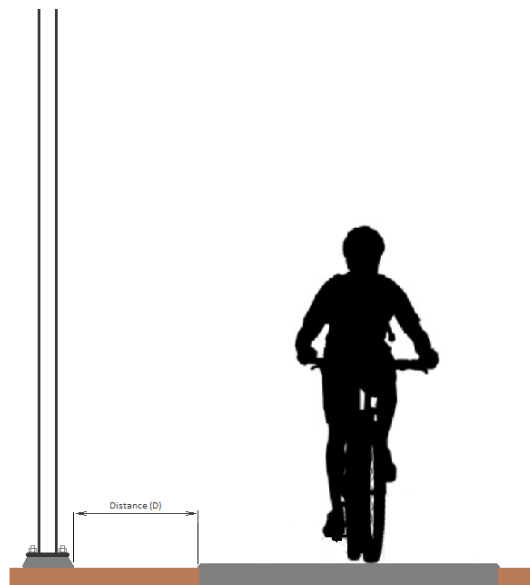


Figure 3. Cycle way and Footpath clearances

3.2. Electrical

The supply system is a three phase and neutral 230/400 V +10% - 6%, 50 Hz, solidly earthed system. Lights shall be supplied from alternate phases sequentially along the lighting circuits, no two adjacent lights are to be on the same phase.

All street and public space lighting to be electrically fed from the nearest substation and incorporated into the existing site wide lighting control network. Area Lighting affixed to site buildings shall be fed from a local distribution board of the building to which it is affixed.

All pole mounted lights shall include a suitable rated circuit breaker located behind a removable cover at the base of the pole. The cover shall be accessible from the ground without the use of a ladder and require the use of a tool to remove.

Lighting controlled by a P.E. Cell, timer or other automated device shall be switched through the use of a suitable rated contactor actuated by the control device. No control device should direct switch a lighting circuit. Unless otherwise requested, lighting not controlled by the site wide lighting control system shall use a PE cell for control and shall include an Off/Auto/Manual selector switch.

Prior to the installation of new external lighting circuits, voltage drop calculations shall be submitted to, and approved by the UON representative. No lighting supply cable is to be run under a path, road, building or any other man made surface or structure without the express permission of the UoN.

Care needs to be taken during replacement of existing lighting and installation of new lighting to ensure that no trespass rules exist (eg one side of road may be fed from Substation A and the other side of road may be fed from Substation B). The UON is to be consulted with regard to any new or changes to the existing lighting supply.

3.3. Lighting Design

The lighting design shall be completed by a suitably qualified lighting consultant. Lighting design shall include a Photometric drawing to be submitted to, and approved by the UON representative prior to acceptance of any proposal. The Photometric drawing should also include light levels required by Australian Standard for the area covered by the drawing.

For the purpose of compliance with Australian Standard, the average Lux level is to be used.

Regardless of Australian Standard, no walkway lighting level shall be less than 3.5 Lux (Average Horizontal illuminance)

3.4. Footing

Footings are to be rag bolt type footing, embedded in concrete. Pile depths and diameters are to be as pole manufacturers requirements. When designing pile depth, soil bearing capacity is to be established to ensure adequate support.

The table below can be used as a guide to estimate ground compaction. If this table is to be used rather than completing a compaction test, 30% shall be added to the manufacturers recommended depth. The estimate of ground compaction must be approved by the UoN. Rag bolts are not required to extend into the extra depth, reo shall be extended by 30%.

| Soil Type (As defined in AS/NZS 4676:2000 Appendix I2) | | | |
|--|--|--|-----------------------|
| Soft | Firm | Very Firm | Hard |
| Wet clays; silty loams; wet or loose sands | Damp clays; sandy clays; damp sands | Dry clays; clayey sands; coarse sands; compact sands | Gravels; dry clays |
| fb > 60kPa | fb > 100kPa | fb > 150kPa | fb > 240kPa |

The above only applies to established soils. If new fill has been used in an area, the depths need to be achieved in the underlying established ground, in other words, the fill does not contribute to the overall depth.

All concrete to have a minimum characteristic strength of 32MPa if covered or 40MPa where an exposure classification of Moderate is determined in accordance with AS2159 Piling-Design and installation.

Concrete shall be placed and vibrated to optimum compaction and pile casting are to be used for construction purposes where required. Minimum clear concrete cover to be 75mm. Concrete to be poured on the same day as the drilling of the pile.

Reinforcement bars are to be supported during concrete curing and is to be located in the centre of the pile not more than 150mm above the pile base. Rag bolt cage shall be located a minimum of 65mm from the pile base. All reinforcement is to be minimum 500 Plus Rebar and is to conform to the requirements of AS 4671 Steel Reinforcing Materials.

Longitudinal reinforcement to be 100mm clear of pile ends i.e. overall cage length to be 200mm less than pile depth. All hold down bolts to be minimum Grade 4.8 placed centrally within the pile.

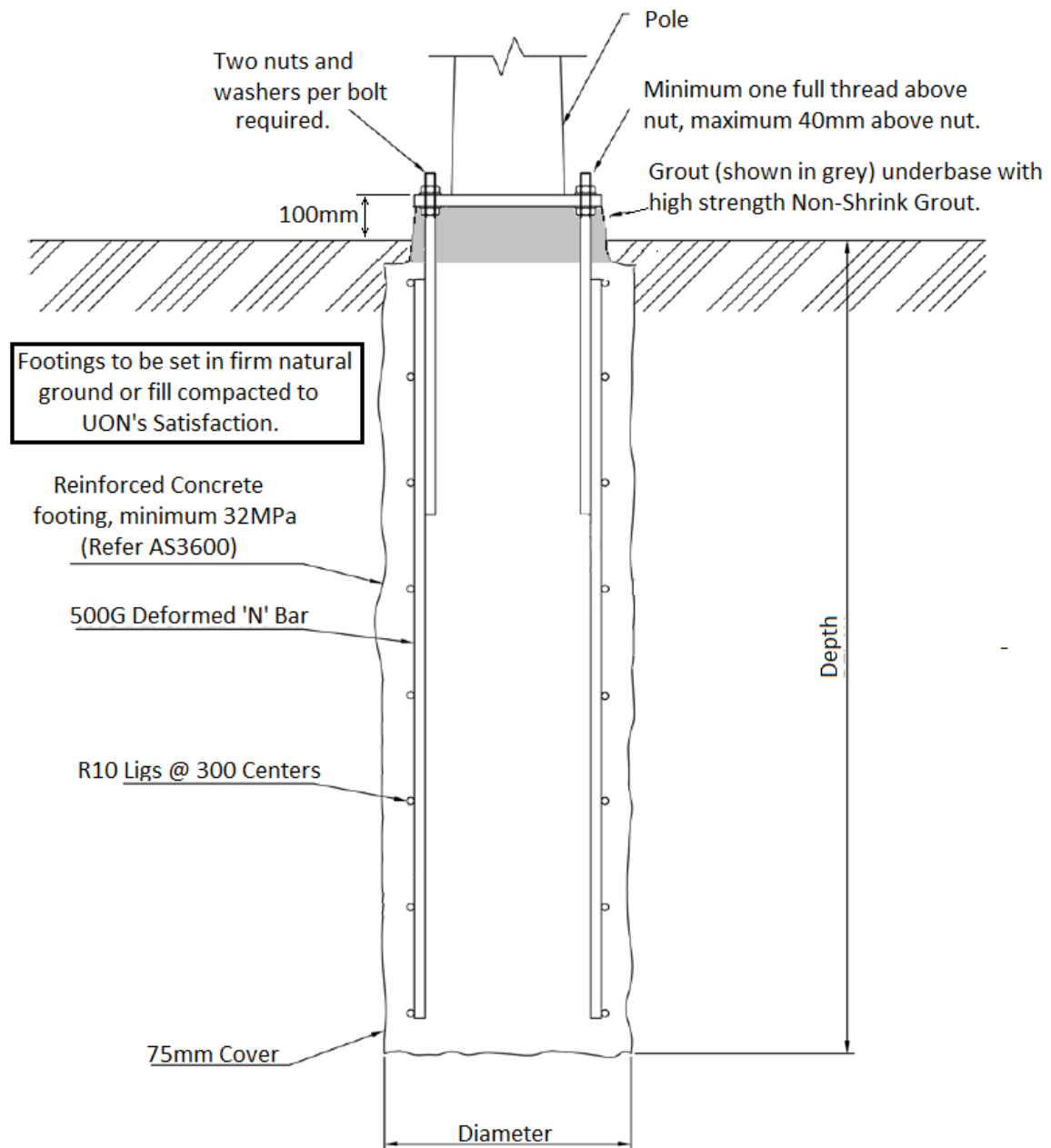


Figure 4. Footing design

Excavations in excess of 600mm are not to occur within 3m of the pile edge. The pile design does not consider torsional moments greater than 5% of the overturning moment or 3kNm, whichever is the lesser.

The distance between the top of the pole base plate and the natural ground level shall be no less than 100mm. There shall not be more than 40mm of thread protruding above the baseplate nut once installed. This 40mm is not to be achieved by cutting the rag bolt once installed. No hot dipped galvanised products should be cut or ground in any way. Bolts protruding above the base late shall be wrapped in “Denzo” tape or equivalent.

Once the pole installation is finished, the concrete used to fill the pile shall not be visible. The grout only will be visible once the installation is complete with clear defined straight edges between the grout and surrounding natural ground (As per Figure 4). Grout shall be high strength, non-shrink grout. The rag bolts beneath

No piles are to be installed in a location that may damage the root structure of surrounding trees or vegetation. Any pole that is to be installed near a tree, which is within 12 times the tree trunk diameter of the tree must be approved by the UON. For example, if there is a nearby tree that is 300mm at the base, a pole cannot be located within 3.6 meters (12 x 300mm) of the base of the tree without UON permission.

In the event that a pole is being replaced, the existing footing may be reused if:

- The height of the new pole is less than the existing pole.
- The pole is constructed of the same material e.g. Metal, Concrete etc.
- The pole being removed is perfectly straight (At the discretion of UON).
- The new light fitting is not significantly larger or heavier than the existing fitting. (At the discretion of UON).
- The rag bolts are in good condition. (At the discretion of UON).
- The existing pole is in the correct location for the new lighting design (If applicable).

If an existing footing is not being reused it must be removed, and the cost to do so included in any quoted price. Existing wiring can be reused if in good condition.

A UON Excavation permit shall be approved prior to any excavation.

3.5. Poles

Poles shall be rag bolt mounted, metal construction generally of the following heights.

| Area Type | Height |
|---------------------------|-------------------------------------|
| Walkway lighting | 2.8 meters |
| Carpark and Area lighting | 4 meters |
| Roadway lighting | 8 meters |
| Building affixed fittings | 2.4 meter (Match existing fittings) |

Table2. Pole heights

Poles shall be hot dipped Galvanised unless otherwise request by UoN to fit in with proposed or existing landscape/architecture.

Any outreach extending over a roadway shall have a minimum of 6 meters clearance from the road.

All steel items shall be hot dip galvanised in accordance with AS 4680. All coating, other than on threads of bolts, shall be to zinc coating class Z600 in accordance with AS 1397. Hot-dip galvanised coatings on threaded fasteners shall be as per AS/NZS1214. All pole welds shall be continuous.

Any control gear, overcurrent protection or termination shall be mounted at the base of the pole behind an inspection plate. This inspection plate shall require the use of a tool for removal.

The pole shall have a nameplate stating as a minimum, type of pole, name of manufacturer and date of manufacture. An asset number shall also be installed using a 316 Stainless steel label and Strap. See label details below. Asset numbers will be issued by the UON representative.

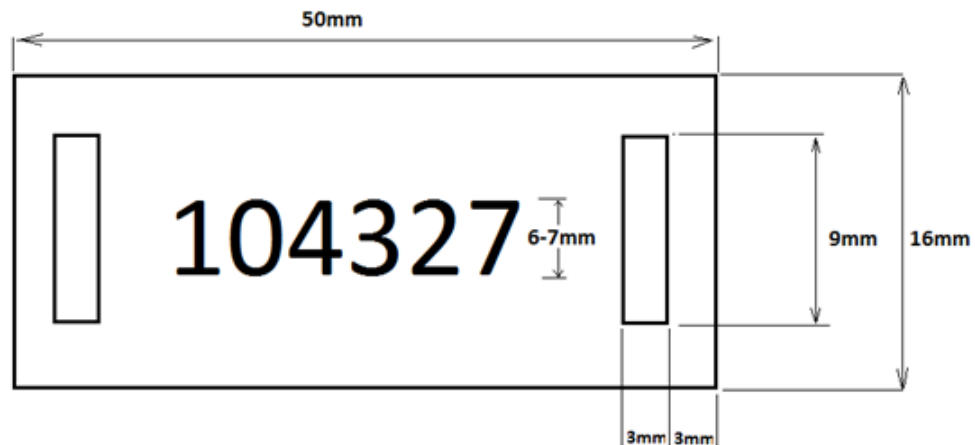


Figure 5. Pole asset number label

Each pole shall also include an engraved label, adjacent to the circuit breaker stating the location the pole is fed from. This shall include the name of the circuit breaker number, distribution board name and building where the Distribution Board is housed.

Sectional poles shall be assembled and installed as per manufacturer's instruction. The UON representative should be advised of assemble times to allow inspection. Light mounting adapters shall be hot dip galvanised in accordance with AS 4680. Fastening bolts/grub screws shall be located a minimum of 3 points, evenly paced around the circumference of the spigot.

3.6. Earthing

The first point of connection for any earthing conductor entering the pole shall be at a welded earth stud within the pole control gear housing area. Any other required earths should initiate from that stud.

4. Light Fittings

All Light fitting shall be approved by the UON prior to installations. All light fitting shall be covered by a 5 year on site warrantee that covers all costs associated with the repair of the light fitting, including but not limited to, the cost of all material, travel, access, lifting equipment and labour.

Lights shall be parallel with the direction of the road with a 5 degree upcast. Lights mounted directly above a pedestrian crossing shall be parallel to the road with no upcast.

Light fittings shall include bottom access have no removable parts, lids with gaskets that could allow rain entry to fitting. Light fittings shall include self-clearing heat sink blades so as not to build up tree/leaf debris in heat sink channels

5. Inspection and Testing

The UON representative should be advised prior to energising any installation that involved a new pole to allow for inspection.

6. Drawings and Data

The contractor shall submit the following drawings and data prior to any new installation.

- Photometric drawing of area.
- Voltage drop calculations.
- Footing drawing (Can be “typical drawing” marked up with dimensions)
- Pole load calculations.
- Pole GA Drawings

7. Defect Liability Period

All Light fitting shall be approved by the UON prior to installations. All light fitting shall be covered by a 5 year on site warrantee that covers all costs associated with the repair of the light fitting, including but not limited to, the cost of all material, travel, access, lifting equipment and labour.

8. Miscellaneous

A ground search shall be completed prior to any excavation to establish the location of underground services. The ground search will be provided and managed by the contractor. The ground search shall be completed by a 3rd party company that undertakes services location as their core business.

Traffic control will be required if any part of the work area extends onto a roadway or vehicle thoroughfare. Any traffic control that is required to complete the works is to be supplied and managed by the contractor and provided a suitably RMS qualified traffic controller. If any road, walkway or cycleway is fully blocked and alternate route must be established and communicated to the route users. The contractor shall advise the UON one week prior to the use of any traffic control or detours on site.

No work is to take place in the power corridor unless prior agreement has been made with the University of Newcastle. The power corridor extends to 8 meters horizontally from the area directly below or above the powerline. See restricted work area below.

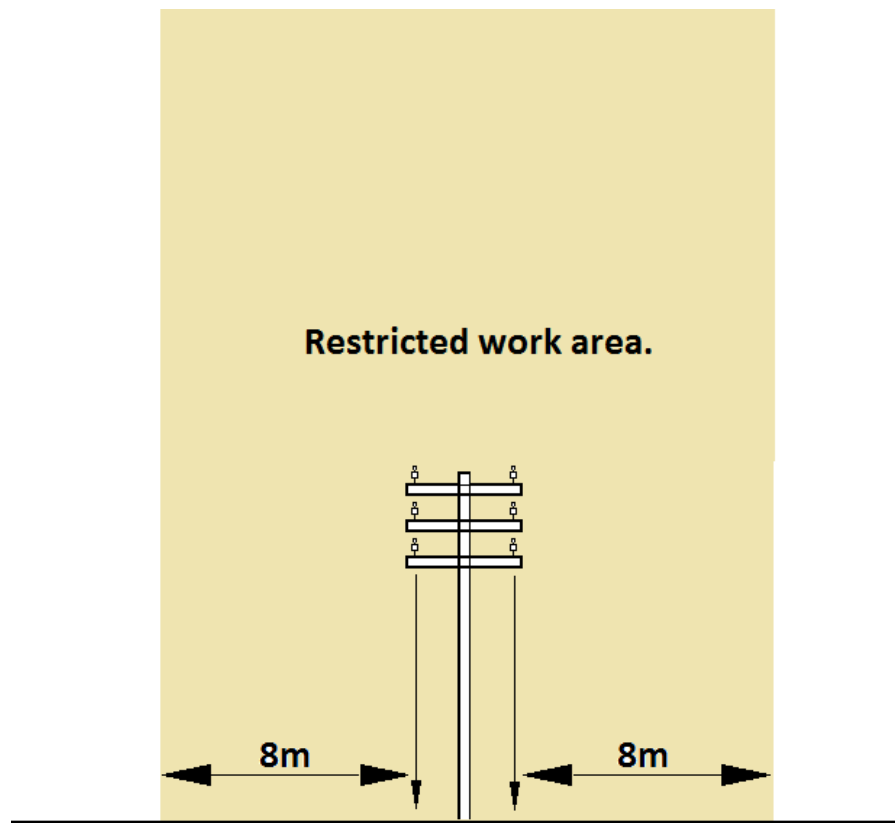


Figure 6. Power Corridor

Pay all fees to authorities in connection with applications, inspections and approvals.

Once the works is complete the area is to be cleaned to the point that there is no sign of the work having taken place.