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FOREWORD

Welcome to Western Power's updated **12th edition**, of the Underground distribution schemes (UDS) manual as published in 18th April of 2024.

This document has been revised to reflect all aspects of Western Power's involvement in the *land development* process for subdivision projects regardless of title designation. It is to be used by *developers*, property owners and industry to design and construct, a technically compliant *development*.

The UDS manual contains independent stand-alone sections on policy, processes, design requirements, and references to installation requirements in conjunction with Western Power's web page.

The structure further provides user access to other Western Power documents, including but not limited to the Distribution design catalogue (DDC), Distribution substation plant manual (DSPM), Underground cable installation manual (UCIM) and the WA Service and installation requirements (WASIR).

The UDS manual as a 'living document,' is to be further reviewed and updated as a part of a detailed restructure and transformation to align and meet the evolving needs of *consumers* and industry. During this restructure Western Power will seek to work closely with affected industry and *consumer* groups as part of the review process.

I would also like to acknowledge the valuable input from the Urban Development Institute of Australia, Civil Contractors Federation, Subdivision Design Forum and the Western Australian Planning Commission.

The information in this UDS manual is intended to provide the required levels of guidance which we hope all stakeholders find relevant and understandable. It reflects Western Power's commitment to continuous improvement and our desire to collaborate closely with all participants either seeking to subdivide, redevelop and or undertake a project as a part of the *land development* industry.

In keeping with this, we value your ongoing support and feedback on any aspect of this UDS manual.

Ben Bristow

Head of Grid Transformation

Western Power

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1. Introduction

1.1 Application

This edition supersedes all previous editions of the UDS manual. The application of these requirements and subsequent amendments *shall* be applied to all new and or altered *strata* and *freehold subdivision developments*.

Where *work* on a *development* was commenced or formal *contracts* to undertake the *work*, was signed by both Western Power and the *developer*, prior to the publication of these revised requirements the network operator may grant permission, on receipt of an application from the *developer*, for exemption from these amended requirements. Where exempt, the *subdivision development shall* be completed in accordance with the designated published network requirement(s).

1.2 Publication

1.2.1 Application date

These requirements *shall* apply from the date shown in the 'record of revisions' located at the front and on the cover page of this document.

1.2.2 Printing and updates

This is an electronic media based document and therefore uncontrolled when printed or copied. To ensure you are using the most current version, it is essential that the web based document is referenced.

1.3 Document ownership and administration

This document is and remains the property of the copyright owner, being the Electricity Networks Corporation, who reserves the right to develop, administer, publish and revise the edition, at their absolute discretion. Any use of this material, except for the educational purposes by Western Australian based registered training organisations (RTOs) or as permitted by written agreement from the copyright owners, is prohibited.

1.4 Disclaimer

These requirements have been compiled and published by Western Power using definitions, drawings, guidelines, standards, electricity supply publications and information consistent with the relevant Acts and Regulations of the State of Western Australia at the date of publication.

Standards and energy supply publications are revised periodically. The content of this document may at times not align with referenced externally published material, therefore users *shall* make their own inquiries in terms of any referenced external content.

1.5 General enquiries and contacts

Western Power welcomes feedback on these requirements and their application, to assist in maintenance and improvement of the document. Your comments and or queries *should* be directed to Western Power's Customer Service Centre on 13 10 87 or submitted on-line through the Western Power's [website](#):

- Customer Service Centre on 13 10 87:
On-line:
Western Power contact enquiries.
- In writing to:
The Manager Distribution Grid Strategy and Planning,
Grid Transformation,
GPO Box L921 Perth WA 6842.

1.6 Purpose and scope

This UDS manual sets out the procedures for every underground distribution *scheme* (UDS) relating to *subdivisions* that may or has the potential to be supplied with electricity from Western Power's network. The manual governs the relationship, between:

- Western Power as the network operator, whose network a UDS *shall* become a part of; and
- Every *developer* / property owner, as the proponent of a *subdivision*, who requires a UDS to provide a distributed reticulated supply of electricity to lots within a *subdivision*; and
- Requirements for an electrical distribution system for a *built/survey strata subdivision* within a *freehold lot* to be undertaken by others outside the UDS processes as non-Western Power infrastructure that is to be connected to Western Power's network.

This UDS manual has been developed to inform *land developers*, *design organisations* and *subdivision installation contractors* on the policies, processes, practices and technical requirements relating to the provision of *electricity infrastructure services* for all new or altered *subdivisions* within or connected to Western Power's network including but not limited to:

- Western Australian Planning Commission *subdivision* processes for the creation, execution and clearing of conditions.
- Requirements for *subdivision electricity infrastructure*, lot *point(s) of supply(connection)*, *interface works* / connection arrangements to the existing Western Power network and *reinforcement* requirements to support anticipated load increases.
- Removal or relocation of overhead distribution *electricity infrastructure*, which is adjacent to or within a proposed *subdivision*.
- Restriction of *land* use associated with existing transmission *electricity infrastructure*.
- Determination of responsible parties to undertake *simple and complex subdivisions* design and construction.
- Subdivision design and construction requirements.
- Residential financial equalisation arrangement for *complex connection services* associated with large residential *subdivisions* (HV pool).
- *Subdivision* handover of the installed UDS *simple or complex connection service* to Western Power for final testing, commissioning and acceptance enabling connection to the network and energisation.

The primary purpose of this UDS manual is to define the requirements for industry / *consumer* driven externally designed and constructed *developments* as a well as describing the requirements applicable to both Western Power and the applicant/*developer*.

The *subdivision* requirements cover both greenfield and brownfield arrangements inclusive of *simple and complex strata and freehold subdivisions* to indicate whether Western Power or the *developer* is responsible for the design and construction of the *works*. The responsible party in practice, may vary on a case by case basis and as agreed by Western Power considering such issues as the appropriateness of:

- *Developer's contractors* working near existing *electricity infrastructure* in brownfield areas;
- Western Power undertaking *simple (small) connection service subdivisions* within a larger greenfield *development* involving the same *developer*.

1.7 Definitions and abbreviations

In this document, unless the contrary intention appears, the definition, term and phrase used has the meaning as given by the following:

1.7.1 Definitions

<i>Australian and New Zealand standard</i>	AS/NZS prefix refers to standards developed by Standards Australia and Standards New Zealand. SA/SNZ prefix refers to international standards (e.g. ISO, IEC) adopted by Standards Australia and New Zealand.
<i>acceptance of quote</i>	The acceptance by the developer of the quote provided by Western Power for the provision of electricity infrastructure. Unless agreed otherwise by Western Power this is to occur upon receipt of payment from the developer.
<i>boundary re-alignment</i>	The boundary between two (2) existing lots is shifted by less than one (1) metre.
<i>Boundary-relocation</i>	The boundary between two (2) existing lots is shifted by more than one (1) metre.
<i>bypass infrastructure</i>	Electricity infrastructure installed to provide an alternate route or prospective alternate route between two (2) points on the electricity distribution network. One (1) of the two (2) points may be on a proposed part of the network.
<i>cable jointer</i>	A person appropriately qualified to undertake the type of cable jointing and termination described.
<i>connection point</i>	Has the same meaning as that given by the WASIR.
<i>connection service(network)</i>	The installed network distribution electricity infrastructure, rated in accordance with the connection agreement, to facilitate the transfer of electricity to and or from Western Power's electricity network. Refer also to the WASIR. Simple connection service (small) (SCS) is defined as a single shared or sole use connection point comprising a device with a total capacity, equivalent to but not exceeding four (4) three phase standard connection services, installed to service either built/survey strata or freehold lot or lots connected to Western Power's overhead or underground distribution electricity infrastructure. Note the number of connections may be further limited by the type of device. Complex connection service (large) (CCS) is defined as a single or multiple connection points comprising a device or devices with a collective capacity exceeding that of a simple connection service, installed to service either built/survey strata or freehold lot or lots connected to Western Power's overhead or underground distribution electricity infrastructure.
<i>contract</i>	The formal agreement between the developer and the person(s), contractor, enterprise or organisation engaged by the developer for the execution of the electricity infrastructure construction works.
<i>consumer</i>	Has the same meaning as that given by the WASIR

<i>contractor</i>	The person(s), enterprise or organisation contracted by the developer to execute the package of subdivision, construction works.
<i>decoupled CCS subdivision</i>	Construction of a subdivision stage that is permitted to commence prior to the issue and payment of the interface works quote.
<i>design conformance review (DCR)</i>	Western Power’s review process established to ensure design documentation and certificates forming a part of the developer’s engineering submission; together with Western Power’s design parameters as contained in the design information package (DIP) have been incorporated into the final UDS design.
<i>design information package (DIP)</i>	A Western Power package of distribution network information and design parameters, unique to the UDS or development that a developer is required to use in the preparation and design of the UDS electricity infrastructure.
<i>designer</i>	The person engaged or employed by a design organisation to design the UDS electricity infrastructure.
<i>design organisation</i>	The organisation engaged by the developer to design the electricity infrastructure for a UDS.
<i>developer</i>	A person(s), enterprise or other legal entity that seeks to develop land which is to include or will contain UDS electricity infrastructure within the prescribed land.
<i>development</i>	Has the same meaning as that given by the Planning and Development Act 2005.
<i>distribution quotation management system (DQM)</i>	A Western Power system that enables entry and tracking of consumer work requests, in addition to the calculation and generation of quotes for any resultant works or undertakings.
<i>electrical contractor</i>	A qualified person or organisation as prescribed by the ‘Electricity (Licensing) Regulations 1991’ - Part 4, engaged and directed by the developer to undertake the requested UDS electricity infrastructure project and or works.
<i>electricity infrastructure(infrastructure)</i>	Wires, apparatus, equipment, plant or structures used, or to be used for, or in connection with, or to control, the transportation of electricity inclusive of associated reinforcement of and interface works to Western Power’s network. Refer also to the WASIR.
<i>engineer</i>	A person who is either a current professional civil or electrical engineer and is registered (NER) or is eligible for corporate membership (chartered status) with Engineers Australia.
<i>enterprise</i>	An owner, operator, business, company or corporation governed by a single administrative body.
<i>freehold title lot</i>	(Formerly known as green title) A defined portion of land depicted on a plan or diagram for which a separate ‘crown grant’ or ‘certificate of title’ has been or can be issued. Refer also to the WASIR definition for lot.
<i>interface works</i>	Works external to the subdivision including required reinforcement, extension and connection to Western Power’s network.
<i>land</i>	Has the same meaning as that given by the Planning and Development Act 2005.

<i>LV design</i>	A Western Power program to calculate voltage drop, fuse reach, line loads, kilowatt losses, transformer loadings in underground and overhead low voltage radial networks.
<i>must</i>	A mandatory requirement.
<i>network designer</i>	The person engaged by Western Power to determine the subdivision parameters and coordinate the development of the electricity infrastructure UDS design.
<i>offer, quote</i>	An offer by Western Power to the developer setting out the costs, terms and conditions upon which the electricity infrastructure of a subdivision is to be constructed in a conformed design.
<i>point of supply (connection)</i>	Has the same meaning as that given by the WASIR
<i>practical completion</i>	The completion of works such that the works can be used for the purpose for which it was designed, without restriction.
<i>prefer</i>	A choice to be adopted unless circumstances justify a variation.
<i>project manager (site)</i>	The person appointed by the developer to direct, administer the contract and site construction works inclusive of the coordination of required inspections and certifications for and on the developer's behalf. The nominated person shall have the required skills, knowledge and experience necessary to oversee the development and administer the contract. (Western Power reserves the right to review and reject a developer's nomination).
<i>project network officer (PNO)</i>	The officer appointed by Western Power as their representative to whom all site contractual, design, construction, inspection and application matters are to be referred. Note: A PNO may delegate elements of the role to other appropriately qualified and or experienced network personnel.
<i>reinforcement works</i>	Strengthening of Western Power's network as required to provide capacity for the subdivision.
<i>scheme</i>	All equipment and components associated with distribution electricity infrastructure and services within a subdivision.
<i>service pillar</i>	A distribution device owned by Western Power located on a consumer's property or other network approved location for the provision of a connection point on that electricity distribution network for the consumer's electrical installation. Note may be substituted by a service pit in certain network operator approved circumstances.
<i>standard connection service (network)</i>	Has the same meaning as that given by the WASIR
<i>shall</i>	A mandatory requirement.
<i>should</i>	A requirement to be adopted unless circumstances justify a variation.
<i>site</i>	The developer's workplace which includes all parts of the development that is the subject of the offer and acceptance between Western Power and the developer for the provision of subdivision UDS electricity infrastructure.

<i>strata plan (built)</i>	Has the same meaning as that given by the WASIR
<i>strata title</i>	Has the same meaning as that given by the WASIR
<i>subdivision</i>	The total area of land included in the WAPC subdivision boundary. This shall include all stages and the amalgamation of lots. Refer also to the Planning and Development Act 2005.
<i>substation</i>	A collection of switchgear and/or transformer(s) on a single site which may or may not be screened or enclosed. Refer also to the WASIR.
<i>surveyor</i>	A person appointed by the developer who is eligible for membership of the Institution of Engineering and Mining Surveyor Australia (IEMSA) or the Institute of Surveyor, Australia (ISA)
<i>survey strata plan</i>	Has the same meaning as that given by the WASIR
<i>survey strata title</i>	Has the same meaning as that given by the WASIR
<i>transmission voltage</i>	Including voltages at 66kV and above.
<i>Western Power</i>	Electricity Networks Corporation, trading as Western Power, a statutory corporation pursuant to the Electricity Corporations Act 2005.
<i>working day</i>	Any day from Monday to Friday excluding public holidays but including Western Power's rostered day off.
<i>work(s)</i>	The electricity works associated with the provision of electricity infrastructure to the development that is the subject of the offer and acceptance.

1.7.2 Abbreviations

The following abbreviations have been used in this document:

CCS	complex connection service (large)
CU	compatible unit (s)
DCR	design conformance review
DDC	Distribution design catalogue
DIP	design information package
DOF	drop out fuse
DQM	distribution quotation management system
EPR	earth potential rise
HV	High voltage: exceeding low voltage, but not exceeding or including 66kV. As defined by AS/NZS 3000. Note also referred to as medium voltage (MV).
KV	kilovolt
LES	live end seal
LFI	low frequency induction
LGA	local government authority
LV	low voltage – (As defined by AS/NZS 3000).
MEN	multiple earthed neutral
MPS	modular package substation.
PAW	public access way
PTSWA	Power Training Services WA
PTT	pole top transformer
POS	public open space
RMU	ring main unit
RWUC	revision while under construction
SCS	simple connection service (small)
SFAIRP	so far as is reasonably practicable
SOR	schedule of rates
SPUD	single phase underground distribution.
SPURS	single phase underground rural supply (redundant network system)
SWIS	The electricity network in the South-West corner of Western Australia. Refer to the WASIR a map in the appendices.
SWIN	South West Interconnected Network
UDIA	Urban Development Institute of Australia.
UDS	underground distribution scheme
UPCoP	Utilities providers code of practice
WAPC	Western Australian Planning Commission.
WASIR	Western Australian Service and installation requirements
XLPE	cross-linked polyethylene (cable)

1.8 Reference documents

The following has been provided as a guide to assist readers gain a broader awareness of the regulatory, industry and network compliance framework within the *land development* environment. The following listings and references are to be read in conjunction with these requirements but *should* not be construed as a full or complete list of all statutory, industry and network requirements.

1.8.1 Acts and regulations

The Western Australian State Government publishes an extensive list of Acts and Regulations via the WALW [website](#) which may directly or indirectly impact the future *development* of *land* within the State of Western Australia, including but not limited to:

- Aboriginal Heritage Act 1972 (As amended).
- Biodiversity Conservation Act 2016.
- Biodiversity and Agriculture Management Act 2007.
- Community Titles Act 2018.
- Contaminated Sites Act 2003.
- Electricity Act 1945:
 - Electricity (Licensing) Regulations 1991.
 - Electricity Regulations 1947.
 - Electricity (Network Safety) Regulations – 2015.
- Electricity Industry Act 2004:
 - Network Operator Technical Rules.
 - Network Quality & Reliability of Supply Code 2005.
 - Electricity Distribution Regulations 1997.
- Energy Coordination Act 1994.
- Energy Operators (Power's) Act 1979:
 - Energy Operator Regulations 2016.
- Environmental Protection Act 1986:
 - Environmental Protection (Noise) Regulations 1997.
- Environmental Protection and Conservation Biodiversity Act 1999.
- Fair Trading Act 2010.
- Land Administration Act 1997.
- Metropolitan Water Supply, Sewerage, and Drainage Act 1909:
 - Metropolitan Water Supply, Sewerage and Drainage By-laws 1981.
- Planning and Development Act 2005.
- Public Works Act 1902.
- Strata Titles Act 1985:
 - Strata Titles (General) Regulations 2019.
- Transfer of Land Act 1893:
 - Transfer of Land Regulations 2004.
- Work Health and Safety Act 2020 (previously Occupational Safety and Health Act 1984):
 - Work Health and Safety (General) Regulations 2022.
 - Work Health and Safety (Mines) Regulations 2022.
 - Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulations 2022.

1.8.2 Codes and guidelines published by DMIRS (Building and Energy)

[Website](#)

- Code of practice for - Persons working on or near energised electrical installations.
- Guidelines for the management of vegetation near powerlines.
- Guidelines for the safe management of high voltage electrical installations.
- Guidelines for the safety of buildings near network operator electrical assets.
- Guidelines for the safe management of private power poles and lines.
- WA Electrical requirements (WAER).

1.8.3 Codes and guidelines published by DMIRS (Worksafe)

[Website](#)

- Code of practice: (Excavation).
- Guidelines for work in the vicinity of overhead power lines.
- WorkSafe's danger zones.

1.8.4 Documents published by Western Australian Planning Commission (WAPC)

[Website](#)

- Form 1A –Application for approval of freehold or survey-strata subdivision
- Model subdivision conditions schedule.
- Planning bulletin 33/2017 Rights-of-way or laneways in established areas.
- Policy No. DC 2.6 (2021) (Residential road planning).
- Position statement: Dark sky and Astro -tourism.
- State planning policies.

1.8.5 Documents and guidelines published by others

- Guidelines for restoration and reinstatement following work in road reserves, published by Western Australian Local Government Association. WALGA [website](#).
- Utility providers code of practice, published by Utility Providers Services Committee (DBYD) [website](#).

1.8.6 Documents published by Standards Australia

A sample of documents that may be accessed via Standards Australia:

[Website](#)

- AS/NZS 1158 - Lighting for roads and public spaces.
- AS/NZS 2053 - Conduits and fittings for electrical installations.
- AS 2067 - Substations and high voltage installations exceeding 1kV a.c.
- AS/NZS 3000 - Australian/New Zealand - Wiring rules.
- AS/NZS 3008 - Electrical installations - Selection of cables.
- AS/NZS 3835 - Earth potential rise – Protection of telecommunications network users, personnel and plant.
- AS 4799 - Installation of underground utility services and pipelines within railway boundaries.
- AS/NZS 4853 – Electrical hazards on metallic pipelines.
- SA/SNZ TS IEC 61000.3.5 - Electromagnetic compatibility (EMC) - Limits - Limitation of voltage fluctuations and flicker in low-voltage power supply systems for equipment with rated current greater than 75A.
- AS/NZS 7000 - Overhead line design – Detailed procedure.
- IEC 60853 - Calculation of the cyclic and emergency current rating of cables. (Refer to the IEC)

Note: For additional guidance refer also to the Electricity (Network Safety) Regulations – 2015.

1.8.7 Documents provided or published by Western Power

Website:

- Artwork on Western Power assets ([public](#)).
- As – constructed manual (depot pack).
- Basic embedded generator (EG) connection technical requirements ([public](#)).
- Deciding between distribution overhead and underground construction in road reserves ([public](#)).
- Distribution commissioning manual ([public](#)).
- Distribution construction standards handbook (DCSH) ([public](#)).
- Distribution customer connection requirements (DCCR) ([public](#)).
- Distribution commissioning manual ([public](#)).
- Distribution design catalogue (DDC) ([public](#)).
- Distribution equipment labelling standard (DELS) ([public](#)).
- Distributed energy resource management - Validation principles ([public](#)).
- Distribution substation plant manual (DSPM) ([public](#)).
- Electrical system safety rules (ESSR) ([public](#)).
- FAQ earthing standard ([public](#)).
- Network and subdivision charges (HV subdivision pool) ([public](#)).
- Noise compliance requirements for distribution transformers ([public](#)).
- Overhead to underground conversion standard (OHUG) ([public](#)).
- Planning for works near overhead powerlines (restricted).
- Request for quote on work associated with WAPC application (restricted).
- Roadside power pole requirements (restricted).
- Safety health & environment (SHE) policy ([public](#)).
- Streetlight information (general).
- Streetlight manual (restricted).
- Switchboard arrangement for small strata lot developments ([public](#)).
- Subdivision design guideline for bedding and backfill sand (#4) ([public](#)).
- Technical rules ([public](#)).
- Telecommunication equipment located in the vicinity of proposed distribution HV earths ([public](#)).
- Underground cable installation manual (UCIM) ([public](#)).
- Un-metered supply network standard (UMS) ([public](#)).
- Western Australian Service and installation requirements (WASIR) ([public](#)).

1.9 Scope

This UDS manual details the administrative, design and technical requirements applicable to the provision of *electricity infrastructure* for *subdivisions* that are to be integrated into and form a part of Western Power's SWIN distribution network.

The *electricity infrastructure works* consist of but is not limited to the following:

- Low voltage *electricity infrastructure* within a *subdivision*.
- High voltage network extension within a *subdivision*.
- Street lighting within the *subdivision*.
- Distribution *substations* within a *subdivision*.
- High voltage *reinforcement* and *interfacing works* outside a *subdivision*.
- Low voltage *reinforcement* and *interfacing works* outside a *subdivision*.
- Upgrade of existing distribution *substations* outside a *subdivision* for that *subdivision*.
- *Developer* requested replacement of overhead with underground *infrastructure* in road reserves adjacent to the *subdivision*.

Note: Before entering into *subdivision* discussions and designs, *developers* are encouraged to read [section 2](#) of this UDS manual inclusive of but not limited to overhead and underground general design principles.

1.10 General roles and responsibilities of developers.

The *developer* is the *enterprise* seeking to create a *subdivision* and serviced lots that can be used or sold to prospective *land* purchasers.

As such the *developer* is the applicant and therefore responsible for the *electricity infrastructure works* and shall pay Western Power the *quoted* amount to complete Western Power's portion of *works* and for the creation and connection of the nominated *subdivision*.

For complex (large) *subdivisions*, the *developer* is also responsible for:

- a) Implementing all the requirements of this UDS manual for the design and construction of the *electricity infrastructure works* and associated connection *infrastructure*;
- b) Requesting a DIP from Western Power;
- c) Appointing and authorising a *design organisation (designer)*, civil and cable laying *contractors*, a licensed *electrical contractor* and associated trades to undertake the *electricity infrastructure works* in accordance with this UDS manual;
- d) Installing and connecting (excluding *interface works*) *electricity infrastructure* for the provision of a reticulated supply of electricity to the *subdivision development*;
- e) Ensuring a safe, reliable and quality distribution network is designed and constructed for end user *consumer* of electricity for the life of the asset. The life expectancy of the asset is fifty (50) years.
- f) Testing, commissioning and quantity assurance reporting in accordance with this UDS manual and network / regulatory requirements; and
- g) *Site* safety for the whole *subdivision site* during all phases of the *development*.

Note: Unless agreed otherwise, Western Power will undertake all UDS requirements for *simple (small) subdivisions*.

1.11 General roles and responsibilities of Western Power

Western Power is responsible for:

- a) Advising the WAPC and the *developer* of the *electricity infrastructure* requirements / *works* required to provide a reticulated supply of electricity to each lot forming part of the *subdivision*;
- b) Conducting Western Power's portion of *works* in accordance with the scope of *works* and associated *quotation (quote)*;
- c) *Site safety* at locations where Western Power undertakes the *electricity infrastructure works*;
- d) Conducting network quality assurance functions in accordance with this UDS manual and Western Power, [Safety health and environment policy\(ies\)](#); and
- e) Where Western Power undertakes *work*, within the *developer's site* Western Power will do so in accordance with the *developer's site* safety requirements and will comply with any lawful direction of the *developer's site* safety representative.

1.12 Types of subdivisions

1.12.1 Subdivision type based on land use and classification

Subdivisions in general are undertaken on zoned *land* including residential, rural residential, commercial and industrial *subdivisions*. Rural residential *subdivision developments* are generally approved on *land* zoned 'rural' or 'special rural.'

Western Australia *subdivision* types include:

- *Freehold* (green title) lot *subdivision*.
- Vacant and *survey strata subdivision*.
- *Built or building strata subdivision*.
- *Strata title schemes*. Refer also to the [Community Titles Act 2018](#).

Subdivision of freehold, survey-strata and some built strata lots, require the approval of the Western Australian Planning Commission (WAPC).

In general, *built strata* lots (of a certain size) do not require the approval of the WAPC where the appropriate local government agency, certifies that a given *strata plan* is exempt from the need to obtain the WAPC's approval. (Refer: WAPC Development control policy No. DC 1.3 Strata titles)

It is common to have a mixture of residential and commercial with segregated and/or industrial *freehold lots* within a *subdivision development*. Multi-storey (vertical) vacant *strata subdivisions*, with a mixture of commercial units at lower levels and residential apartments on upper levels, (mixed use) are common with there being a trend towards community title *strata development* arrangements.

1.12.2 Network subdivision groupings

For the purposes of this UDS manual, Western Power classifies *subdivision* types into two (2) groups, based on the connection capacity / arrangement, being either a *simple or complex connection service*, each having a separate set of processes and responsibilities.

1.12.2.1 Simple connection service – (SCS small subdivision)

Unless the nature of the *works* requires civil construction, Western Power will undertake the design, supply and installation of the *connection service* and associated network *electricity infrastructure* for these types of *subdivisions*.

The supply arrangement is via an underground *simple connection service* for capacities not exceeding a *standard connection service at each point of supply (connection)*. For additional information refer to Western Power's [Overhead to underground conversion standard \(OHUG\)](#).

The following examples are classified as *SCS (small) subdivisions*:

- a) One (1) or two (2) *freehold* lots connected to a shared *connection service*;
- b) Up to four (4) *strata* or *freehold* battle axe lots connected to a sole use *connection service*;
- c) Up to six (6) (note 1) *strata* or *survey-strata* lots connected to a sole use *connection service*;
- d) Up to four (4) (note 1) vacant *strata* or *survey-strata* lots in a *strata plan/scheme* to be connected to a sole use *connection service*;
- e) Re-alignment/relocation of lot boundaries with a single *connection service*; and
- f) Amalgamation of lots into one (1) single lot with a single *connection service*.

Subdivisions within this category include:

- *Built strata* in a *strata scheme/plan* which are exempt from the need to obtain WAPC approval; and
- *Survey strata scheme/plan* requiring WAPC approval.

Note: The *developer* shall ensure that:

1. The combined design load for the lots being created shall not exceed the equivalent total capacity of four (4) three phase *standard connection services*;
2. Any existing overhead/underground network *electricity infrastructure*, *connection services* and or multiple points of supply arrangements are removed as a part of the *subdivision development*;
3. All internal *consumer strata* distribution infrastructure is completed in accordance with Western Power's [Switchboard arrangement for small strata lot developments](#);
4. Private *consumer subdivision* connection and distribution infrastructure shall not enter or be located within public open space and or road reserve; and
5. Overhead to underground connection conversions are to be undertaken by Western Power.

For *freehold SCS subdivisions* incorporating *civil works*, Western Power may approve the design and installation of the required network *electricity infrastructure* by the *developer*. Where approval is granted, the same processes as that required for *complex (CCS) subdivisions* shall be implemented for the UDS works with the final connection to the network being completed by Western Power.

1.12.2.2 Complex connection services – (CCS large subdivision)

For the purposes of this UDS manual, *complex connection service (CCS) subdivisions* are those *developments* where the number of *strata / freehold lots* being created, exceeds the number serviced by a *SCS* arrangement and the project encompasses a *civil construction element*.

The design and installation of the network *electricity infrastructure* for this type of UDS *development* shall be undertaken by the *developer*.

Note: *CCS strata* underground *electricity infrastructure* beyond the *point of supply (connection)* and within the *subdivision* does not form a part of Western Power's distribution network. Private *subdivision consumer* distribution infrastructure shall be installed in accordance with the applicable industry standards and shall remain the responsibility of the property owner. The *point of supply (connection)* shall be designed and installed by the *developer* in accordance with Western Power's connections requirements. Refer to the [WA Service and installation requirements \(WASIR\)](#).

1.13 Western Power and WAPC land development process

1.13.1 High level process for subdivisions requiring WAPC clearance

The high level *land development* process for subdivisions requiring WAPC clearance is shown at [figure 1](#).

Note: For both *SCS* and *CCS* subdivisions, the WAPC process is identical. However, as prescribed in [clause 1.12](#), the responsibilities and internal Western Power processes may differ. The process and Western Power's involvement are described in the following sub-clauses.

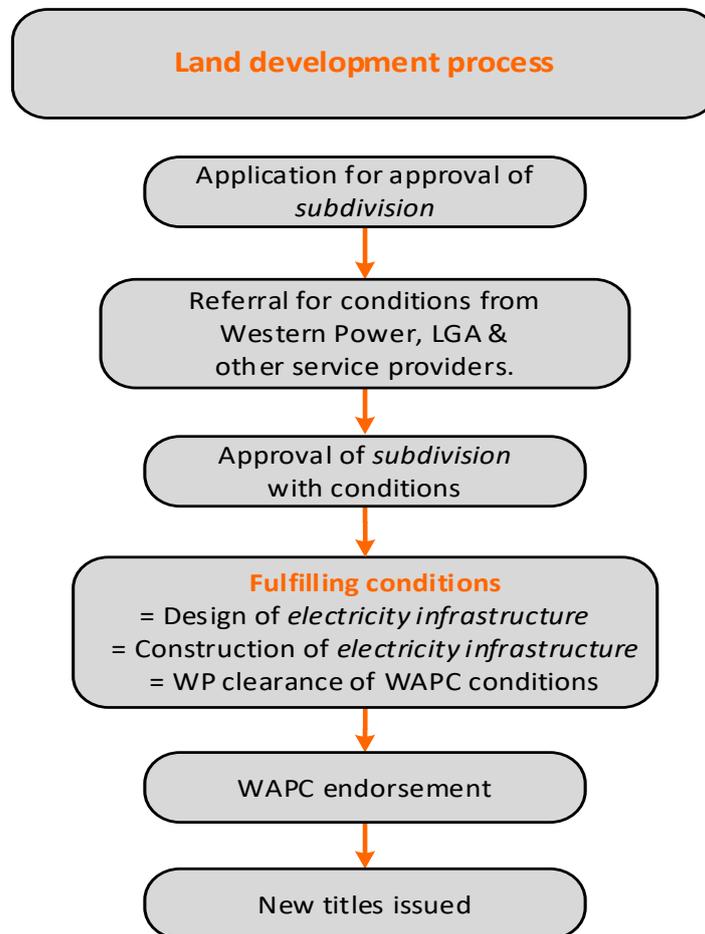


Figure 1: Land development process

1.13.1.1 Application for approval of subdivision

The *developer shall* submit an appropriate application form to WAPC for a *subdivision development* with *subdivision* plans and supporting documentation.

Responsibility: The developer

1.13.1.2 Referral for conditions

WAPC refers the application to Western Power, other service providers and relevant local government agencies for recommendations of relevant conditions and servicing requirements.

Western Power *will*, where and as required, recommend conditions on the need for *electricity infrastructure*, *land*, removal of assets and easements including the protection of existing network assets.

Responsibility: WAPC and Western Power

1.13.1.3 Approval of subdivision with conditions

WAPC issues a consolidated set of conditions, including any Western Power's requirements for the *subdivision* to proceed. The approval period is four (4) years for *subdivisions* consisting of six (6) or more lots and three (3) years for *subdivisions* of five (5) lots or less.

Responsibility: WAPC

1.13.1.4 Fulfilling conditions

The *developer* is responsible for fulfilling all of the listed WAPC conditions, inclusive of those associated with Western Power.

Where a *developer* or *design organisation* seeks to change or amend, one (1) or more of the WAPC conditions through an approach to either WAPC or Western Power, the approach and project is to be treated as a cancellation, unless agreed otherwise by the affected parties and Western Power. Any costs incurred *shall* be borne by the *developer*.

UDS design of electricity infrastructure (CCS large subdivision)

The *developer shall* engage a *design organisation* to design the *electricity infrastructure* to serve the *subdivision development* in accordance with the requirements of the WAPC and Western Power.

The *design organisation shall* engage an *engineer* to oversee the design and certify that the UDS design complies with the requirements of this UDS manual, listed WAPC and any other Western Power project requirements. As directed by the *developer* the *engineer shall* or formally authorise the *design organisation* to submit the design package and drawings to Western Power for a *design conformance review* (DCR).

**Responsibility: The *developer*,
*design organisation & engineer***

Construction of electricity infrastructure: (CCS large subdivision)

Where Western Power notes the design package as conforming, the *developer* may engage and instruct their *contractor(s)* to proceed with the construction of the *subdivision* asset in accordance with the SCS or CCS *subdivision* requirements, whichever is applicable. Refer to [clause 6.2](#).

Responsibility: The *developer*

Western Power clearance of conditions

When all of the WAPC and Western Power conditions have been met, the *developer* has confirmed that the *infrastructure works* are compliant with the requirements of this UDS manual, then a request for clearance may be sent to Western Power for review. Where those conditions have been confirmed as being met, a 'clearance certificate' will be issued.

**Responsibility: The *developer*, and
site project manager/surveyor Western Power**

1.13.1.5 WAPC endorsement

The *developer* is to submit the deposited plan(s) to WAPC after collecting all of the 'clearance certificates' from Western Power, other service providers and the relevant local government authority (LGA). The WAPC will subsequently validate and endorse the submitted deposited plans, where satisfied those deposited plans are in accordance with the approved plans and where all conditions have been met.

Responsibility: The *developer* and WAPC

1.13.1.6 Issuing of new titles

With the endorsement of the WAPC, the *developer* may then apply to Landgate for property titles.

Responsibility: The *developer* and Landgate

1.14 Non-WAPC referred subdivisions

SCS subdivisions that do not require WAPC clearance, are to be managed through Western Power's inhouse *development* process and the simplified process depicted in [figure 2](#) below.

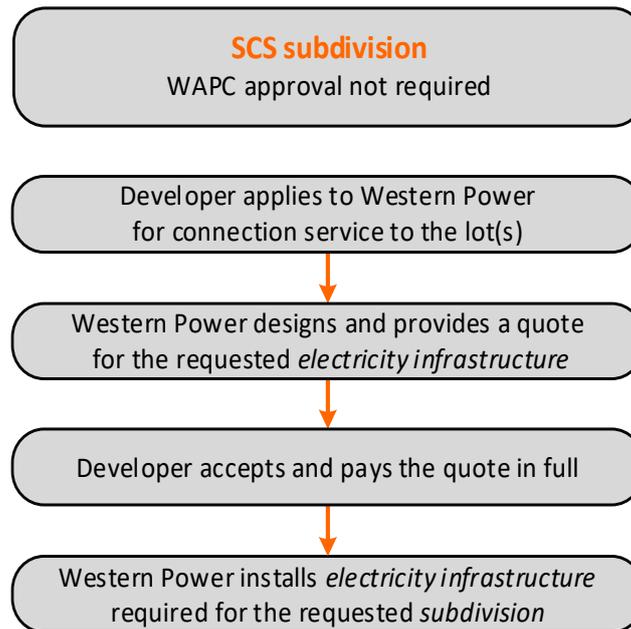


Figure 2: SCS subdivision process WAPC approval not required

2. General design policies

2.1 Western Power's design principles for network extension in subdivisions

Western Power is required to ensure that their network is fit for purpose, the quality of supply meets statutory requirements and is functionally safe to supply electricity to connected *consumers*.

In order to fulfil those obligations, the design and construction of network extension and *electricity infrastructure for subdivisions must* comply with the following major design principles:

2.1.1 Safety

Safety is Western Power's priority value. Western Power's network *must* be designed, constructed, maintained and operated to ensure the safety of *consumers*, the public and network /industry personnel.

Developers have a direct responsibility to ensure that the design and construction of all *subdivision electricity infrastructure* satisfies the following electrical, construction and operational safety criteria:

2.1.1.1 Electrical safety

Developers shall apply safety in design principles as a part of the *subdivision development*, which on completion, *must* enable Western Power personnel to establish appropriate processes / procedures in the identification and management of hazards, while undertaking network operational and maintenance functions. As a minimum the *electricity infrastructure must* meet the requirements of:

- Electricity Industry Act 2004 and associated Codes / Regulations;
- Electricity Act 1945 and associated Publications / Regulations including but limited to Electricity (Network Safety) Regulations 2015, (Schedule 2);
- Work Health and Safety legislation; and
- Applicable network and industry standards and requirements.

In addition to the above, designs need to be developed in line with industry best practice including analysis of each *site* in terms of construction, operational, environmental, heritage, planning, *land* access and visual impact.

2.1.1.2 Construction safety

Subdivision construction and subsequent operational activities *must* be carried out in a manner that ensures safety and conforms with:

- Work Health and Safety legislation;
- Electricity (Network Safety) Regulations 2015; and
- Applicable network requirements.

2.1.2 Extension of high voltage feeders for now and future

HV networks are not only extended or reinforced to meet the requirement of a *subdivision*, but also to meet any planned future growth. HV feeder cables *must* be extended to meet the requirements of Western Power distribution *development* plans.

The *developer shall* install HV feeder cables according to the Western Power specified plan, created and provided to meet the long term planning requirements.

HV feeder cables *must* also be designed either in a 'Y' or 'radial' configuration (See [figure 3](#) below) so that:

- a) The exit HV feeder cable from the zone *substation* or upstream of the Y split, *must* be 400mm² XLPE AL cable. Where 400mm² XLPE AL cable cannot be suitably installed due to installation or *site* constraints owing to its large bending radius, 240mm² XLPE CU cable is allowed subject to approval by Western Power.

The minimum length of exit cable and the location of the Y-split from the zone *substation* is dependent of the type of feeder, load size, distance of the load centre from the zone *substation* and the surrounding network configuration. It *must* not be less than two (2)km; and

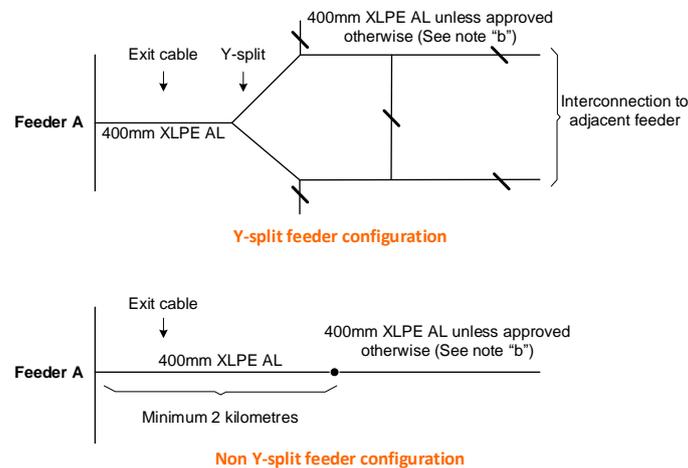


Figure 3: Y Split and non Y split feeder configurations

- b) Interconnection between the HV feeder cables is close to where the feeder splits and at the end of the feeder where appropriate; and
- c) All backbone feeders through new *subdivisions* *must* be 400mm² XLPE AL cable. A backbone feeder is primarily a radial feeder emanating directly from a zone *substation* circuit which supplies all the loads of the feeder, including the loads of its tee-off feeders along its length. HV feeders through a *subdivision*, which is of remote distance from existing zone *substations* and is in proximity to a proposed future zone *substation*, will become backbone feeders emanating from that zone *substation*; and
- d) Any new underground feeder or portion of a new underground feeder that has an installed transformer capacity of 1MVA or more *must* be designed so that an alternative (normally open) source of supply can be closed to provide supply.

2.1.3 Power quality

The *developer* shall ensure that:

- The design and function of the *subdivision* provides Western Power's network *consumers* and all other *consumers* who are to take a supply from Western Power's network have a quality of electricity supply within the limits stated below.

2.1.3.1 Voltage level

For

- low voltage, the requirements of the Electricity Act 1945 *shall* apply (i.e. 240V single-phase or 415V three-phase) – plus or minus 6% of the nominal voltage at and downstream of the *point of supply* (*connection*). Refer to [clause 5.3.5](#);
- medium and high voltage (i.e. 12.7kV and 19.1kV single phase / 6.6kV, 11kV, 22kV and 33kV three-phase) Western Power will determine acceptable volt drop ranges.

It *should* be noted that the voltage levels specified in this UDS manual are the average values measured at the *consumer's point of supply* (*connection*), as prescribed in Western Power's [Technical rules](#).

2.1.3.2 Voltage fluctuations and flicker

Voltage fluctuations at the *consumer's point of supply (connection)* shall be within the limits defined in SA/NZS TS IEC 61000.3.5: - Electromagnetic compatibility (EMC) – Limits – Limitation of voltage fluctuations and flicker in low voltage power supply systems for equipment with a rated current greater than 75A.

Design organisations shall complete this evaluation where the network supply to the lot being developed forms a part of the *subdivision works*. Evaluation of lots developed independently of the *subdivision works* shall be undertaken by the property owner in conjunction with Western Power.

Evaluations that form part of the *subdivision* shall be in accordance with SA/NZS TS IEC 61000.3.5, completed and signed by the *developer's design organisation (engineer)* as described in [clause 5.2.1](#) and submitted to Western Power for review as part of the DCR process.

2.1.4 Network reliability

The *developer* shall ensure the *subdivision electricity infrastructure* is designed to provide Western Power's network connected *consumers* with the expected reliable supply of electricity by:

- a) Providing interconnections with other HV and LV feeders to the *subdivision*, so that in the event of a feeder loss, the other feeders may continue to maintain the supply to *consumers* at the required level of reliability and security. To permit flexibility, Western Power may not require LV connections for broadacre *subdivisions* with transformer sizes 63kVA or less, with distances greater than 100 metres between the closest associated *service pillars*; and
- b) Including interconnection of HV feeders, for both urban distribution feeders and radial distribution feeders in the Perth metropolitan area depending upon load and arrangement and number of residences, respectively. The requirements shall be in accordance with the requirements of [Technical rules](#) for the SWIN clauses 2.5.5.3(b)(2)(c) and 2.5.5.4 Interconnection between rural distribution feeders shall be provided in accordance with [Technical rules](#) clause 2.5.5.5.

Note: To enable the full utilisation of transformer capacity in residential *subdivisions*, the design load on each transformer is to be as close as possible to the nameplate rating of the transformer without exceeding that rating. Refer to [clause 5.3.22](#).

Note: To enable the advancement of fault location and network restoration, ring main units (RMUs) installed within CBD and metropolitan urban areas shall be remotely operable. Western Power will advise on the specific requirements and communications protocol as part of the DIP.

Western Power may waive the RMU automation requirement where:

1. Communications to the RMU location is not available;
2. The RMU is within a remote location; and or
3. The requirement is deemed unnecessary.

2.1.5 Network maintainability

The *developer* shall ensure that all *electricity infrastructure* is designed and constructed to minimize the cost of maintenance during that *infrastructure's* life cycle.

2.1.6 Environmental and heritage management

The *developer shall* ensure the *subdivision electricity infrastructure* is designed and constructed to comply with applicable legislation governing environmental, heritage, planning and *land* access requirements. This includes but is not limited to historical, cultural, heritage, noise, contamination, clearing, soil management, rare flora, fauna and fire safety requirements. (For additional information refer to Western Power's [Distribution substation plant manual \(DSPM\)](#) and [Safety health & environment \(SHE\) policy\(ies\)](#)).

2.1.7 Meeting community expectations

The *developer must* ensure the network in the *subdivision* is designed and constructed to meet all applicable requirements of the relevant statutory authorities.

2.2 Requirement provisions for underground or overhead infrastructure

2.2.1 Electrical reticulation

The following defines *subdivision* requirements for network underground *electricity infrastructure* and *connection services* including where overhead *connection services* may be retained or provided.

The requirements consider greater expected intensity of *land* use, especially building construction and vehicular movement and subsequent increased safety hazards associated with overhead *infrastructure* on smaller lots. These requirements were previously agreed in principle with Department of Mines, Industry Regulation and Safety (Building and Energy).

These requirements apply to Western Power's *electricity infrastructure* servicing *freehold subdivisions* and private distribution infrastructure servicing *built / survey strata* lots and common property.

Underground *electricity infrastructure* is mandatory for all new *freehold and survey strata subdivisions* for lot sizes up to ten (10) hectares and applies to all *subdivisions*, including residential, rural residential, commercial and industrial.

Subdivisions with lot sizes between ten (10) hectares and fifty (50) hectares may be developed, utilising overhead *electricity infrastructure* however the *consumer's point of supply (connection)* for each lot *shall* be from an underground *service pillar* or where permitted a similar network device. Underground *infrastructure* is preferred.

Subdivisions in which all lot sizes are over fifty (50) hectares may be created without network *electricity infrastructure*. Where un-serviced lot(s) are to be sold 'as is,' a restrictive covenant is to be placed on the lot title deed advising potential buyers of this *site* condition. Where *electricity infrastructure* is to be installed, underground *connection services* are preferred although an overhead *connection service* may be permitted.

2.2.2 Freehold title subdivisions

2.2.2.1 Electricity infrastructure internal to freehold subdivisions

- a) All new *electricity infrastructure* within a *freehold title subdivision* *must* be underground unless the lot size is greater than ten (10) hectares.
- b) All existing overhead *electricity infrastructure* within a *freehold title subdivision* *must* be removed unless the lot size is greater than four (4) hectares.
- c) Existing overhead *electricity infrastructure* within a *freehold title subdivision* on a lot with an area between four (4) hectares and ten (10) hectares *must* be removed from the lot unless it meets the criteria prescribed in [clause 2.8](#).
- d) Where a *freehold title subdivision* incorporates a new through road or section of an existing or proposed through road then *bypass infrastructure* may be necessary in the road or road section.

2.2.2.2 Electricity infrastructure external to freehold subdivisions

- a) All new *electricity infrastructure* within road reserves bordering a *freehold title subdivision* must be underground unless the lot size is greater than four (4) hectares.
- b) It is *preferred* that existing overhead *electricity infrastructure* bordering a *freehold title subdivision* is removed however may, where approved by Western Power, remain in situ if new reticulation is installed electrically parallel to it.
- c) New low voltage underground *electricity infrastructure* must be installed if more than two (2) *freehold titled lots* are created fronting the same road and the combined lot frontages span an existing bay of low voltage overhead *infrastructure*. This requirement may be applied where more than one (1) *subdivision* is occurring simultaneously and the combined lot frontages of the *subdivisions* span an existing bay of low voltage overhead *infrastructure*.

Note: Existing redundant *electricity infrastructure* shall be removed.

- d) New *electricity infrastructure* may be required to ensure a suitable supply to the *subdivision* exists.

Note: The requirements of this clause shall only apply where the existing overhead *electricity infrastructure* is on the same side of the road as the proposed *subdivision*.

2.2.2.3 Connection services in freehold subdivisions

- a) All lots within *freehold title subdivisions* must be connected underground unless the lot size is greater than fifty (50) hectares.
- b) No *connection service* is required for lots greater than fifty (50) hectares.
- c) Where the boundary of a *freehold titled lot* area is less than four (4) hectares is realigned or relocated then an underground *connection service* is required to be installed if there is no existing *connection service* to the lot.
- d) If the boundary of a *freehold titled lot* area is between four (4) hectares and fifty (50) hectares is relocated then an underground *connection service* is required to be installed if there is no existing *connection service* to the lot.
- e) If the boundary of a *freehold titled lot* area is less than four (4) hectares is realigned and the realignment results in an existing overhead *connection service* traversing another lot than the one it is servicing, then an underground *connection service* is required to be installed in lieu of the overhead *connection service*.
- f) If the boundary of a *freehold titled lot* area is greater than four (4) hectares is realigned and the realignment results in an existing overhead *connection service* traversing another lot than the one it is servicing then the overhead *connection service* is required to be re-routed.
- g) New *freehold title* commercial/industrial *lots* that have an existing overhead *connection service* must be connected underground if more than two (2) lots are being created.
- h) New *freehold title* residential *lots* that have an existing overhead *connection service* must be converted to an underground *connection service* unless the lot size is greater than fifty (50) hectares.
- i) *Freehold title* *lots* that have an existing overhead *connection service* must be converted to underground if the boundary is relocated.

2.2.3 Survey strata subdivisions

2.2.3.1 General

Strata subdivisions can be supplied via either a *simple* (SCS) or *complex* (CCS) *connection service* dependent on size and complexity of the requested supply arrangement.

Private distribution *consumer* infrastructure within the *strata subdivision* and beyond the *point of supply (connection)* is the responsibility of the *developer* / property owner and does not form part of Western Power's distribution network .

Developer's should consider Parts 7(16) and 7(17) of the [WAPC's Form 1A](#) –'Application for approval of freehold or survey-strata subdivision' before applying [clause 2.2.3.4\(g\)](#).

The following information details the *electricity infrastructure* and *connection service* requirements.

2.2.3.2 Reticulation internal to survey strata subdivisions

- a) All new *electricity infrastructure* and private distribution infrastructure within a *survey strata subdivision* shall be underground unless the area of the *strata development* and or common property is greater than ten (10) hectares.
- b) All new *electricity infrastructure* and private distribution infrastructure within common property with an area greater than ten (10) hectares shall be underground when it is installed in or adjacent to roads passing and servicing *survey strata lots* of area ten (10) hectares or less.
- c) All existing overhead *electricity infrastructure* within a *survey strata subdivision* shall be removed unless the area of the *survey strata* lot or common area that the *electricity infrastructure* is located within is greater than four (4) hectares.
- d) Existing overhead *electricity infrastructure* within a *survey strata subdivision* on a *survey strata* lot or common property with an area between four (4) hectares and ten (10) hectares shall be removed from the lot unless it satisfies the criteria referenced at [clause 2.8](#).
- e) Where a *survey strata subdivision* requires internal installation of HV *electricity infrastructure* then *bypass infrastructure* may be required.

2.2.3.3 Reticulation external to survey strata subdivision

- a) All new *electricity infrastructure* bordering a *survey strata subdivision* shall be underground unless the area of the *survey strata* lot or common area is greater than four (4) hectares.
- b) Generally, existing *electricity infrastructure* within the street and or bordering a *survey strata subdivision* may remain in situ. However, if two (2) or more lots are being created and more than one (1) *point of supply (connection)* is being provided then new *electricity infrastructure* shall be installed.

Note: Existing redundant *electricity infrastructure* shall be removed.

- c) New low voltage *electricity infrastructure* shall be installed if more than two (2) *survey strata* titled lots are created fronting the same road and the combined lot frontages span an existing bay of low voltage overhead *infrastructure*. This requirement is to be applied where more than one (1) *subdivision* is occurring simultaneously and the combined lot frontages of the *subdivisions* span an existing bay of low voltage overhead *infrastructure*.

Note: The requirements of this clause shall only apply where the existing overhead *electricity infrastructure* is on the same side of the road as the proposed *subdivision*.

2.2.3.4 Connection services in survey strata subdivisions

- a) All *survey strata* lots and common property in *survey strata subdivisions* shall be connected underground unless the area of the *survey strata* lot or common property that is being connected is greater than fifty (50) hectares.
- b) New *survey strata* lots that have an existing overhead *connection service* shall be converted to underground unless the lot size is greater than fifty (50) hectares.
- c) If the boundary of a *survey strata* lot area is less than four (4) hectares is realigned or relocated and the realignment results in an existing overhead *connection service* traversing another *freehold title* or *survey strata* lot than the one it is servicing then an underground *connection service* is required to be installed in lieu of the overhead *connection service*.
- d) If the boundary of a *survey strata* lot area is greater than four (4) hectares is realigned and the realignment results in an existing overhead or underground *connection service* traversing another *freehold* or *survey strata* lot than the one it is servicing then the *connection service* is required to be re-routed off that lot. Refer also to [clause 2.9](#).
- e) Where *survey strata* lots or *built strata* lots are created on a *freehold lot*, a main switchboard (MSB), suitable for supplying all of the *strata* lots, shall be established at the *point of supply (connection)*. Refer also to [clause 4.1.5.1](#) for addition *developer / consumer* obligations.
Consideration shall be given to the maximum permissible consumer mains cable route length from the *point of supply (connection)* to the meter position. Refer to [WA Service and installation requirements \(WASIR\)](#) sections 11 and 12.
- f) *Survey strata* lots that have an existing overhead *connection service* shall be converted underground where the boundary(s) are relocated.
- g) WAPC's model condition (E3) and associated advisory notes relate to 'service access rights' for *strata schemes*. This condition requires that a one (1) metre wide 136C easement is applied to ensure access to the *connection service* and electrical *point of supply (connection)* through other *survey strata* lot/s where building connections do not exist or access cannot be obtained via common property. Refer to [clause 5.3.15](#).
- h) Where details of a proposed *survey strata development* on a *freehold lot* is known at the time of *subdivision*, the design load shall be determined in accordance with [clause 5.3.3.5](#) and the *connection service* and *point of supply (connection)* may be located as part of the *subdivision* to suit the future *development*.

2.2.4 Amalgamations

Lot(s) created by the amalgamation of, one (1) lot into another or two (2) or more lots are considered a new lot. A new underground *connection service* is required in accordance with [clause 2.2.2.3](#) and [clause 2.2.3.4](#) unless either:

- a) The WAPC apply conditions that prevent the lots being sold or developed without further *subdivision*; or
- b) The amalgamated lot is being created to allow the immediate *subdivision* into smaller lots and this is formally confirmed and guaranteed to the satisfaction of Western Power.

2.3 Three phase infrastructure

Due to increasing demand and evolving nature of energy usage, all new *subdivisions* shall be serviced with three-phase *electricity infrastructure* to each lot within that *subdivision*.

Where single-phase *electricity infrastructure* is the closest to a proposed *subdivision*, but three-phase *electricity infrastructure* is available within 500 metres of the *development*, the *developer* shall extend the three-phase *electricity infrastructure* to each lot within the *subdivision*.

Where single-phase *electricity infrastructure* is the closest and three-phase *electricity infrastructure* is within one (1) kilometre from the proposed *subdivision*, Western Power may elect, where there is a demonstrated benefit to the network to extend the existing three-phase network *infrastructure* to within 500 metres of the *subdivision*.

The *developer shall* then be required to extend the *infrastructure* over the last 500 metres to the *subdivision*. Western Power's contribution to the *works* would be based on the value of the benefit to the network.

For some urban fringe and country areas it may be technically impracticable to establish three-phase *infrastructure*. In these situations, the *developer should* contact Western Power to consider other possible options or alternative suitable supply arrangements inclusive of stand-alone power (SPS) / hybrid systems.

2.4 Subdivision headworks

The community recognizes the benefits of underground *electricity infrastructure* including improved aesthetics, and a safer and more reliable power supply. To meet community expectations, Western Power will extend new headworks in underground for urban and urban fringe areas.

Western Power will advise of any required headworks as part of the DIP and may also require a binding guarantee from the *developer* for any temporary *works* (<5 years) within those urban fringe and country areas.

2.5 Increasing existing overhead transformers and switchgear

Western Power will not increase the capacity of existing aerial transformers to meet the needs of *subdivisions*. This means underground cables, ground mounted switchgear and transformers *shall* be installed to supply the *subdivision*.

The *reinforcement* and *infrastructure works* associated with the proposed underground *electricity infrastructure* will need to be completed to meet the *subdivision's* capacity requirements and any planned or logical future growth.

2.6 Network capacity augmentation

Network capacity at each lot of a *subdivision* may be limited by the existing capacity of the network. The *developer* may be required to *reinforce* the network to achieve the design capacity of its proposed *electricity infrastructure* in the *subdivision*.

Major *subdivisions*, e.g. multiple stage large residential and large industrial *subdivisions* for resource processing plants, may have substantial capacity requirements. These *subdivision* loads may require new distribution *infrastructure*, and in the event of significant accumulated loads a new zone *substation* and new transmission *infrastructure* to provide the network capacity needed to supply the *subdivision*.

The *developer must* ensure that a *site* for the zone *substation* and associated buffer zones, is provided at no cost to Western Power. In addition, major upgrades to the existing HV network (e.g. construction of a new feeder may be required to service these *subdivisions*). Typically, Western Power will pay for the transmission works, i.e. 66kV and above including *infrastructure* and the zone *substation*. The *developer* is required to pay for any distribution augmentation.

The *developer must* consult Western Power at the *subdivision development* planning stage to ensure transmission and distribution *infrastructure reinforcement* is considered. It *should* be noted that the need for a new zone *substation* will vary with different *subdivisions* and locations.

Note, in urban fringe, remote and country areas, there may be constraints on the existing network such as network capacity and geographical distance from a zone *substation*. These can have a significant effect on the cost of extending and reinforcing distribution network.

These costs can be substantially higher than would be experienced for a similar level of *reinforcement* within a metropolitan network. The *developer* is advised to consider and include these additional costs in the feasibility study stage of the *development*.

2.7 Future transmission infrastructure equipment

Currently, the installation of underground *electricity infrastructure* is limited to the distribution system. While the technology exists for underground transmission power lines, i.e. power lines operated at 66kV and above, it is generally cost prohibitive.

Areas constructed with distribution underground *electricity infrastructure* may need to establish overhead transmission *infrastructure* through or install a new zone *substation* within the area. Western Power will advise the *developer* of the potential network corridor and zone *substation* locations at the time of subdividing. The *developer must* inform prospective *land* purchasers of Western Power's future *development* requirements.

Where Western Power has advised of future transmission *infrastructure* the *developer must* also ensure this is shown on all marketing documents and other materials provided to prospective *land* purchasers.

2.8 Treatment of existing assets within or adjacent to a subdivision

The following *shall* apply to all *land development* proposals, including but not restricted to all *subdivisions*, amalgamations and *freehold / strata* title *developments*.

The treatment of existing Western Power overhead *electricity infrastructure* that traverse or are adjacent to such *development* proposals *shall* be as prescribed in following sub-clauses.

2.8.1 Transmission power lines (operating at 66KV or above)

Transmission *electricity infrastructure* and lines are those that operate at 66,000 volts and above.

Where overhead transmission *electricity infrastructure* traverses or is adjacent to a *development*, generally the *electricity infrastructure* can remain in situ. However, an easement in gross is to be provided for the *infrastructure* at the proponent's cost.

The *electricity infrastructure* is to be considered adjacent to the *development* if the *development* is within the prescribed safety clearance zone (the easement) applicable to the particular transmission equipment or line. This is determined in accordance [AS/NZS 7000](#) 'Overhead line design – detailed procedures'.

There may be circumstances where it is technically impractical for the overhead transmission *electricity infrastructure* to remain in situ. Each case will be considered on its merits by Western Power.

2.8.2 Distribution infrastructure that traverse lots of ten (10) hectares or less

For an overhead distribution *electricity infrastructure* that traverses lots of ten (10) hectares or less within the *development*, the following *shall* apply:

2.8.2.1 Rebuild underground through the development in road reserves

The overhead distribution *electricity infrastructure shall* be rebuilt in underground construction within gazetted road reserve(s) through the *development*.

2.8.2.2 Relocate off the development

Where no gazetted road reserves are created as a part of the *development* or the gazetted road reserves that are created are deemed not suitable by Western Power, then the overhead distribution *electricity infrastructure* is to be relocated entirely off the *development* and rebuilt in underground construction.

Where none of the following circumstances exist, then the overhead *electricity infrastructure* can be rebuilt in overhead construction where:

- a) The surrounding *electricity infrastructure* is already installed underground;
- b) The local government authority has a requirement for underground *electricity infrastructure* in the area;
- c) There is an underground *scheme* proposed or in place for the area;
- d) Clearing required for overhead construction would cause unacceptable environmental impact or excessive maintenance costs to Western Power; or
- e) An objection has been made by an affected member of the community and has not been resolved.

Note: Whenever *electricity infrastructure* is to be relocated off the *development*, it is the responsibility of the *developer* / proponent to undertake all negotiations with all affected property owners, members of the community and relevant government departments and agencies. Western Power will not be an active participant in these negotiations.

2.8.2.3 Rebuild underground through a development outside of road reserves

In circumstances where, Western Power's deems, it is technically impractical to achieve one of the previous two (2) options, the overhead distribution *electricity infrastructure* may be rebuilt in underground construction through the *development* outside of gazetted road reserves.

In such circumstances, the rebuilt underground *electricity infrastructure* *must* be installed within one (1) metre of a property boundary if the area of the lot is less than two (2) hectares. Where the *developer* considers the required underground *infrastructure* alignment to be technically impracticable, they *shall* submit an alternative solution to Western Power for consideration.

Where the area of the lot is two (2) hectares or greater the underground *electricity infrastructure* may be installed away from the property boundary provided all of the following conditions are met:

- a) A local government authority has restricted the construction of buildings on the lot to a local government authority nominated building envelope;
- b) The building envelope is at least two (2) metres from the underground power line easement;
- c) Cabling is installed in ducts to Western Power's requirements;
- d) Spare duct(s) are installed to Western Power's requirements;
- e) Permanent above ground markers are installed along the cable route to Western Power's requirements; and
- f) Cable pulling pits are installed to Western Power's requirements along the spare duct route if the duct length is in excess of the cable drum length.

In all cases a [Planning and Development Act 2005](#) Section 167 easement is to be provided at the *developer's* cost. The section(s) of the installed underground *electricity infrastructure* through the *development* off gazetted road reserves is to be kept to an absolute minimum.

To minimise the impact of undergrounding the overhead *electricity infrastructure* on adjacent *land* owners, the line to cable transition pole and its stay wire(s) are to be located within the *development*. The transition pole location within the *subdivision* *must* minimise the impact on future landowners, i.e. not block driveways, PAWs, etc.

In general, the transition pole *shall* be located within 0.5m of the lot boundary. Stay wire(s) location(s) *shall* be determined and coordinated with affected property owners, relevant government agencies and the road authority.

2.8.2.4 Rebuild overhead through a development outside of road reserve

In circumstances where in Western Power's deems it technically impractical to achieve one (1) of the previous three (3) options, the overhead *electricity infrastructure* may be rebuilt in overhead construction through the *development* outside of gazetted road reserves provided:

None of the following circumstances exists:

- a) Where any appropriate authority/government agency has a requirement for new *electricity infrastructure* in the property to be underground;
- b) Where clearing required for overhead or underground construction would cause an unacceptable environmental impact;
- c) Where an objection has been made by an affected member of the community and has not been resolved; and

All of the following conditions are met:

- d) The lot size is four (4) hectares or larger;
- e) The edge of any existing or proposed building or building envelope for the lot is at least ten (10) metres from the centre line of the overhead *electricity infrastructure*;
- f) Ongoing ready access will be provided to the *electricity infrastructure* for construction, operation and maintenance; and
- g) Vegetation *shall* be cleared and kept clear from the *electricity infrastructure* in accordance with Western Power's network requirements;

And either:

- h) The overhead *electricity infrastructure* runs parallel to a roadside boundary;
 - i) The overhead *electricity infrastructure* is within ten (10) metres of the roadside boundary;
- Or
- j) The overhead *electricity infrastructure* runs parallel to the lot boundary;
 - k) The local government authority requires a firebreak of minimum width three (3) metres in the lot along the boundary, and
 - l) The overhead *electricity infrastructure* is located between the lot boundary and the firebreak.

Note: Whenever a power line is to be relocated within a property, it is the responsibility of the proponent to perform all negotiations with, and obtain the approval of, affected members of the community and relevant government authorities/ agencies and bodies. Western Power will not be an active participant in these negotiations.

Formal advice of network requirements will be provided via the DIP.

2.8.2.5 Leave in-situ

In circumstances where, Western Power deems, it technically impractical to achieve one (1) of the options outlined in [clauses 2.8.2.1](#), [2.8.2.2](#) or [2.8.2.3](#) then the existing overhead distribution *electricity infrastructure* can remain in situ provided it meets the conditions stated in [clause 2.8.2.4](#).

Formal advice of network requirements will be provided via the DIP.

2.8.3 Distribution infrastructure that traverse lots larger than ten (10) hectares

For overhead distribution *electricity infrastructure* that traverses lots of greater than ten (10) hectares within the *development*, the overhead *electricity infrastructure* may remain in situ provided that no building envelope or structure remains or is proposed to be within the boundaries of the *infrastructure* easement. Where the easement is implied, the easement width *shall* be a minimum of ten (10)m from the centreline of the overhead infrastructure”

There may be circumstances where it is technically impractical for the overhead electricity infrastructure to remain in situ. Each case will be considered on its merits by Western Power.

2.8.4 Cost responsibilities

The cost of all *works* associated with relocating or undergrounding distribution *electricity infrastructure*, including vegetation clearing and the cost for provision of easements etc, is the responsibility of the *developer* / proponent.

Note: In some cases the replacement of an aging overhead *electricity infrastructure* with underground construction may result in a partial cost benefit to Western Power. Where Western Power determines that this is the case it will contribute to the cost of underground construction, equivalent to the partial cost benefit.

2.8.5 Basic underground philosophy

This policy formalises the long-standing practice, embodied in *land development* clearance conditions previously agreed between Western Power and Department of Planning.

The philosophy is that as *land* is developed, there is a need to maximize *land* utilisation which often results in conflict between the *land* owner and the safe operation of the overhead *electricity infrastructure*.

This requirement is intended to mitigate the following principal problems:

- Risk to public safety and security of supply. Pressure to maximize *land* usage can result in unregulated construction under or close to overhead *infrastructure* (e.g., metal sheds, sea containers and stored equipment). These often breach safety clearances from overhead *infrastructure*, which not only jeopardises the security of the supply, but also more importantly, poses a serious risk to public and personal safety.
- In built-up areas, building setback requirements have been progressively relaxed since the introduction of Department of Planning residential design codes 'R Codes.' This allows construction of buildings much closer to property boundaries than was previously permitted. In many cases, new setbacks would permit buildings to be constructed within the safety clearance zone (easement) of transmission lines that are located on their normal road reserve alignment. The conditions imposed by the easement would require such buildings to be located outside of this zone. Similarly, the safety clearances from overhead distribution lines may affect or impose construction constraints on adjacent buildings or defined building forms of future buildings. Refer to [clause 2.8.6.2](#).
- Increased difficulty of access for operation and maintenance. *Development of land* usually results in the construction of fences, gardens, walls and other improvements. These can cause difficulty in gaining access to the *electricity infrastructure* for operational or maintenance purposes if not effectively managed.
- Satisfaction of public expectations. There is a growing public expectation that overhead *electricity infrastructure* will be removed from properties or placed underground particularly at the distribution voltage level. Implementing this at the *subdivision* stage simplifies this and ensures a user pay outcome.

Note: The requirements for transmission and distribution *electricity infrastructure* differs for the follows reason:

In the case of transmission *infrastructure*, it is generally cost prohibitive to relocate or underground this type of equipment. The only alternative is to protect such *infrastructure* with an easement.

As there are significantly fewer transmission *infrastructure* installations (and are more important in terms of the network) compared to distribution *infrastructure* installations it is practical to patrol transmission lines on a regular basis to ensure that easement conditions are being complied with.

Subdivision planners are therefore advised to discuss with Western Power the effects of transmission *infrastructure* on *land* use at the preliminary planning stage.

In the case of distribution *infrastructure*, easements are a limited practical deterrent but are required to provide Western Power with the appropriate authority to have *infrastructure* infringements addressed or removed.

With such a vast network of distribution *infrastructure* throughout the State, it is not possible to patrol all distribution *infrastructure* to ensure that easement conditions are being complied with. Easements are often forgotten or ignored by property owners, hence the need for relocation or undergrounding of distribution overhead *infrastructure*. Lot sizes of ten (10) hectares was chosen as the limit below which the pressure to maximise the available *land* begins to jeopardise the integrity of an overhead distribution *infrastructure*.

2.8.6 Relocation or removal of existing poles adjacent to subdivisions

The following sub-clauses *shall* be read in conjunction with Western Power's:

- Overhead line design manual (OHLDM)
- [Utility providers code of practice \(UPCoP\)](#)
- Guideline for placement of power poles within road reserves in built-up areas.

Note: Where relevant network information is contained within an unpublished document the required specific information will be made available via the DIP.

2.8.6.1 Relocation

a) Lots with less than a thirty (30) metres street frontage:

Poles *shall* be relocated to align with lot boundaries or removed / replaced with underground *infrastructure*. Where it can be demonstrated to Western Power by the *developer* that an existing pole will not hinder or affective lot usage, Western Power may permit the pole to remain in situ.

b) Lots with a street frontage or frontages greater than thirty (30) metres:

Poles may remain in situ where they do not hinder general or driveway access. The *developer must* also be able to demonstrate the provision of at least twenty (20) metres of suitable flat frontage for each affected lot.

2.8.6.2 Removal

Developers shall consider the following in determining the need to replace existing overhead with underground *electricity infrastructure* as an addition to project *Infrastructure works* scope.

- a)** The effect that *subdivision works* including changes to ground levels and structures such as retaining walls have on safety clearances to existing Western Power overhead *infrastructure*; and
- b)** Constraints that overhead distribution *infrastructure* may impose on adjacent building *developments* as referred to in [clause 2.8.5](#).

Safety clearance considerations include:

- c)** WHS (General) Regulations 1996 where working in the vicinity of overhead power lines; and
- d)** AS/NZS 7000 clearance requirements for transmission / distribution *infrastructure* from structures.

Refer to [clause 2.2.3.3](#) for undergrounding requirements of existing overhead *electricity infrastructure* adjacent to *survey strata subdivisions*.

2.9 Existing overhead network assets within road reserves and properties

Underground *electricity infrastructure* provides significant benefits for both network operators and the community through enhanced levels of safety and supply reliability together with improved access and aesthetics.

In addition to the above, construction of new overhead *electricity infrastructure* within or adjacent to properties:

- a) Restricts effective *land* use, building construction and vegetation propagation, conservation;
- b) Requires ongoing access to the overhead *infrastructure* for maintenance and operational purposes;
- c) Requires either the retention or extension of safety clearance zones in and around *electricity infrastructure*; and
- d) May be contrary to Department of Planning or local government criteria.

2.9.1 Within road reserves

New overhead construction is deemed unacceptable in existing underground areas or in areas that are being or will be provided with underground *electricity infrastructure* within the next ten (10) years. Temporary (less than twelve (12) months) overhead *electricity infrastructure* may be permitted for *redevelopment works*.

For all types of extensions or augmentation *work*, excluding rectifications on existing network deficiencies (E.g. power quality or overloaded transformers upgrades) underground construction is to be installed.

Rectification exemptions for existing network deficiency situations may apply in the following situations:

2.9.1.1 City or town areas

- a) **Overhead distribution line extensions:** - not acceptable, unless required on a temporary basis for *subdivision development work*.
- b) **Upgrades of existing overhead distribution lines:** - acceptable, provided the *work* does not involve changes beyond the immediate requirements of the upgrade or alteration.
- c) **Relocations of existing overhead distribution lines:** - acceptable for projects involving up to ten (10) poles in one location (E.g. construction of a roundabout). However, overhead distribution relocations over distances greater than 200 metres are not deemed acceptable (E.g. road widening).
- d) **Pole top transformer (PTT) installations:** - New PTT installations on existing poles are not acceptable. Upgrading existing PTTs is acceptable but only when a suitable *site* for a ground-mounted transformer is not available.
- e) **Pole top equipment installations (e.g. pole top switches, reclosers, capacitors):** - Acceptable, provided the installation is within the principles of [clause 2.9.1](#) and the *work* does not involve an extension of the overhead *electricity infrastructure*. Existing drop out fuses (DOF's) may be replaced in situ but relocation of existing DOF's *should* be avoided without thorough assessment of the impact on *consumer* aesthetics.

DOF's *must* not be installed for new transformer installations within city or town areas. RMU's *shall* be used to supply new installations within city and or town areas.

2.9.1.2 Semi-rural or city fringe areas

- a) **Overhead distribution line extensions:** - acceptable only when underground construction cannot be used due to and because of hard rock or obstructions.
- b) **Upgrades of existing overhead distribution lines:** - acceptable.
- c) **Relocations of existing overhead distribution lines:** - acceptable.
- d) **Pole top transformer installations:** - it is acceptable both to install new PTTs on existing poles and to upgrade existing PTTs.
- e) **Pole top equipment installations (e.g. Pole top switches, DOF's, reclosers, capacitors):** - acceptable.

2.9.1.3 Rural areas

- a) **Overhead distribution lines extensions:** - acceptable.
- b) **Upgrades of existing overhead distribution lines:** - acceptable.
- c) **Relocations of existing overhead distribution lines:** - acceptable.
- d) **Pole top transformer installations:** - it is acceptable both to install new PTTs on existing poles and to upgrade existing PTTs.
- e) **Pole top equipment installations (E.g. pole top switches, DOF's reclosers, capacitors):** - acceptable.

2.9.1.4 Subdivision areas (developments)

As prescribed by this UDS manual for new *subdivision developments*.

2.9.1.5 Connections

For advice on [Deciding between overhead or underground network construction](#) and clause 12.2.1.2 of the [WA Service and installation requirements \(WASIR\)](#).

2.9.1.6 Summary

Areas	Types of overhead constructions				
	Extensions	Upgrades	Relocations	Pole top transformers	Pole top equipment
City or town	X ⁽¹⁾	✓ ⁽²⁾	✓ ⁽³⁾⁽⁶⁾	X ⁽⁴⁾⁽⁶⁾	✓ ⁽²⁾⁽⁶⁾
Semi-rural or city fringe	X ⁽⁵⁾	✓	✓	✓	✓
Rural	✓	✓	✓	✓	✓
Existing or to be undergrounded in the next ten (10) years	X ⁽¹⁾	X	X	X	X

1) Only acceptable on temporary basis for *subdivision development work*.
 2) Acceptable, providing the *work* does not involve changes beyond immediate requirements of upgrade or alteration.
 3) Acceptable for projects involving up to ten (10) poles in one location (e.g. construction of roundabout). However, not acceptable for line relocations over distance greater than 200 metres, (e.g. due to road widening).
 4) Upgrading existing PTTs is acceptable but only when a suitable *site* for a ground-mounted transformer cannot be found.
 5) Only acceptable when underground cables cannot be installed because of hard rock / obstructions.
 6) Exemption for rectification for existing network deficiencies

Overhead constructions are - ✓ - acceptable ✗ - not acceptable

Table 1: Acceptable overhead construction type

Note: for the purposes of [clause 2.9.1](#), and table, the *land* use terms have the following meanings:

- a) **City or town areas:** - as defined by the [WA Service and installation requirements \(WASIR\)](#) clause 12.2.2.
- b) **Semi-rural or city/town fringe areas:** - areas not covered by a), c) and or d).
- c) **Rural areas:** - areas where the average lot size is greater than ten (10) hectares.
- d) **Subdivisional areas:** - areas subject to *land subdivision*.

2.9.2 Within properties

The construction of new low voltage overhead *electricity infrastructure* is no longer permitted within private properties and is to be restricted, avoided wherever possible for high voltage networks.

Property owners are required to extend their low voltage installation underground to the property boundary in support of their specific requirements for *land* use.

Where a *redevelopment* is proposed the requirements of this UDS manual *shall* apply.

Replacement of like-for-like assets is not considered an upgrade of those assets and is therefore to be managed in accordance with [clause 2.8](#).

The following sub-clauses prescribe acceptable situations where Western Power may permit the construction or upgrade of overhead *electricity infrastructure* outside a road reserve and within private property:

2.9.2.1 New overhead construction

- a) New low voltage overhead *electricity infrastructure shall* not be installed inside properties.
- b) New high voltage overhead *electricity infrastructure shall* not be installed inside a lot less than ten (10) hectares.
- c) For a lot greater than ten (10) hectares, new overhead high voltage *electricity infrastructure* may be installed where:
 - I. the edge of the existing or proposed building or building envelope on the lot or adjacent lot is at least ten (10) metres away from the centre line of the overhead distribution line; and
 - II. there is no significant increase in visual pollution from the area around the existing or proposed building or building envelope; and
 - III. where clearing is required for overhead or underground construction there is no unacceptable environmental impact; and
 - IV. there is no unresolved objection made by a State or local government agency or affected member of the community.

2.9.2.2 Upgrading existing overhead assets

- a) For a lot less than ten (10) hectares, existing overhead *electricity infrastructure* inside private properties may be upgraded, where the requirements of [clause 2.8](#) is satisfied and:
 - I. there is no increase in the width of the existing network asset corridor;
 - II. there is no significant increase in restrictions on *land* usage;
 - III. there is no significant need or increase in Western Power operational or maintenance activities; and
 - IV. There is no significant impact or increase in visual pollution, i.e. blocking out views.
- b) For a lot greater than ten (10) hectares, existing overhead *electricity infrastructure* inside private properties may be upgraded where approved by Western Power however;
- c) The requirements of [clause 2.9.3.1](#) *shall* apply.

2.9.2.3 Summary

Network asset / type	Option	Condition
New or upgraded LV Line	Not permitted	Na
New or upgraded HV Line	Not permitted	Lot size < ten (10) hA
	Permitted	Lot size > ten (10) hA Building envelope > ten (10) metres from centre line No increase in visual pollution No clearing required
New or upgraded pole top transformer	Permitted	Outside a town or metropolitan area
New network service cable	Permitted	Lot created prior to 2001 Outside a town or metropolitan area <i>Consumer</i> supply is no greater than a <i>standard connection service</i> Cable and pole limitations/requirements are achieved
Upgraded service cable	Permitted	Lot created prior to 2001 Existing connection <i>Consumer</i> supply is no greater than a <i>standard connection service</i> Cable and pole limitations/requirements are achieved
Notes		
Refer to Section 2 for <i>freehold subdivision</i> specific requirements		
Refer to the Western Power technical requirements for service lead and pole limitations / conditions.		

Table 2: Overhead connections within existing properties

2.9.3 Connection service from overhead transformers located within a property

2.9.3.1 Overview

Significant benefits are achieved where a *connection service* is provided from the road reserve. For example:

- a) Transformers installed in the road reserve create an LV network and can supply a higher number of *consumers* improving utilisation rates.
- b) Access to transformers for maintenance and operational tasks via the road reserve reduces the impact and inconvenience on connected *consumers*.
- c) Issues arising from *connection services* provided to neighbouring properties across property boundaries are resolved.

Note: Overhead *electricity infrastructure* and associated *connection services* installed within private property *must* be relocated to the road boundary or undergrounded when a property is subdivided.

2.9.4 Conditions

2.9.4.1 Connection service from within a property

Connection services from transformers installed inside properties *shall* be provided only if all of the following conditions are satisfied:

- a) The *work* can be performed without breaching the requirements of this UDS manual including but not limited to [clauses 2.8](#) and [2.9](#); and
- b) The owner of the property where the transformer is located is informed, and formally acknowledges, that they *shall* cover the cost of relocating any *connection services* to neighbouring property (ies), if the property is subdivided.

2.9.4.2 Road connections

Connections from overhead transformers located inside properties to *service pillars* installed in the road reserve may only be provided when all of the following conditions are satisfied:

- c) Conditions a) to b) of [clause 2.9.4.1](#) above are satisfied; and .
- d) The owner of the property where the transformer is located does not object to the connection. (If they do not agree to the connection, a new transformer *shall* be installed in a suitable location, either overhead or underground.)

2.9.4.3 Connection services to adjacent properties

Connection services may be provided from a transformer located inside an adjacent property only if all of the following conditions are satisfied:

- e) Conditions a) to d) of [clause 2.9.4.1](#) and [2.9.4.2](#) above have been satisfied;
- f) A low voltage network cable between the transformer and a *service pillar* for the adjacent property is installed in the following manner:
 - I. By using the shortest practical direct route between the transformer pole and property boundary;
 - II. The maximum cable route length *shall* not exceed thirty (30) metres and not extend more than twenty (20) metres from the transformer pole;
 - III. The cable is installed in HD conduit, one (1) metre deep and protected with slabs; and
 - IV. An easement over the cable route is *preferred* but not essential.
- g) The *service pillar* *should* not be installed next to the transformer pole if it is not required to service the property on which the transformer is located. However, if a *service pillar* is installed, it *should* be used as a termination point for the LV cable to the adjacent property;.
- h) The *service pillar* for the adjacent property *should* be located just inside this property (approx. 300 mm from the property boundary); and
- i) The *connection service* to the adjacent property *should* be provided only from the transformer pole. It *should* not be provided from an existing LV overhead distribution line located inside another property.

2.9.5 Connection service method

The *consumer connection service* *shall* be provided from the *service pillar* in accordance with [Distribution construction standards handbook Part 5, \(DCSH\)](#) drawing U 19/3.

3. General charging policies

3.1 Distribution headworks, reinforcement and interface works

All distribution headworks charges, *reinforcement* and *interface works*, including network extensions, removals, relocations or upgrades, external to *subdivision*, shall be fully funded by the *developer*. This work may include construction of new HV feeder(s) from a zone *substation*, distribution transformers, LV networks, etc, for the *subdivision*. The modification of network *electricity infrastructure* may also include the relocation of transmission line protection pilot cables affected by the *subdivision works*.

3.2 SCS residential subdivisions in existing underground areas

Where Western Power undertakes the *works*, the *developer* will be charged the estimated full cost of the design and construction for all the *electricity infrastructure* installation, including trenching and laying of cable. The *developer* by agreement with Western Power may undertake their own trenching and cable laying in accordance with the installation requirements ([section 6](#)) in this UDS manual. Western Power's trenching and cable laying costs will be deducted from the original *quotation*.

Refer to [clause 1.6](#) 'Purpose' regarding flexibility of responsible parties to undertake some smaller *subdivision electricity infrastructure* works.

3.3 SCS residential subdivision in existing overhead areas

For simple (single) *connection service subdivision developments* located within an existing overhead distribution network area, the *developer* shall be charged for the full cost of the *electricity infrastructure* design and construction, including *reinforcement* and *interface works*, trenching and laying of cables.

Note: Western Power, at its discretion, may apply fixed price rates where a *strata subdivision* satisfies the requirements of Western Power's [Overhead to underground conversion standard \(OHUG\)](#).

Note: A *developer* may seek authority from Western Power to undertake elements of this *work* (excluding *interface works*) where the *subdivision* consists of *freehold lots* and civil construction.

3.4 CCS residential subdivision lots of 1,000m² or less in urban areas

The *developer* is responsible for the design, supply, installation and testing of the *subdivision electricity infrastructure* ([clause 4.3.3](#)) and payment of Western Power's *quotation* for the associated *infrastructure* and *interface works* ([clause 4.3.2.10](#)).

To provide equity between *developments*, a mandatory financial residential *subdivision* high voltage *scheme* (HV pool) is managed and maintained by Western Power for and across the land development industry. Applies to all CCS residential *subdivisions* with lot sizes of 1000m² or less. Refer to [clause 3.8](#).

For each lot within an eligible residential *subdivision*, an after diversity maximum demand (ADMD) per kVA system charge, is levied on the *developer* and paid into the HV pool. The pool reimburses the scheduled cost of the required and installed high voltage *infrastructure* for that *subdivision*.

The [HV system charge](#) is published via Western Power [website](#).

The provision and installation of low voltage (LV) *infrastructure* and street lighting does not form part of the HV pool mechanism and is therefore to be paid for in full by the *developer*.

The residential *subdivision* HV pool does not include 33kV *subdivisions*. Design and construction of 33kV *electricity infrastructure works* shall be fully funded by the *developer*.

Refer to [clause 3.8](#) for additional information on the HV pool policy and operation.

3.5 CCS residential subdivision urban /rural & special rural lots < 1000m² (broadacre)

The HV pool does not apply to residential *subdivision* types with lots larger than 1000m² as the provision of *electricity infrastructure* is not consistent with the HV pool principles and or operation.

3.6 Commercial and industrial subdivisions

The *subdivision* HV pool does not apply to industrial and commercial *subdivisions*.

Where a *subdivision* has a mixture of residential, commercial and industrial *freehold lots*, the *subdivision* is considered a commercial or industrial *subdivision*, where the total design load of the commercial and industrial lots is greater than 50% of the total design load of the *subdivision*.

Likewise a *development* would be considered as a residential *subdivision* where the total design load of the residential lots (not exceeding 1000m²) is greater than 50% of the total design load of the *subdivision*.

For the purpose of assessment, schools are considered to be commercial lot.

3.7 Changes to existing assets that require alteration

The cost of *works* associated with removing, relocating or undergrounding transmission or distribution *electricity infrastructure* including zone *substations*, distribution *substations*, power lines, vegetation clearing and the cost for providing easements etc, is to be fully funded by the *developer*.

For residential *subdivisions* with lot size not exceeding 1000m² the *subdivision* HV pool *shall* be applied to the undergrounding of one (1) HV overhead distribution line that traverses the *subdivision*. The undergrounding of any additional overhead distribution *infrastructure* is to be fully funded by the *developer*.

3.8 High voltage pool policy and operation

3.8.1 Background history

Western Power introduced the high voltage (HV) pool in 1999. The HV pool mechanism was developed as a joint initiative between The Urban Development Industry of Australia (UDIA) and Western Power.

Due to the use of standard size components and for network planning purposes, the HV *electricity infrastructure* of a *subdivision* often provides capacity in excess of that required by the *subdivision*.

It was often the case, that the first *developer* in an area paid for the entire HV *electricity infrastructure* required to service the area. The excess capacity was then utilised by subsequent *developers* without a contribution to the cost.

The cost of low voltage (LV) *electricity infrastructure* of a particular *subdivision* is intricately linked to the need of that *subdivision*; and its capacity is mostly used by that *subdivision*.

The HV pool mechanism was introduced as part of Western Power pricing strategy to address inequities between *developers* in the application of the Western Power's full cost policy for providing *subdivision electricity infrastructure*.

Initially, two (2) HV pools were established, E.g. 'residential HV pool' for residential *subdivisions* of lot sizes not more than 1000m² and 'commercial/industrial HV pool' for commercial and industrial *subdivisions*. The 'commercial/industrial HV pool' failed to achieve an equitable result and it was subsequently agreed with UDIA to discontinue the schemes use.

The 'residential HV pool' provides the land development industry with a cost equalising mechanism for *electricity infrastructure* for a residential *subdivision* UDS.

The provision of *electricity infrastructure* to new *subdivisions* remains a full cost policy; however, Western Power has agreed to maintain and operate the 'residential HV pool' for residential *subdivisions* provided it remains cost neutral to Western Power.

3.8.2 High voltage pool administration

Western Power administers the 'residential HV pool' and, by agreement with UDIA, recovers the cost of administering the HV pool by recouping 4% of the HV pool charge ([clause 3.8.6](#)) of each proposed *subdivision*.

Western Power's administration work on the HV pool includes:

- Day-to-day maintenance of the *scheme*.
- Training of HV pool administrators and industry users.
- Management of the pool integrity including auditing.
- Financing the inherent lagging nature of the HV pool income, and
- Provision of I.T. support to develop and maintain the required technology systems.

The administration fee is collected by adding 4% to the system charge each time it is reset. This fee is not to be included in the HV pool but is directed to a separate account to pay for Western Power's administration of the HV pool.

The operation of the HV pool does not create the relationship of:

- employer and employee;
- *developer* and *contractor*;
- partnership; or
- joint venture;

and between Western Power and the *developer* in respect of a UDS.

3.8.3 System charge

The system charge is the cost per kVA (\$/kVA) to fund HV pool payments. Refer to [clause 3.8.7](#).

The system charge in \$/kVA is inclusive of the four (4)% HV pool administration fee. The latest [HV system charge](#) is published via Western Power's [website](#).

The system charge is required to be reset either every six (6) months or when the HV pool balance is trending away from neutrality.

3.8.4 Subdivision design load

The design load used to calculate the system charge for the proposed *subdivision* includes all residential and commercial/industrial design loads within the WAPC *subdivision* boundary. The design load requirements are in [clause 5.3.3](#).

3.8.5 Schedule of rates

Western Power's design process and cost estimating package is based upon a suite of compatible units (CU). Each CU is a physical network component broken down into its individual parts with associated estimated material cost and estimated installation costs.

The schedule of rates (SOR) for each CU in the HV pool is estimated using the Western Power material costs and industry installation rates. The Western Power material costs are automatically updated weekly and the industry installation rates are updated by industry representatives annually.

The schedule of rates is used to calculate the HV pool payment of each *subdivision*. Refer to [clause 3.8.7](#).

3.8.6 HV pool charge

The HV pool charge of a proposed *subdivision* is the system charge multiplied by the proposed design load of that *subdivision* (\$/kVA x design load).

The HV pool charge is the amount paid into the pool by the *developer* for the provision of HV *electricity infrastructure* of a UDS for a proposed *subdivision* based on the 'design load' of that *subdivision*.

3.8.7 HV pool payment

The HV pool payment is the amount paid to the *developer* by the HV pool for the provision of the HV *electricity infrastructure* of a UDS for a proposed *subdivision*.

The HV pool payment is estimated by adding up the schedule of rates of all the CUs required for the HV *electricity infrastructure* of the UDS for the proposed *subdivision*.

3.8.8 High voltage pool mechanism

The HV pool mechanism is independent of the cost of installations. The HV pool mechanism equalises the HV *electricity infrastructure* costs by requiring *developers* to pay the HV pool charge into the HV pool and the HV pool then pays the *developer* the HV pool payment.

The net result is that the HV pool collects funds from *developers* who contribute under their share of HV *electricity infrastructure* and compensates *developers* who pay over their share, with the objective of keeping the HV pool in balance.

A complying residential *subdivision* that meets the economic criteria can participate in the HV pool. Refer to [clause 3.8.11](#).

The *developer* is to install both the HV and LV *electricity infrastructure* at their cost. However, the *developer* pays Western Power to carry out other works. The payment to Western Power includes the following:

- a) The payment from the *developer* to Western Power to carry out all the HV and LV *electricity infrastructure* installation works excluding civil works;
- b) The payment from the *developer* to Western Power to carry out works such as network *interfacing work*, or work requested by the *developer* and the DCR; and
- c) The net difference between the HV pool payment paid to the *developer* by HV pool and the HV pool charge paid into the HV pool by the *developer*.

$$\{\text{Payment} = (\text{other costs}) + (\$/\text{kVA} \times \text{design load} - \text{Total of SOR of CUs})\}.$$

A balance of HV pool payment will exist when the amount of payment is negative. The balance of HV pool payment is available to the *developer* only upon successful completion of the handover inspection for the *subdivision*.

3.8.9 Subdivisions and assets included in HV pool

The following *subdivisions* and assets are included in the 'residential HV pool':

- a) CCS *subdivisions* consisting of residential *freehold lots* not exceeding 1000m² processed through the WAPC *land development* process;
- b) The provision of the high voltage overhead and underground *reinforcement* and *interfacing works* necessary for the proposed *subdivision*, provided they are carried out in accordance with the requirements of Western Power's *subdivision* requirements and this UDS manual;
- c) The provision of underground HV *electricity infrastructure* within the proposed *subdivision* boundaries;
- d) The removal of one (1) HV overhead distribution line with transformers and pole top switches is included in the HV pool. However, the relocation or removal of any additional HV *electricity infrastructure* does not form part of the HV pool; and
- e) CCS connected *subdivisions* consisting of residential lots with a mixture of lots greater than and less than 1000m² of which the electrical loads for the lots exceeding 1000m² does not exceed 50% of the total *subdivision* load.

3.8.10 Subdivisions and assets excluded from HV pool

The following *subdivisions* are excluded from the 'residential HV pool':

- a) SCS residential *subdivisions* lots.
- b) CCS residential *subdivisions* with lots sizes exceeding 1000m².
- c) CCS residential *subdivisions* with a mixture of lots greater than and less than 1000m² of which the load of the lots exceeding 1000m² is more than 50% of the total *subdivision* load.
- d) *Subdivisions* supplied from or with a 33kV distribution network.
- e) HV *electricity infrastructure* that is not associated with the permanent supply of the design load such as more than one (1) HV network relocation, temporary installations or additional *works* required by Western Power for network *reinforcement*.
- f) The provision of low voltage (LV) *subdivision electricity infrastructure*.
- g) Extensive *substation earthing infrastructure* required to either temporarily substitute or reinforce an initial stage *subdivision* network *development*.

3.8.11 Economic test

The HV pool mechanism is designed to accommodate the vast majority of residential *subdivisions*, but there are some occasions where the inclusion of a *subdivision* into the HV pool would increase the system charge unreasonably, to the detriment of all other HV pool participants.

To manage this possibility two economic tests have been included in the HV pool process. A *subdivision* that fails in either one of the two following tests cannot participate in the HV pool.

The two tests are:

3.8.11.1 System charge impact test (Economic % Test)

The system charge impact test is a measure of the impact on the baseline system charge when the proposed *subdivision* is included in the HV pool.

It is determined by comparing the sum of the HV pool payment for the proposed *subdivision* and the baseline accumulated HV pool payment, divided by the sum of the proposed design load and the baseline accumulated design load with the baseline system charge (see formulae below).

$$\text{Baseline system charge} = \frac{\text{Baseline Acc HV pool payment}}{\text{Baseline Acc design load}}$$

$$\text{Economic \%} = \frac{(\text{Acc HV pool payment} / \text{Acc design load}) - 1}{\text{Baseline system charge}} \times 100\%$$

Where:

- a) Baseline Acc HV pool payment = Accumulated HV pool payment used in the determination of the last system charge reset;
- b) Baseline Acc design load = Accumulated design load used in the determination of the last system charge reset;
- c) Acc HV pool payment = Baseline Acc HV pool payment + HV pool payment of the proposed *subdivision*;
- d) Acc design load = Baseline Acc design load + Design load of the proposed *subdivision*;
- e) If the test result indicates that the system charge would increase by more than 2% (i.e. Economic % > 2%) then the proposed *subdivision* fails the system charge impact test.

3.8.11.2 Ratio test (Economic kVA Test)

The Economic kVA test is a measure of the cost effectiveness of providing HV *electricity infrastructure* for the proposed *subdivision*.

It is determined by comparing the HV cost per kVA (i.e. total of SOR of CUs divided by the design load) of the proposed *subdivision* with the baseline system charge (see formula below).

$$\text{Ratio} = \frac{\text{HV pool payment of the } \textit{subdivision} / \text{design load of the } \textit{subdivision}}{\text{Baseline system charge}}$$

If the result is equal to or greater than four (4) times (i.e. Ratio ≥ 4) then the proposed *subdivision* fails the ratio test.

3.8.12 Economic re-test

When the first stage of a *subdivision development* in an area or any stage of a CCS connected *subdivision development scheme* fails the economic tests, that stage cannot participate in the HV pool.

If within five (5) years or as otherwise agreed by the UDIA and Western Power (the committee) of the 'acceptance of quote' of that stage the *developer* completes further stages of the *subdivision*, or other *developers* construct *subdivisions* that are adjacent to the original *subdivision*, the economic tests *shall* be recalculated by using the combined HV pool payment and design load for all stages.

Developers shall be responsible for initiating any retesting of stages that have previously failed.

If the *subdivision* with the combined stages or *subdivisions* subsequently passes the tests, the HV pool will pay the *developer* the HV pool payment and the *developer shall* pay the HV pool the HV pool charge for the *subdivision* under re-test.

When the system charge is reset, no *subdivisions* that previously failed the economic tests are eligible for an economic re-test until a further stage of *subdivision* or another *subdivision* is connected. The economic re-test *shall* be done using the SOR appropriate at the time when the connection of a further stage of *subdivision* or another *subdivision* takes place.

3.8.13 Alternative generation and energy storage

When considering the total load capacity of a *subdivision* for the purposes of determining HV pool eligibility, the installation and connection of energy storage and or alternative generation *shall* not form any part of the total load calculation.

3.9 'Per-lot fee' system

The per-lot fee replaced the bond system and is applied to all *subdivision* energisation *quotations* issued by Western Power.

The per-lot fee provides funds for Western Power when called upon to undertake selected *subdivision works* resulting from *developer* default. A component of the fee will also be used to cover related administration costs. For example, debt recovery fees for defaults.

- a) Terms and conditions – These terms and conditions comprise the per-lot fee arrangements for *subdivision* energisation, unless specifically excluded or modified in writing by an authorised representative of Western Power.
- b) Applicability – The per-lot fee *shall* apply to *subdivisions* of five (5) or more *freehold titled lots*. The fee is applicable to residential and commercial lots and includes public open space. Un-serviced and balanced lots will not be charged.
- c) The per-lot fee has been revised to \$0 per-lot.
- d) Revision – The per-lot fee will be reviewed on an annual basis. At each review Western Power will assess the total cost of *land developments* defaulted in the prior twelve (12) month period. Western Power will set the revised fee to ensure reasonable risk is covered within the next twelve (12) month period.

- e) Payments – Where a per-lot fee *quote* supplied by Western Power payment options and deadlines will also be provided. Note that Western Power *must* receive the per-lot fee payment in full prior to enabling Western Power processes to proceed.
- f) Modifications or amendments – Western Power *shall* require an additional per-lot fee payment when a *developer* increases the number of lots being developed. The *developer* is required to finalise additional payment where required, in advance of *works* commencing, or if they have commenced, then before those *works* continue. Where a *developer* reduces the number of lots being developed, the *developer* can apply to Western Power for a refund of the appropriate per-lot fee payment.
- g) Early clearance – Payment of the per-lot fee *shall* not by itself secure early clearance. Early clearance will only be given after the design DCR has been accepted by Western Power ([clause 4.3.2.6](#)) and the *subdivision quote* and per-lot fee *quotations* where required have been paid in full and deposited plan accepted by Western Power. Refer also to [clause 4.1.5](#) – (Clearance request submissions), and [clause 6.2.3](#) for time to complete the *subdivision* where early clearance granted. For early clearance requests it is recommended that MGA Zone 50 files be provided with the deposited plan to assist with the later energisation process.

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4. Land development process

This section details:

- The *developer's* and Western Power's involvement in the WAPC's *land development* process; and
- Western Power's processes and responsibilities for both SCS and CCS *subdivisions*.

4.1 Western Australian planning commission subdivision process

The Planning and Development Act 2005 requires *subdivisions* plans to be approved by the WAPC.

Under the Act, the Registrar of Titles *shall* not create or register a 'certificate of title' for *land* within a *subdivision* plan, unless the title has WAPC endorsed approval. The high level process from the application of *subdivision development* through to issuing new titles is described in [clause 1.13](#).

4.1.1 WAPC subdivision process

- a) The *developer* submits an application for a *freehold* or *survey strata subdivision* to WAPC.
- b) WAPC will refer the application to Western Power, other service providers and relevant local government agencies to determine the conditions for the *subdivision development*.
- c) Western Power will review the existing network (both distribution and transmission) to determine the conditions to be recommended and applied to the *subdivision* application.
- d) Western Power will then submit their condition recommendations to the WAPC.
- e) WAPC will review all submitted utility condition recommendations and advise the *developer* accordingly.
- f) WAPC may reject or approve the *developer's subdivision* application, subject to all conditions being met.
- g) Western Power will also receive a copy of the approval and advise the *developer* of the appropriate next steps to meet the conditions, which may include an application for a *connection service*.
- h) The *developer* completes the *subdivision works* and fulfills all WAPC condition requirements .
- i) The *developer* requests clearance of the conditions from Western Power and other applicable utilities / agencies.
- j) On request Western Power will validate condition compliance and issue a 'clearance certificate' where WAPC's conditions have been met.
- k) The *developer* is to then submit the final deposited plan(s) to WAPC after collecting all 'clearance certificates.' The WAPC will endorse and approve the submitted deposited plans when satisfied those deposited plans are in accordance with the approved plans and the applied conditions.
- l) The *developer* can then apply to Landgate for titles.

An application guide for approval of *freehold* and *survey strata subdivision* is available from [WAPC's](#) website.

4.1.2 WAPC (Western Power) conditions for subdivision development

4.1.2.1 Reasons for imposing subdivision application conditions

As the responsible network operator and public utility, Western Power through the WAPC process, imposes conditions on a *subdivision* application to ensure:

- a) Lots being created have adequate underground *electricity infrastructure* and *connection services*;
- b) Potential impacts on Western Power’s network, both now and for the life of the *subdivision* are addressed;
- c) The network *electricity infrastructure* is extended in an appropriate and safe manner that satisfies the long-term requirements of the network and connected *consumers*;
- d) The extension of the network complies with applicable safety / legal requirements and network requirements;
- e) The electricity supply quality is suitable for all connected *consumers* to the surrounding network and individual *subdivision*;
- f) Future property owners are made aware of any restrictions of use and or nature of the service provider; and
- g) The reliability of the network is maintained or improved.

4.1.2.2 When will conditions be imposed

Western Power will seek WAPC model conditions on *subdivision* applications in accordance with the following:

When & where	Summary of conditions
<i>Freehold title subdivision</i>	Provision of underground <i>electricity infrastructure</i> with, one (1) or shared <i>connection service</i> per lot.
<i>Survey strata title subdivision</i> (public)	Provision of underground <i>electricity infrastructure</i> to <i>survey strata</i> lots, one (1) <i>connection service</i> per <i>strata</i> plan.
Existing or future transmission/ distribution network asset	Provision of <i>electricity infrastructure</i> service easement.
Network <i>infrastructure</i> on or near to <i>subdivision</i> being affected	Relocation/removal/replacement of <i>electricity infrastructure</i> .
Provision <i>substation sites</i> required	Provision of <i>land</i> .

Table 3: Summary of subdivision development conditions

A full description of WAPC’s ‘E’ and ‘Ea’ Model conditions schedule can be obtained from [WAPC’s website](#).

Where underground *electricity infrastructure* is required, a WAPC condition may also specify that any existing overhead *electricity infrastructure* located on the same side of the road as the *land* being subdivided together with any *consumer* services within property boundaries be converted to underground.

In the *development of subdivision* conditions for approval, WAPC takes electricity recommendations from Western Power but may add or delete conditions as it sees fit. A utility or government agency may seek amendment to or challenge a WAPC condition or determination.

Where a WAPC condition applies to Western Power any alteration or amendment is to be managed through Western Power’s Planning and Land Development team.

4.1.3 Western Power 'clearance certificate' processes

Western Power will issue a 'clearance certificate' when all of the following has been received or demonstrated:

- a) a clearance request is received from the *developer*;
- b) all Western Power conditions have been met;
- c) other conditions as required based on the specifics of the *subdivision* application which may have a potential impact on Western Power's network, are addressed to the satisfaction of Western Power;
- d) all WAPC and Western Power's requirements in the DIP are met and validated;
- e) overhead *electricity infrastructure* and *connection services* forming a part of the *subdivision* or affected by the *subdivision* are converted to underground; and
- f) the issuing of a 'clearance certificate' *shall* not compromise community or network safety.

4.1.4 How can Western Power conditions be met?

4.1.4.1 SCS subdivisions

For SCS *subdivisions*, the following *must* be completed to meet WAPC and Western Power's *electricity infrastructure* conditions:

- a) The applicant/*developer* of a *subdivision* *must* complete a Western Power 'connection application' which can be downloaded from Western Power's [website](#);
- b) Western Power will provide a design and *quotation* for the *works* required to meet the conditions;
- c) The *developer* is required to pay the *quoted* amount and complete the *works* in accordance with the specified terms and conditions;
- d) Overhead *electricity infrastructure* and existing *connection services* are converted to underground; and
- e) Other conditions as specified, together with the specifics of the *subdivision* application which may have a potential impact on Western Power's network, are addressed to the satisfaction of Western Power.

4.1.4.2 CCS subdivisions

For CCS *subdivisions*, the following *must* be completed to meet WAPC and Western Power's *electricity infrastructure* conditions:

- a) The *developer* is to engage a *design organisation* to coordinate and develop the *electricity infrastructure* design for the proposed *subdivision*;
- b) The *design organisation* *shall* request a *design information package* (DIP) from Western Power;
- c) The *design organisation* on behalf of the *developer* is to submit the design in accordance with the requirement contained in the DIP and this UDS manual to Western Power for a design conformance review (DCR);
- d) Western Power will issue a *quotation* for the *interface works* to the *developer*;
- e) The *developer* is required to pay the *quoted* amount and complete the *works* in accordance with the terms and conditions specified in the *quotation* and the requirements of this UDS manual;
- f) Overhead *electricity infrastructure* and *connection services* are converted underground in accordance with WAPC and Western Power requirements and timelines; and
- g) Other conditions as specified in the DIP, together with the specifics of the *subdivision* application which may have a potential impact on Western Power's network, are addressed to the satisfaction of Western Power.

4.1.5 Clearance request submission

On completion of the required financial and installation requirements, the *developer* is required to submit a 'request for clearance' from Western Power. Refer to Western Power's [website](#) for additional information on *land subdivision* requirements.

4.1.5.1 Requirements

WAPC conditions on approved *subdivision* plans for both *freehold* and *survey strata developments* shall only be cleared after the following requirements are met:

- a) Payment in full of Western Power *quotation* including where appropriate a per-lot fee ([clause 3.9](#)) have been received;
- b) Copies of the deposited and or *survey strata plan(s)* for the *subdivision* have been submitted and received by Western Power detailing *substation sites*, easements, restrictive covenants and any other 'notification' requirements; and
- c) Compliance confirmation has been provided for other special requirements inclusive of but not limited to provision of main switchboard and associated *consumer* infrastructure for *survey or built strata developments*, restricted covenants, and 'notices of completion' together with:

Either,

- d) Western Power acceptance of 'as constructed' drawings ;

Or,

- e) For an early clearance, request a copy of 'approved for construction drawings' being part of the DCR submission and compliance with early clearance requirements of [clause 3.9](#).

Note: Where applicable construction and 'as-constructed' drawings *shall* show both the location of the *consumer's* main switchboard, associated private distribution network and network *infrastructure*.

4.1.5.2 Clearance

Western Power will approve clearance and endorse the submitted deposited plans provided all conditions and requirements are met. A 'clearance certificate' letter, along with the endorsed deposited plans, will be forwarded to the *developer*. In cases where clearance is not provided, Western Power will advise the *developer* of the reasons why clearance was not granted.

4.1.6 Clearance of special subdivision lots

Developers may elect to construct *subdivisions* in progressive stages.

The formation of new lots in stages may result in the creation of a parcel of un-serviced *land* (balance lot) of substantial size or smaller lots that are or may be similar in size to the adjacent lots.

Designs *must* be electrically holistic, inclusive of all serviced / un-serviced lots, network *electricity infrastructure, connection services, switching points, etc*, within the boundaries of the *subdivision*.

Creation of a balance lot, or use of live end seals (LES) *must* be done so sparingly and in consultation with Western Power to ensure the efficient, safe electrical control and management of the installed *subdivision infrastructure and connection services*.

Western Power will review the inclusion of any un-serviced lot or LES on a case by case basis and reserves the right to reject any application or design where:

1. safety in design principles have not been effectively applied;
2. there is insufficient supportive evidence to justify the creation of the balance lot or use of LES.

Note: Clearance of a *subdivision* containing special lots may not be provided or delayed, where Western Power deems that required *subdivision civil works, connection services* and associated *infrastructure*, essential to the protection and validation of network *electricity infrastructure* is either not installed, complete and or gazetted.

4.1.6.1 Balance lots

4.1.6.1.1 Serviced

Where a lot or lots that can be sold or used 'as is' inclusive of lots that are of a similar size to the adjacent lots within the *subdivision*, the lot(s) shall be serviced and *electricity infrastructure* installed. All overhead *electricity infrastructure* and *connection services* have been removed to the satisfaction of Western Power.

Design and 'as constructed' drawings including deposited plans *must* show all serviced and un-serviced lots and payment for the *electricity infrastructure* shall be made. A copy of the stamped deposited plan(s) is to be provided to Western Power with the 'as constructed' drawings and records. Refer to [clauses 6.2.2.7 and 6.2.2.10](#) for additional information.

4.1.6.1.2 Un-Serviced

Where a lot is substantially larger and Western Power's deems that the *land* would not be sold or used as is, then servicing of the lot may be deferred subject to agreement with Western Power, or a financial provision is made for the installation of appropriate *infrastructure*, as determined by Western Power.

Western Power will consider all or some of the following in lieu of a financial contribution:

- a) A 'letter of undertaking' from the *developer*, in a form agreeable to Western Power, stating the *developer's* intention to further subdivide and develop the balance lot, which is identified by the WAPC as zoned for future urban purposes and that the lot shall not be sold before the *land* is serviced, is submitted to and accepted by Western Power;
- b) Evidence is provided that the WAPC (application number) has identified or zoned the *land* for future *subdivision* purposes and has approved a future structured plan;
- c) Lot(s) are identified as 9000 series lots.
- d) Provision of a '70A notification' is registered on the title(s) noting that the lot owner shall liaise with Western Power to provide a suitable *connection service* and *electricity infrastructure* or make a financial contribution for same prior to the sale of *land*;
- e) Unless approved otherwise by Western Power, all existing overhead *electricity infrastructure* and *connection services* has been removed;
- f) A 'letter of agreement' from the *developer*, in a form agreeable to Western Power, stating the *developer's* intention to further subdivide the property is provided or in the event of a prior sale of the *land* shall request and pay for a suitable *connection service(s)* and *electricity infrastructure* or make a financial contribution agreeable to Western Power; and
- g) The balanced lot is to be developed by a state or local government body.

Note: Where Western Power deems [sub-clause 4.1.6.1.2](#) items a) and g) to be applicable, a *developer* may choose to collectively submit a single piece of correspondence which clearly and distinctly addresses the requirements of both conditions.

Where a financial contribution is required:

- h) In situations where specific *electricity infrastructure* requirements are unknown, Western Power will only require the installation of the cable network, within a valid alignment, for the proposes of clearance (where appropriate); and

Note: Cable is not to be installed in situations where a high degree of uncertainty exists regarding the suitable location and size of the cable.

- i) Transformers, switchgear and other *infrastructure* shall not be installed until the *consumer's* requirements are known and they are ready to construct their premise. Refer [clause 4.1.6.2](#).

Design and 'as constructed' drawings including deposited plans shall show the un-serviced balance lot(s).

4.1.6.2 Substation installation not considered appropriate at the subdivision stage.

The *preferred* location for *substations* within multi residential, commercial, industrial *subdivisions* is within public owned *land*. Refer [clause 5.3.19](#). Alternative arrangements may be agreed between Western Power and the *developer* if the installation is not appropriate at the time of *subdivision* for the following reasons.

- **Situation 1:** Local planning *scheme* built form building setback requirements or the proposed building *development* does not provide adequate *land* for an external *substation* including consideration of fire clearance requirements. It is expected that the *substation* would be installed within the building as part of the subsequent building *development*.
- **Situation 2:** The proposed *site* building *development* and *subdivision* are not undertaken concurrently and it is considered inappropriate to nominate a *substation* location that may not suit the future *development*. *Should* the *substation* be installed external to the future building then an extension of road reserve for the *substation site* is *preferred*.

Western Power may accept a deferment of the *substation* installation subject to the following:

- a) A financial provision is paid to Western Power to contribute to the future *works*, being the present estimate cost of the *works*;
- b) Additionally for [Situation 1](#), approved local planning *scheme* and associated built form conditions applying to the lot demonstrating setback and other requirements preventing an external *substation* installation are provided; and
- c) A letter of 'access offer agreement' from the *developer* in a form agreeable to Western Power, describing the arrangement is submitted to Western Power .

4.1.6.3 Homestead lots

Homestead lots generally form part of a proposed larger residential *subdivision development*. Based on size, such lots could be serviced via overhead distribution *electricity infrastructure*. These lots *should* only be cleared as a part of the whole *subdivision*, as each lot would have an underground *point of supply (connection)* via the network that is to be constructed within that *subdivision*.

In some instances, a *developer* may seek clearance of homestead lots prior to the construction of the *subdivision*. Western Power will provide clearance of homestead lot(s) subject to the following conditions being met:

- a) The homestead lots front an existing road where an existing network connection is available;
- b) A DIP request for the *subdivision* has been submitted and received by Western Power;
- c) The *developer* provides a 'letter of undertaking' in a form agreeable to Western Power, that the underground *connection service* for the homestead lot(s) *shall* be incorporated into the design of the *subdivision* and converted as part of the *subdivision*;
- d) The *developer* is to provide an undertaking ([clause 4.1.6.1](#)) for the balance of the lot;
- e) The existing aerial *connection service* to the homestead lot *must* be converted to underground at *developer's* cost prior to clearance being issued; and
- f) The *electrical contractor* has submitted a 'notice of completion' with a copy to Western Power (accompanying the request for clearance application) indicating that *site* electrical *works* are complete enabling the overhead to underground conversion to be finalised by Western Power.

Note: Where an individual rural lot is to be created or excised from a larger rural lot and access to a network *connection service* is not available or Western Power determines it is not practical in terms of distance and or accessibility, the *consumer* may seek to be exempted from the provision of a network connection. Where the application is supported by Western Power, an appropriate restrictive covenant *shall* be placed on the 'certificate of title.'

4.1.7 Clearance charges

There is no charge on the initial submission of a ‘request for clearance.’ However, re-submission of a ‘request for clearance,’ resulting from insufficient or incorrect detail in the original application, *shall* incur a charge in accordance with the ‘Network service charges’ – published by [Western Power](#) from time to time.

4.1.8 Electronic land development process (eLDP)

Electronic land development process (eLDP) is a ‘shared land information platform’ (SLIP) initiated by the Department of the Premier and Cabinet. The eLDP is a ‘end to end,’ case-managed system encompassing the whole of the *land development* process, from lodgement of the application of *subdivision* approval, to the issue of titles. This system is not available or accessible to *developers*.

4.2 Development of SCS subdivision lots

SCS *subdivisions* are defined in [clause 1.12](#). There are two (2) *subdivision* processes for the provision of a *connection service*. The processes vary slightly depending on whether or not a WAPC clearance is required. Details and responsibilities for each stage are given in the following sections.

Note: The process for SCS *freehold subdivisions* is the same as that required for CCS *subdivisions*.

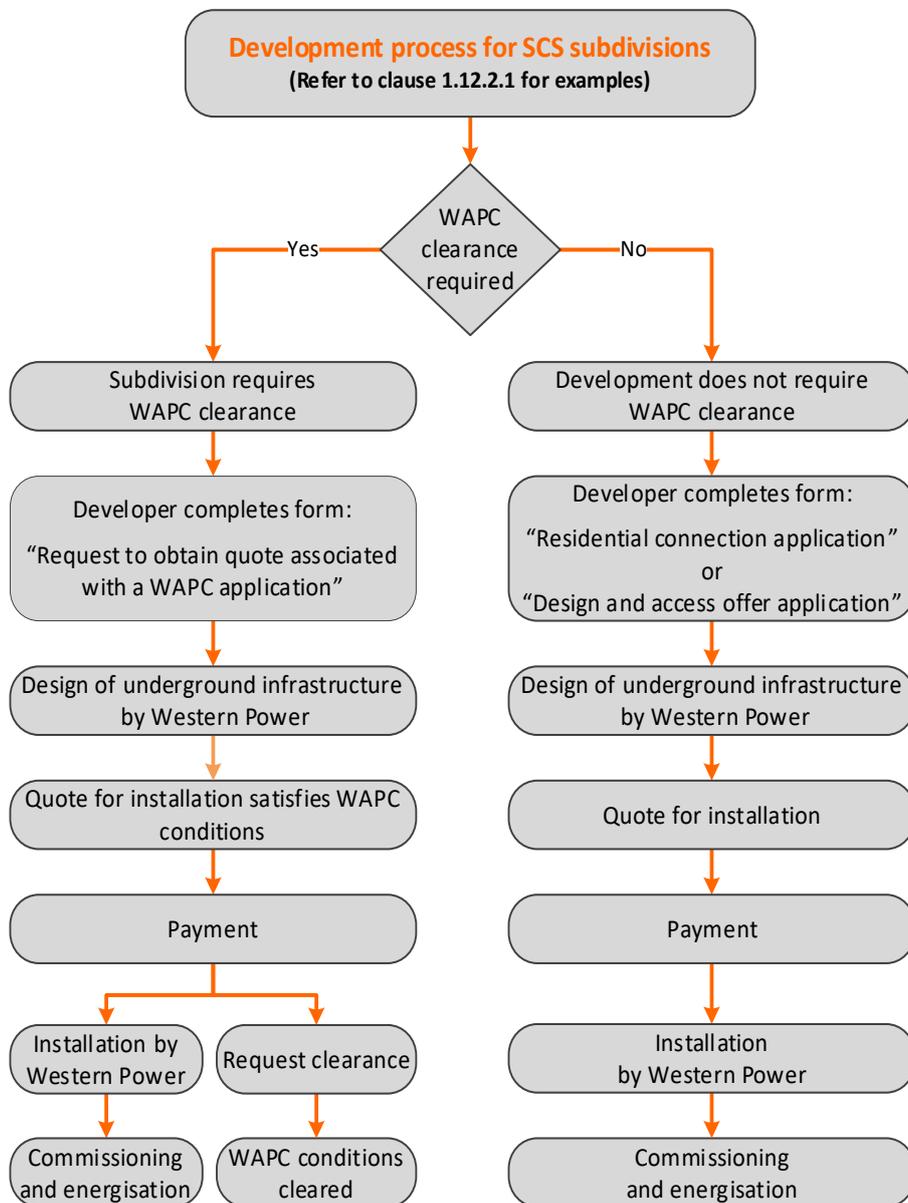


Figure 4: Development process for SCS subdivisions

4.2.1 Process detail

The following flow chart has been provided for *developers*, who intend to proceed with the *development* of a SCS *subdivision*:

WAPC clearance required (Freehold, vacant or survey strata subdivision)	WAPC clearance not required (Previous cleared subdivision or built strata development)
The <i>developer</i> is to complete an on-line <i>subdivision</i> application via Western Power's website	The <i>developer</i> is to complete an 'on-line design & quotation application for a new electrical connection' via Western Power's website
The application <i>shall</i> not be processed unless the <i>subdivision</i> is approved by WAPC.	The application <i>shall</i> not be processed if WAPC approval is required.
Western Power will create a design project and advise the <i>developer</i> of the reference project number.	Western Power will create a design project and advise the <i>developer</i> of the reference project number.
Western Power will prepare a design for the underground <i>connection service</i> and provide a <i>quotation</i> for the <i>work</i> required to meet the WAPC clearance conditions and WP's requirements.	Western Power will prepare a design for the underground <i>connection service</i> and provide a <i>quotation</i> for the required <i>work</i> in accordance with WP's requirements .

Table 4: Process detail for SCS subdivisions

The *quote* is valid for ninety (90) days and is subject to design and application charges. Where the connection requirements change or if the *quote* expires, Western Power reserves the right to cancel (refer to [clause 4.3.2.8](#)) or charge for any additional time spent in the preparation of a review and any subsequent amended *quotation*.

Western Power may provide the *developer* two (2) options to pay for the *work* where the *developer* decides to proceed. The payment options are as follows:

Either:

- a) A full up-front payment of the *quoted* amount at the time of the 'acceptance of quote'

Or:

- b) Provided the total amount *quoted* is for more than \$30,000, two (2) staged payments of:
- I. 30% of the *quoted* amount, plus a \$550 administrative charge at the time the *quotation* is accepted; followed by
 - II. 70% of the *quoted* amount prior to commencement of *site works*.

4.2.2 Western Power's responsibility

The *quote* provided by Western Power covers the following scope of *works*:

- a) The design of UDS for the *subdivision*;
- b) The supply and installation of all materials including cable and *service pillars* for the provision of underground *electricity infrastructure*;
- c) The supply and installation of streetlight poles and fittings, where required;
- d) The trenching and laying of cables;
- e) Western Power will provide a *connection service point* in the form of a *service pillar* at property boundaries or where deemed appropriate a *service pit* or *substation*. Any *consumer* electrical installation infrastructure beyond *connection service point* is the responsibility of *land owner* or the *developer*.

4.2.3 Developer's responsibilities

The *developer/property owner's* scope of *work* and expenses include the following:

- a) The accurate pegging of all *subdivision* and lot boundaries;
- b) Providing *land* for the installation of the *connection service* device or *substation* (transformers and switchgear) where required;
Note: The *connection service* must be located within the property or where the service is from a *substation* incorporated as part of public open space / road reserves, at no cost to Western Power.
- c) Prior to the commencement of any *works*, the *developer* must ensure that finished ground levels at each *connection service pillar* or *substation site* is set and all final survey boundaries pegs are in place;
- d) Any verge reinstatement, clearing or pruning of vegetation to Western Power's required safety profiles and relocation of other services, such as gas or water;
Note: *Developers* are to liaise directly with the relevant local government agency or service utility with regard to the cost of such *works* and or repairs;
- e) Obtain all necessary, relevant permits, approvals and clearances including but not limited to native title, environmental, heritage and planning;
- f) Where an easement restrictive covenant or 'notification' is required by Western Power, the *developer* shall provide at no cost to Western Power;
- g) Advise potential *land* purchasers of all easement locations, restrictive covenants and 'notifications' and their use and restrictions;
- h) Notify all affected parties, including other Western Power *consumers* affected by the *development*.
Note: Where existing overhead *electricity infrastructure* and *connection services* are to be removed as part of the *subdivision work*, the *developer* is responsible for the reconnection of affected Western Power *consumers* to the underground *infrastructure* and all associated costs to carry out the *works*;
- i) *Consumer* electrical installation infrastructure beyond *connection service* point including consumer main cables between the *service pillar* to the *consumer* site main switchboard and network meter location;
- j) Coordination of all other services work; and
- k) Ensure the *works* are undertaken and the *site* maintained, in accordance with Work Health and Safety legislation and other relevant Acts of Parliament, during the construction phase.

4.3 Development of CCS subdivisions

Developers intending to proceed with the *development* of a *CCS subdivision* shall engage a *design organisation* to prepare and produce the *subdivision* design in accordance with this UDS manual and applicable network requirements.

4.3.1 Process

The following figure outlines the *development* process for *CCS subdivisions*.

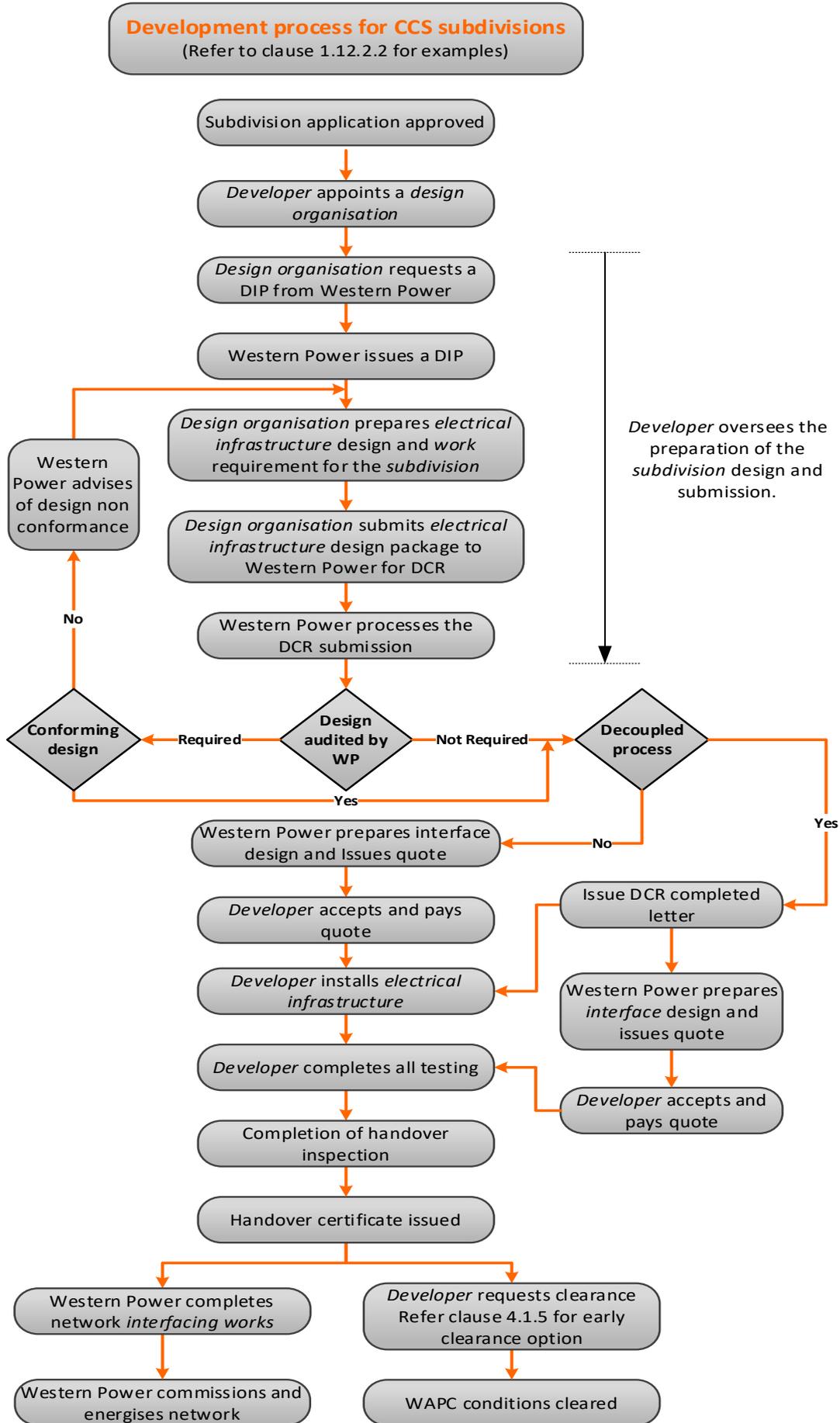


Figure 5: Development process for CCS subdivisions

4.3.2 Process detail

4.3.2.1 Designs for underground distribution schemes

Developers are responsible for the provision of UDS designs through the engagement of a *design organisation*. The *developer* is also required to appoint an *engineer* to check and certify that the UDS design meets the requirements of this UDS manual, applicable legislation, together with network and industry standards.

Western Power will:

- a) Provide the *design organisation* with a DIP appropriate for the *development* and the location.
- b) Provide a *site* visit service, where required, to confirm the location of any Western Power infrastructure, (Costs may apply); and
- c) Audit the UDS design certified by the *engineer* to ensure the design and certification conforms with Western Power's design requirements, planning criteria and construction practices.

4.3.2.2 Developer DIP request

4.3.2.3 Network DIP preparation

Western Power will review the proposed *subdivision*, prepare the DIP, containing the information outlined at [clause 4.4.2](#), and issue the package electronically to the *design organisation*.

Any proposed changes to the information contained in the DIP, *must* have written approval from Western Power before the change(s) are incorporated into the design.

The information contained in the DIP is valid for a period of six (6) months from the 'date of issue'.

4.3.2.4 UDS design preparation

On receipt of the DIP, the *design organisation* is to prepare the UDS design. It may be necessary for the *design organisation* to enter into negotiates on behalf of the *developer* with Western Power to specify which, if any, part of the *works* is to be undertaken by Western Power, E.g. headwork extensions.

Where agreement is reached with Western Power the *design organisation*, is to incorporate the agreed *works* into the design and the project 'bill of materials,' inclusive of clearly defined allocated responsibilities. This *work* is to be reflected in the final *quotation* from Western Power.

4.3.2.5 Design conformance review (DCR)

When the UDS design is completed, the *engineer shall* check and certify that the design meets the requirements of this UDS manual, applicable legislation, network and industry standards. The *design organisation's engineer shall* or authorise the *designer* to electronically submit the design to Western Power for a DCR in accordance with [clause 4.4.4](#) through the appropriate application web-portal on Western Power's [website](#).

4.3.2.6 Western Power DCR submission review

On receipt of the *developers subdivision* design, Western Power will acknowledge the design lodgement and initiate a DCR to ensure design parameters have been incorporated into the design and required design documentation.

Note: A DCR review does not constitute approval of the design. Western Power takes no responsibility for the accuracy or correctness of the UDS design or associated 'bill of materials.'

Western Power will carry out a conformance audits on the UDS designs as it deemed appropriate. Western Power also reserves the right to carry out a conformance audit on every UDS design submitted to Western Power or undertaken by a Western Power appointed person.

Western Power will advise the *design organisation* whether the design is accepted or rejected due to non-conformance. If a design is rejected, Western Power will provide advice on the non-conformance and advise the *design organisation* of the re-conformance review fee. The *design organisation* may then redesign and resubmit the UDS design together with the required re-conformance review fee.

4.3.2.7 Quotation provision

Western Power will issue a *quotation* to the *developer* of the UDS design where the design has satisfied the requires of the DCR. Western Power will not provide a *quotation* where a design has failed a conformance audit. The *quotation* will include standard charges, DIP and DCR fees, *reinforcement* and *interface work* costs and quality assurance charges.

4.3.2.8 Formal offer validity

An *offer* from Western Power in the form of a *quotation* is valid for a period of 90 (ninety) days from the date of official correspondence. If payment has not been received within that 90 (ninety) days validity period, the project file *shall* be cancelled unless agreement in writing is received from Western Power to extend. *Should* the project be re-established at a later date, it *shall* be treated as a new *subdivision* and subject to charges.

4.3.2.9 Acceptance and payment of quotation

Where the *developer* accepts and pays the *quote*, the *development* is to proceed in accordance with the agreed project criteria. Refer to [clause 4.3.2.10](#) and [section 6](#).

Alternatively a *developer* may request to defer payment via the *decoupled* construction arrangement, which would allow the *developer* to commence construction *works* prior to the issuing and payment of Western Power's *quotation*. This option is subject to Western Power approval.

Installation is to be coordinated through the nominated Western Power resource centre, with the *developer* being responsible for purchasing materials and accepting those resources required for the *work* agreed to be undertaken by Western Power.

The *developer* is responsible for seeking approvals from and advising all other authorities, agencies and or groups involved in the *subdivision works* and underground services)E.g. Telstra, local councils, etc) and issuing of required drawings to those parties.

4.3.2.10 Payment of quotation

For *non-decoupled CCS subdivision developments*, Western Power offers two (2) payment options.

Either:

- a) A full up-front payment of all charges applicable.

Or

- b) Provided the total *quotation* is for more than \$30,000, two (2) staged payments of:
 - I. 30% of the *quoted* amount, plus a \$550 administrative charge at the time the *quotation* is accepted; followed by
 - II. 70% of the *quoted* amount prior to commencement of *site works*, or clearance request, and to include per lot fee if applicable.

For *decoupled CCS subdivision developments*, where the delayed *quotation* payment has been approved by Western Power, the *quoted* amount together with all other fees and charges *shall* be included in one (1) payment. Refer [clause 4.3.2.12](#) for additional *decoupled* project information.

Payment in full is a required prerequisite for early clearance requests. Refer to [clause 3.9](#) 'per-lot fee' system for early clearance requirements.

4.3.2.11 Delayed construction

Those projects for which the *quoted* payment is a prerequisite to UDS construction commencement, the *developer* is required to provide a construction administration package and commence their construction works on *site* within six (6) months of *quotation* payment. *Should* this not occur Western Power reserves the right to provide a revised *quotation* (including re-conformance charges). *Should* nine (9) months elapse Western Power reserves the right to cancel the project and provide a refund to the *developer* minus any costs incurred to date of project cancellation.

4.3.2.12 Decoupled construction agreement

Staged CCS *subdivisions* may, due to critical timeframes, be permitted to commence construction prior to an *interface works quotation* being issued and payment made following submission of DCR documentation. For these *decoupled* projects, Western Power will issue a letter acknowledging completion of the DCR and confirm that a *quotation* will be issued, following the completion of Western Power's *interface works* design.

The *quotation shall* be paid prior to a *project network officer* (PNO) being appointed, issuing of the 'handover certificate' and Western Power completing *interface works*, including commissioning, and energisation of the *subdivision*.

4.3.3 Developer's responsibilities

The *developer* shall fulfil the following responsibilities in accordance with the requirements of this UDS manual ([clause 6.2](#)) which *shall* include the following scope of *work* and expenses:

- a) Requirements as prescribed at [clause 4.2.3](#);
- b) Compliance with all statutory and technical requirements applicable the *subdivision development*;
- c) The *developer shall* engage and appoint a *design organisation* to coordinate and prepare the *electricity infrastructure* design for the proposed *subdivision* for and on behalf of the *developer*;
- d) The *developer shall* appoint a *design organisation (engineer)* to oversee the design of the UDS and to certify that the UDS design meets the requirements of this UDS manual. The *developer shall* also ensure that the *design organisation* is covered by professional indemnity insurance of no less than two (2) \$million, either personal or under the umbrella of the *design organisation*;
- e) When engaging a *design organisation*, the *developer shall* provide the *design organisation* with:
 - i. statements of approval, consent or clearances including but not limited to federal, state, and local government agency cultural, heritage, and environmental approvals;
 - ii. authorisations, notifications and or acknowledgements from other effected parties and or relevant utility, service providers;
 - iii. complete subdivision engineering and load requirements for all stages of the current and future proposed subdivision. Where load requirements are not known at the time of design then the kVA values specified in [section 5](#) of this UDS manual *shall* be used;
- f) The *developer shall* install / appoint effective *site* management to oversee and manage the *subdivision works*;
- g) The *developer shall* engage suitably qualified and competent *contractors* to carry out the construction of the *subdivision works*;
- h) The *developer shall*, where required, engage a suitably qualified and experienced organisation to undertake traffic / road geometry risk and safety assessments with respect to proposed or existing street furniture, ground mounted equipment, roadway clear zones, etc.;
- i) Assessments for civil and other builder's *works* on proposed and existing WP assets, such as ground level changes, retaining or other walls, excavation activities for the install & Include clause specific to *developer's* 'handover checklist';

- j) The *developer* is responsible for ensuring that the *design organisation, engineer(s), installation contractors* and all non-network personnel associated with the *development*, fulfil their responsibilities during the design and construction phases. The *developer* remains responsible for meeting Western Power's requirements;
- k) Provision of *land* for the installation of *substation* (transformers and switchgear) *infrastructure*, where required. The *land shall* be incorporated as part of public road reserves or public open space (POS) at no cost to Western Power;
- l) Where any easement, restrictive covenant or 'title notification' is required by Western Power, the *developer shall* provide these instruments, at no cost to Western Power;
- m) All necessary and required civil works;
- n) Advise all potential *land* purchasers of all current and or pending *infrastructure / easement* locations, restrictive covenants, and 'notifications' together with their proposed use and restrictions as a part of any sale or marketing material published to promote the *subdivision*;
- o) The *developer* is responsible for notifying, negotiating with and obtaining agreement and approval from all parties, including other Western Power *consumers* affected by the *subdivision work*. Where existing aerial *electricity infrastructure* is to be removed as part of the *subdivision works*, the *developer* is responsible for reconnecting existing Western Power *consumers* to the underground *infrastructure* and for all associated costs;

Where *electricity infrastructure* is to be installed within a road reserve, the *developer shall* obtain the approval of the relevant government agencies, road authority, affected utilities and property owners;

- p) The *developer shall* notify, negotiate with and obtain agreement from parties (traditional owners, government agencies /authorities, property owners, etc) affected by the removal, relocation of vegetation from or within the *development*, neighbouring properties, public open space(s) and/or road reserves arising from the *works* associated with UDS *subdivision*. The *developer shall* also make provision for clearing of vegetation and any *site restoration works*, required by Western Power to complete *subdivision interface works*;
- q) The *developer shall* engage relevant professionals/appropriate persons to undertake, complete supplementary tasks including by not limited to:
 - i. traffic & road geometry risk and safety assessments with respect to proposed and or existing network infrastructure street furniture, ground mounted equipment;
 - ii. Roadway clear zones (LGA and/or MRWA requirements);
 - iii. Assessments of civil and other building works on proposed and existing assets, such as ground level changes, retaining or other walls, excavation activities specific to the developer's handover checklists.
- r) Providing Western Power with 'as constructed' drawings and 'as constructed' records in accordance with the time lines specified in [clause 6.2.2.7](#);
- s) Supplying, installing and testing of all cables and equipment and cable jointing in accordance with this UDS manual. Where the *developer* has agreed with Western Power to the undertaking *interface works* ([clause 6.2](#)) Western Power *shall* undertake jointing and termination of the *infrastructure* to the existing Western Power cables and equipment;
- t) Providing equipment that meets Western Power's technical requirements;
- u) Supply and installation of street lighting;
- v) Provide pre-commissioning sheets for all *connection service infrastructure*, cable connections, transformers, RMUs and streetlights;
- w) Documented QA of:
 - i. cable alignments, cable depths, sand bedding, sand cover and danger tape;
 - ii. equipment locations;
 - iii. joints and terminations.

- x) Providing Western Power with a twelve (12) month warranty for all equipment, installations and civil works.

The *developer's works* shall not include any structure or service that obstructs the *electricity infrastructure* within the *electricity infrastructure* or the light pole alignment as prescribed by the [Utility providers code of practice \(UPCoP\)](#), including but not limited to drainage infrastructure, buildings, fences, walls etc.

The *developer* is responsible to ensure that all of the design and construction *works* for the *subdivision* meets and satisfies this UDS manual and the aforementioned requirements.

4.3.4 Western Power's responsibilities

Western Power is responsible for:

- a) Providing a DIP (and where appropriate, information for preliminary feasibility studies) necessary to allow the *developer's design organisation* to develop a design for the UDS *scheme*;
- b) Provision of the *interface* design description and or drawings;
- c) Reviewing the *developer's* DCR submission. This is not an approval or endorsement of the design. That is the responsibility of the *developer's design organisation (engineer)*;
- d) Handling technical and construction matters with the *developer* that cannot be resolved by the *developer's design organisation*. Refer site query process [clause 6.2.2.3](#);
- e) Carrying out quality assurance audits at key stages of *subdivision* installation and testing; and
- f) Where required by Western Power, witness tests performed by the *developer's* installation contractor and/or perform such network tests as deemed appropriate prior to hand-over of the *works*.

4.3.5 Charges and refunds

4.3.5.1 General

Charges contained in the formal *offer* are provided on the basis that all applicable information has been provided by the *developer* and unless otherwise specified, the following assumptions have been made on *works* to be carried out by Western Power:

- a) All Western Power *work* to be undertaken within normal working hours unless otherwise specifically stated in the *quotation*. The *developer* may request Western Power to carry out quality assurance inspections and witness any tests after hours (additional costs *shall* apply);
- b) The *site* is readily accessible by a two (2) wheel drive vehicles;
- c) *Site* plans without marked contours *shall* be assumed to be level;
- d) *Site* access is on a continuous basis. *Site* access and conditions are not detrimental to Western Power employees' or contractors' ability to work in an efficient, productive and safe manner;
- e) The *work site* is a greenfield *site* and clear access is available to trench on the allocated alignment without obstruction from other services, vegetation, etc.;
- f) All trenching is carried out in sandy soils free of rock;
- g) All trenching is able to be carried out by machine;
- h) Reinstatement is based on minimum greenfield reinstatement;
- i) Trenches are level and accurately follow the allocated alignment resulting in minimum cable lengths;
- j) All survey information, including boundaries, are accurate;
- k) Lot boundaries as shown on the pre-calculated plan are correct; and
- l) Electricity demand allocations are as shown on the design drawings. Calculations are based on either information provided by the *developer* or Western Power standard values.

Any additional costs arising from deviations in these assumptions *shall* be charged to the *developer*. If any of the above assumptions are not applicable, Western Power *must* be informed to enable the calculation of new charges and to avoid delays.

Changes to the *subdivision* layout, *land* use, zoning or the project staging may result in design changes and may incur additional charges.

4.3.5.2 Subdivision charges for individual installation schemes

The charges published on the [Western Power's Networks and subdivision website page](#), are the minimum charges assuming the *design organisation* uses Western Power's software and standard design presentations.

Western Power reserves the right to charge additional fees for designs, drawings, calculations and study results not presented in the format shown in [table 5](#). The *developer shall* be responsible for payment to Western Power of a recovery tax on capital contributions for commercial and industrial *subdivisions*. This amount *shall* be included in Western Power's *quotation*. Refer to Western Power's [website](#) for additional information on 'recovering tax contributions.'

4.3.5.3 Charges arising from redesign

The amount of additional expenses incurred by Western Power due to design revisions may vary. *Developers should* confer with Western Power as soon as possible, to determine any change to the total project cost. Where a revision is requested after *subdivision* construction has commenced, Western Power may charge 'stand-down' expenses.

Design changes which result in the need for Western Power to reissue DIPs or repeat conformance reviews may incur additional charges.

4.3.5.4 Refunds

If a project is cancelled at the *developer's* request during construction, project payments made will be refunded less all non-recoverable costs (including material and/or labour) incurred by Western Power.

Once a project has been completed, a refund is not available.

4.4 Western Power network design information

4.4.1 Request for design information package

When requesting a DIP, the *developer must* provide all of the information, in electronic format, detailed as shown in the following table,. Refer [clause 4.3.2.2](#).

Project name	Name of the <i>subdivision</i> and stage
Developer's name	<i>Developer's</i> name and contact details
Location plan	Showing nearby roads and map number and grid reference as depicted by from the Department of Planning Lands and Heritage street view maps.
WAPC number	If the WAPC reference number is not available at the time of requesting the DIP, the <i>developer must</i> provide the number to Western Power prior to the DCR submission . Survey diagrams are not essential at this stage.
Number and type of lots	Split into residential, commercial and industrials lots, respectively.
Proposed design loading ADMD's	This assists with the required network planning study. Western Power will specify the <i>preferred</i> design ADMD in the DIP where the <i>developer</i> proposed design ADMD is considered not suitable.
Letter of authorisation	Letter from the <i>developer</i> appointing the <i>design organisation</i> and certifying <i>engineer</i> for the <i>subdivision</i> , together with contact details and an authorisation to coordinate the design with Western Power.
Payment guarantee for DIP & CR fees	Letter of acceptance from the <i>developer</i> confirming responsibility for payment of the DIP and DCR fees <i>should</i> the project not proceed.
Number of stages	Full details for CCS <i>subdivision developments</i> with more than one (1) stage. Note: The current <i>developer</i> is responsible for the provision of information pertaining to previously completed stages, forming part of or associated with the creation of the proposed <i>subdivision development</i>
Stage plan	A preliminary pre-calculated cadastral plan (electronic format <i>preferred</i>) showing stage boundaries, lot boundaries and sizes, lot numbers and contours (optional). Any other information to be on separate layer/s.
Subdivision time frames	Essential for <i>subdivisions</i> with multiple stages as it assists with the required network planning study.
Concept plan (electronic format)	For greenfield CCS <i>subdivisions</i> with a large number of stages. Provision of a comprehensive concept plan when the DIP for the first stage is requested, may assist Western Power develop a DIP to cover all the stages. For any subsequent stage, the <i>design organisation</i> is still required to send a request with an updated concept plan, which <i>shall</i> show the design of previous stages. Western Power will provide a project number and SPIDA coordinates.

Table 5: Required DIP request information

4.4.2 Design information package DIP & validity period

Western Power will provide the *design organisation* with a DIP in an electronic format.

The information package will contain information unique to a *scheme* or stage of *subdivision development*. The DIP, along with the *design information package* within the UDS manual and other relevant manuals, is to be used as the basis to complete the *scheme* design.

The DIP is valid for six (6) months from date of issue. Where the *subdivision development* or stage does not commence within this validity period, the *developer* through their *design organisation shall* re-apply for a DIP, together with a new application fee. A single three (3) month extension to the DIP validity period can be requested by the *developer*. Detailed formal justification and explanation of the extenuating circumstances for the extension request, is required which will be taken into consideration by Western Power when assessing the extension request.

Western Power reserves the right to reject any application for an extension of the DIP validity period or to impose further conditions or recover costs incurred as a result of the extension.

The DIP will include the information detailed in the following table:

DIP letter	Detailed conditions and design requirements to be applied. It will also include a reference number for future correspondence and drawing numbering.
DIP drawing (.pdf & .dgn)	<p>Details of HV system, e.g. cable size, entry and exit points at the <i>development</i> boundary.</p> <p>Transformer and switchgear locations, cable routes, etc.</p> <p>Requirements for HV Y splits and location options within the existing network for connection.</p> <p>Details of LV cables and <i>interconnection points</i>.</p> <p>Three-phase fault levels.</p> <p>Any undergrounding or relocation of overhead systems required within the <i>development</i> and/or on surrounding boundary roads, if required.</p> <p>Any <i>work</i> Western Power requires to be done as part of the project.</p> <p>Project funding arrangements.</p>
SPIDA map LV (.pdf)	SPIDA map showing surrounding LV network.
SPIDA map HV (.pdf)	SPIDA map showing surrounding HV network.
LV design files (.lvd)	<i>LV design</i> files of existing network if required.
Surrounding subdivision design drawings both (pdf) and or relevant dgn drawing layers to protect third party identity.	Design drawings of previous <i>subdivision</i> stages surrounding the <i>development</i> , where available and if required.
WAPC.pdf	<i>Subdivision</i> approval letter with WAPC conditions.
General	Other relevant information.

Table 6: Design information package

Any changes to the information contained in the DIP, *shall* be formally approved by Western Power before the change(s) can be included in the design.

4.4.3 Information for feasibility studies

A *developer* appointed *design organisation* may request information to facilitate, undertake preliminary feasibility studies. A SPIDA map of the existing surrounding HV and LV networks may be sufficient for such studies rather than a DIP.

Where requested, Western Power will provide a SPIDA map and charge the fees shown in [clause 4.3.5.2](#). If more information is required, the standard DIP will then be prepared and the appropriate fee charged.

Due to the nature of distribution *electricity infrastructure* systems, the surrounding HV and LV network can change significantly with time. Network changes may result in a variation of the cost of providing supply extensions to *subdivision developments*. This variation may be significant.

Accordingly, Western Power will not accept any responsibility for variations between a *developer's* budget estimate and firm *quotations*, nor for any direct or indirect consequent impact on the *developer's* costs.

4.4.4 Submission requirements for design conformance review

When submitting a design drawing(s) (including a revised drawings) for DCR, the *design organisation* is to provide the entire document package in the appropriate electronic format, as detailed below:

Document Name	Format required & detail
UDS design drawing.	DGN format (Microstation). The <i>subdivision</i> plan drawings <i>shall</i> be geospatially correct by incorporation of Map Grid of Australia MGA Zone 50 grid system. This geospatial information is required to enable incorporation into Western Power's GIS. Refer note 2 below. All DGN drawings sent to Western Power <i>must</i> be saved in 'default view,' as opposed to 'sheet view,' prior to submittal.
LV volt drop assessment report.	'LV design file' or other format approved by Western Power.
Voltage fluctuation assessment report.	Motor data and flick assessment in accordance with AS/NZS 61000 3.5 in a format approved by Western Power.
Bill of materials (see note 1 below).	TXT file based on the DDC manual created from Microstation or DQM CU EXPORT FACILITY and generated by the DQM/CAD <i>Interface</i> – Urban residential design software.
<i>Design organisation's</i> authorisation.	PDF format authorising Western Power and its contractor and agents to use the UDS design drawings as Western Power sees fit and authorising Western Power to provide drawings to the <i>developer</i> and other parties, and as otherwise provided in clauses 4.4.7 , 6.2.2.6 and 6.2.2.7 of this UDS manual.
NER <i>engineer</i> certification/check sheet	PDF format.
NER <i>engineer's</i> certificate of two (2) \$M professional indemnity (PI) insurance.	PDF format (Note: The certificate of PI insurance can be submitted on annual basis).
<i>Developer</i> sourced, statements of approval, consent or clearance as required by but not limited to federal, state, local government agencies and other relevant utility / service providers.	PDF format.
Other certificates, reports and FSA's as required for the subdivision development, e.g. <i>substation</i> retaining wall certificate.	PDF format.

Table 7: Submission requirements of design for DCR

Note 1:

The 'bill of materials' *shall* include those materials to be provided by Western Power for any agreed *works* to be undertaken by Western Power. Scope of those *works* is based on compatible units contained in Western Power's [Distribution design catalogue \(DDC\)](#). It *shall* be in a format suitable for direct loading into Western Power's DQM.

Note 2:

- The MGA Zone 50 file *should* only include the pre-calculated cadastral plan of the current *subdivision* stage where Western Power assets are to be installed.
- If the MGA Zone 50 file is not provided with the submission for DCR, it is to be provided to Western Power through the appropriate application web-portal on Western Power's [website](#) at least five (5) working days prior to the handover inspection.

The MGA Zone 50 file is required for Western Power's GIS data base, so that the necessary switching and commissioning programs can be produced for the energisation of the *subdivision*.

4.4.5 Developer design delays < three (3) months for DIP and DCR

Projects on hold for more than three (3) months during DIP or DCR processes due to the *developer* or *design organisation* information delays, *shall* be closed and invoiced.

4.4.6 Revision of design due to major and minor changes while under construction

During the construction of a *subdivision*, changes to the *electricity infrastructure* may be required which may necessitate changes in the electrical design.

4.4.6.1 Major changes in design

If a major change is made to a design after the *design conformance review* and payment has been received from the *developer*, the *design organisation shall* submit the revised design drawing to Western Power for a *design conformance review* (DCR) of the revision while under construction (RWUC).

The following changes are considered major and therefore a DCR of 'a revision while under construction' *shall* be required:

- a) Encroachments and easements within or impacted adjoining properties/lots.
- b) Relocation of *uni-service pillars*.
- c) Addition or deletion of *service pillars (connection services)*
- d) Installation of cables (HV or LV cables) to the 2.4 – 3.0m pole alignment
- e) Change of cable route.
- f) Change of status of switching points.
- g) Relocation of switchgear or transformer *substation*.
- h) Addition or deletion of lots in the *subdivision*.
- i) Addition or deletion of streetlights.
- j) Changes that may or will affect the *interface scope of works and quotation*.
- k) Revised CAD drawings indicating boundary changes.

Note: Where a *design conformance review* of a RWUC is deemed time critical, from a delivery perspective, the *design organisation* may request to have the review processed in accordance with Western Power's decoupling procedures. For further information refer to [clause 4.3.2.12](#).

4.4.6.2 Minor design changes

If a change is minor and deemed not significant enough to warrant a review of the design, the change *shall* be reviewed by the *developer's design organisation*. Details of all minor changes are to be recorded in a change register, forwarded to Western Power for consideration and shown in the 'as constructed' drawings.

Any request for a minor design change conformance review will be treated in the same manner as a major design change conformance review. For details of changes considered to be minor. Refer to [clause 6.2.8.28](#).

4.4.7 Intellectual property license

By submitting a UDS design drawing (including a revised drawing) for a DCR, the *developer* and the *design organisation* consent to Western Power and their contractors / agents:

- a) using the UDS design drawings as Western Power sees fit including, without limitation, for *design conformance review* purposes, to update Western Power's asset registers including SPIDA-web, for 'Dial Before You Dig' purposes, and to facilitate the design of other nearby, surrounding or adjacent *subdivisions* and *distribution schemes*;
- b) providing the UDS design drawings to the *developer* and other parties including, without limitation, *design organisations* of nearby, surrounding or adjacent *subdivisions* and *distribution schemes*; and

- c) providing the UDS design drawing or associated certification as part of any statutory investigation or request for information.

4.5 Submission for DCR with approved nonstandard equipment

A *developer* is to request (prior to DCR) written approval from Western Power if there is an intention to use any nonstandard solutions or equipment in the *subdivision*, pre-approved or otherwise. To obtain approval for nonstandard equipment or determine what nonstandard equipment has been approved refer to the approval process shown in [clause 7.3](#).

4.5.1 Prior to DCR and quote issued by Western Power

Prior to the DCR submission to Western Power the following is to occur:

- a) The *design organisation* shall show the approved equipment detail on the design drawing;
- b) The *design organisation* shall show the make and equipment part number for switchgear on the design drawing;
- c) The *design organisation* shall show the make and Western Power dummy stock code for transformers on the design drawing; and
- d) The *developer* and *design organisation* shall adhere to any other conditions for approved non-standard equipment as stated on the ‘letter of approval’.

Western Power will initiated the DCR and if conforming issue a *quotation*.

Note: Where required the equipment part number or dummy stock code will be provided to the *developer*.

4.6 Dispute resolution process

The following mechanism is available to assist *developers/design organisations* with specific *subdivision* project issues. The pathway provides channels for *developers/design organisations* who feel their concerns have not been resolved. The process is managed by a Western Power appointed market segment manager who will act as the *consumer* advocate.

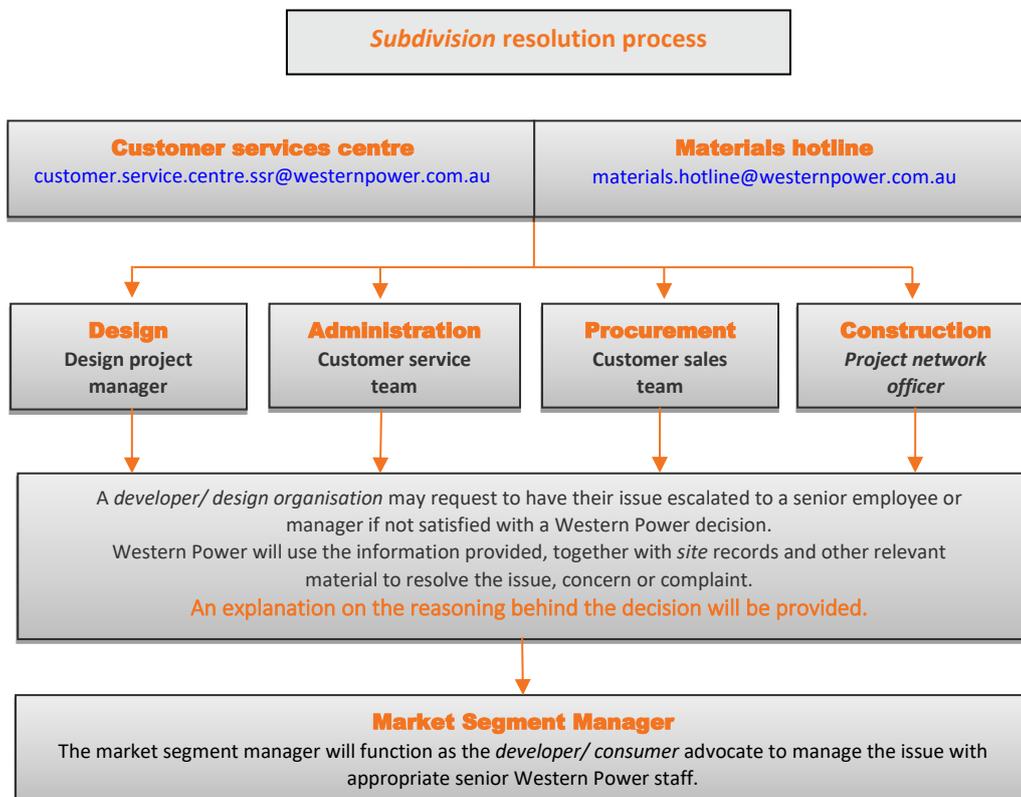


Figure 6: Subdivision resolution process

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5. UDS design requirements

This section informs *developers*, *design organisations* and *designers* on Western Power's requirements for the design of the *electricity infrastructure* in underground *subdivision* distribution networks.

5.1 UDS design responsibilities

5.1.1 Developer responsibilities

In addition to the requirements of [clauses 1.10](#), [4.2.3](#) and [4.3.3](#) the *developer shall*:

- a) be responsible for the overall design, construction, connection and delivery of the *electricity infrastructure* and *interface reinforcement works* forming a part or whole of the proposed *subdivision*;
- b) ensure the requirements of the proposed *subdivision* are clearly communicated to all parties directly and indirectly involved in and with the *subdivision development*; and
- c) notifying all concerned parties, including other Western Power *consumers* affected by the *subdivision development*.
- d) obtain and provide to Western Power, all relevant clearances and approvals required for the UDS, including environmental, heritage and planning etc.; and
- e) obtain all approvals from local government, other service providers (including but not limited to Main Roads WA, Telstra and Water Corporation) and other affected parties / *consumers*.

The *developer shall* either be directly responsible for or appoint a *project manager* to direct and administer the *site construction works* inclusive of project coordination and associated inspections / certifications for and on behalf of the *developer*.

5.1.2 Design organisation responsibilities

The *design organisation shall* via their endorsed nominated representative:

- a) inspecting the *site* prior to designing the UDS to identify / confirm any particular *site* requirements to be incorporated into the UDS design;
- b) as required communicate the design requirements of the *developer* to Western Power;
- c) as required communicate the design requirements of Western Power to the *developer*;
- d) *shall* on behalf of the *developer*, design and document the required UDS *subdivision electricity infrastructure* in accordance with the *developer's* and Western Power's requirements; and
- e) provide Western Power with electronic 'deposited plans' and 'as constructed' drawings of the completed UDS *subdivision*.

5.1.3 Engineer's responsibility

The *engineer* is responsible for:

- a) overseeing the design of the *electricity infrastructure* in each UDS;
- b) checking and approving the design of the *electricity infrastructure* in each UDS;
- c) certifying the UDS design as being compliant with the requirements of this UDS manual, applicable legislation, engineering standards and network requirements,
- d) ensuring that a UDS design is safe to construct and connect to Western Power's network; and
- e) overseeing unresolved issues arising from or during the construction of the UDS *infrastructure*.

5.1.4 Designer's responsibility

The *designer* is responsible for:

- a) designing the UDS in accordance with all applicable legislation, engineering standards, network requirements and the requirements of this UDS manual;
- b) attending pre-start *onsite* and design meetings;
- c) Providing information as required by Western Power to process the DIP and DCR, including *site* formation and *design information package* from the *developer's civil engineer* and *surveyor*; and
- d) Resolving any *site* issues arising from the construction of UDS in a *subdivision development* as directed by the *developer's engineer*.

5.2 Qualifications and experience

The *design organisation* shall:

- a) employ an *engineer* and *designer(s)* to design the *electricity infrastructure of subdivisions*;
- b) have professional indemnity (PI) insurance of no less than two (2)\$ million;
- c) be formally authorised by the *developer* to represent, in conjunction with the *site project manager*, the *developer* in matters relating to the design of *electricity infrastructure for subdivisions*; and
- d) be responsible to the *developer* and their *site* representative.

Personnel employed by the *design organisation* shall have the following minimum qualifications and experience:

5.2.1 Engineer

The *engineer* shall:

- a) have attained and continues to maintain chartered status with Engineers Australia in the field of electrical engineering. The individual shall also have accrued a minimum of ten (10)-years (full-time) demonstrated experience primarily involving design and engineering of electrical distribution networks within Australia;
- b) be competent in the application of Western Power design software of *LV design* and with a detailed knowledge of engineering standards and network requirements. Refer to [clause 1.7](#);
- c) have Professional Indemnity (PI) insurance of no less than two (2)\$ million. Where the *engineer's* PI insurance is already covered by the professional liability insurance of the *design organisation* a separate PI insurance is not required; and
- d) Western Power reserves the right to exclude an individual or organisation from certifying UDS designs where said individual or organisation has a proven case(s) of incompetence and or negligence.

5.2.2 Designer

A *designer* shall:

- a) have formal training in electrical engineering with at least a diploma in Electrical Engineering from a nationally accredited institute in Australia or suitable equivalent electrical trade qualification;
- b) experienced in electrical distribution design;
- c) proficient in drafting skills, *preferably* Microstation; and
- d) be competent in the application of Western Power design software of *LV design* and with a detailed knowledge of *subdivision* standards and network requirements.

5.3 Design requirements

All UDS designs *shall* comply with the [Electricity \(Network Safety\) Regulations 2015](#), this UDS manual and Western Power requirements including relevant information and technical standards, specified in the DIP.

5.3.1 Electricity network safety

The overarching objectives of network safety *shall* encompass all activities carried out in the course of the design, construction, commissioning, operation, maintenance and decommissioning of the network over the life of that installed *infrastructure* (E.g. typically being 50 years). Application of effective network safety strategies together with the fundamental principles of AS 5577 *shall*:

- a) ensure the safety of the public, and persons near or working on network assets;
- b) protect the environment, public / private property as well as network assets; and
- c) manage safety aspects arising from the loss of electricity supply or ignition of fires.

As such, *subdivision* designs *must* be created and implemented in accordance with the requirements described above.

5.3.2 Environmental, and heritage considerations

The *developer shall* investigate, manage and resolve all relevant environmental impacts, title, cultural, heritage matters and *land* encumbrances associated with the *subdivision* as is required by the relevant and applicable statutes applicable at the time of the *development* process. Issues associated with a *subdivision* may also include but not limited to those given in [Section 7](#) of Western Power's [Underground cable installation manual \(UCIM\)](#) available via Western Power's [website](#).

If Western Power is to undertake *work* within or associate with the *subdivision*, the *developer* is to provide copies of its environmental approvals and management plans where those approvals may cover the Western Power work.

If *developer* is to undertake any works outside the *subdivision* or undertake *interface works* by agreement with Western Power, the *developer must* undertake necessary environmental, planning, heritage assessments and provide copies of the required approvals to Western Power upon request.

Information on [SHE policies](#) is available from Western Power's [website](#).

5.3.3 Design load

The maximum demand on a transformer or a LV feeder, when divided by the number of loads supplied, provides a value which is the 'average contribution per *consumer*,' or simply the 'average demand' for a typical *consumer*.

The maximum demand on a transformer or a LV feeder is determined by using following the formula:

$$\text{Maximum Demand} = (N+1)/N \times \text{ADMD per lot} \times \text{number of lots},$$

Where N = Number of lots and

ADMD = 'After Diversity Maximum Demand'

For practical purposes, groups of 50 or more loads (i.e. $N \geq 50$) on a transformer or a LV feeder, $N \times \text{ADMD}$ are considered to produce a figure sufficiently close to the ultimate maximum demand. The effect of ADMD will diminish when N is reduced substantially below 50.

Hence, the ADMD is the average load per *consumer* determined by dividing the group maximum demand by the number of *consumers* in the group when the group size is at least 50.

The *developer must* use design loads for all UDS *subdivision* designs as defined by the following sub-clauses.

To prevent incorrect diversity factor calculations, the number of nodes used in the *LV design shall* be the same as the number of loads that are shown on the design drawing plus known loads for future adjacent stages. Unloaded nodes *shall* not be included.

5.3.3.1 Residential, single phase, diversified loads – LV design A and B loads

For these loads, the load kVA is to be equal to the recommended After Diversity Maximum Demand (ADMD) value in the following table:

Residential Load Categories	ADMD
Single dwelling lots.	Determined by ADMD calculator and specified in the DIP.
Duplex, triplex, or quadruplex lots.	Determined by ADMD calculator and specified in the DIP.
Group housing/units up to 10 units.	Determined by ADMD calculator and specified in per unit in the DIP.
Denser group housing exceeding 10 units, smaller units, retirement villages etc.	Determined by ADMD calculator and specified in per unit in the DIP.

Table 8: minimum ADMD values (kVA)

The ADMD value of single, duplex, triplex or quadruplex lots and group housing units will be determined by the ADMD calculator. The ADMD calculator determines the ADMD of these lots based on size, *land* value and location (suburb). The value will be specified in the DIP. The ADMD values specified are minimum values.

The ADMD provided is based on the assumption that *LV design* software is used to obtain the maximum load on a transformer or a LV feeder. When the number of loads is less than 50, the maximum load *shall* be scaled up by the formula in [clause 5.3.3](#).

5.3.3.2 Rural residential, single or three-phase, diversified loads LV design C loads

Rural residential *development*, including hobby farms, rural home *sites* and rural retreats, are generally on lots of one (1)ha to ten (10)ha in Rural or Special Rural Zones. These loads are generally higher than that in residential lots in urban areas. Therefore, the minimum ADMD value of 5kVA *must* be used.

Where there is reason to believe that the actual design value *should* be greater than 5kVA, an appropriate greater value may be used following consultation with Western Power.

If the number of loads on a transformer is substantially below 50, the ultimate load on the transformer *shall* be calculated using the formula,

Maximum Demand = $(N+1)/N \times \text{ADMD per lot} \times \text{number of lots}$.

5.3.3.3 Non-residential, three-phase diversified loads – LV design C loads

For these loads, the *developer must* use average load kVA values e.g. *commercial and light industrial estates*, unless otherwise known.

The current minimum design requirement for these loads is 200kVA/hectare.

The above value is based on a horizontal *development*, e.g. single storey building. If the *development* is likely to be a multi-level *development*, the minimum design value will also depend on the total usable floor space and the type of usage. Multi-level *development* loads *shall* be considered discrete loads. Refer to [clause 5.3.3.5](#).

(To obtain the load kVA, multiply the kVA/hectare figure with the area of the lot, in hectares. Note: One (1) hectare = 10,000m²)

5.3.3.4 Single phase, non-diversified, discrete loads - LV design D loads

For these loads, the *developer must* use maximum load kVA values, e.g. from the name-plate rating, equipment specifications.

(e.g. Streetlights, pumps, and other significant single-phase loads).

To obtain the maximum kVA value for a single-phase load, use either:

$$\text{Single-phase kVA} = \frac{kW}{\text{power factor } \phi};$$

$$\text{Or Single-phase kVA} = VI = \frac{240}{1000} * I$$

5.3.3.5 Three-phase, non-diversified, discrete loads – LV design E loads

For these loads, the *developer must* only use maximum load kVA values calculated in accordance with AS/NZS 3000, and by agreement with Western Power. For example:

- High schools: as specified by *design organisation* or electrical consultant and a minimum of 600kVA.
- Primary schools: as specified by *design organisation* or electrical consultant and a minimum of 250kVA.
- Neighbourhood shopping centres: obtain the load kVA based on a minimum load density of VA/hectare; or as specified by *design organisation* or electrical consultant with a minimum of 200kVA/hectare.
- Large shops/business centres: as specified by *design organisation* or electrical consultant.
- Pumps and other large three-phase fixed equipment: obtain from equipment nameplate or specifications.

Note: Connection of distributed energy resources does not facilitate the reduction in overall capacity. The stated allocation is based on the long term and or potential required capacity for the life of the *subdivision* and *development*.

5.3.3.6 Single phase, non-diversified, discrete loads –LV design F loads

LV design F loads can be used to model single-phase discrete loads on a three-phase network typically used for unmetered and or streetlight circuits.

5.3.4 Aquatic inundation considerations

The *developer shall* ensure that all above ground and buried assets are located to minimise risks to the installed *electricity infrastructure* associated with flooding, groundwater levels, inundation, erosion, tidal movement etc. Consideration *shall* also be given to flood mitigation measures where network *infrastructure* assets are or will be located below ground level within a *consumer's* building or structure.

Consideration *shall* also be given to the physical and technical requirements associated with water course drains and navigable canals in terms of cable entry and exit depths. Refer to [clause 5.3.16](#).

Detailed information can be obtained from the Department of Water and Environmental Regulation via Landgate SLIP (Shared land information platform) website.

5.3.4.1 Flood water considerations

For *subdivision developments* two (2) flood events are to be considered; for river and river fringe flooding and; to that related to localised peak storm events generally referred to as inundation. For both flood event types, State Planning policy requires residential habitable floor levels, not be below the 1% Annual Exceedance Probability (AEP) reference flood level plus defined freeboard margins.

Freeboard allows for such factors as wind and wave action, together with historical and modelling uncertainties.

The *developer shall* ensure ground mounted assets are installed above the following minimum flood level requirements and in localities not subjected to prolonged surface water pooling.

- a) Distribution *substation* and HV switchgear *sites*:
 - I. 1% Annual Exceedance Probability (AEP) event plus 500mm freeboard;
 - II. May be greater at locations requiring increased flood security for example hospitals and essential services facilities. These sites are to be determined on a case by case basis;
- b) *Mini / uni-service pillars* and *pits*: 1% AEP event plus 300mm;
- c) Free standing low voltage (LV) frames, not forming part of a *substation*: 1% AEP event plus 300mm;
- d) Streetlight pole cut-out or cable termination whichever is the lowest: 1% AEP event plus 300mm.

Note: In determining the final locations for network *infrastructure* the requirements of Western Power's technical and engineering requirements *shall* also be taken into consideration and where applicable applied. Refer to [clause 1.8](#).

5.3.4.2 Water table consideration

High water table levels above the underside of a network ground mounted equipment support base, is deemed unacceptable regarding settlement as it will over time potentially de-stabilise the asset foundation thus affecting the reliability of the network asset and associated cable terminations.

The impact of water table levels *shall* be addressed as follows:

- a) Less than 0.5m below proposed network asset level - deemed to be an unsuitable location.
- b) Greater than 1.0m - deemed to be acceptable. Refer to [Distribution substation plant manual \(DSPM\)](#) for standard base arrangements.

Note: For *sites* within the identified range above (0.5 to 1.0m), the *developer* is to either seek an alternative *site* for the network *infrastructure* or implement a detailed geotechnical investigation to determine if an appropriate foundation or structure is available that provides the required design capacities for the life of the installation. *Site* analysis *must* be undertaken and confirmed by a qualified geotechnical *engineer* (NER) and submitted to Western Power for review in accordance with the [Distribution substation plant manual \(DSPM\)](#).

Any deviation from Western Power's technical and engineering standards *must*, in all cases, be submitted for review by Western Power, before being approved for construction.

5.3.4.3 Compliance documentation

As part of the DCR submission the *developer must* demonstrate compliance through the provision of hydrology reports and drawings, in a format acceptable to Western Power, indicating the 1% Annual Exceedance Probability (AEP) levels and *land* contours and AHD values of *substations*. This information *shall* be in a suitable format to enable inclusion into Western Power's GIS for future project reference. Additionally water table levels are to be provided in those locations where any network ground mounted equipment and *substations* are proposed to be installed.

Where hydrology drawings are not available for the proposed *subdivision* then flood levels *shall* be demonstrated in a manner acceptable to Western Power. (E.g. local government, *land* owner or previous *developer* records).

5.3.5 Point of supply (connection)

Point of supply (connection) is the point on the network where electricity is supplied to the *consumer* and is the Western Power network and *consumer interface*.

Unless approved otherwise by Western Power, all new and infill *subdivision developments shall* be serviced via an underground *electricity infrastructure* and *service connection*. Refer to [WA Service and installation requirements \(WASIR\)](#) clauses 12.2.1.2 and 12.5.2 for additional information.

Western Power will only provide one *point of supply (connection)* per *freehold title lot* and the *point of supply (connection)* shall be in the form of a shared *service pillar* ([clause 5.3.6](#)), a LV frame ([clause 5.3.7](#)) or *substation* ([clause 5.3.19](#)) at the lot boundary.

Western Power will only provide one *point of supply (connection)* to service all the *survey-strata* lots which may include 'common property lot' shown on a *strata plan*.

The combined allocated / future maximum demand (MD) for the *strata, freehold site/installation* shall not exceed the rating of the *connection service* designated for that *site* or *sites* where it is to be a shared or sole use service. For a *connection service* incorporating a *mini-service pillar* or *pit* ([WASIR](#) clause 12.5.2) the equipment rating shall not exceed the equivalent total capacity of the device.

For residential lots, one (1) *mini-service pillar* is to be installed to service adjacent lots, permitting a maximum of two (2) consumer mains cable connections.

Where a *developer* seeks to install one (1) *service pillar* per lot due to unusual circumstances, such as parapet walls, large lot sizes, restrictions of common lot boundary access, built to property boundary or retaining walls higher than 300mm, the *developer* shall provide justification to Western Power and obtain approval prior to finalisation of the design. Refer [clause 2.2.3.4](#).

A *uni-service pillar* is to be provided for any group housing lot (*built strata, survey strata or freehold*) where the combined capacity may or exceeds the rating of the *mini-service pillar, pit* or preferred device.

Each commercial or industrial or lot shall be serviced, either directly from a *uni-service pillar* or a *substation*, dependant on the design capacity requirement.

Where a *uni-service pillar* is installed on a group housing, commercial or industrial lot, the top bar is not to be used for the purposes of network interconnection as it is designated as the *consumer's point of supply (connection)* and consumer mains cable termination point.

5.3.6 Service pillars and pits

5.3.6.1 Service pillar location

When lots face a gazetted public road, *service pillars* shall be located within the lot boundaries at the corner, as shown on:

- [Figure 25: Pillar Location and Installation Requirements](#).
- [WA Service and installation requirements \(WASIR\)](#) (figure 54).
- [Utility providers code of practice \(UPCoP\)](#) Typical lot entry arrangements.

The [UPCoP](#) provides additional advice on utility service lot entry arrangements, both front of lots and laneways, inclusive of *service pillar* locations at the lot boundary intersection. Refer to [clause 6.2.8.19](#).

Service pillars shall only be permitted in gazetted laneways where there are no other roads in the vicinity, or it is necessary due to high retaining walls along the front property boundary preventing safe access for operational and maintenance purposes. Refer to [clause 5.3.13](#) for additional laneway requirements.

For multiple battle-axe *freehold* lots with a shared driveway, a *service pillar(s)* may be located to the side of the driveway. Where this results in a consumer's main cable crossing adjacent lots, the arrangement shall be covered by an easement across the common driveway.

An easement may also extend along a common driveway, enabling all consumer mains cables to be installed within a common trench. Easements shall be created under Section 136C of the Transfer of Land Act 1893 in favour of Western Power. Refer to [figure 24](#).

In residential *freehold* and *strata title subdivisions*:

- a) *Service pillars* for lots created with non-gazetted rear laneway frontage and street access leg *shall* be located at the street frontage, not the laneway. Location *shall* be on the street boundary of the front lot with the principal street frontage adjacent to, but not within the access leg if it is 1.5 metres or less; and
- b) Where the *service pillar* cannot reasonably be located adjacent to a common *freehold* lot boundary e.g. because of an existing driveway, then at Western Power's discretion:
 - i. a *mini-service pillar* may be located elsewhere on the front street boundary of the lot. An easement *shall* be provided from the common boundary to the *service pillar* to protect any future consumers main cables from an adjacent lot . The easement *shall* be a Section 136C of the Transfer of Land Act 1893 in favour of Western Power; or
 - ii. a *service pit* arrangement may be permitted where access to the *serviced pillar* would be restricted or the location of a *service pillar* may comprise network and or public safety Refer to [clause 5.3.6.2](#).

Note: Any decision to locate a *service pillar* in a non-standard location or be substituted by a *service pit* *must* be justified by a detailed risk assessment (FSA) in consultation with Western Power.

Note: *Service pillar* and *pit* locations shall be selected so as not to create a hazard or be subjected to damage.

Note: The installation of *mini/uni service pillars* and *pits* *shall* not be located within fenced backyard(s) or an inaccessible portion of a *consumer's* property.

5.3.6.2 Service pit locations

In addition to the requirements of [clause 5.3.6.1](#) a below ground *service pit* may be considered for use in the following situations where:

- I. a *service connection* is designed to be installed in a laneway and there is no acceptable standard *service pillar* location(s);
- II. the installation of a *service pillar* would be located within a thoroughfare (I.e. driveway or path) and would directly present a trip/traffic hazard or safety concern;
- III. the location of the *service pillar* would be exposed to ongoing repair;
- IV. an existing *service pillar* is damaged or Western Power deems as being 'at risk' from repeat damage; and
- V. the location of other existing utility services inhibits the required clearances from the *connection service* installation.

Note: Any decision to substitute a *service pillar* with a *service pit* *must* be justified by a detailed risk assessment and approved by Western Power.

Note: The installation of *uni-service pillars* is not permitted in laneways.

Note: Use of 'live end seals' (LES) *must* be done so sparingly and in consultation with Western Power. Where used, 'live end seals' are to be located at the end of a laneway and *preferably* in an accessible area not covered by hard stand (asphalt or concrete). Refer to [clause 6.2.8.20](#).

5.3.6.3 Service connection exclusion zone

An exclusion zone *shall* be maintained around network equipment to allow network staff, emergency personnel and where authorised *electrical contractors*, sufficient room to gain access to or remove covers from network equipment, and to provide a safe working environment while operating switches, links, or fuses, completing or removing *connection services* or carrying out maintenance tasks.

The *land* within the exclusion zone *shall* be flat, supported where required, with batters or retaining walls to prevent soil erosion. It is required that no communications or other utility services *shall* pass through or be located within the network service exclusion zone.

For both *mini / uni-service pillars* and *pits*, the service exclusion zone *shall* be the minimum separation required between the service asset low voltage earth electrode at the centre of the service asset and other services as defined in AS/NZS 3000 Table 3.7. This requires 500mm separation from water services, sanitary drainage and gas, and 600 for stormwater drainage.

Note: The exclusion zone *shall* include an area within the property boundaries, extending 500mm in the horizontal plain from the centre of the *service* asset to the adjacent property boundaries and uninhibited access in the vertical plain.

Refer to [clause 5.3.6.1](#) for drawings indicating the exclusion zone and relation to lot boundaries and other utility services. For additional information refer to section 12 of the [WA Service and installation requirements \(WASIR\)](#).

The requirement for an unimpeded exclusion zone and responsibility for the ongoing maintenance of that zone is further prescribed in the [Western Australian Electrical Requirements \(WAER\)](#). Any intrusion into or obstruction of the zone is to be rectified by the offending party (ies) at their cost. Where there is doubt as to the long term effectiveness of the regulation the *developer shall* also register a restrictive covenant over the asset exclusion zone.

5.3.6.4 Service pillar identification

Service pillars and *pits* bearing Western Power's present or former embossed logos and utilising triangular keyed cover locking bolts *shall* not be used for private non Western Power electricity distribution systems.

5.3.6.5 Service pillar network connections

Mini-service pillars installed on either side of a road *shall* be connected independently to the LV feeder. (*Mini serviced pillar / pit*, daisy chained connections are not permitted).

For *service pillar*, streetlight fuse and cable termination connection requirements refer to [Distribution construction standards handbook \(DCSH\)](#) sections 'U' and 'R.' Refer also to [clause 8.7](#).

5.3.7 LV kiosk installation

A LV kiosk (PENDA 1.1) have specific design, construction and installation requirements.

The standard earthing arrangement *shall* be adjacent to the asset whilst maintaining the minimum AS/NZS 3000 clearances from the earth rod and the earthed cabinet. The impacted lot *shall* have an appropriate restrictive covenant and or exclusion zone as detailed on the 'design drawing' to cover that specific lot / area from the kiosk to 250mm beyond the earth ring. Refer to the [Distribution design catalogue \(DDC\)](#) and [Distribution substation plant manual \(DSPM\)](#) for details.

5.3.8 HV cables

The *developer* is to ensure that high voltage cables are used as a minimum for all UDS works, in accordance with the following requirements unless specified otherwise in the DIP.

Where the design proposes the use of termiticide treated cables, the formal safety assessment (FSA) *shall* include all identified environmental risks and the mitigation to control those risks. Western Power will review the *developer's* design & FSA prior to DCR. Refer to the [Underground cable installation manual \(UCIM\)](#) for cable details.

Note: Corresponding cable joints *shall* also require termite protection to maintain the integrity of the treated asset.

Note: Unless specified otherwise, Western Power 33kV cables have termite treatment.

a) Cables used on 6kV to 22kV three-phase systems between RMU's.

- 400mm² aluminium (240mm² copper cable only permitted where 400mm² aluminium cable cannot be used due to installation or *site* constraints owing to its larger bending radius) XLPE insulated, PVC/HDPE sheathed cables used on 6.6kV, 11kV and 22kV systems before Y-split or the exit cable of not less than two (2) km from zone *substations*.
- 3x1 core 400mm² aluminium XLPE after Y-split unless approved otherwise by Western Power.

Note: Western Power will specify the size of HV cables to be used for specific situation in the DIP.

b) Cables used on 33kV three-phase systems between RMU's.

- 3x1 core 185mm² aluminium XLPE insulated PVC/HDPE sheathed cables.

c) Cables used on 6kV, 11kV and 22kV three-phase between RMUs and transformers or down stream of DOF's.

- 3x1 core 35mm² aluminium XLPE insulated PVC/HDPE sheathed cables.

d) Cables 33kV three-phase between RMUs and transformers or down stream of DOFs

- 3x1 core 50mm² aluminium XLPE insulated PVC/HDPE sheathed cables.

e) SPUD transformer cables 12.7/22kV.

- 1 core 35mm² aluminium XLPE insulated PVC/HDPE sheathed cables.

5.3.8.1 HV live end seals

HV cables that are, in the future proposed to be extended beyond the *subdivision* project stage, *shall* terminate into a live end seal adjacent to the stage boundary as a working end.

HV network extensions may include network feeders and interconnections to meet network planning requirements and to supply transformers in adjacent *subdivision* stages.

Note: The use of live end seals (LES) *must* be done so sparingly and in consultation with Western Power. Where used 'live end seals' are to be located in an accessible area not covered by hard stand (asphalt or concrete). Refer to also [clause 6.2.8.20](#).

5.3.9 LV cables

The *developer* is to ensure that low voltage cables are used as a minimum for all UDS *works*, in accordance with the following requirements unless specified otherwise specified in the DIP.

5.3.9.1 Feeder cables

- 240mm², 3 core, solid aluminium conductor, copper screen neutral (wave wound), 0.6/1kV, XLPE insulated, PVC sheathed cables.
- 120mm² cables may only be used for a spur feeder with not more than six (6) residential lots connected or for rural lots connected to a 63kVA three-phase transformer where the feeder length is not exceeding 500m.

5.3.9.2 Mini-service pillar connection cables

- 25mm², 3 core, stranded copper conductor, helical wound stranded copper neutral screen, 0.6/1kV, XPLE insulated orange PVC sheath cables. Provide at least 300mm of slack in proximity to the *service pillar* to provide flexibility in the final positioning/repositioning.

5.3.9.3 Street lighting cables

- Single core 16mm² stranded copper, XLPE insulated, helical copper wire neutral screen, PVC sheathed cables.

5.3.9.4 LV live end seals

LV feeder cables, which are in the future, to be extended beyond the *subdivision* project stage *shall* terminate into a live end seal adjacent to the stage boundary as a working end.

Live end seals for future extensions to adjacent stages are acceptable, where a future direction connection is deemed impracticable by the location of the network *infrastructure* to the stage boundary.

Note: The use of live end seals (LES) *must* be done so sparingly and in consultation with Western Power. Where used 'live end seals' are to be located in an accessible area not covered by hard stand (asphalt or concrete). Refer also to [clause 6.2.8.20](#).

Note: All LV 16/25 mm service cables *shall* be terminated or provision made for future access and installation into the associated network *infrastructure*.

5.3.10 Cable alignment

All network *electricity infrastructure* cables (excluding private street lighting cables) *shall* be installed in the 0-500mm alignment within the gazetted road reserve in accordance with the [Underground cable installation manual \(UCIM\)](#) and the [Utility providers code of practice \(UPCoP\)](#).

Alternative locations *must* only be considered where a formal safety assessment (FSA) identifies unacceptable risks created by the use of the standard alignment.

Alternative locations *shall* be considered in the following level of priorities:

- a) Cable trench layouts – see drawings UDS-6-2 in [clause 8.7](#).
- b) Access to the 0 -500mm alignment is obstructed (e.g. tress or other services)
- c) Utilise the 0 – 500mm alignment on the other side of the road.
- d) The 2.4 – 3.0m alignment *should* only be considered where no overhead infrastructure is present and the 0 - 500mm alignment on both sides of the road is deemed impractical to utilise.

Designers intending to install cables near existing/proposed walls and/or structures built within close proximity to the property boundary, through private properties, public open space (POS) and public access way (PAW), *must* first seek prior approval from Western Power and where affected other utility providers, local government authorities (LGA) and property owners. Refer also to [clause 5.3.15](#).

Prior to seeking approval from Western Power, the *developer shall* undertake a comprehensive multi-criteria analysis that includes assessment of all possible options and associated risks across the entire asset lifecycle (constructability, operability, maintainability). The *developer* and *design organization shall* ensure that all risks are reduced SFAIRP.

Where Western Power permits cables to be installed out of the nominal 0 - 500mm, the cables are to be installed as directed by Western Power and in accordance with the [Underground cable installation manual \(UCIM\)](#). Refer also to [clause 5.3.12](#).

5.3.11 Permitted number of cables within nominal green field cable alignment

The *design organisation* is to determine the number of cables that can be installed in the nominal cable alignment in accordance with the requirements on drawing UDS-6-2 in [clause 8.7](#): Cable trench layout (sheets 1 of 7) and the [Underground cable installation manual \(UCIM\)](#)

LV cables *shall* also be assessed in accordance with AS/NZS 3008, IEC 60853 and the ratings identified on the design drawings. Where a de-rating study is required, the *project manager* and *engineer* is to liaise with Western Power to ascertain technical parameters for the study. Refer to [clause 6.2.8.6](#).

When HV or LV cables are installed in ducts, a minimum clearance of 100mm between property boundary and duct is required. For HV feeder and transformer cables in ducts on the bottom layer, a minimum duct separation of 100mm is permitted.

The minimum depth of cover over cables and cable joints below the expected finished ground level *shall* be in accordance with the [Underground cable installation manual \(UCIM\)](#) and [clause 6.2.8.6](#).

Where the cable alignment on one (1) side of the road is unable to accommodate the number of required cables, excess cables are to be installed on the cable alignment on the opposite side of the road.

5.3.12 Ducts

The *developer shall* ensure that all cable conduits, ducts and pipes are correctly selected in accordance with the [Underground cable installation manual \(UCIM\)](#) and comply with the relevant Australian standards.

Cable conduits, ducts and pipes (including spares) *must* be shown on the UDS design drawings. The following table may be used as a guide prior to the review and update of the [Underground cable installation manual \(UCIM\)](#):

Description	Cable Size	HD Duct /Conduit Nominal Size (mm)	HD Polypipe Nominal Size. External/Internal Diameter (mm)
HV feeder cables	95 – 400mm ²	150 mm	160/135
HV transformer cables	≥ 50mm ²	150 mm	160/135
HV transformer cables	< 50mm ²	100 mm	110/93
LV cables	120 – 240mm ²	100 mm	110/93
LV service cable	25mm ²	50 mm	63/53
LV streetlight cables	16mm ²	50 mm	63/53

Table 9: Cable duct/conduit and pipe sizes

5.3.13 Cables and electrical services in access lanes and laneways

[WAPC Planning Bulletin Number 33 \(2017\)](#) (Right of way or laneways in established areas guidelines) defines a ‘Laneway’ as a narrow local street type without a verge located along the rear and/or side property boundary, typically used in more dense residential areas when smaller lot layouts justify rear garaging, and where alternative vehicle access is needed for lots fronting busy streets or parks.

[WAPC Policy No. DC 2.6 \(2021\)](#) (Residential road planning) requires a minimum of six (6) metres and a maximum of thirteen-five (13.5)m for the width of reserve for laneways.

Western Power’ requires *subdivision* cables and associated *electricity infrastructure*, including transformers, switchgear, *service pillars* and street lighting to be installed within the gazetted road reserve, adjacent to the associated property front boundaries and not from laneways.

UDS designs seeking to install network cables and *infrastructure* in access lanes or laneways will require Western Power approval prior to the DCR submission.

Western Power will accept cables and *infrastructure* in laneways where:

- a) There is no alternative route for the installation of cables and no acceptable location(s) for the associated network *infrastructure*;
- b) Access to *infrastructure* from normal gazetted public road reserves is unsafe or not available; and
- c) Other WAPC conditions in the *subdivision* approval do not permit the installation of *infrastructure* within the standard gazetted public road reserve.

Where Western Power approves to installation of cables within a laneway, the cabling *must*:

Either

Be installed in the 0 – 500mm alignment from property boundary in cable ducts with a minimum of one (1) spare duct,

Or;

Be direct buried in soil, provided 300mm of clean sand is installed below the cables and clean sand is installed above the cables all the way up to the road base with a minimum of one (1) spare duct.

Note: For the *subdivision* clean bedding and backfill sand requirements refer to the [Subdivision design guideline for bedding and backfill sand \(#4\)](#) and the [Underground cable installation manual \(UCIM\)](#).

5.3.14 Cable near to retaining walls / structures

Cables and *infrastructure* directly buried alongside or adjacent to significant existing or future structures, (E.g. retaining walls, building foundations, brick fences, etc) present a future and or lifecycle excavation/collapse hazard, which *must* be addressed in the formal safety assessment (FSA) with the design.

Typically the risk can be reduced though the use of alternative construction methods or conduits/ducts installed to facilitate replacement without the need for future excavation. Refer to [clause 5.3.10](#) and [clause 6.2.8.13](#).

For proposed *subdivisions*, the location of all such structures and their civil design details *must* be shown on the UDS design drawings submitted for DCR.

5.3.15 Easements

Where Western Power approves, in conjunction with the local government authority and or any affected third party, the installation of network equipment and or cables in private properties, POS or PAW, the *infrastructure* is to be protected by an easement. Easements required for any *infrastructure shall* be an easement in gross pursuant to the [Energy Operators \(Powers\) Act](#). The *developer must* arrange with Western Power's Conveyance Team for the creation of any required easement at no cost to Western Power and *shall* be responsible for advising all potential *land* purchasers and affected parties of the easement locations, use and restrictions.

Easements may be required to ensure appropriate clearances are maintained from and or around network *infrastructure*. Easements facilitates:

- the installation, identification and protection of buried services;
- the creation of unrestricted access to the associated equipment; and
- protects *consumers*, members of the public and the environment from the consequences of fire, noise and or pollution in the event of equipment failure.

The minimum width of an easement for the installation of underground electrical cables *shall* be a minimum of one (1) metre. Easements may also be required within *survey strata scheme subdivisions* for *consumer* owned services.

'Easement in Gross' is an easement, used by service utilities / authorities to protect their interests over crown and *freehold title lot land*. An easement in gross is an easement without a dominant tenement. Western Power usually requires one of the following types of easement in gross.

a) Section 167 easement (previously section 27A easement)

This is an easement created automatically on new *subdivision* plans under Section 167 of the [Planning and Development Act 2005](#) (previously Section 27A of the Town Planning and Development Act, 1928).

It is created when new titles of lots within the *subdivision* are created, to facilitate the installation of and ongoing access for roads and utility services including Western Power distribution systems. The easement *must* be shown on the deposited plans submitted to the DPLH for the issuing of *land* titles.

b) Section 136C easement

An easement created on *freehold titles* including *survey strata* lots and plans under Section 136C of the [Transfer of Land Act 1893](#) to provide for *consumer* owned services such as electrical and plumbing connections to the requisite utility network.

c) Section 144 crown easement

Crown easements are required to protect cables in existing POS. These are granted by the Minister under the [Land Administration Act 1997](#). Crown easements require the approval of the DPLH.

d) Energy Operators (Powers) Act 1979

Easements for transmission and distribution overhead *infrastructure* on *freehold title land* within new *subdivisions* can be created with an easement in gross under the [Energy Operators \(Powers\) Act 1979](#).

5.3.16 Water course drains and navigable canals.**5.3.16.1 Water courses and drains**

The *developer shall* ensure all water course drains are shown on the UDS design drawings. In all cases the *developer shall* ensure cable depth of cover *shall* not be adversely impacted when located in proximity of water course drains and navigable canals (E.g. Inundation, erosion).

Substations shall not be installed near water course drains, or sumps where the requirements of [clause 5.3.4](#) cannot be achieved. Detailed requirements for *substation sites* are shown in [clause 5.3.19](#).

The design drawing *must* show the installation of cables crossing a water course and or open drain detail. Cables *must* be installed in concrete-encased heavy-duty ducts no deeper than 1200mm and have a minimum cover of 500mm below the bottom of the water course drain. Refer to the [Underground cable installation manual \(UCIM\)](#) for additional information.

Where the water course drain is non-navigable, is not associated with a road reserve or does not meet the requirements above, cables *shall* be installed in heavy-duty ducts with an extra steel conduit for additional support and cross the open course drain in open air. The steel conduit and heavy-duty duct *must* be extended at least two (2) metres into soil on either side of the open course drain to provide support so that the cable does not suffer damage by its own weight.

5.3.16.2 Navigable canals

Cabling under trafficable canals is not permitted. Alternative provisions in road reserves or suitable access provisions within bridge structures *must* be provided to address maintenance requirements and safety associated with boat impact / anchors or dredging damage.

5.3.17 Transformers and size

Transformer types and sizes to be installed in different types of *subdivisions* must meet the design criteria in the following table:

Residential subdivision.	MPS transformers. 630kVA & 1000kVA Non-MPS transformers may only be used with the approval of Western Power where there is a significant local load to warrant the increased transformer size. Piggy backing of transformers is not permitted.
Rural residential subdivision with three-phase power.	63kVA, ground mounted transformers with up to a maximum of five (5) transformers in a string. MPS transformers. Piggy backing of transformers above 63kVA is not permitted. Piggy backing of three-phase transformers with single-phase transformers is not permitted.
Rural residential subdivision with single-phase power.	25kVA or 50 kVA SPUD transformers. Note: Where approved by Western Power.
Commercial and Industrial subdivision.	Non-MPS transformers up to maximum of 1000kVA. Piggy backing of transformers is not permitted.

Table 10: Transformer sizes

5.3.18 HV breach joints

HV breach joints are deemed to be a supply option of last resort, therefore *shall* not be used unless formally approved by Western Power. High voltage ring main units (RMU) *must* be used where a HV feeder splits into two (2) or more branches and/or feeds transformers. Specific RMU requirements will be specified in the DIP. Standard RMU sizes include 2+1, 2+2, 2+3, 3+0, 3+1 and 3+2.

Where approved, HV breach joints may be used in the following situation:

- a) The currently available range of switchgear is not adequate, e.g. a 4+2 is required; and
- b) The breach joint is switched on each of the three (3) sides so that isolation can occur if there is a joint problem; and
- c) None of the three (3) sides of the breach joint *must* form part of a major interconnection between adjacent HV feeders.

Note: The use of a breach joint and the corresponding electrical isolation hazard *must* be documented in a formal safety assessment (FSA) and formally approved by Western Power. The maximum size cable that can be breached from a 400mm² HV cable is 95mm².

5.3.19 Substations

5.3.19.1 Substation sites

When the installation of a *substation* (including package *substations*, transformers and switchgear) is required, the relevant clauses contained in the [WA Service and installation requirements \(WASIR\)](#) shall apply. Refer [clause 5.3.4](#) for *substation* flood water mitigation requirements.

The *developer* is responsible for advising potential *land* purchasers of all *substation sites* inclusive of the proposed use and restrictions on the use of adjacent residential, commercial and industrial lots. As a minimum, established and future *substation sites* *must* be shown on all *developer* sales brochures and promotional material.

Substation sites are to be located on public owned *land* (e.g. road reserve extension or public open space) or in the case of *substations* dedicated to a single lot they may be located within the lot adjacent to the road reserve. The *developer* is responsible for providing all *substation sites*.

Substation sites to be located within the road reserve, *must* be located in the indent of that road reserve and as close as possible to the road boundary line extension along normal gazetted public road reserve. The *site shall* include where required oil containment, retaining walls, batters, kerbing and site traffic /pedestrian protection as prescribed by the [Distribution substation plant manual \(DSPM\)](#). Refer to the additional requirements for fire separation clearances.

Retaining walls are *preferred* to batters. Refer to the [DSPM](#) and *substation site* drawing example [clause 8.7 – figure 26](#). Where the *developer* chooses to locate *substation sites* on POS, it *shall* take the following into consideration:

- a) Suitable location of *sites* within POS;
- b) Size, shape, contour and dimensions of POS; and
- c) Community standards of health, safety and amenity.

Note: Transfer of *land* for a *substation site* may not be appropriate in some situations. Refer [clause 4.1.6.2](#) for consideration of these alternative arrangements.

Civil consultant's drawings detailing *site* levels, retaining walls and battered slope designs *shall* be submitted for DCR. For elevated *sites*, a signed certificate of verification is required by a registered professional *civil engineer* (NER) verifying that the *substation* retaining walls are structural sound and/or battered slopes are appropriate, fit for the purpose.

Substation sites cannot be located on a transmission easement or distribution cable easement.

The *substation site* civil and *land* requirements are shown on drawings in the [Distribution substation plant manual \(DSPM\)](#).

Western Power may specify the location of *substation sites* of a *subdivision* based on strategic operational requirements in the DIP.

The following restrictions apply to the use of POS, PAW and lots immediately adjacent to *substation sites*:

5.3.19.1.1 Fire separation:

[Distribution substation plant manual \(DSPM\)](#) and the [WA Service and installation requirements \(WASIR\)](#) define spatial separation between buildings and *substation* equipment. These requirements can be mitigated by provisions of suitable fire rated walls or buildings.

Where the fire clearance requirements of residential, commercial, industrial or lots that are vested in the Crown are not mitigated to be contained within the *substation site* as part of the *subdivision works*, the *developer shall* place a restrictive covenant in the form of a section 129BA under the [Transfer of Land Act 1893](#) to burden the affected lot/s and define *substation* to building clearance requirements or to discuss other options with Western Power. Extension of road reserve to the extent of the fire clearance requirements (ie in lieu of) would not be considered as an acceptable option.

Lots that are vested in the Crown require consent from the Department of Planning Lands and Heritage and any management body or any utility or public authority that will be granted a management authority to enable the restrictive covenant to be placed. Design drawings for distribution transformer *sites* adjacent to or within residential, commercial or industrial lots *shall* indicate dimensioned fire clearance area limits around the *site* and be submitted as part of the *design conformance review*.

For preparation of restrictive covenant documentation, *developers* may use prescribed wording provided by Western Power or prepare their own document which *shall* be reviewed by Western Power. Contact Western Power's Conveyance Team for document preparation options and applicable fees.

Note: A property owner may choose to erect/construct and maintain an appropriate independent fire rated barrier within a restricted zone following formal consultation with Western Power.

The installation of a barrier(s) does not negate the need for the restrictive covenant unless the *substation* is permanently removed from service. Note, the care and maintenance of such structures, remains the responsibility of the *developer/property owner*.

5.3.19.1.2 Noise compliance

Noise emitted from distribution transformers and associated equipment such battery systems located adjacent to lots where noise sensitive premises exist or are proposed, *shall* be evaluated to ensure compliance with State Government Environmental Regulations and protection requirements.

Compliance *shall* be achieved by one or a combination of the following considerations:

- a) Adequate distance separation from the *substation* and premises.
- b) Compliance consistent with local environmental noise influencing factors, (E.g. adjacent major roadways).
- c) *Substation* walls or fences erected to attenuate sound pressure levels entering the adjacent properties. NER structural *engineering* sign off is required where the wall /barrier is an integral part of *substation* installation.
- d) Notifications on property titles or notes on *development* plans to identify the noise affected portion of the lot that may require building design features to address noise compliance.

Transformer noise assessment where required *shall* be undertaken to ensure compliance with Environmental Protection (Noise) Regulations 1997 and particularly the Environmental Protection (Western Power Electrical Distribution Transformer Noise Emissions).

Western Power has developed in conjunction with the Department of Environment Regulation and the UDIA, a work instruction [Noise compliance requirements for distribution transformers](#) for use by *developers* to assess noise compliance, assisting in the determination of *substation* siting and any attenuation or notification measures required to ensure compliance. This document is available from Western Power's [website](#).

Design drawings for *substation sites* adjacent to existing or proposed noise sensitive premises *shall* indicate dimensioned noise affected area limits around the *site* and be submitted as part of the *design conformance review*.

Details shall be noted on the design drawings and evidence *shall* be provided of any notifications (70A notification under the [Transfer of Land Act 1893](#) or clauses in the 'detailed area plan' when requesting *subdivision* clearance. 70A notifications *shall* be submitted to WP for agreement and signing. Refer to [clause 5.3.19](#) for *developer* sales brochures and promotional material requirements.

5.3.19.1.3 Substation screening and fencing

The *developer* is responsible for the installation of screening and boundary fencing which *must* meet these requirements and the requirements of the [DSPM](#) and [WASIR](#).

Metallic screening or boundary fencing adjacent to *substations* is not recommended and is to be avoided in *subdivision developments*. Where a *developer* intends to install metallic screening or boundary fencing the *developer* shall ensure future land owners are fully aware of the maintenance obligations and any potential risks identified as a part of the site formal safety assessment (FSA).

Based on the network *connection point* for each project Western Power may state in the DIP whether a metallic fence poses a step-touch voltage risk or not.

If exemption is granted in the DIP, the *developer shall* record this exemption in the project records as the outcome of the metallic fence step-touch voltage assessment by Western Power.

Note: EPR studies may still be required for other metallic structures/services around the *substation site* such as metallic pipelines, telecommunication services, etc.

If no exemption is granted for metallic fences, an EPR study *shall* be carried out to assess step-touch voltages on metallic fences for the *substation(s)* in that *subdivision* stage/project. It *shall* be assumed that a metallic fence is installed on the Western Power *site* boundary but not connected to the *substation* earthing.

For such fences, the *subdivision/substation(s)* earthing *shall* be designed to meet tolerable step-touch voltage limits of AS2067. The EPR study *shall* be undertaken using the fault levels and protection settings provided by Western Power in the DIP. An EPR report detailing any mitigation needed to meet tolerable voltage limits on the fence is to be submitted to Western Power for conformance. The EPR study will have one of two outcomes:

The *substation* earthing has been designed such that step-touch voltages on the fence are within tolerable voltage limits and metallic fences will not pose a step-touch voltage risk.

The step-touch voltages limits on the metallic fence cannot be met, then one of the following options can be used:

- a) The *substation site* boundary can be increased such that the step-touch limits on the metallic fence are met at the new *substation site* boundary; or
- b) The *developer shall* install a masonry property boundary fence at the same time as the installation of the *substation*. This masonry fence is required on all sides of the *substation* adjoining private property and extending along the private property boundaries to the point where step-touch voltages on the property boundary fence are within limits.

Note: These options *shall* not be used to mitigate step-touch voltages for the power system earthing design of the Western Power *substation site*. Western Power may consider a *developer's* alternative solution.

5.3.19.2 Substation equipment termination requirements

HV and LV cables *shall* be correctly terminated into switchgear. Incorrectly terminated cables may create electrical hazards, jeopardising the safety of Western Power's employees, persons engaged in the operation and maintenance of the equipment and the safety of the general public.

The configuration of switches, switchfuses and the layout of terminating cables *shall* be clearly shown on the design drawing submitted for *design conformance review*. Refer [clause 8.2.5](#).

Terminating cables layout requirements:

The layout of terminating cables *must* be designed according to the following practice:

- a) The 35mm² HV cable of the local transformer *must* be connected to the nearest switchfuse.
- b) Crossing of HV cables *must* be avoided as far as practicable.
- c) All 35mm² HV cables *must* not be connected to switches as they are not fault rated unless protected by fuses.
- d) The destination of every HV cable *must* be clearly shown on the switchgear configuration and cable layout diagram.
- e) LV cables *shall* be clearly named and labelled in accordance with the network [Distribution equipment labelling standard \(DELS\)](#).

5.3.20 HV earths near to telecommunications equipment

HV earths (E.g., *substation* and HV cable pole terminations) *should* not be located within fifteen (15)m of any existing or proposed telecommunications provider equipment pits and equipment.

Where this is not possible, an assessment in accordance with AS/NZS 3835 *must* be conducted, together with formal approval obtained from the relevant telecommunication provider (E.g. Telstra) to allow HV earths to be installed within 15m of their equipment. This approval together with the EPR evaluations/calculations are to be provided as part of the DCR submission.

Deep earths at *service pillars* to assist in achieving *substation* earthing requirements are not considered HV earths for the purposes of these requirements.

Refer to Western Power's [website](#) for:

- [FAQ earthing standard](#) and
- [Telecommunication equipment located in the vicinity of proposed distribution HV earths](#).

5.3.21 Distribution HV infrastructure in proximity to metallic pipes

During an earth fault on the HV network *infrastructure*, a potential difference or voltage, can develop between a HV earth and metallic pipeline due to Earth Potential Rise (EPR). A frequency voltage can be induced onto the metallic pipeline (Low Frequency Induction (LFI)) where HV *infrastructure* is in parallel to that pipeline. These electrical effects can be on both buried and above ground metallic pipes.

Where HV power lines, cables and earths are to be installed in proximity of metallic pipeline(s), the *design organisation must* assess EPR/LFI on the pipeline in accordance with Australian Standard AS/NZS 4853, as set out below to ensure the total *site* risk is As Low As Reasonably Practicable (ALARP).

This assessment is applicable to any new, upgraded or modified *subdivision infrastructure works*, where any new or existing asset, forming a part of the *subdivision works*, has or will be connected to a HV earth in the vicinity of existing metallic pipeline or appurtenance of any other utility.

The design *shall* follow the process steps below:

1. The first pass (Level 1) EPR/LFI assessment *shall* be completed in accordance with the process in AS/NZS 4853: Figure 4.1 using appropriate values from Tables 4.2 and 4.3 of the standard as a zone of interest to identify possible metallic pipeline assets (pipeline or appurtenances) of concern from DBYD.

- a) If no metallic pipeline assets are identified within the zone of interest: Document the assessment for submission with the DCR. No further action is required.
- b) If any part of a metallic pipeline is found within the zone of interest or Tables 4.2 and 4.3 of the standard do not cover the project's design parameters: Continue to step 2.

2. For metallic pipeline assets identified in the Level 1 assessment, a detailed (Level 2) EPR/LFI assessment *shall* be done as per AS/NZS 4853: using *site* specific parameters to calculate a refined zone of interest.

Note: Western Power may request a Water Corporation pipeline assessment to be carried out for Water Corporation assets.

- a) If the Level 2 zone of interest contains no metallic pipeline assets: Document the assessment and parameters for submission with the DCR. No further action is required.
- b) If only an inaccessible asset or buried pipeline(s) is still within the refined zone of interest but no above ground metallic pipeline assets:
Calculate the touch voltage at the pipeline, compare to allowable touch voltage limit document the assessment for submission with the DCR and notify the pipeline asset owner of the extent of pipeline within the hazard contour.

c) If there are still accessible or above ground metallic pipeline assets within the Level 2 zone of interest that cannot be avoided by design improvements / changes, continue to Step 3.

3. For metallic pipeline assets that remain within the zone of interest after the Level 2 assessment, the design *shall* be completed so as to ensure the total risk posed by the installation is As Low As Reasonably Practicable (ALARP) as per Level 3 assessment in AS/NZS 4853. The assessment demonstrating ALARP *shall* be documented in full to produce a detailed report. The pipeline asset owner *shall* be notified and supplied with a copy of the report. Where mitigation options require *works* on or around the pipeline asset, approval from the pipeline owner for such *works shall* be obtained. Projects assessed to Level 3 ALARP risk *shall* be tested after construction before energisation to verify the design.

All assessment reports *must* be signed off by a NER. The *design organisation must* provide the signed assessment report to Western Power as part of the DCR submission. Where the pipeline owner is required to be contacted, this *shall* be prior to the DCR submission and the assessment report, the notification letter to the pipeline owner and any required approvals from them *shall* be provided as part of the DCR submission.

5.3.22 Low voltage feeder design criteria

The *developer must* ensure their *design organisation* uses the following design parameters to design each LV feeder forming part of the UDS design:

- a) Voltage variations upstream of the *consumer's point of supply (connection)* (i.e. *service pillar*) *must* be within the allowable limit of plus or minus 6% of the nominal voltage of 240V single-phase or 415V three-phase under normal conditions.
- b) Conductor current carrying capacity to be adequate under normal operating conditions.
- c) The sum of current of all outgoing feeders of a transformer does not exceed the name plate continuous rated current of that transformer.
- d) LV feeders *must* be protected by LV fuses installed immediately after the transformer secondary protection. The fuse rating for residential street circuits *shall* not exceed 315A at any *substation*. LV feeder length *shall* be within the protection reach of the fuses and downstream fusing *must* not be used to extend the length of a feeder backbone.
- e) Where feeders are separated by not more than two (2) lots outside a *subdivision*, that is or will be further developed, the feeders *shall* be interconnected by underground cables installed in cable alignment along the road boundary of the undeveloped lots via suitable open points.

Design organisations are to use the *LV design* software package to ensure voltage drop, line currents and fuse protection are adequate for each circuit and *must* include the *LV design* file in the submission for DCR. *Design organisations* may, where approved by Western Power, choose to use other methods or software to carry out the evaluation and assessment.

5.3.23 Uni-serviced pillars for LV feeders

In order to provide operational flexibility in residential *subdivisions*, a *uni-service-pillar must* be installed as follows along the complete length of every LV feeder:

- a) Less than six (6) lots: No *uni-service-pillar* required.
- b) Between six (6) and sixteen (16) lots (inclusive): one (1) *uni-service-pillar* required.
- c) Between seventeen (17) and thirty two (32) lots (inclusive): two (2) *uni-service-pillar* required.
- d) One (1) *uni-service pillar* every sixteen (16) lots (or part thereof) where the number of lots exceeds thirty two (32).

An exemption may be granted by Western Power in particular situations, e.g. laneways and retaining walls. Refer to [clauses 5.3.5](#) and [6.2.8.19](#) for additional information on the installation of *uni-service pillars* in circumstances, such as parapet walls, large lots or retaining walls.

Switching points *shall* be created at each *uni-service-pillar* within residential *subdivisions*. For commercial and industrial *subdivisions* one (1) *uni-service-pillar* is required for each lot. Refer [Distribution construction standards handbook \(DCSH\)](#) drawing U9 for cable termination arrangements.

Note: Where a *uni-service pillar* is installed to create a circuit termination off point, the installed device is not to be included in the aforementioned feeder count.

5.3.24 Load and network connection on LV spurs

In the design of LV feeder networks, spur LV feeders are unavoidable in the following situations therefore *designers must* give specific consideration to ensure power reliability and qualities are maintained in the future.

5.3.24.1 Short LV spur feeder

A short LV feeder that will not be extended due to no possibility of further *subdivision* growth, a *uni-service-pillar* is to be installed on the last lot where the total of more than six (6) lots is connected to the spur feeder. This *uni-service pillar* may be used for any future interconnection.

5.3.24.2 LV feeder in cul-de-sac

The cul-de-sac exists in a short street and or canal block layout. For LV feeders that finish at the end of a cul-de-sac where there is no possibility of any future interconnection at the end of the LV feeder, the following design principle *should* be followed.

- a) If the number of lots in the cul-de-sac does not exceed 16, a *uni-service pillar must* be installed at the entrance.
- b) If the number of lots is more than 16, then a *uni-service pillar must* be installed for every 16 lots of the Cul-de-sac.
- c) A second LV feeder *shall* be made available at the entrance of the cul-de-sac. The second feeder *shall* be a feeder with either no load connected or spare capacity which can pick up not less than 25% of the design load of the cul de-sac feeder.

5.3.25 Electrical requirements for disturbing loads

The *developer's design organisation must* ensure any disturbing loads (E.g. motor starting, commercial / industrial equipment) requirements (proposed or existing) comply with the published power quality requirements. Actual starting and full load operating details *must* be used in the assessment which *shall* be submitted to Western Power prior to DCR. Refer to [clause 2.1.3](#) Power quality and the [WA Service and installation requirements \(WASIR\)](#) for details.

5.3.26 Street lighting

5.3.26.1 General

Street lighting forming part of a WAPC *subdivision* application *shall* be undertaken in accordance with Western Power's street lighting and UDS manual requirements.

Street lighting installations not associated with a WAPC *subdivision* application are to be undertaken and completed in accordance with the applicable regulatory, network and industry requirements included but not limited to those publications listed at [clause 1.8](#).

Consideration *shall* also be given to the requirements of the local government authority (LGA) as a part of any street lighting design and dark sky requirements. The *developer shall* formally advise Western Power of the LGA's requirements.

Note: Western Power does not accept and or take responsible for any non-standard and or private street lighting infrastructure and or associated street furniture.

Streetlights can be either:

- Western Power standard steel or decorative streetlight poles;
- Western Power standard or decorative or decorative LED luminaires; or
- Private (non-Western Power) streetlighting poles and luminaires.

Note: Refer to Western Power's Distribution Design Catalogue - [sections 12 & 13](#) for further details on options, combinations for standard and decorative pole / luminaire light fitting configurations.

The method of supplying the street lighting is dependent on local government policy.

The *developer shall* ensure their *design organisation* liaises with the LGA, to establish / confirm the street lighting requirements and that designs are appropriate for the *development*.

Each free standing streetlight installation *shall* be supplied from the nearest *service pillar* fuse to a link at the streetlight column. The number of fuses shall depend on the type of *service pillar* installed. Streetlights may be supplied from a separate street lighting circuit originating from a network *substation* where the equipment has the installed facility.

Note: Western Power decorative powder coated colour pole care and maintenance costs may be similar to the cost of a new pole, due to the powder coat finish stripped and reapplication processes to the industry standard.

5.3.26.2 Streetlights near to existing overhead power lines

The *developer's design organisation shall* ensure their UDS design satisfies the installation and operational clearances in accordance with AS/NZS 7000 'Overhead line design – Detailed procedures' between both existing and any new overhead *infrastructure* and streetlights installed in the *subdivision*. The *design organisation must* show the required clearances in the UDS design drawings to be submitted for DCR.

Free stranding streetlights *must* not be installed on the same side of a road where existing overhead transmission and/or distribution (HV and LV) overhead *infrastructure* is to remain.

Clearance assessments are to be in accordance with AS/NZS 7000 and *shall* also allow for pole deflection and foundation rotation. Unless specified otherwise, this *shall* be a minimum of five (5)% of the pole height.

Adequate clearances *shall* also be maintained from existing or proposed network overhead distribution and transmission *infrastructure* though the creation of easements or selection of appropriate *sites* for the placement of *consumer* poles and streetlights. For additional information refer to AS/NZS 7000 Table CC1 'Typical easements widths'.

5.3.26.3 Streetlight locations

Western Power streetlights, excluding luminaries mounted on wood poles, are to be installed along the extension of common property boundary line on the 2.7m alignment unless prior written approval is obtained from Western Power.

Where the road reserve has a verge wider than 3.7m, streetlights *must* be installed with a minimum set back from the kerb line in accordance with the following published Western Power requirements. The *developer* is also required to obtain the approval from the LGA, road authority and other affected utility providers.

- Placing of power poles within road reserves in built up areas.
- Placing of poles along roads with speed limits not exceeding 70 km/h.
- Placing of rigid poles along roads with speed limits exceeding 70 km/h.

The *design organisation shall* show the setback on the *scheme* design drawing for DCR where it is not on the 2.7m alignment.

For cul-de-sacs, and roads terminating at a tee junction, streetlight locations are to be determined in consultation with the LGA, road authority and Western Power.

Streetlights *shall* not be installed in water courses, drains or areas subjected to regular inundation.

Streetlights in laneways *shall* be positioned centrally in a one (1)m deep x one (1)m wide road reserve extension at lot boundaries, with a minimum 400mm clearance to the lot boundaries. The terminal cover *shall* in all cases face into the laneway.

5.3.26.4 Western Power's standard streetlights

Western Power has two (2) types of standard streetlights:

- Western Power non-decorative streetlights. (Refer to Distribution design catalogue -[section 12](#))
- Western Power decorative streetlights. (Refer to Distribution design catalogue -[section 13](#))

Where one (1) of Western Power's non-decorative streetlights is installed, the same type of streetlight *shall* be used across the *subdivision development*. Western Power will own, operate and maintain the streetlight system in this case.

Non-decorative streetlights are not suitable for laneway locations due to potential glare and light spill issues. Unless otherwise approved in writing by the LGA, streetlights in laneways *shall* be four-five (4.5)m high and as prescribed by and agreed by Western Power and the LGA. Refer to [clause 5.3.26.5](#).

5.3.26.5 Approval of Western Power supplied decorative subdivision streetlight fittings

A *developer* may choose to install either Western Power non-decorative or decorative streetlights.

Energy consumption on Western Power's:

- non-decorative streetlights *shall* be charged to LGAs as per gazetted street lighting tariff.
- decorative streetlights *shall* be charged to LGAs at a higher gazetted tariff.

Therefore decorative streetlights can only be installed in *subdivisions* where the LGA is on an appropriate tariff contract. *Developers* are required to seek the approval of LGAs where there is an intention to install Western Power decorative streetlight fittings within the *subdivision development*.

Where *subdivisions* are to be progressively developed in multiple stages, *developers* are *shall* involve the LGA to provide a blanket approval for decorative streetlights for the complete *development* instead of individual stages. LGAs may also wish to consider providing blanket approval for all the *subdivision developments* within a suburb or the whole city/town to Western Power directly. LGA *should* also specify the streetlight standard colour and the type of luminaire.

5.3.26.6 Non-Western Power supplied streetlights (Private street lighting)

The *developer* is responsible for all *work* associated with the installation of non-Western Power street lighting systems. The LGA is responsible for the ongoing operation and maintenance of the system and payment of the applicable tariff charges. The LGA may choose an un-metered or metered supply. All UMS connections *shall* be in accordance with Western Power's [Un-metered supply network standard \(UMS\)](#).

Notes:

Un-metered supplies are only available to statutory authorities. The total load connected to each *point of supply (connection)* is restricted to 4.8kW single-phase as prescribed in the [Un-metered supply network standard \(UMS\)](#). In addition to the requirements for the UDS manual and the UMS standard the following additional conditions *shall* apply:

- a) The *developer's design organisation* *shall* provide Western Power with formal confirmation from the applicable LGA accepting that:
 - i. the LGA *shall* own, operate and maintain the street lighting system and pay the applicable tariff charges; and
 - ii. in addition to any advice submitted via the electrical contractor's statutory forms, the LGA *shall* advise Western Power of any increases or reductions in the loads connected to the network supply of the life of the installation.
- b) The streetlight installation *shall* comply with AS/NZS 3000 including earthing and protection;
- c) The installation *must* not be connected to Western Power's street lighting system;
- d) The *developer* is responsible for all installation work, including cabling;
- e) Cabling *shall* not be installed in Western Power's 0 - 500mm alignment. The *preferred* location is in the 2.4 - 3.0m alignment as indicated in the [Utility providers code of practice \(UPCoP\)](#);

- f) Where an un-metered supply is required, a streetlight may be supplied via a fuse from the nearest *service pillar* with appropriate labelling;
- g) Where a metered supply is required the installation *must* be provided from a main switchboard incorporating metering to Western Power requirements:
 - i. The switchboard *shall* be fitted with a weatherproof durable label, installed by the *developer* adjacent to the main switch, reading 'Main Switch – Un-metered Supply - Installation Maintained by City/Shire of <Insert City/Shire Name> - Isolate supply at all times before commencing work.'
- h) Each streetlight *must* be equipped with a means of isolation located within the pole base;
- i) Each streetlight *shall* be identified as belonging to the City/Shire of <Insert City/Shire Name> and include instructions for maintenance and repairs to be referred to the City and not Western Power;
- j) 'preliminary notice' and 'notice of completion' are to be submitted in accordance with the Electricity (Licensing) Regulations 1991 to Western Power to initiate the issue of a service ruling and final inspection of the installation as appropriate. In addition to normal information, the *developer's electrical contractor* is required to endorse the 'preliminary notice' and the 'notice of completion' in the following terms if it is an un-metered supply: 'Un-metered supply. Total load kW '

5.3.26.7 Street lighting outside gazetted public road reserve

Western Power's streetlights, including decorative streetlights under a Synergy scheme, can only be installed in gazetted public road reserve. Where an LGA or other authority require lights for POS, PAW and Crown Reserve, private street lighting *shall* be installed.

5.3.27 Underground transmission protection pilot cables

The DIP will identify if any existing transmission protection aerial pilot cables are to be relocated underground. These underground pilot cables *must* be shown on the UDS design drawing and designed as follows:

- I. *Must* not be installed in the vicinity of high voltage cables;
- II. *Must* be installed in an alternative route to HV cables; and
- III. Multiple pilot cables must be installed in separate routes (ie shared trench arrangements are not permitted).

5.3.28 Existing consumers and affected parties

Where existing overhead *electricity infrastructure* is to be removed as part of the *subdivision* work, the *developer* is responsible for the reconnection of existing Western Power overhead (aerial) connected *consumers* to the underground system at their cost.

The reconnection of existing *consumers* can be achieved via one of the following options:

- a) Connection to a *service pillar* located at the front property boundary.
- b) Connection to a Western Power approved wall mounted *service pillar*; or
- c) Connection of the existing *consumer's* overhead service via their service pole from *service pillar* located at the front property boundary.

The *design organisation* is to include the appropriate design on the UDS design drawing to be submitted for DCR.

5.3.29 Subdivision design drawing requirements

The *developer must* ensure that the design drawing submitted for DCR complies with the 'Subdivision design drawing minimum requirements' in [clause 8.2](#).

Failure to meet the above minimum requirements will result in a non-conformance response.

5.3.30 Variations to Western Power designs or standards

Western Power will consider requests for variations in design or standard practice. Requests *shall* be made by the *developer* in writing to Western Power's Customer connection services and supported by:

- a) a formal safety assessment (FSA) (Refer to the note);
- b) technical detail and marked up plan showing proposed changes; and
- c) sufficient developer documentation to justify the requested changes.

Note: Prior to seeking approval from Western Power, the *developer shall* undertake a comprehensive multi-criteria analysis that includes assessment of all possible options and associated risks across the entire asset lifecycle (constructability, operability, maintainability). The *developer* and *design organization shall* ensure that all risks are reduced SFAIRP.

5.4 Design for 63KVA, (THUDS) three-phase, ground mounted transformer application

In broadacre *subdivisions* the *developer* may seek to install multiple smaller transformers rather than using bigger single transformer arrangements.

5.4.1 Design aspects and philosophy

The design philosophy in the following table *shall* be followed :

Design Aspect	Philosophy
ADMD	An ADMD of 5kVA per rural lot <i>should</i> be used unless demands for discrete loads are known. ADMD for other areas <i>shall</i> be as per instruction from Western Power.
Cable installation	HV cables <i>shall</i> be 35mm ² three-phase for 6/11kV and 22kV, and 50mm ² for 33kV. LV cables <i>must</i> be 4-core, 25mm ² and of sufficient length to ensure voltage drop constraints are met. Refer to the DSPM
Earthing	Same earthing as the 315kVA MPS transformer <i>site</i> . Refer to the DSPM
Foundations	Refer to the DSPM .
HV Connections	The transformer is designed to be loop in /loop out of up to five (5) transformers in a single string.
Installation lot size	In <i>subdivisions</i> the same <i>site</i> size and layout as the 315kVA MPS <i>shall</i> apply DSPM , so that the transformer can be upgraded easily in the future.
LV fusing	The transformer is fitted with 100A red spot fuses and distribution busbar.
Number of load connections	The number of connections <i>shall</i> be determined by the <i>design organisation</i> in accordance with Western Power's separately published ADMD load criteria.
Voltage drop	To facilitate minimum volt drop, the transformer <i>must</i> be close to the centre of the load.

Table 11: 63kVA transformer design aspects and philosophy

5.4.2 HV connection

63kVA transformers may be piggy-backed up to a maximum of five (5) transformers in a string. Western Power requires *developers* to install ground mounted 2+1 RMU switchgear to supply transformers.

Where a *subdivision* requires two (2) strings of transformers, a 2+2 RMU is to be installed to supply each string with a balanced number of transformers. The *design organisation must* ensure that equal numbers of transformers are on each string. A single RMU reduces the amount of installed HV assets.

Where there is no confirmed potential for further network extension in an existing residential overhead network, Western Power will advise via the DIP if the transformers can be supplied from pole top drop out fuses. The *design organisation must* assess the transformers for the presence of ferroresonance and include their findings in the formal safety assessment (FSA).

5.4.3 LV connection

The transformer low voltage side is fitted with three-phase 100A fuses and distribution bar.

The *preferred* connection arrangement is one (1) 240mm² LV feeder cable from the distribution bar to a nearby *service uni-pillar*. Where required the feeder can then be split into two (2) x 120mm² LV feeder cables for reticulation where LV feeder lengths do not exceed 500m. Refer [clause 5.3.9](#).

A maximum 4 x 25mm² service cables may be connected to the distribution bar.

Developers are not permitted to connect consumer's main cables directly to the distribution bar. *Consumers must* always be connected via a *service pillar* located at the property boundary.

5.5 Single phase underground distribution system (SPUDS)

The use of a Single Phase Underground Distribution System (SPUDS) system will be communicated via the DIP. The typical application *shall* be for a *subdivision* zoned 'Rural' or 'Special Rural' with lot sizes typically ranging between one (1) and four(4) hectares where there is no network requirement for 3 phase HV reticulation.

The HV reticulation system is designed as a single-phase wire earth return (SWER) system, operated at 12.7kV. This HV voltage is adopted to suit both the 22kV and 33kV systems and allow standard equipment to be used throughout the SWIN.

The system is based on servicing the residential lots using 25kVA single-phase pad-mounted transformers, each serving up to four (4) *consumers*. Each transformer is internally fused to protect the system from transformer faults. Refer to [clause 5.3.3](#).

The single-phase SWER supply is provided by a single core 35mm² HV underground cable with a heavy-duty copper screen to provide the earth return path. The single core cable loops the string of 25kVA transformers using separable, non-load break connectors.

A SPUD system may be supplied from one (1) of the following network options:

- a) Metropolitan 22kV 3-wire system with no running earth.
- b) Country 22kV 4-wire system with running earth.
- c) Country 33kV 4-wire system with running earth.

Note: Surge arresters must be provided on the unused bushing of the last pad-mounted transformer in the 'string.'

Use of the SPUDS system is dependent on the size of the *subdivision* together with the configuration and voltage of the available HV overhead *infrastructure*. Such systems can be broadly categorised as:

- d) Metro 22kV or country 33kV, two-phase with pole top or ground mounted isolating transformer and a string of 25kVA, single-phase, 12.7kV, 2- bushing or 3- bushing tee off transformers.
- e) Country 22kV, single-phase (with running earth) HV direct connected via DOF and up to a maximum of 8 x 25kVA, single-phase, 12.7kV, 2- bushing or 3- bushing tee off transformers.
- f) Metro 22kV or country 33kV, 3 x two-phase pad-mounted isolating transformers (loop in & loop out) and each with a string of 25kVA single-phase, 12.7kV, 2- bushing or 3- bushing Tee off transformers.
- g) Metro 22kV, two-phase HV direct connected via DOF and a string of 25kVA, single-phase, 22kV, 4-bushing transformers.

Each SPUD transformer reticulates the LV supply to *service pillars* via a three (3) core 25mm² XLPE cable. Consumer main cables are not permitted to connect directly to the transformer. *Consumer* connections *must* always be via a *service pillar* at property boundary.

Detailed SPUDS arrangements and designs are covered by Western Power's SPUDS manual available on request.

5.6 Design documents

5.6.1 Western Power manuals, guidelines and standards

Refer [clause 1.8](#) or the Western Power's [website](#) for corresponding Western Power publications, manuals and guidelines.

5.6.2 Western Power design software and manuals

Designs are to be completed using Western Power's DQM/CAD interface software. This includes the following:

- DQM/CAD interface for Underground distribution design (URD CAD)
- Project designs using PD CAD

For enquiries about purchasing the identified design software, enquires *should* be forwarded to Western Power Customer Service on 13 10 87

In addition to the above, specific engineering software is required to be used to provide the evidence/confirmation that technical requirements have been met.

5.6.3 Western Power design manuals

- *LV design* user guide.
- DQM/CAD Interface urban residential design user guide.
- Project designs using CAD for Microstation manual.
- Poles n wires, Streets earthing design, etc.

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6. Installation policy and requirements

This section outlines the installation requirements available to a *developer* and defines the processes, policies and requirements governing the construction of the underground distribution network (UDS) in *subdivision developments*.

The installation process cannot commence until the *developer's* UDS design conforms to Western Power's requirements and the *developer* has accepted Western Power's *quotation*. Where a *decoupled* project process has been agreed, the construction *works may* commence prior to the issuing of the *quotation* and payment acknowledgement. Refer [clauses 1.7, 4.3](#) and [6.2](#).

Note: Partial energisations may contribute to significant safety issues. Therefore any *work* required at the front end of a *subdivision* to facilitate *onsite* building programs, including the removal and relocation of existing assets, *must* be processed as a separate project.

6.1 SCS subdivisions

6.1.1 Installation policy

For a proposed SCS *subdivision* or similar amalgamation of lots into one (1) lot to be serviced by a single *mini service pillar*, Western Power will design and construct the UDS. Refer to [clause 1.6](#) for information on flexibility in defining a simple *connection service* (SCS) *subdivision*.

The *developer* may elect to carry out trenching and laying of cable in accordance with the requirements in [clause 6.2.8](#). The *developer shall* advise Western Power of their intention to carry out trenching and cable laying when requesting a *quotation*. Refer to [clause 1.12](#).

Note: For *strata developments* the *developer* is responsible for the removal of any existing *consumer* overhead infrastructure and installation of underground *service connections* inclusive of the provision of the *site* main switchboard, internal private electrical reticulation and association electrical protection in accordance with the [WA Service and installation requirements \(WASIR\)](#).

6.1.2 Process and responsibility

Following receipt of payment for the *works*, Western Power will:

- issue a payment acknowledgement and appoint a *project network officer* (PNO) to schedule and oversee the construction *works*.
- Provide advice on the earliest available date for the commencement of the UDS *works* in accordance with the *work* program schedule.

The *developer* is to then:

- contact the PNO within 10 working days to verify the program schedule and construction program;
- complete their *works* in accordance with [clause 4.2.3](#) and where they undertake trenching and laying of cables; they *must*:
- complete the handover certificate and forward it to the PNO before Western Power begins the UDS *works*. Refer to [figure 4](#) for project cycle details.

6.2 CCS subdivisions

For CCS *subdivisions*, the *developer* is responsible for the design, material supply, *electricity infrastructure* installation, inspection, testing and administration of the *subdivision*. Refer to [clause 1.7](#) for *subdivisions* definitions.

Western Power will carry out the *interfacing works* required to connect the *subdivision electricity infrastructure* to the SWIS network unless there is a requirement for the *developer* to perform *works* as specified in the DIP. Refer to [clause 1.12, section 3](#) and [figure 5](#) for project cycle details.

The following table summarises the *developer* and Western Power process and the responsibilities for CCS subdivisions.

Event No.	Activity Description (Activities may not necessarily be carried out in event No order.)	Responsibility
1	Preparation of the <i>scheme</i> DIP and <i>quotation</i> .	Western Power
2	Acceptance and <i>quotation</i> payment. This may by agreement be deferred where the process is <i>decoupled</i> . Refer Figure 5 .	Developer
3	Preparation of <i>scheme</i> design submitted for DCR review.	Developer
4	Appointment of the <i>site project manager</i> .	Developer
5	Provision of the construction administration package.	Developer
6	<i>Purchase</i> of materials and equipment.	Developer
7	Provision of all the materials necessary to complete the construction <i>works</i> in accordance with the conformed design.	Developer
8	Security of all Western Power materials released to the <i>developer's site project manager</i> and/or installed on <i>site</i> .	Developer
9	Provision of project and safety management associated with the construction of the <i>works on site</i> for the proposed <i>subdivision</i> and <i>interface</i> with the Western Power's network.	Developer
10	Construction <i>works</i> undertaken as per conformed design drawings. Installation, jointing and termination of all equipment completed in accordance with the conformed design, Western Power specifications, standards and relevant Australian codes and standards.	Developer
11	QA documentation requirements completed. Refer to clause 4.3.3 .	Developer
12	Inspection and testing including pre commissioning undertaken.	Developer
13	Test results and schedules provided as required by Western Power.	Developer
14	PNO to conduct periodic inspections during the construction <i>works</i> and testing. <i>Developer's site project manager</i> to assist with provision of required evidence / information. (Schedules, tests, reports, photographs etc.). Refer clause 6.2.2.4 .	Western Power & Developer
15	Provision of 'as constructed' drawings.	Developer
16	Provision of 'as constructed' records.	Developer
17	Handover inspection (pre-handover meeting) conducted by the <i>site project manager</i> and PNO for the proposes of determining <i>practical completion</i> .	Developer & Western Power
18	Rectification of defects.	Developer
19	Handover Inspection (handover meeting) undertaken with the <i>site</i> PNO.	Developer & Western Power
20	Provision of handover certificate. May, subject to approval, be conditionally issued with exceptions for example: Completion of streetlight installation and conversion of overhead to underground <i>consumer</i> connections.	Developer & Western Power
21	Completion of the <i>interface works</i> as agreed by Western Power.	Western Power or developer
22	Commissioning and energisation of the <i>subdivision works</i> .	Western Power
23	Clearance of WAPC conditions on submission and acceptance of the 'deposited plans' and either early clearance payments received, or handover inspection has been completed from the <i>developer</i> . In all cases, compliance of easement / individual conditions <i>must</i> be finalised by the <i>developer</i> .	Western Power & developer
24	Provision of an unconditional 12-month warranty for the installed <i>electricity infrastructure</i> commencing from the acceptance date of the hand-over certificate.	Developer

Table 12: Developer subdivision process & responsibilities

6.2.1 UDS development site

6.2.1.1 Developer's site

The *developer* is responsible for the *site* created to construct the UDS *development*. Refer [clause 1.7](#) for a definition of '*site*.'

6.2.1.2 Site safety

Before any *works* are undertaken on the *site* in connection with *subdivision works*, the *developer shall*:-

- a) Prepare and approve a '*Site safety management plan*' for the *development*. The '*plan*' *must* incorporate Western Power's [Electrical system safety rules \(ESSR\)](#);
- b) Provide a copy of their '*Site safety management plan*' to Western Power prior to construction of *works on site*. (Refer [clause 6.2.2.2](#));
- c) Western Power's PNO will liaise with the *developer's site project manager* to ensure all Western Power's personnel who will enter/work on the *developer's site* are inducted according to the *developer's 'Site safety management plan*;'
- d) Western Power's personnel and contractors *shall* follow the *developer's 'Site safety management plan*' and all lawful directions given by the *site project manager* in connection with *site safety*.
To the extent that Western Power's own work safety practices and procedures are:
 - e) more specific to the UDS *works* to be undertaken; or
 - f) more exhaustive than those of the *developer's 'Site safety management plan*.'

Western Power's personnel and contractors *shall* follow those practices and procedures.

6.2.1.3 Liaison and cooperation for site safety

The *developer must* ensure that Western Power's personnel have uninterrupted access to that part of the *development site* required for the UDS *works* to be undertaken by Western Power.

The *developer's site project manager* and Western Power's PNO and personnel will liaise and cooperate to:

- a) Identify the extent of Western Power's *site* for UDS *works*;
- b) Fix the date and times for access to the Western Power *site*; and
- c) Ensure that as far as reasonably practicable, Western Power will have continuous, uninterrupted and exclusive access to that *site* at all times while they completes required tasks, inspections and *interface works*.

6.2.2 Construction administration

6.2.2.1 Commencement of construction

The construction phase of the UDS is to commence upon either:

- a) Receipt of the completed '*acceptance of quote*' submission, accompanied by payment in full of the *quotation*, or
- b) Issue of a DCR completion letter for projects agreed to be *decoupled*.

Delay in commencing the *works on site* may result in either a reissue or cancellation of the issued *quote*. Refer to [clause 4.3.2.11](#).

6.2.2.2 Information to be provided prior to commencement of construction

The *developer shall* provide the following information as a package to Western Power's *subdivision* administration (subdivisionsadmin@westernpower.com.au), which is to include all information as a zip file at least two (2) *working days* prior to commencement of construction:

- a) Copy of the 'site safety management plan.' Refer [clause 6.2.1.2](#).
- b) The name of the *site project manager*.
- c) The name of civil *contractor*.
- d) The name of the cable laying *contractor*.
- e) The names of *electrical contractor/workers* assigned to the *electricity infrastructure* installation and a copy of their qualifications to demonstrate compliance with [clause 6.2.7](#).
- f) A letter authorising the above entities to carry out the *subdivision works* and to hand-over the *work* to Western Power.
- g) Confirmation of the latest design revision.
- h) Commencement date of the construction works.
- i) Scheduling information sheet.
- j) An up-to-date construction project programme and schedule of *site meetings*. Refer [figure 7](#). This *shall* include installation events detailed in [clause 6.2.2](#).

Western Power is to be immediately advised of any change of personnel.

Submission of these documents does not constitute Western Power's endorsement or approval of the contents or nominated organisation(s) / personnel therein.

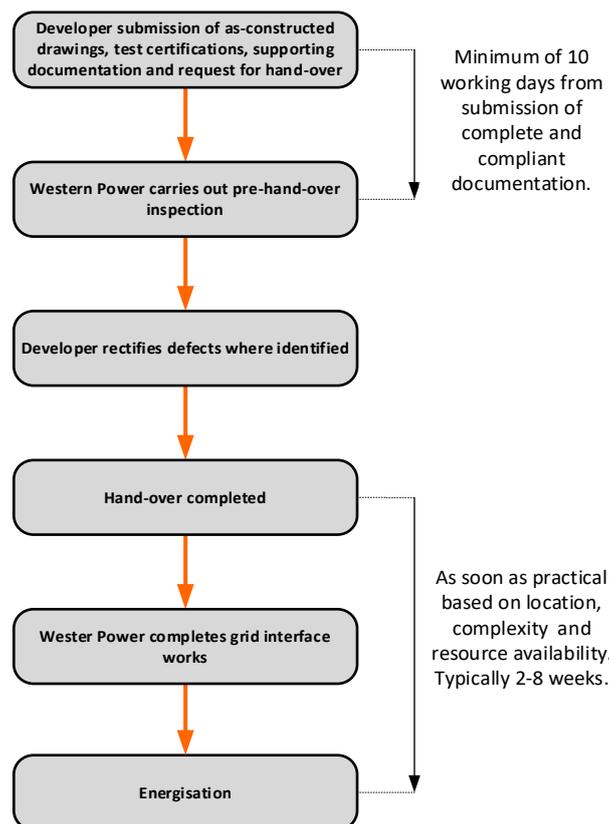


Figure 7: CCS subdivision construction timeline

Note: Following receipt of the project, Western Power may construct the *interface works* at any stage in accordance with schedule resource availability.

6.2.2.3 Site queries

Any *site queries* related to the *electricity infrastructure* installation shall be directed to the *developer's site project manager* as per the process diagram [figure 8](#) below.

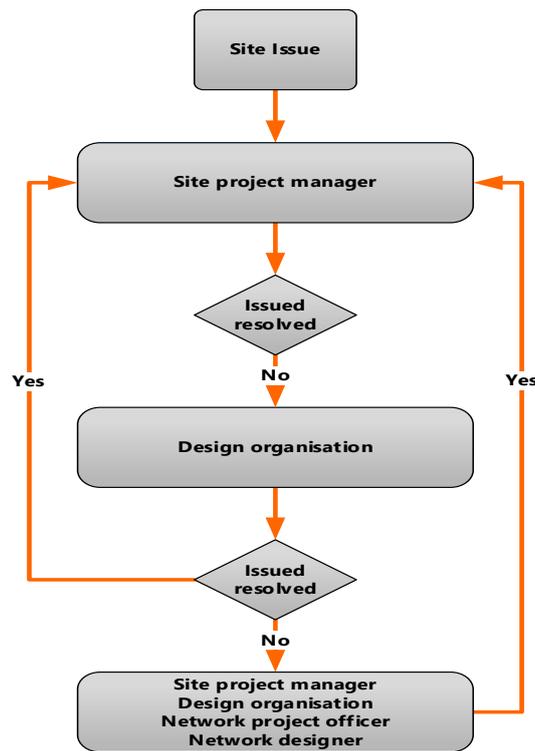


Figure 8: Site query process

6.2.2.4 Key project personnel

Site project manager (engineer)

Western Power requires the *developer* to appoint a *site project manager* as the *site* representative for the construction of the *development* inclusive of the installation of *electricity infrastructure* and *connection services*. In addition to the functions given by the *developer*, the *site project manager* is the *developer's* representative for the following purposes in connection with the UDS works namely:

- a) Provide Western Power with a copy of the 'site safety management plan;'
- b) Arranging *site* meetings;
- c) Communications regarding the *works* programme and advising resource and material availability;
- d) Referring all technical matters to their *design organisation*. Refer [clause 5.1.2](#);
- e) Ensuring Western Power receives the signed-off electrical cable test schedules and HV cable joint schedule;
- f) Ensuring Western Power receives the signed-off 'material & equipment schedule for *subdivision*;'
- g) Ensuring Western Power receives the signed-off 'as constructed' drawings;
- h) Preparation for the handover inspection;
- i) Handover inspection and handover sign-off, and
- j) Accepting warranty commitments on behalf of the *developer*.

Refer to [clause 1.7](#) for eligible details and *site project manager* definition.

Project network officer (PNO)

Western Power will appoint the *project network officer* (PNO) to be their primary point of contact and monitor of equipment and installation standards forming part of the *subdivision development*.

The PNO is also responsible for:

- a) conducting random and periodic inspections during the progress of the installation construction work; and
- b) the coordination of pre-handover inspections, testing and commissioning, *interface works* and energisation.

Refer to [clause 1.7](#) for a *site project network officer* definition.

6.2.2.5 Inspection

The PNO will conduct random and periodic inspections during the progress of the *electricity infrastructure* installation. The *developer must* give the PNO, *site* and equipment access to conduct all required, requested inspections. Any issues or defects identified by the PNO will be reported to the *site project manager* for their attention and action.

The *developer's* project program *must* provide the PNO with dates (and any progressive updates) for the following key milestones:

- a) The commencements of any cable laying/pulling to enable inspection of equipment and methodology;
- b) Trench backfills to enable inspection of duct/cable alignment, separation and depths prior to backfill;
- c) *Site* suitability and soil compaction requirements for network specific assets, including but not limited to ground mounted equipment, *substations*, switchgear, etc.;
- d) Cable jointing, termination and testing of high voltage cables, and *substation* / switchgear earthing.

The *site project manager must* allow one (1) *working day* for the PNO to inspect trenches prior to being backfilled. Where base soil compaction has been backfilled prior to inspection, the *developer shall* be responsible for all associated costs to remove, reinstall and re-inspect as required by the PNO.

To assist the PNO in confirming installation compliance and reducing the requirement for potholing and other invasive procedures the *contractor* is required to progressively record evidence inclusive of photographs. These *shall* be of underground cable installations prior to and after backfilling to indicate cable arrangements and depth below finished ground level at least one (1) per cable run.

Photographic evidence *shall* be of good quality and include adjacent features to identify the relevant *subdivision*. Photographs *shall* be submitted together with the test sheets and where required compaction certificates.

For any Western Power requested potholing, the *developer's site project manager* and *contractor shall* be responsible for DBYD enquiries and any associated service damage.

6.2.2.6 Testing

The *developer shall* conduct tests to prove the integrity of *electricity infrastructure* installed and to ensure all applicable technical requirements are met at least four (4) weeks prior to handover of the asset and equipment to Western Power. Required tests are listed in [clause 6.2.6](#).

The *developer* is required to provide Western Power with a schedule of proposed tests at least three (3) working days in advance of the tests being conducted. Western Power reserves the right to witness any test or to require tests to be repeated or equipment to be opened up or trenches potholed for inspection.

The *developer must* give Western Power access to the *site* and equipment necessary to undertake any tests Western Power deems necessary to evaluate the integrity of any part of the network installed by the *developer*. The *developer* is responsible to clear the *site*, provide access to equipment, provide potholes, remove / replace any panels and or other actions as deemed necessary by Western Power.

The *developer* is responsible for repairing, correcting or replacing any equipment or workmanship issues found to be unsatisfactory as a result of inspection and or testing.

6.2.2.7 As constructed drawings

Upon completion of UDS *subdivision works*, the *developer shall* provide Western Power with 'as constructed' drawings for the completed *subdivision works*.

The *developer shall* ensure that the 'as constructed' drawings:

- a) Are certified 'as constructed,' signed and dated by a *surveyor* who is eligible for membership of the Institution of Engineering and Mining *Surveyor* Australia (IEMSA) or the Institute of *Surveyor*, Australia (ISA) and by the *developer's site project manager*.
The *developer's site project manager* is also required to certify that all *subdivision electricity infrastructure* assets, including but not limited to cables, transformers, switchgear, *service pillars*, streetlights, are physically installed as shown on the 'as constructed' drawings;
- b) Are notified / certifying as being 'as constructed' together with the name and contact details of the *design organisation* and cable *contractor* company;
- c) Are to include revision numbers, revision dates and 'as constructed' details, including any changes in design or to WP standard requirements;
- d) Include detailed dimensioned, using standard symbols, the locations for all underground in-line, breech joints, live end seals and all off-alignment cables;
- e) Identify the location and nominate all cable depths, greater than 1200 below finished ground level;
- f) Are to be in DGN (Microstation) format incorporating the MGA Zone 50 grid system. Refer [clause 4.4.1](#) and [table 5](#); and
- g) Be submitted electronically to Western Power together with the certificates from the *site project manager* and the *surveyor* via the appropriate application web-portal on Western Power's [website](#), at least five (5) working days prior to the scheduled date for the pre-handover inspection.

Refer also to clause 6.4 for mandatory requirements of the [Utility providers code of practice \(UPCoP\)](#), regarding DBYD drawing information that proves to be inaccurate.

The 'as constructed' drawings will be processed by Western Power and forwarded to the PNO prior to the handover inspection. The PNO will not accept any 'as constructed' drawings on *site* from the *developer* or *onsite construction contractors*.

By submitting 'as constructed' drawing(s) (including revised drawings), the *developer* and *design organisation*, consent to Western Power and its contractors and agents:

- h) using the 'as constructed' drawing(s) as Western Power sees fit including, without limitation, to update Western Power's asset registers including SPIDAWeb, Dial Before You Dig, and to facilitate the design of other nearby, surrounding or adjacent *subdivisions* and *distribution schemes*; and providing the 'as constructed' drawing(s) to other parties including, without limitation, *designers* of nearby, surrounding or adjacent *subdivisions* and *distribution schemes*.

6.2.2.8 As constructed records

Upon completion of the UDS *subdivision works*, the *developer must* provide Western Power with the following ‘as constructed’ records:

- a) The records *shall* include locations of *service pillars/pits*, road crossings, cable pits, cable joints, live end seals, *substations*, streetlights, cables through nonstandard alignments or a POS, PAW, ROW or private property and cables in the allocated alignment at minimum 100m intervals and at changes of direction. All locations *shall* be dimensioned from the nearest property boundary. The cable installation records *must* be signed off by either a *surveyor* who is eligible for membership of IEMSA or ISA or the *developer’s contractor*;
- b) Electrical cable test schedules signed off by the licensed electrical worker who has conducted the tests or by an accredited *cable joiner* if tests have been carried out by such person;
- c) Earth test schedules, inclusive of injection testing where required. Tests to be signed off by the licensed electrical worker who conducted the tests or by an accredited *engineer* if tests have been carried out by such person. Validation of EPR values by the *developer’s engineer* is required;
- d) A HV cable joint schedule signed off by an accredited *cable joiner* who has conducted the *work*;
- e) A material and equipment schedule *must* be completed and signed off by the cable laying *contractor*;
- f) Photographs to assist QA review. Refer [clause 6.2.2.5](#); and
- g) All required certificates including but not limited to compaction certificates.

Note: All ‘as constructed’ records *shall* be cited and counter signed by the *developers site project manager* prior to being submitted to Western Power.

The *developer shall* ensure that the ‘as constructed’ records are provided to the Western Power at least five (5) working days prior to the scheduled date of the pre-handover inspection.

Standard forms for ‘electrical test schedules,’ ‘HV cable joint schedules’ and ‘material and equipment schedules’ are available on request from [Western Power](#).

By submitting ‘as constructed’ records (including revised drawings) the *developer*, their *contractors* and the *design organisation*, consent to Western Power and its contractors and agents:

- h) using the ‘as constructed’ records as Western Power sees fit including, without limitation, to update Western Power’s asset registers including SPIDA-web, Dial Before You Dig , and to facilitate the design of other nearby, surrounding or adjacent *subdivisions* and *distribution schemes*; and
- i) providing the ‘as constructed’ records to other parties including, without limitation, *designers* of nearby, surrounding or adjacent *subdivisions* and *distribution schemes*.

6.2.2.9 Pre-handover inspection

The *developer shall* provide a notice for the pre-handover inspection as shown in [figure 11](#).

Pre-handover inspection occurs when, in the PNO’s opinion, all *electricity infrastructure* in the UDS is substantially completed (i.e. *practical completion* is achieved).

During the pre-handover inspection, the PNO is to indicate to the *site project manager* any defects or outstanding items to be rectified. The *site project manager* is responsible for recording any defects and or outstanding items. Refer to [figure 12](#).

6.2.2.10 Handover inspection

The handover inspection is deemed to be completed only when all electrical connections including live end seals, have been completed and tested, all covers, safety equipment and signs are in place and any remaining minor *works* can be carried out without removing safety covers or access to electrical connections. (E.g. Paint damage repair on pad-mounted equipment or the replacement of temporary labels with a permanent labels).

The PNO will notarise the 'inspection report' ([figure 12](#)) and certify completion ([figure 13](#)) of the handover inspection when the *developer* has satisfied the following conditions:

- a) All *works* associated with the UDS *subdivision* or stage undertaken by the *developer* has been completed, except *reinforcement*, *interface works* and commissioning to be undertaken by Western Power;
- b) All inspection certificates are completed satisfactorily by the *developer* and endorsed by Western Power;
- c) All tests have been carried out by the *developer* and endorsed by Western Power;
- d) Western Power has received all 'as constructed' drawings in electronic format and all the 'as constructed' records. (Where applicable, drawing and record reference/version numbers have been recorded on the 'handover certificate');
- e) All high voltage switches have been locked in the open position. All high voltage fuse switches are fitted with the correct size fuses and locked in an open position, and high voltage earth switches are locked in the closed position;
- f) All links and fused links for the low voltage network have been handed over to the PNO and all LV switches are in the open position;
- g) All equipment or partial installed equipment included in the handover inspection are clearly marked, labelled and tagged to signify the equipment's function and status. Refer to [Distribution equipment labelling standard \(DELS\)](#) and [Electrical system safety rules \(ESSR\)](#) requirements; and
- h) The *site project manager* has been made formally aware, that upon completion of the handover inspection, all equipment in the *subdivision*, now forms part of Western Power's operational network and no *site contractor* can access the *subdivision infrastructure* unless authorised by the PNO.

6.2.2.11 Handover

Handover is a key milestone for CCS *subdivisions* to enable the:

- a) provision of WAPC clearance following handover; and
- b) transfer of ownership and operational control of the equipment to Western Power to enable connection to their network and live commissioning checks to be conducted.

The handover of the *subdivision* occurs when all *works* associated with the UDS *subdivision* or stage *electricity infrastructure works* have been completed.

The handover certificate in [figure 13](#) is the official acknowledgement by the *developer* that the ownership of all *electricity infrastructure*, associated with their *subdivision works*, has passed to Western Power and has been constructed in accordance with this UDS manual.

The handover certificate is also an acknowledgement by the *developer* that they and any other parties under their control, no longer have access to the *electricity infrastructure*.

Upon handover Western Power owns the network and access can be obtained only through Western Power's PNO and Networks operational control centre (NOCC).

The *developer* unconditionally warrants the design and installation and all *electricity infrastructure* for which they undertook in the UDS for a period of twelve (12) months from the date on the handover certificate. Refer to [clause 6.2.4](#).

6.2.2.12 Commissioning

Western Power commissioning requires the energisation of equipment therefore can only commence after handover and completion of *interface works* by Western Power.

The *developer* is responsible for all pre-commissioning of equipment which may be witnessed by the PNO.

6.2.2.13 Early clearance

In accordance with [clause 4.1.5](#), the *developer* may request early clearance of *CCS subdivisions* from Western Power. The *quotation* payment is a requirement for *decoupled* and *non-decoupled* projects where early clearance is requested.

6.2.3 Early clearance completion

The *developer* is required to complete all of the *electricity infrastructure installation work* in a UDS up to the handover inspection stage within twenty (20) weeks of the date of early clearance given by Western Power. This is to ensure there are no delays to home builders requiring a supply for building works.

6.2.4 Warranty

The *developer must* provide an unconditional twelve (12)-month warranty for the design and installation of all equipment *electricity infrastructure* associated with the provision of electrical services to the *subdivision* undertaken by, or on behalf of the *developer*. The warranty commences from the accepted date of the hand-over.

Defects in the *electricity infrastructure* which arise during the warranty period and are solely caused by Western Power supplied equipment will be rectified by Western Power at Western Power's cost.

All other defects, omissions or unmanaged / unacceptable risks identified in the formal safety assessment (FSA), in the *electricity infrastructure* which arise during the warranty period *shall* be rectified by Western Power at the *developer's* cost. Prior to carrying out any rectification *work* Western Power may, at its sole discretion, require full or part payment of Western Power's estimate of the costs for rectification.

6.2.5 Ownership and responsibilities for equipment

When the *developer* supplies and installs the *electricity infrastructure* associated with the UDS, the *developer* owns the equipment and is responsible for its security up and until the time ownership formally transfers to Western Power, following issue of the handover certificate.

Where Western Power supplies and installs equipment, ownership of the materials and equipment remains the property of Western Power, both during and at the completion of the project.

6.2.6 Tests

The *developer shall* carry out tests on all installed equipment that forms part of the *subdivision* including those specified below. The *developer shall* complete and submit the relevant **Distribution commissioning forms** to the PNO.

Testing, inspections and checks inclusive of recording of results, *shall* be undertaken in accordance with the following requirements, on all equipment forming part of the *subdivision*, including but not limited to, those elements listed in [table 13](#) to demonstrate compliance with test requirements.

Distribution commissioning forms are provided in the network [Distribution commissioning manual](#). When completing the 'commissioning forms' reference to Western Power project details, (E.g. MS/SS number in the 'Work package number.' Location) *shall* be included.

All electrical testing of *electricity infrastructure shall* be carried out by an electrical worker licensed under the [Electricity \(Licensing\) Regulations 1991](#) and/or an accredited *cable jointer* as permitted under [clause 6.2.7.6](#).

The electrical worker or accredited *cable jointer*, who carries out the tests *shall* complete and sign off the 'commissioning forms' and forward the completed documents to the NPO to be received at least five (5) *working days* prior to the hand-over inspection.

Equipment to be tested	Commissioning form Reference	Commissioning form be completed
LV cables	2.6 - LV - Cables with / without pillars	Complete items 1 – 8 only.
HV cables	2.1 - HV XLPE - Cables	Complete items 1 – 7 only.
HV cables	2.2 - HV - Mixed cables	Complete items 1 – 8 only.
Earthing	4.1 - Earthing system resistance testing (all equipment)	Complete all items Refer to clause 6.2.2.8 items 'a' and 'c'
LV switchgear *	4.10 - LV Kiosk	Complete items 1 – 3 only
HV switchgear *	4.9 - HV - Ring-main switchgear	Complete items 1 – 7 only
Transformers *	3.1 - MPS - Distribution transformer	Complete items 1, 2 and 3 only
Transformers *	3.2 - NON-MPS - Distribution transformer	Complete items 1, 2 and 3 only
Transformers *	3.3 - Single-phase Transformer (pole mount / pad mount)	Complete items 1, 2 and 3 only
Transformers *	3.6 - SWER Isolation transformer (Ground mount)	Complete items 1, 2 and 3 only
Streetlights	2.7 - Steel streetlights	Complete items 1 – 5 only
Pillars and pits *	2.9 - Pole to Pillar	Complete items 3.1 and 3.2 only Provide Completed pit compaction certificate
Note* - Compaction testing certificates and evidence <i>shall</i> be provided for all ground mounted equipment.		

Table 13: Distribution commissioning schedule

Note: Refer to the network [Distribution commissioning manual](#).

Equipment commissioning and energisation of the completed installation does not form part of the *developer's* requirements and *shall* be undertaken by Western Power following hand-over.

Where energisation does not follow immediately after commissioning then prior to energisation (assuming that sufficient time has lapsed between the hand-over and the energisation period), that part of the network to be energised *shall* be retested in accordance with the requirements of the network [Distribution commissioning manual](#).

Energisation delays requested by the *developer / consumer* may be subject to time limitations and or network reinspection fees.

6.2.7 Installer requirements, qualifications and responsibilities

All persons undertaking *work* associated with a UDS in *subdivisions* *must* hold the required current licences and authorisations. The *developer* *shall* ensure that all *work* associated with a UDS is carried out by qualified competent persons as required by the applicable legislation, industry and network requirements.

As a minimum the following *shall* apply:

6.2.7.1 Cable laying contractor

The cable laying *contractor* *shall* employ suitably qualified cable layers for the installation of underground cables.

6.2.7.2 Cable layer

A person undertaking cable laying *must* have a ‘Statement of Attainment’ for the nationally accredited unit of competence AQF training ‘UETDRDU016 – Lay power cables’ (as amended).

Note: Persons who has previously completed equivalent ‘Lay underground electrical cables’ training may continue to undertake cable laying.

6.2.7.3 Cable joiner

A person engaged in cable jointing *work must* hold qualifications suitable for the *work* they are to undertake being:

AQF UET30821 ‘Certificate III in ESI – Distribution underground’ (as amended). This qualification applies to all jointing and termination *work* on low and high voltage cables up to 33KV where cables are completely disconnected from the source of electricity supply.

Note: Certificate III *cable jointers* where authorised by Western Power, may work on LV & HV cables that are connected to system as long as the cables are isolated, earthed and covered by an ‘electrical access permit’ (EAP). Certificate III *cable jointers* may also undertake work on energised LV cables where they hold a ‘Statement of Attainment’ in AQF training UETDRDU011 – ‘Joint, terminate & maintain energised LV underground polymeric cables’.

Or,

‘Statement of Attainment’ from a Recognised Training Organisation in UETDRDU013 – ‘Joint, terminate & maintain HV underground polymeric cable’ (as amended) and/or UETDRDU015 – ‘Joint, terminate & maintain LV underground polymeric cable’ (as amended) undertaken by recognised current trade or industry qualified electrical or electricity workers.

Or,

Holders of the following Western Power accreditation can continue to joint underground cables.

- Category D - (comparable to UETDRDU013) - *Cable joiner* underground HV up to 33kV (XLPE). This category applies to all jointing and termination *work* on low and high voltage cables in underground greenfield *sites* completely disconnected from the network source of electricity supply.
- Category E - (comparable to UETDRDU015) - *Cable joiner* underground LV to 600Volts (XLPE). This category applies to all jointing and termination *work* carried out on low voltage cables underground greenfield *sites* completely disconnected from the network source of electricity supply.

Western Power qualified *cable jointers* may perform cable insulation testing, continuity and core-to-core testing of underground cables, provided they have previously completed the required training.

6.2.7.4 Electrical worker

The following *work must* be carried out by electrical workers licensed under the [Electricity \(Licensing\) Regulations 1991](#):

- The final connection of all underground cables and circuits, including switchgear, transformers, earthing and streetlights.
- The wiring of circuits, including street light circuits.
- The testing of cables and circuits, except where the testing of cables is permitted under [clause 6.2.7.6](#).
- Earth testing, inclusive of injection testing where required.
- The installation of *substation* equipment, including transformers and switchgear, excluding the unloading and positioning of *substation* equipment onto their supporting bases.

6.2.7.5 UDS subdivision installer qualification matrix

Table 14 summarises UDS installer qualification requirements.

Qualifications	Lay cable	Joint cables (up to 33KV)	Joint cables (up to 600V)	Testing (Excluding earth & VLF)	Testing Earth & VLF	Cable Termination	Cable & Circuit Connection (Note 1)
Accredited Cable layer AQF UETDRDU016 – Lay power cables. Refer cl 6.2.7	P	N	N	N	N	N	N
Accredited <i>cable jointer</i> AQF UET30812 Certificate III in ESI – Distribution Underground or Statement of Attainment that includes units demonstrating competency. Refer cl 6.2.7	N	P	P	P	N	P	P
Category D <i>cable Jointer</i>	N	P	N	P (Note 2)	N	P (Up 33KV Cable)	P
Category E <i>cable Jointer</i>	N	N	P	P (Note 2)	N	P (Up to 600V Cable)	P
Electrical Worker [licensed under the Electricity (Licensing) Regulations 1991]	N	N	N	P (Note 3)	P (Note 3)	N	P (Note 3)

Table 14: UDS installer qualifications

P = Permitted N = Not permitted

Note 1: Cable & circuit connection includes the connection of cables and circuit on switchgear, transformers, earthing and streetlights.

Note 2: Accredited *cable jointers* may perform cable insulation testing, continuity and core-to-core testing of underground cables, provided they have completed the required training and hold a current qualification for the cable voltage being testing. That is, LV can test up to 1000V and HV test 1000V to 33kV.

Note 3: As defined in the existing [Electricity \(Licensing\) Regulations 1991](#). However this may change from time to time and the *developer must* ensure that the requirements in the Regulations are complied with.

6.2.7.6 Accreditation and training enquiries

The *developer* can find out whether a vendor is a Western Power *preferred* vendor, or whether a person is accredited or authorised to carryout *subdivision works*, by contacting Power Training Services:

For any enquiries about gaining accreditation, please contact Power Training Services. Power Training Services can be contacted at:

Power Training Services WA
90 Training Place, Jandakot WA 6164
Phone (08) 9411 7888
Email: pts@westernpower.com.au / Web: ptstraining.com.au

6.2.8 Construction requirements and standards

6.2.8.1 General requirements

The *developer shall* ensure that the UDS *subdivision* is constructed in a manner that is safe and efficient with minimal disruption to the public and in accordance with:

- a) The construction requirements and standards described in this UDS manual, refer to [clause 1.8](#);
- b) All statutory and requirements, refer to [clause 1.8](#); and
- c) Western Power's network requirements and [SHE policy\(ies\)](#).

6.2.8.2 Site safety

The *developer* is responsible to ensure that the *site* is safe in accordance with the Work Health and Safety Act 2020 and the Work Health and Safety (General) Regulations 2022. The *developer shall* also comply with all lawful directions and decisions from the PNO relating to the safety of Western Power's personnel or assets.

6.2.8.3 Installation drawings

The *developer shall* ensure all *electricity infrastructure*, including *substations*, earthing and streetlights, are installed in accordance with the requirements listed in [section 1](#) and the drawings and diagrams shown in [section 8](#).

6.2.8.4 Finished ground level

The *developer must* ensure:

- a) Prior to the commencement of any electrical work, including cable laying, the finished ground levels are established;
- b) Where the road reserves have not been constructed or formed, the *site project manager* has ascertained and agreed with the PNO on the required depth of cover for cables before any excavation within the proposed road reserves is commenced; and
- c) *Service pillars, pits, pad-mount transformers and switchgear shall* not be installed unless the *sites* are completed with finished ground levels, retaining walls and required hardstand.

6.2.8.5 Survey pegs

The *developer shall* ensure:

- a) The *site project manager* has accurately pegged all *subdivision* and lot boundaries. Any additional costs incurred by Western Power as a result of boundaries not being and or incorrectly pegged *shall* be charged to the *developer*;
- b) Prior to the commencement of trenching and cable laying *work*, all final survey pegs are in place and maintained in-situ throughout trenching and cable laying until the PNO has completed final inspections;
- c) The *site project manager* replaces any moved or missing pegs;
- d) Where there are large curves or long lot frontages, sufficient pegs are in place to enable accurate placement of cables in the allocated alignment(s);
- e) Offset pegs are installed at agreed acceptable distances from the property boundary prior to trench excavation commencing. Final boundary pegs *must* be installed by the *developer* upon completion of ground *works* and prior to the installation of *service pillars*. Any offset pegging attached to road kerbing *shall* be durable, permanently fixed and not present a hazard to the general public; and
- f) All hardstand surfaces around *electricity infrastructure*, have durable and permanently fixed boundary markers in the hardstand where the hardstand extends beyond the asset designated area. This includes but is not limited to - *substations, pillars, pits, cable easements etc.*, in locations such as stairway landings, driveways, median strips, footpaths etc.

The depth of cover of cables *shall* be in accordance with [clause 6.2.8.6](#). Trenching *must* be such that the final contour of the road reserve is followed.

6.2.8.6 Trenching

The *developer shall* ensure that all trench excavations comply with the conformed *scheme* design drawings and undertaken in accordance with:

- a) [Underground cable installation manual \(UCIM\)](#);
- b) [Utility providers code of practice \(UPCoP\)](#); and
- c) [Clause 8.7](#)– Equipment and installation drawing UDS-6-2;
- d) [Code of practice: \(Excavation\)](#). Refer [WorkSafe's website](#)

The [UCIM](#) requires depth of trenches and road reserve crossings, at all points, *shall* ensure the amount of cover over cables, conduits and ducts is not less than 750mm and *shall* not exceed 1200mm unless prior Western Power approval has been sought and given.

Prior to seeking approval from Western Power, the *developer shall* undertake a comprehensive multi-criteria analysis that includes assessment of all possible options and associated risks across the entire asset lifecycle (constructability, operability, maintainability). The assessment *shall* be submitted to Western Power, accompanied with a cable de-rating study that has been completed and certified by the *developer's engineer* in accordance with relevant standards.

The *developer* and *design organization shall* ensure that all risks are reduced SFAIRP. Inadequate planning and coordination between services *shall* not be deemed sufficient justification for non-standard depths. Trench depths *shall* be adequate to ensure cable joints have the same 750mm depth of cover.

Trenching *shall* follow the final contour of the road reserve. Where the presence of structures, existing services or plant in the road reserve does not allow the installation of cables at the minimum specified depth of cover, the *site project manager must* bring the matter to Western Power's attention and seek direction prior to proceeding further.

Machine excavation of trenches *shall* not be used where there are existing cables within required minimum approach distances. Refer [clause 6.2.8.26](#). Where there are existing cables in the cable alignment, hand digging *must* be used to excavate for the installation of new cables.

The *developer* through their *site project manager* is responsible for the coordination of any joint trenching requirements and facilitating the installation of other utility services.

6.2.8.7 Cable conduits and ducts

The *developer shall* ensure that all conduits and ducts are installed in accordance with:

- a) the conformed design drawings as indicated in [clause 8.3](#) – Cable duct specification; and
- b) [Clause 8.7](#)– Equipment and installation drawings.

6.2.8.8 Cable laying

The *developer shall* ensure that all cable laying *works* comply with Western Power's [Underground cable installation manual \(UCIM\)](#).

Cables *shall* be installed within Western Power's standard alignment and in accordance with the [Utility providers code of practice \(UPCoP\)](#) and drawing No. UDS-6-2.

Other services are not permitted within the power cable alignment without prior Western Power formal approval.

During the installation, underground HV or LV cables straight joints, *must* be kept to a minimum. The number of HV or LV cable joints permitted is to be calculated using the following formula:

$$\begin{aligned} N &< 1 + L1/L2 && \text{for } L1 > 150\text{m} \\ N &= 0 && \text{for } L1 \leq 150\text{m} \end{aligned}$$

Where,

- N = Number of joints permitted
- L1 = Total cable route length between terminals (metres)
- L2 = 250m (standard cable drum length)

Joints at existing working end (live end seal) locations are additional to these requirements. All cables *shall* be marked and or tagged as the cable is laid, to individually identify each, prior to cable jointing.

All cut cables ends *must* be sealed immediately after cutting to prevent water ingress. Refer to [Underground cable installation manual \(UCIM\)](#) and UDS manual [clause 8.7](#) for cable sealing requirements.

These cables *shall* include:

- a) Cables, both HV and LV laid in the ground for future use .
- b) LV cables including 25mm² service cables to be terminated into *service pillar* or pole termination.
- c) LV cables to be terminated into the transformer or pole termination.
- d) HV cables to be terminated into switchgear or pole termination.

Refer [clause 6.2.8.20](#) for live end seal requirements.

The *preferred* method of installing cable is to mount the cable drum on jacks, cable trailer or cable stands and unroll the cable from the drum into the trench. If it is necessary to pull in the cable, then cables *must* be fully supported by suitable proprietary cable rollers during cable laying.

At no stage may the cable be permitted to drag on the ground or be subjected to treatment which could damage the outer sheath. Any cable damage *shall* cause Western Power to reject the affected part of the installation and new cable *shall* be laid.

6.2.8.9 Crossings: Railway, utility services, road and vehicle crossovers

The *developer shall* ensure that all cables crossing roads and vehicle cross-overs are installed to meet the requirements of Western Power's [Underground cable installation manual \(UCIM\)](#).

6.2.8.10 Backfilling

The *developer* is responsible for all greenfield / brownfield, backfill, reinstatement and surface restoration works associated with the *subdivision development shall* ensure:

- a) Bedding and backfilling meets the requirements of:
 - I. [Underground cable installation manual \(UCIM\)](#);
 - II. [Subdivision design guideline for bedding and backfill sand \(#4\)](#);
- b) Where cable joints or terminations are performed by Western Power, the appropriate portions of the trench are not to be backfilled until the Western Power work is completed;

Note: The *developer* is responsible for bedding and back fill following the completion of the works.

Additional charges *may* be imposed for any extra work required by Western Power.

- c) All backfill, reinstatement and restoration *shall* be completed in a manner that ensures, water run-off, or collection, does not cause soil erosion.

Note: For addition information refer to WALGA's [Local government guidelines for restoration and reinstatement in Western Australia](#)

6.2.8.11 Reinstatement

The *developer shall* ensure:

- a) Reinstatement is based on minimum greenfield reinstatement criteria specified for the *subdivision*; and
- b) Those reinstatement conditions specified by WALGA's requirements.

6.2.8.12 Cable and duct placement at road truncations

The *developer shall* ensure that all cables and ducts, crossing roads at truncations are installed from edge to edge of the cable alignments in accordance with:

- a) Drawing No. UDS-6-3; and
- b) [Clause 8.7– Equipment and installation drawings](#).

6.2.8.13 Cable installed near to retaining walls / foundations

Where cable(s) are to be installed near to existing structures, E.g. retaining walls, building foundations, brick fences, the *developer shall* ensure that the cable(s) are installed in and protected by cable ducts.

For new and or planned future structures, a *developer* may choose to install deep footings to support the required structure instead of cable ducts. Such structures *must* not encroach on or into the nominal cable alignment of 0 – 500mm. Where this option is not used, cable ducts *must* be installed prior to the construction of structure or wall. Refer also to [clause 5.3.14](#).

6.2.8.14 Cable installed in laneways

In accordance with [clause 5.3.13](#) the *developer must* obtain Western Power's prior approval for the installation of underground cables in a laneway. Where approval is granted by Western Power, cable(s) *must* be:

Either:

Installed in the 0 – 500mm alignment from property boundary in cable ducts with a minimum of one (1) spare duct,

Or:

Direct buried in soil, provided 300mm of clean sand is installed below the cable(s) and clean sand is installed above the cable(s) all the way up to the road base with a minimum of one (1) spare duct.

Prior to seeking approval from Western Power, the *developer shall* undertake a comprehensive multi-criteria analysis that includes assessment of all possible options and associated risks across the entire asset lifecycle (constructability, operability, maintainability). The *developer shall* ensure all associated risks have been reduced SFAIRP.

Note: Clean sand *must* meet the selection criteria of sand for bedding in [Subdivision design guideline for bedding and backfill sand \(#4\)](#) and the [Underground cable installation manual \(UCIM\)](#).

6.2.8.15 Cable installed in easement

Where cable(s) are to be installed in an easement, the *developer must* supply and install the cable heavy duty ducts as detailed in the conformed design drawing with the cross-section details of cable easement in [figure 23](#).

6.2.8.16 Cable installed off nominal alignment

Where Western Power approves installation of cables outside the 0 – 500mm alignment, the *developer must* ensure each cable is installed in a heavy duty duct with PVC marker tape.

Where Western Power approval is granted to install cables in the 2.4 – 3.0m alignment, it *must* be installed in cable heavy duty duct with PVC marker tape.

The *developer must* comply with [clause 5.3.10](#) in regard to the approval of cables off the nominal alignment of 0 – 500mm.

6.2.8.17 LV cable joints and terminations

The *developer shall* ensure that all low voltage cables are jointed and/or terminated only by suitably qualified *cable jointers* using techniques and work practices as detailed from time-to-time by the manufacturer and or by Western Power.

When terminating low voltage three-phase cables the core numbers and colours *must* always match each other and cores one (1), two (2) and three (3) *must* be terminated red, white, blue, respectively. All LV cable terminations *should* be undertaken prior to termination at equipment of origin.

The *developer's work shall* include:

- a) Labelling of all cable ends with 'cattle tags' as detailed in Western Power's [Distribution equipment labelling standard \(DELS\)](#); and
- b) Have clear and legible labelling of all equipment to which cables are or will be terminated.

Western Power *work shall* include:

- a) Permanent labelling of all equipment after handover and prior to commissioning in accordance with Western Power's [Distribution equipment labelling standard \(DELS\)](#).

6.2.8.18 HV cable joints and terminations

The *developer shall* ensure that HV cables are jointed and/or terminated only by suitably qualified *cable jointers* using techniques and work practices as detailed from time-to-time by the manufacturer and or by Western Power. All cable joints *must* be installed in accordance with the manufacturer's instructions supplied with the cable joint kit.

Wherever possible, cables are to be terminated and connected at both ends on the same day and if terminating into a live end seal this *shall* be undertaken prior to terminating onto the equipment of origin. Particular care *shall* be taken to ensure correct phase connection occurs.

The *cable joiner shall* maintain a record of all joints and terminations completed, together with photographic evidence to support the submission of the pre-handover *site* inspection verification report ([figure 11](#)) to the PNO prior to handover inspection. Labelling *shall* be undertaken as detailed in [clause 6.2.8.17](#).

6.2.8.19 Service pillars installation

The *developer shall* ensure that *services pillars* and *pits* are installed and located within lot boundaries along public road reserves in accordance with this section and [clause 5.3.6.1](#).

Where retaining or boundary walls exist along the boundary, *mini service pillars shall* be installed as per the details in [clause 8.7](#). A *service pillar* may be substituted by a *service pit* where the installation of the *service pillar* would constitute an unacceptable level of risk to the *consumer* and or the installed network asset. Justification for the substitution needs to be supported by a formal safety assessment (FSA).

Mini and *uni-service pillars* have an embossed level indicator to indicate at what depth below finished ground level the base is to be buried. For *subdivision service pillar* locations where finished ground levels have not been established, the *developer* is to ensure the level indicator is at least a 50mm above the existing ground level to facilitate future landscaping which typically raises the *site* finished ground level.

Service pillars shall be installed on flat ground. In situations where sloping ground is unavoidable the 100mm level, *shall* be the average height of the embossed level indicator above ground. Additional service cable at the *service pillar shall* be provided to assist with minor *service pillar* height adjustments.

Uni-service pillars shall not be installed behind retaining walls higher than 300mm or in locations where access is impeded /restricted or the *uni-service pillar* would present a hazard to the public / network personnel.

Where the configuration of the *subdivision development* and associated retaining walls is such that there are no suitable available standard *uni-service pillar* locations, one of the following options may be adopted subject to the completion and presentation of a satisfactory formal safety assessment (FSA) to Western Power:

- a) Install the *uni-service pillar* at road level in an indent or truncation of the retaining wall at the joint property boundary. The indent or truncation *shall* have sufficient space to allow personnel to install cables, access the components inside the *pillar* and permit safe operations and maintenance of the *infrastructure*.
- b) Install the *uni-service pillar* at a suitable stair access-way location at or near road level. The location *must* ensure that Western Power personnel have unimpeded access to the *pillar* at all times and public access is not impeded or restricted.

Note: Suitable provision (heavy duty ducts) *must* be made during wall installation for the consumer mains and future network cable access. Western Power cables installed under or through retaining walls *shall* be enclosed in ducts.

Note The following dimensioned diagrams have been provided as a minimum guide and as such may require larger clearance distances as a result of the *site* FSA.

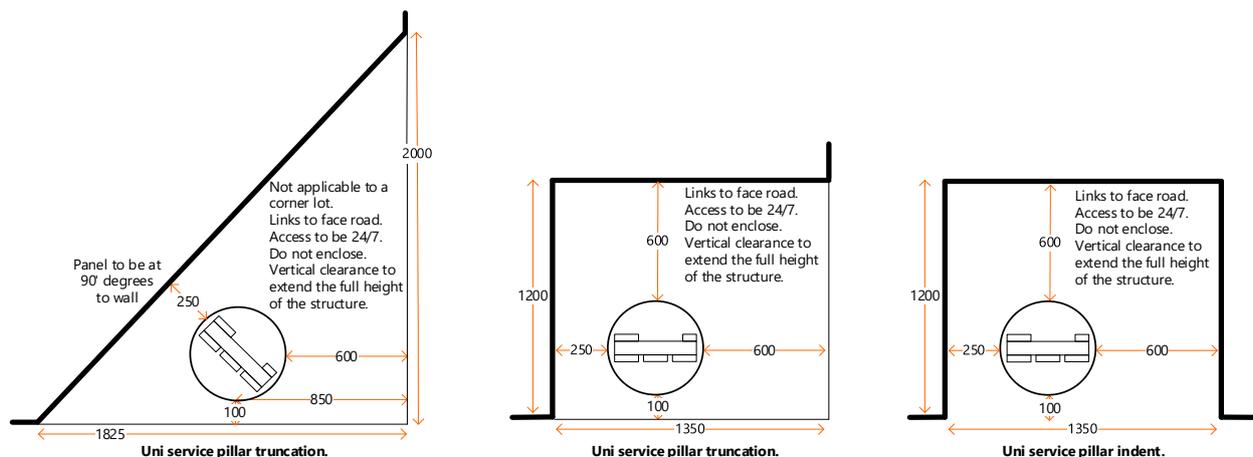


Figure 9: Uni-service pillar retaining wall options

6.2.8.20 Live end seal terminations

Both HV and LV cables may be extended beyond the *subdivision* boundary for future stage extensions. The *developer shall* ensure any installed cables are terminated as detailed below.

The use of live end seals (LES) *must* be done so sparingly and in consultation with Western Power to ensure the efficient, safe electrical control and management of the installed *subdivision infrastructure* and *connection services*. Where use is permitted, consideration *shall* be given to the current and future location of the live end seal in that a seal *must* be:

- a) In an accessible, identifiable area not covered by hard stand (E.g. asphalt, concrete, Etc.);
- b) At a distance where in the future, it would not be practical to terminate directly to the previously establish network asset such as a ring main unit, *uni-service pillar*, etc.;
- c) In a location that avoids unnecessary additional cable joints; and
- d) Coordinated and aligned with future HV and LV cables in other greenfield *subdivisions*.

Cables terminated into HV and LV live end seals and installed underground *shall* be provided with a protective cable cover and identify with an above ground marker post at the seal location.

Live end seal terminations *shall* be completed prior to termination of the cable at its origin irrespective of whether the equipment is live or not. For detailed instruction on the equipment design and construction refer to [Distribution design catalogue \(DDC\)](#): HU3 (HV) and LU62 (LV)

All live end seal locations *shall* be detailed on the 'as constructed' drawings including dimensions within and beyond *subdivision*.

Note: Previous working ends, comprised cable ends brought to the surface, capped and enclosed within a *service pillar*, painted white and labelled 'Working end only not for connection.' This white *service pillar* arrangement has not been permitted for a number of years and if identified is to be reported to Western Power via the 13.13.51 service number.

6.2.8.21 Western Power streetlights

The *developer* is responsible for all *subdivision works* associated with the installation of streetlights. Western Power streetlights are to be installed in the positions nominated on the conformed *scheme* design drawing in accordance with the [Distribution design catalogue \(DDC\)](#) and [clause 5.3.26.3](#).

6.2.8.22 Substation

The *developer shall* ensure that each *substation site* is prepared and constructed in accordance with:

- a) The requirements shown on the conformed design drawing.
- b) [Clause 5.3.19](#);
- c) [Distribution substation plant manual \(DSPM\)](#); and
- d) [WA Service and installation requirements \(WASIR\)](#).

The *developer shall* also ensure that all *substation* equipment is installed by a licensed *electrical contractor* in accordance with the following:

- e) The manufacturer's information; and
- f) Western Power's requirements as illustrated in the [Distribution substation plant manual \(DSPM\)](#) and the [Distribution design catalogue \(DDC\)](#).

6.2.8.23 Substation ducts

The *developer shall* ensure all accessways and ducts are installed in accordance with the [Distribution substation plant manual \(DSPM\)](#).

6.2.8.24 Substation earthing

The *developer shall* install *substation* earthing in accordance with the *substation* earthing requirements detailed in [Distribution substation plant manual \(DSPM\)](#) chapter 3 or approved nonstandard earthing arrangement as identified in the UDS design where a standard earthing is deemed unacceptable.

The *substation* earthing grid *must* be buried and be constructed to comply with the requirements of the [DSPM](#) and Western Power's [FAQ earthing standard](#).

All earthing cables *must* be tagged and labelled at the earth bar end to clearly indicate where they are connected.

6.2.8.25 Access to electrical equipment

The *developer must* ensure that all *contractors* and personnel requiring access to any equipment that has been commissioned and handed over to Western Power, first obtains approval to access the *site* inclusive of the required electrical permit(s) from Western Power.

6.2.8.26 Excavation near to existing asset

In addition to the requirements of [clause 6.2.8.6](#) the *developer* must ensure that when excavation work is to be carried out near Western Power underground and overhead electrical networks, their *contractor* complies with the following:

- a) [Working near electricity - Safe distance and network assets](#), published by Western Power;
- b) [Code of practice: \(Excavation\)](#), published by WorkSafe; and
- c) [Utility providers code of practice](#), published by the Utility Providers Services Committee.

6.2.8.27 Working in the vicinity of overhead power lines

The *developer* must ensure that when work is to be carried out in the vicinity of Western Power's overhead power network, their *contractor(s)* complies with:

- a) [The Work Health and Safety Regulations 1996](#),
- b) [Guideline to work in the vicinity of overhead power lines](#) published by WorkSafe; and
- c) When planning work near both underground and above ground power lines, their *contractor* advises Western Power and complies with the requirements of [clauses 6.2.8.25](#) and [6.2.8.26](#).

6.2.8.28 Minor changes during construction

During construction of underground *electricity infrastructure*, a *developer* may need to make minor changes to the UDS design to address a *site* specific requirement. The following changes are considered minor. All changes *must* be forwarded to the *developer's design organisation* for approval before being submitted to Western Power for further consideration.

- a) Minor adjustment of cable truncation.
- b) Minor relocation of street lighting being not more than the distance of a standard lot frontage within the current *subdivision* to a maximum of not more than twenty (20)m within the street lighting alignment (outside transmission line easement) but still meeting other requirements.
- c) Relocation of *service pillar* for a reticulation supply along the same LV feeder towards the district *substation*.
- d) Relocation of *mini service pillar* across side lot boundary from the corner of a lot to the corner of the adjacent lot.
- e) A change that in the opinion of Western Power does not affect the agreed design/scope of works, functionality or integrity of the *electricity infrastructure*.

All approved minor changes *must* be shown on the 'as constructed' drawings to be submitted to Western Power prior to commencement of the pre-handover inspection. Refer to [clause 4.4.6.1](#) for those requirements defined as major changes during construction.

6.2.8.29 Existing consumers and affected parties

The *developer* is responsible for notifying all concerned parties, including other Western Power *consumers* affected by the *works* associated with a UDS.

Where existing overhead aerial *infrastructure* is to be removed as part of *subdivision development*, the *developer* is also responsible for the reconnection of existing Western Power overhead connected *consumers* to the underground system. The *developer* shall engage the services of an *electrical contractor* to undertake these reconnections. All such reconnection work *must* be completed before the overhead *infrastructure* in the street is removed.

There are three (3) options for reconnection of services to existing *consumers* affected, viz:

- a) Where there is sufficient space at the front boundary of the affected lot for a *service pillar* to be installed, as shown in drawing [figure18](#) and in the [Underground cable installation manual](#), the existing overhead services is to be replaced with an underground service. Western Power will provide a *service pillar* at the *developer's* cost. The *developer* is responsible for installing the underground service from the *service pillar* to the existing *consumer*.
- b) Where there is insufficient space for a *service pillar* to be installed, a wall mounted *service pillar* shall be required. Western Power's PNO will supply the wall mounted *service pillar* to the *developer*, who is responsible for having the unit installed on the facade of the affected building.

A minimum of four (4) weeks' notice is required to enable Western Power to order the unit. Western Power will supply and install the underground service cable up to the facade of the building, allowing sufficient length to reach the mounted wall *service pillar*. The *developer* is responsible for fixing the cable to the facade of the building, up to the wall mounted *service pillar*. Western Power will undertake the final connection of the underground service to the wall mounted *service pillar*, in conjunction with the *developer's electrical contractor*.

- c) Retain the existing overhead service. In this case, the *developer* shall install the service pole. The service pole *must* be located so that the existing aerial service cable can be terminated on the pole. A meter enclosure *must* be mounted on the pole and able to accommodate a standard meter panel (450mm x 225mm) and a *consumer's* panel (225mm x 225mm).

This enclosure *shall* be the *consumer's* new main switchboard for the premises. The service pole *must* be wired with sufficient lead length to reach the *service pillar* as indicated on the Western Power drawing.

Note: The length of the service lead and location of the *consumer* pole *shall* comply with the [WASIR](#) requirements.

For all of the above options, the *developer* is to inform existing *consumers* affected that all wiring downstream of the Western Power *service pillar* is their responsibility. That is, if the wiring is damaged (e.g. by storms, fire, etc) they are responsible for repairs.

6.2.9 Installation reference documentation

For the complete list of the applicable legislation, standards, network requirements, codes of practice and guidelines, refer to [clause 1.8](#).

7. Materials and equipment

Only materials and equipment approved by Western Power may be used within a *subdivision* forming part of Western Power's network. Materials and equipment listed with corresponding stock code numbers in the [Distribution design catalogue \(DDC\)](#) are classified as being Western Power approved.

[Distribution design catalogue \(DDC\)](#) lists are revised from time-to-time, therefore *developers* and *design organisations* are reminded to ensure they are referring to the correct stock codes. The process to seeking approval of nonstandard equipment is shown in [clause 7.3](#).

7.1 Materials & equipment for subdivisions

7.1.1 Direct purchase from Western Power

Western Power holds stock of approved materials and equipment for UDS *developments* at Jandakot Stores. *Developers* may purchase this material for CCS *subdivision schemes*.

Developers wishing to acquire network materials and equipment from Western Power, need to be registered as a *consumer* with the Western Power's External Sales team. More information is available via the 'How to register' section of the Western Power's [website](#).

Once registered, purchase orders can be managed through to the via email orders directly to external.sales@westernpower.com.au. A order confirmation *should* be received within two (2) working days following placement. Quotations remain valid during the quarter in which they were obtained or until the next price change, whichever occurs first.

7.1.2 Project ordering from Western Power

The following summarises the process for ordering materials:

- a) *Contractors* are to request an External Sales team *quotation* through the provision of a 'bill of quantities' complete with the list of stock items and the UDS *subdivision* project number. Note that more than one (1) *contractor* may be requesting a *quote* for the same *subdivision* and or *developer*.
- b) Western Power will provide a *quotation* with price and delivery availability subject to 'Terms and conditions of sale of material.' Refer to the Western Power's [website](#).
- c) The successful *contractor* is to accept the *quote* and provide Western Power with a purchase order.
- d) Once the order is accepted, Western Power will provide the *developer's contractor* with updates on availability.
- e) Western Power will request collection of the ordered materials when the order is complete. The order *shall* be collected within a timeframe advised by Western Power, or be subject to an automatic return to inventory, which may incur a restocking fee.
- f) **Note:** Western Power requires a minimum of three (3) working days' notice before material can be collected. Refer to [clause 7.1.5](#) - Materials hotline.

7.1.3 Street lighting material lists

Steel and some decorative streetlights are normally available within two (2) to three (3) weeks from the date of order confirmation. However non-decorative streetlights may take up to sixteen (16) weeks to procure. *Developers* and *designers* can check the availability of streetlights from the Standard Streetlight 'material lists' that designates the street lighting items held in stock for *land development work* on Western Power's [website](#).

7.1.4 Material collection process

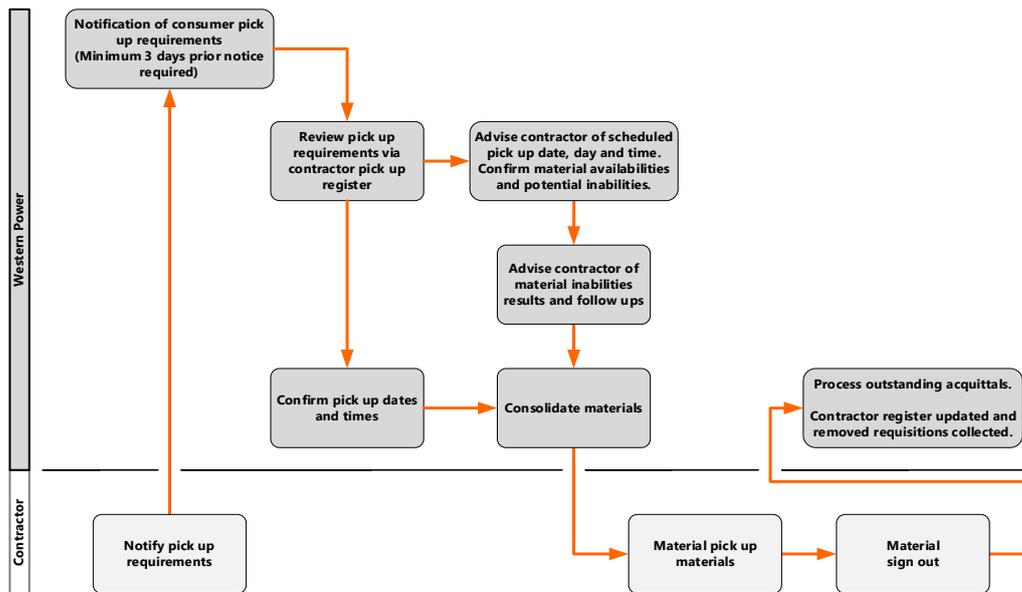


Figure 10: Subdivision materials delivery

7.1.5 Materials hotline

Western Power's External Sales team at Jandakot Distribution Centre have a dedicated materials hotline telephone number and email address to manage *consumer* enquires relating to materials and logistic matters.

Contractors should contact the External Sales team three (3) working days prior to pick up, via the materials hotline on (08) 9411 7795 or e-mail materials.hotline@westernpower.com.au to book an agreed collection time. *Contractors* may also contact the materials hotline to check delivery status and/or negotiate an early delivery.

7.2 Responsibility for security and damage

The *developer* is responsible for the supply of all materials and equipment, including but not limited to cables, switchgear and pad-mount transformers required for the *subdivision works*. Until handover of a UDS is accepted by Western Power, those materials and equipment supplied by the *developer* remain the property of the *developer* and is therefore fully responsible for security. Refer to [clause 6.2.2.8](#) for handover arrangements.

Damage to those materials and equipment and any items supplied by Western Power or other associated contractors /utilities *onsite*, is also the *developer's* responsibility, inclusive of costs to repair and or replace.

7.3 Alternative materials and equipment

7.3.1 Process overview

A *developer* may be permitted to use nonstandard equipment provided it complies with Western Power's technical requirements and is approved by Western Power before installation.

The process requires the submission of a formal application by the way of a DIP (Design Information Package) for each piece of nonstandard equipment prior to the installation and use of that equipment. Application review periods will vary dependant on the number and type of equipment approvals being sought.

For approval, the applicant *must* show how the proposed equipment and where applicable quality assurance program meets or exceeds that currently provided by Western Power's standard range materials and equipment.

An upfront application fee paid, maybe required for each item of nonstandard equipment. Such fees where applied would be to cover a preliminary review of the application and an estimate of the time required to undertake the evaluation. All evaluations *shall* be charged at the nominated hourly rate inclusive of GST.

Where the equipment is approval to use, implementation charges may also be applied to cover network administration and training expenses including but not limited to items such as creating new drawings, updating systems, training for *designers* and *contractors*, etc.

7.3.2 Approval review process

Table 15 shows the process whereby approval is provided for equipment.

Steps	Action	Responsibility
1	Application submissions to be forwarded to Western Power with the DIP.	Applicant.
2	Confirmation letter sent to applicant advising receipt of application.	Western Power.
3	Preliminary review undertaken for completeness of application and estimate of evaluation cost.	Western Power.
4	Pay evaluation costs.	Applicant.
5	Advise of projected review completion date.	Western Power.
6	Undertake evaluation and conformance review of equipment.	Western Power.
7	Advise applicant of recommendations and conditions of approval if required.	Western Power.
8	Prepare agreement between Western Power and applicant for conditions and terms of approval, including costs associated with implementation of new equipment.	Western Power.
9	Accept terms and conditions approved.	Western Power & Applicant.
10	Process complete.	

Table 15: Approval review process for nonstandard equipment

7.3.3 Application for equipment approval

Applications not forming a part of a *subdivision* application are to be forwarded to [Western Power's](#) Engineer and Design Team together with supporting information.

7.3.4 Certificate of approval of equipment

Western Power will provide the applicant with a certificate of approval for each item of nonstandard equipment where the application is approved. The certificate of approval will state the approval conditions and validity.

7.3.5 Notification of use of approved alternative equipment for subdivision

The *developer* must give Western Power prior written notice each time the approved nonstandard equipment is to be used in a UDS. The details of the equipment *must* be shown on the electrical design drawings for DCR and on the 'as constructed' electrical drawing for handover inspection.

Where a *developer* chooses to use an approved nonstandard item, the *developer* is responsible for its use for a period of twelve (12) months from handover.

Developers and *design organisations* should refer to [clause 4.5](#) for details of the process for providing notification to Western Power.

7.3.6 Spares for alternative materials and equipment in subdivision

Approved alternative equipment is nonstandard for Western Power and spares are not held within Western Power stores. The *developer should* make appropriate arrangements to provide spares for replacement to Western Power's satisfaction.

A guarantee of availability of spares by the equipment manufacturer or provision of spare equipment to Western Power at the *developer's* cost in an arrangement acceptable to Western Power.

8. Supplementary material

8.1 Subdivision design submission NER engineer certification (2024)

The following must form part of *design conformance review* submission.

8.1.1 Page 1 of 3

Western Power ref: MS/SS/NS _____ Developer / design organisation ref: _____

Design drawing No. _____ / _____ / _____ Sheet 1 Rev. ____ Date: _____
 Design drawing No. _____ / _____ / _____ Sheet 2 Rev. ____ Date: _____
 Design drawing No. _____ / _____ / _____ Sheet 3 Rev. ____ Date: _____

The above submitted drawings meet Western Power's requirements. This includes (but is not limited to) the following:

HV network

Item	Description	Y	N/A
1.1	HV entry and exit points are as per DIP or as agreed.		
1.2	Correct size HV cable has been used as per DIP or as agreed.		
1.3	HV design is optimum with minimum number of switchgear.		
1.4	Correct land size has been allocated for transformers and RMU's.		
1.5	Substation HV cable layout and connections are correct.		
1.6	Earthing in accordance with AS 2067 section 8 and Appendix G (incl. but not limited to touch and step voltage requirements)		
1.7	No HV earths located within 15m of a telecommunication pit unless approved by the applicable service provider in accordance with AS/NZS 3835.		
1.8	Effect of EPR and LFI on both existing and new metallic pipelines assessed in accordance with AS/NZS 4853 and pipeline owner approval received (where applicable).		
1.9	Effect of EPR on metallic substation fencing assessed in accordance with AS 2067 and suitable mitigation applied (where applicable).		
1.10	129BA restrictive covenant for fire protection applied around substations on residential, commercial/industrial lots in accordance with Western Power's requirements		
1.11	Substation site civil works (i.e. battered slopes or retaining walls) are structurally sound and suitable for their purpose (certified by civil NER engineer).		
1.12	Substation sites mitigated from water inundation.		
1.13	Transformers sites compliant with noise requirements.		
1.14	All equipment sites shall comply with flood level requirements.		
1.15	Substation sites compliance with ground water level requirements.		

LV network

Item	Description	Y	N/A
2.1	Correct data are used in <i>LV design</i> calculations.		
2.2	<i>LV design</i> calculations (including cable capacity & current) are within Western Power's limits.		
2.3	All motor 'flicker' requirements are within acceptable limits defined in AS/NZS 61000.3.5.		
2.4	Transformer capacity is in accordance with DIP for this subdivision stage.		
2.5	LV feeders are as evenly loaded as practical.		
2.6	Transformer and feeder load details are correct and are clearly shown on the submitted drawings.		
2.7	Street lighting design complies with local government authority requirements, AS/NZS 7000 safe clearances from existing power lines, pole setbacks calculator and AS/NZS 1158.		

8.1.2 Page 2 of 3

Other

Item	Description	Y	N/A
3.1	Appropriate design loads for each lot as per DIP or as agreed.		
3.2	Design satisfies WAPC conditions.		
3.3	Distribution easements applied over cables to be installed as required		
3.4	Transmission easements applied to existing transmission power lines.		
3.5	Proposed work in vicinity (WIV) of existing energised Western Power assets can be constructed in accordance with Work Health and Safety (OSH) requirements.		
3.6	Bill of materials is correct.		
3.7	Design drawing minimum requirements satisfied.		
3.8	Appropriate 3 rd party approvals received (e.g. Local Government Authority, Main Roads, Public Transport Authority).		
3.9	All nonstandard equipment clearly identified and agreement by Western Power for its use.		
3.10	All risks (incl. but not limited to Safety, Constructability, Operability, Maintainability) identified and reduced SFAIRP for any planned change of land use / activity within proximity of Western Power network infrastructure		

Note 1 Y - yes, N/A - not applicable**Note 2** DIP - Design information package.

Comments: _____

To the best of my knowledge and by virtue of my NER registration, training, qualifications and experience, I certify that the design submission on the above drawings meet all the Electricity (Supply Standards and System Safety) Regulations 2015 (as amended), Western Power's requirements in the Design information package (DIP), the Underground distribution schemes manual (UDS), published Subdivision design requirements, and other relevant publications referenced in the UDS.

Signed: _____ Date: ____/____/____

Name : _____

Qualifications : _____

Engineer Australia membership number : _____

8.1.3 Page 3 of 3

Authorisation of NER Certification of subdivision design revision for minor changes.

Western Power Ref: MS/SS/NS. Developer / design organisation Ref: _____

To Western Power,

I hereby authorise the following persons to certify design revision submissions for minor changes* for the above subdivision on behalf of myself.

- 1.
- 2.
- 3.

I accept full liability and responsibility of any such certification executed under this authorisation subsequent to any minor changes required on the original design submission with my certification. This authorisation will remain in force unless withdrawn by me in writing.

Signed : _____ Date: _____

Name : _____

Qualifications : _____

Engineer Australia Membership Number : _____

* Minor changes are defined as follows:

- Minor adjustment of cable truncation.
- Minor relocation of street lighting of not more than 20 metres within the street lighting alignment (outside transmission line easement).
- Relocation of pillar for reticulation pump along the same LV feeder towards the district substation.
- Relocation of mini pillars across side lot boundary from the corner of a lot to the corner of the adjacent lot.
- Installation of cables (HV or LV cables) to the 2.7m pole alignment to avoid trees and rocks only.

Note: Any minor change revision submission must include a copy of this authorisation.

8.2 Subdivision design drawing minimum requirements –

8.2.1 Sections 1 to 4

8.2.1.1 1A. Title block that must include the following information:

1. Name of project and staging.
2. Drawing title.
3. Contact details of *developer/project manager*.
4. *Design organisation* contact detail.
5. Lot details and street names.
6. Geographic location provided in DIP drawing.
7. Street view maps (optional).
8. WAPC Ref no.
9. Western Power Ref no.
10. Drawing scale.
11. *Design organisation* drawing number.
12. Sheet number.
13. Revision number.
14. Sheet size.
15. North point.
16. Date drawing created or revision.
17. Western Power logos *must* not be shown on the design organisation's drawings.

8.2.1.2 1B. Revision box

Note: *Must* be updated every time a change is made to a drawing once Western Power has a copy.

1. Revisions number/letter.
2. Checked by.
3. Drawn by.
4. Designed by.
5. NER *engineer*.
6. Date of revision.
7. Provide clear/unambiguous description of changes to all drawing sheets.

8.2.1.3 1C. Drawing revisions

1. Drawing revisions *shall* be highlighted by clouding and revision identification reference. Previous revision highlighting *shall* be removed.

8.2.2 Western Power's legend as per the CAD interface package.

1. All drawing symbology as per Western Power's current legend including colour and line weights.

Note: except where legend is out of date with the DDC and other documents, the *designer* may make variations to the legend.

2. All cable sizes to be identified and matched with legend.

8.2.3 Safety Issues / warnings

1. 'Dial before you dig' logo.
2. Working in the vicinity of overhead lines to comply with 'Worksafe' clearances during construction logo.
3. Telecommunication trunk services.
4. High pressure gas.
5. High pressure water.

8.2.4 Feeder loading, naming and volt drop table

1. *Must* be updated in every stage.
2. *Must* be included for every transformer utilised (even if there is only one (1) lot added or it is situated outside the *subdivision* boundary).
3. Include any existing transformer where the load is altered by the current *subdivision works*.

All subdivisions *must* show:

1. Tx name, and location street address, including type of *land* use if known e.g. primary school or POS etc.
2. Transformer voltages, kVA and rated current.
3. Fuse and circuit No.
4. Amp rating of fuses.
5. Cable size in mm²
6. Accurate circuit description.
7. Maximum volt drop on each feeder.
8. Maximum current on each LV feeder.
9. Total current on Tx.
10. ADMD specified.

Note: Max current is to be calculated by the *LV design* package and not determined arithmetically by adding individual *consumer* loads.

8.2.5 Cable termination and circuit naming:

Substation configuration diagram requirements:

1. Switches and switchfuses *must* be labelled on the configuration diagram.
2. Switches and switchfuses *must* be shown in the same order of the physical arrangement of the switchgear.
3. If the *substation* contains a transformer, the transformer *must* be shown on the left of the switchgear as viewed from the front.

Circuits are to be named as follows:

4. If the load is contiguous with transformer *substation site*, it *must* be named 'CONTIGUOUS SUPPLY' with the nature of *land* use, e.g. 'EXISTING SCHOOL.' See circuit No. 1 of the above table.
5. If the feeder supplies only a pump via a *service pillar*, it *must* be named 'PUMP SUPPLY' with pump size in kVA, the nature of *land* use and Lot number, e.g. 'PUMP SUPPLY 3.5kVA (POS LOT 400)'.
6. Use the last/nearest lot number to the *uni-service pillar* fed by that feeder to which the feeder is connected.
7. For an existing circuit, name the feeder 'EXISTING CIRCUIT' with street name or the lot number at the end of the LV feeder, such as 'POS LOT 400'. Circuits which are not used *should* be marked 'VACANT' or 'FUTURE.'

Note: Circuits *should* be numbered from left to right when viewed from the front of the LV frame.

8.2.6 Street lighting *must* show:

1. Type of lighting
2. Location and orientation.
3. Where decorative lighting is installed, indicate colour and CU unit.
4. Indicate if lighting is private or Western Power.

Note: If private street lighting is installed, a separate drawing *must* be submitted to Western Power prior to handover.

8.2.7 Substation and switchgear land requirements

1. Show *substation* detail with dimensions of *land* including allowance for proposed batters and retaining walls.
2. Location from lot boundaries and adjacent lot numbers *must* be shown
3. Civil requirements (0.5m above the 1% AEP flood level, retaining walls)
4. Duct requirements (if set back in POS, PAW or private property)
5. If nonstandard equipment is to be used, all equipment *shall* be evaluated to the current technical requirements as determined by Western Power's Engineering and Design team. The process requires a formal submission of application for equipment approval.
6. This Western Power approval is required prior to submitting the design for conformance review. Submission of nonstandard equipment *must* comply with Western Power's design requirement.

8.2.8 Pole numbers and location

1. Pole numbers or 'pick ID' for all poles as part of the *subdivision must* be shown on the design drawing.
2. All pole locations need to be surveyed.

8.2.9 HV and LV open points

1. *Uni-service pillar* (LU11) *must* be shown as 'on' or 'off' with arrow point indicating cable terminated on the top bar of the *service uni-pillar*.
2. LV blades (LU9) or LV cable termination to LV ABC switch (LU37) *must* be shown as 'on' or 'off'.
3. Switch point status on the HV of the RMU *must* be shown on drawing as detailed in the DIP.

8.2.10 Stage boundary

1. *Must* cover scope of all works, including live end seals.
2. *Must* include all lots that are provided with a LV supply in this stage and exclude those lots that do not have a supply for this stage.
3. *Must* include all cables, *substations*, *service pillars*, streetlights and any other assets being installed or having their ON/OFF status changed in this stage.
4. *Must* include removal, relocation or modification to any existing Western Power assets. This information will be provided in the DIP.

Note: Boundaries can be discontinuous, i.e. there can be a boundary around the entire *subdivision* and then a small separate boxed boundary around a *service uni-pillar* a distance away that requires its status changed from OFF to ON.

8.2.11 Easements and restrictive covenants

1. Any existing or future transmission easements and assets *must* be shown.
2. Any existing or future distribution easements and assets *must* be shown.
3. Any existing or future easements for other utilities *must* be shown.
4. For underground cable easement, a cross section detail *must* be shown.
5. Type of easement *must* be shown. Refer [clause 5.3.15](#) – Cable easement.
6. Any *substation* fire clearance 'restrictive covenant' *must* be shown.

8.2.12 Design drawing must include:

1. All relevant sections and dependent equipment from previous stages *must* be included if the same transformer is being utilised.
2. Previous stages adjacent to the *subdivision must* be shown having the equipment and cables using the current line sizes, styles and colours.
3. HV and LV interconnection points and sources of all feeders.
4. Any existing transformer which was installed in the previous stage if its capacity is being utilised for the proposed *subdivision*.
5. Location of RMU / drop out fuses if transformer is being installed or upgraded.
6. A detail of location and clearances of all equipment to be installed in the vicinity of aerial lines, easements and structures, only where applicable.
7. HV and LV live end seals.
8. Retaining wall detail showing minimum distance of *service pillar* to the wall.
9. All pre-negotiated and pre-approved *work* partially or fully funded by Western Power as a note, including all material that Western Power is subsidising.
10. Multiple cable trench details. Locate and identify each cable.
11. CAD design drawings *shall* have different engineering disciplines saved onto separate layers.
12. *Service pillars* shown on the drawing for future installation and use *shall* be labelled as such to assist in ensuring cabling is not inadvertently installed to these locations
13. Transformer capacity allocation for future stages to be identified for adjacent stage availability.
14. Identification of dedicated *service pillars* 'DEDICATED PILLAR TO LOT (NUMBER).' (Historical)
15. Details of non-standard depth of cover
16. Simplified Single Line Diagram clearly indicating all proposed network open points (both HV & LV)

8.2.13 Commercial, industrial and mixed use sites

1. Lot size in m.
2. ADMD listed on each lot.
3. For group housing, the number of units and total load *must* be shown.

8.2.14 Conformance review drawing submission procedure)

1. All files and associated project documentation are to be submitted as a collective package, in accordance with Western Power's procedures and requirements as amended from time to time.
2. Where the content of one or more files has or is changed, the collective package of files and documents *shall* be resubmitted as a complete submission each time.
3. Western Power's NER certification letter and check sheet *must* also be included **with** every submission, unless a 'minor change notification' has previously been received in which case *design organisation* certification is required.

8.3 Cable duct specification

8.3.1 Introduction

This specification applies to the supply and installation of ducts for electric cables. Unless otherwise specified, the *developer shall* be responsible for the supply and installation of all cable ducts and concrete encasement (where required) as shown on the *subdivision* design drawings.

8.3.2 Materials

All cable ducts *shall* comply with AS 2053.1. – Conduits and Fittings for electrical installations – general requirements.

They *shall* be heavy-duty (HD) category and light orange in colour. In addition, all ducts *must* be non-metallic and comply with AS2053.

8.3.3 Size of conductors

There are numerous sizes available. The appropriate size as determined in [clause 5.3.11](#) *must* be selected. However, for 33kV *subdivisions*, 150mm duct *must* be used for the high voltage cable.

8.3.4 Installation of ducts

All ducts *shall* be installed in accordance with the requirements of [Underground cable installation manual \(UCIM\)](#).

8.3.5 Supervision of installation

The *developer shall* be fully responsible for the supervision of the duct installation. Any remedial *works* required by Western Power's PNO *shall* be carried out promptly. Any costs incurred by Western Power, as a result of such remedial *works* causing a delay to the Western Power *works*, may be charged to the *developer*.

8.4 Developer pre handover site inspection verification

Electrical assets infrastructure Pre-handover site inspection verification

Project name and stage:

Date:

Project No:

WAPC No:

Key parties

Developer:

Project manager (PM):

Developer's design engineer:

Representative:

Main contractor (MC):

Representative:

Sub-contractor (SC):

Representative:

Western Power

Representative:

Parts	Inspection Items – inspected and verified by Subcontractor (SC) and Main Contractor (MC) to meet the specification, drawings & UDS manual	Ready for Pre-handover
Trenching & bedding	<ol style="list-style-type: none"> 1. Trench alignments/excavation conform to network & UPCoP requirements 2. Trench depths validated to subdivision finished levels 3. Bedding in accordance with network requirements, free of obstructions 	Verified (SC) <input type="checkbox"/>
		Verified (MC) <input type="checkbox"/>
Cable & access installation	<ol style="list-style-type: none"> 1. Cable installation completed in accordance with the UDS Manual 2. LV cables installed to the correct depth and alignment 3. HV cables installed to the correct depth and alignment 4. Conduits, ducts, pulling pits, draw wires installed 5. Cables and access ways clear of other services and obstructions 	Verified (SC) <input type="checkbox"/>
		Verified (MC) <input type="checkbox"/>
Cable jointing, terminations & seals	<ol style="list-style-type: none"> 1. Jointing, terminations, and seals in accordance with the UDS Manual 2. Joints and seals correctly located within and to identified boundaries 3. Joints, terminations, and seals complete, compliant and documented 4. Phasing of joints and terminations correct and validate 	Verified (SC) <input type="checkbox"/>
		Verified (MC) <input type="checkbox"/>
Backfill & surface coverings	<ol style="list-style-type: none"> 1. Boundary pegs in place and visible 2. Clean fill in place around cables and equipment 3. Danger/marker tape correctly installed 4. Backfill and surface coverings in place and complete 5. Reinstatement (where applicable) complete 6. Above ground markers correctly installed and secure 	Verified (SC) <input type="checkbox"/>
		Verified (MC) <input type="checkbox"/>
LV & HV equipment installation	<ol style="list-style-type: none"> 1. Network equipment correctly located within and to identified boundaries 2. Pillars and cable pits correctly installed and terminated 3. Transformers correctly installed and terminated 4. Switchgear correctly installed and terminated 5. Street lighting correctly installed and terminated 6. Supplementary infrastructure and supports installed and complete 	Verified (SC) <input type="checkbox"/>
		Verified (MC) <input type="checkbox"/>

Testing	<ol style="list-style-type: none"> 1. Testing completed in accordance with the UDS Manual 2. LV testing complete, compliant & documented 3. HV testing complete, compliant & documented 4. Test reports documented (note qualifications and experience of joiner(s)) 	Verified (SC) <input type="checkbox"/> Verified (MC) <input type="checkbox"/>
As constructed drawings and documents	<ol style="list-style-type: none"> 1. Finished ground levels documented 2. Agreed non-conforming cable depths confirmed and documented 3. Conduits, ducts, pits, and cables documented 4. Cable joints, terminations and seals locations confirmed and documented 5. Agreed non-electrical utilities located within power alignments documented 6. LV/HV equipment/infrastructure locations confirmed and documented 	Verified (SC) <input type="checkbox"/> Verified (MC) <input type="checkbox"/>

Main contractor's statement

We the contractor certify that the assets constructed comply with Western Power's applicable design and construction manuals including the Distribution substation plant manual (DSPM), the Distribution construction standards handbook (DCSH), the Underground cable installation manual (UCIM) and the Underground distribution schemes manual (UDS) for these works.

Name of contractor:

Name and position:

Signed:

Date:

Developer's statement

Based on the inspection of electrical services installation, to the extent that can be reasonably expected during the periodic site visits, receipt of engineering site reports, review of the contractor's test results, and the as-constructed documentation, we consider that the works are practically complete and ready for handover to Western Power in accordance with the submitted certified design and current issue of the Western Power Underground distribution schemes manual (UDS).

Name of company:

Name and position:

Signed:

Date:

Please submit the completed document together with all relevant data sheets through [Western Power's online application portal](#), two (2) days prior to the pre-handover inspection.

Figure 11: Developer pre handover site inspection verification

8.5 Pre hand over site inspection report



Site inspection report

Pre-handover inspection				
Stage:				
Work order #:	EDM No:	Pre-start meeting:	Yes	No
Date:	Time on site:	Time off site:		
Inspection items:	Result:	Pass	Fail	Person responsible:

Handover inspection achieved

- | | |
|---|---|
| 1 | Yes |
| 2 | No |
| 3 | Numerous visits to complete outstanding defects |
| 4 | Other (See comments) |

Outstanding items:

All the following outstanding items or defects must be rectified by the developer by the required by date.

No.	Outstanding item/defect	Required by date

Action taken / comments:

Inspected By (Western Power): _____ Signature: _____ Pay No: _____

Developer / Project manager: _____ Signature: _____ Date _____

Developer / Project engineer : _____ Signature: _____ Date _____

EDM__

February 2024

Figure 12: Pre handover site inspection report

8.6 Handover certificate



Handover certificate

Original to be returned to works administration on completion
Western Power, 363 Wellington Street Perth WA 6000

1990

Please note that from the date and time stated, the apparatus detailed below which has previously controlled

By _____
(Name)

Of _____

Is now handed over to _____
(Name)

Of _____

Date _____ Time _____

Project number _____

Location _____

Apparatus being handed over _____

With the following exceptions and comments _____

Any further work on the apparatus can only be carried out with the permission of the appropriate authority and subject to the issues of an appropriate permit to work authorisation. (Refer to clause 3.9 of the safety instructions).

Handed over by _____ Accepted by _____
(Sign) (Sign)

Please sign in the space provided below that you understand and acknowledge the changed conditions which now apply to the apparatus.

Name	Signature	Name	Signature

NOTE: In the case of Contractors the above should be signed by the Contractor and forwarded to the Western Power Project Manager stating that all relevant Contractor Employees have been advised.

Distribution: Green copy – Accepting Officer; Yellow copy- Project Officer; Pink copy – Handing Over Officer; White copy – Spare 06/11

Figure 13: Handover certificate

8.7 Equipment and installation drawings

The following section contains sample additional drawings, not reproduced in this UDS manual, for key equipment used by Western Power in the construction of *subdivisions* (UDS)

8.7.1 Low voltage equipment drawings

Listed below are commonly used drawings from the [Distribution construction standards handbook \(DCSH\)](#). Drawings prefixed R in Part 2 and prefixed U in Part 5.

Drawing number	Drawing title
U08 – 01	URD– Mini-service pillar (Square) installation guide
U08 – 04	Mini-service pillar (Round) installation guide
U9	Universal-service pillar installation details
U23-1	UMS Single phase service pit installation guide
U23-2	UMS mini-service pillar termination details
U23-3	UMS Three phase service pit installation guide
U 30	Below ground service pit installation guide

8.7.2 Substation earthing arrangement drawings

Listed below are commonly used drawings from the [Distribution substation plant manual \(DSPM\)](#).

Drawing number	Drawing title
DSPM Section 3	Substation earthing arrangements

8.7.3 Substation ducts arrangement drawings

Listed below are commonly used drawings from the [Distribution substation plant manual \(DSPM\)](#).

Drawing number	Drawing title
DSPM Section 3	Substation ducting cross section – Civil requirements

8.7.4 Streetlight drawings

Listed below are commonly used drawings from the [Distribution construction standards handbook \(DCSH\)](#). – Section 2.

Drawing number	Drawing Title
R26-5	Streetlight (LED) Wiring Installation Standard (Part 1)
R26-6	Streetlight Wiring Installation Standard (Part 2)
R 26-7-1	Streetlight cutout, LED class II luminaires
R 26-7-2	Existing streetlight cutout, & supply cable with new LED class II luminaires
R 27	Fusing arrangement for streetlight columns

Western Power street lighting (non-decorative) equipment drawings are available in the [Distribution design catalogue \(DDC\)](#) – SL – Streetlights

Western Power decorative street lighting equipment is available in the [Distribution design catalogue \(DDC\)](#) – DM – Decorative materials

8.7.5 Cable trench arrangements

Drawing number	Drawing title
UDS-6-2	Cable trench layout (Sheets 1 to 7)
UDS-6-3	Cable and duct placements on truncations
Figure 22:	Placement of duct where cable crosses water course or open drain

8.7.6 Live end seals and cable end cap drawings

Listed below are commonly used drawings references for HV and LV live end seals and caps from the [Distribution design catalogue \(DDC\)](#)

Drawing number	Drawing title
HU3	HV Cable live end seal
LU62	LV Cable live end seal
CN73	Cable end cap

[Distribution construction standards handbook \(DCSH\)](#).

Drawing number	Drawing title
R34 - 1	LV cable live end seal
R34 - 2	HV cable end seal

8.7.7 Cable trench layout (sheet 1 of 7)

<u>CABLE SIZES: (DIA)</u>													
50mm ² HV - 33kV (Tx CABLE)	82mm												
185mm ² HV - 33kV (FEEDER CABLE)	102mm												
35mm ² HV - 22kV (Tx CABLE)	68mm												
185mm ² HV - 22kV (FEEDER CABLE)	93mm												
240mm ² HV - 22kV (FEEDER CABLE)	98mm												
16mm ² S/L	13.5mm												
185mm ² LV	47mm												
240mm ² LV	54mm												
400mm ² HV - 22kV (FEEDER CABLE)	104mm												
<u>MINIMUM CABLE CLEARANCES:</u>													
BETWEEN PROPERTY BOUNDARY AND CABLE	100mm												
BETWEEN LV AND STREET LIGHT CABLES	25mm												
BETWEEN LV AND HV Tx CABLES	50mm												
BETWEEN LV AND HV FEEDER CABLES	200mm												
BETWEEN HV FEEDER CABLES	200mm												
BETWEEN LAYERS OF CABLES	200mm												
BETWEEN HV FEEDER AND Tx CABLES	100mm												
<u>NOTES:</u>													
①	SEE SHEET 2 FOR EXAMPLES OF CALCULATING THE NUMBER OF CABLES THAT CAN BE INSTALLED IN A TRENCH.												
②	SEE SHEETS 3, 4 AND 5 FOR TYPICAL CABLE TRENCH LAYOUTS FOR 2 LAYERS OF CABLES.												
③	SEE SHEETS 6 AND 7 FOR TYPICAL CABLE TRENCH LAYOUTS FOR A SINGLE LAYER OF CABLES.												
<table border="1" style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;">UNDERGROUND DISTRIBUTION SCHEME MANUAL</td> </tr> <tr> <td colspan="2" style="text-align: center;">CABLE TRENCH LAYOUT Green Field CABLE SIZES & SEPARATION SPECS.</td> </tr> </table>		UNDERGROUND DISTRIBUTION SCHEME MANUAL		CABLE TRENCH LAYOUT Green Field CABLE SIZES & SEPARATION SPECS.									
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<table border="1" style="width: 100%;"> <tr> <td>DRAWN: PS</td> <td>DATE: 10/4/2006</td> <td>DRG No</td> </tr> <tr> <td>ORIGINATED:</td> <td>SCALE: NTS</td> <td>UDS-6-2</td> </tr> <tr> <td>CHECKED: GW</td> <td></td> <td></td> </tr> <tr> <td>APPROVED: R. ROGERSON</td> <td>REV 1</td> <td>SHT. 1</td> </tr> </table>		DRAWN: PS	DATE: 10/4/2006	DRG No	ORIGINATED:	SCALE: NTS	UDS-6-2	CHECKED: GW			APPROVED: R. ROGERSON	REV 1	SHT. 1
DRAWN: PS	DATE: 10/4/2006	DRG No											
ORIGINATED:	SCALE: NTS	UDS-6-2											
CHECKED: GW													
APPROVED: R. ROGERSON	REV 1	SHT. 1											
1	27/8/15	BORDER REPLACED	GF	GW									
REV.	DATE	DESCRIPTION	DRGD.	CHKD.	APPRO								

Figure 14: Cable trench layout (sheet 1 of 7)

8.7.8 Cable trench layout (sheet 2 of 7)

EXAMPLES OF CALCULATING THE NUMBER OF CABLES PER LAYER IN A TRENCH											
Minimum Boundary Clearance	Cable Diameter (mm)	Clearance (mm)	Total trench width required (T) (mm)	If T < or = 500: Permitted If T > 500: Not permitted							
Number and Size of Cables	100	54	25	54	25	54	25	54	54	470	Permitted
5x240 LV	100	54	25	54	25	54	25	54	68	509	Not permitted
4x240 LV + 1x35 HV	100	47	25	47	25	47	25	47	68	481	Permitted
4x185 LV + 1x35 HV	100	54	25	54	25	54	25	54	68	430	Permitted
3x240 LV + 1x35 HV	100	47	25	47	25	47	25	47	68	409	Permitted
3x185 LV + 1x35 HV	100	54	25	54	25	54	25	54	98	452	Permitted
1x240LV + 1x240HV #	100	54	25	54	25	54	25	54	104	458	Permitted
1x240LV + 1x400HV #	100	54	25	54	25	54	25	54	93	447	Permitted
1x240LV + 1x185 HV #	100	47	25	47	25	47	25	47	93	512	Not permitted
2x185LV + 1x185HV #	100	47	25	47	25	47	25	47	98	445	Permitted
1x185LV + 1x240HV #	100	47	25	47	25	47	25	47	200	451	Permitted
1x185LV + 1x400HV #	100	47	25	47	25	47	25	47	200	496	Permitted
2x240HV ##	100	47	25	47	25	47	25	47	104	500	Permitted
2x400HV ##	100	47	25	47	25	47	25	47	93	491	Permitted
1x185HV + 1x240HV ##	100	47	25	47	25	47	25	47	68	497	Permitted
1x185HV + 1x400HV ##	100	47	25	47	25	47	25	47	68	366	Permitted
1x35HV + 1x240HV ##	100	47	25	47	25	47	25	47	68	372	Permitted
1x35HV + 1x400HV ##	100	47	25	47	25	47	25	47	68	361	Permitted
1x35HV + 1x185HV ##	100	47	25	47	25	47	25	47	93	654	Not permitted
1x35HV + 2x185HV ##	100	68	100	68	100	68	100	68	93	93	Not permitted

Note 1: For trench with single layer of cables only.
Note 2: When HV feeder cables are to be installed, a maximum of 2 LV cables can only be installed in a 2 layer trench. (Because de-rating of HV cables is not permitted.)

1				27/8/15	BORDER REPLACED	GF	GW
REV	DATE	DESCRIPTION	ORGO	CHKD	APRD		

UNDERGROUND DISTRIBUTION SCHEME MANUAL

CABLE TRENCH LAYOUT

Green Field

SEPARATION EXAMPLES

DRAWN: PS	DATE: 10/04/2006
ORIGINATED:	SCALE: NTS
CHECKED: GW	APPROVED: R. ROGERSON
DRG. No	REV
UDS-6-2	1
	SHT. 2

Figure 15: Cable trench layout (sheet 2 of 7)

8.7.9 Cable trench layout (sheet 3 of 7)

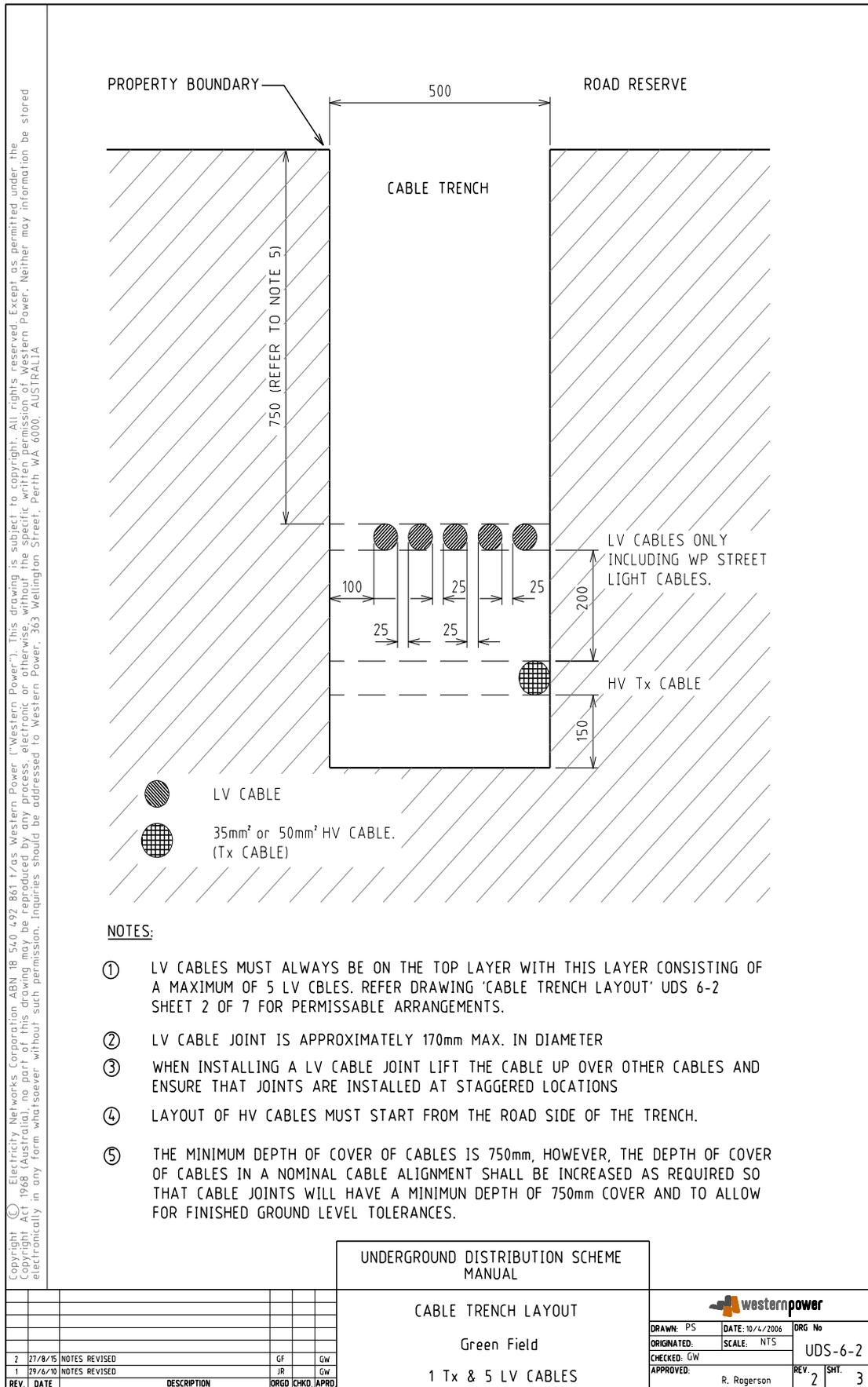


Figure 16: Cable trench layout (sheet 3 of 7)

8.7.10 Cable trench layout (sheet 4 of 7)

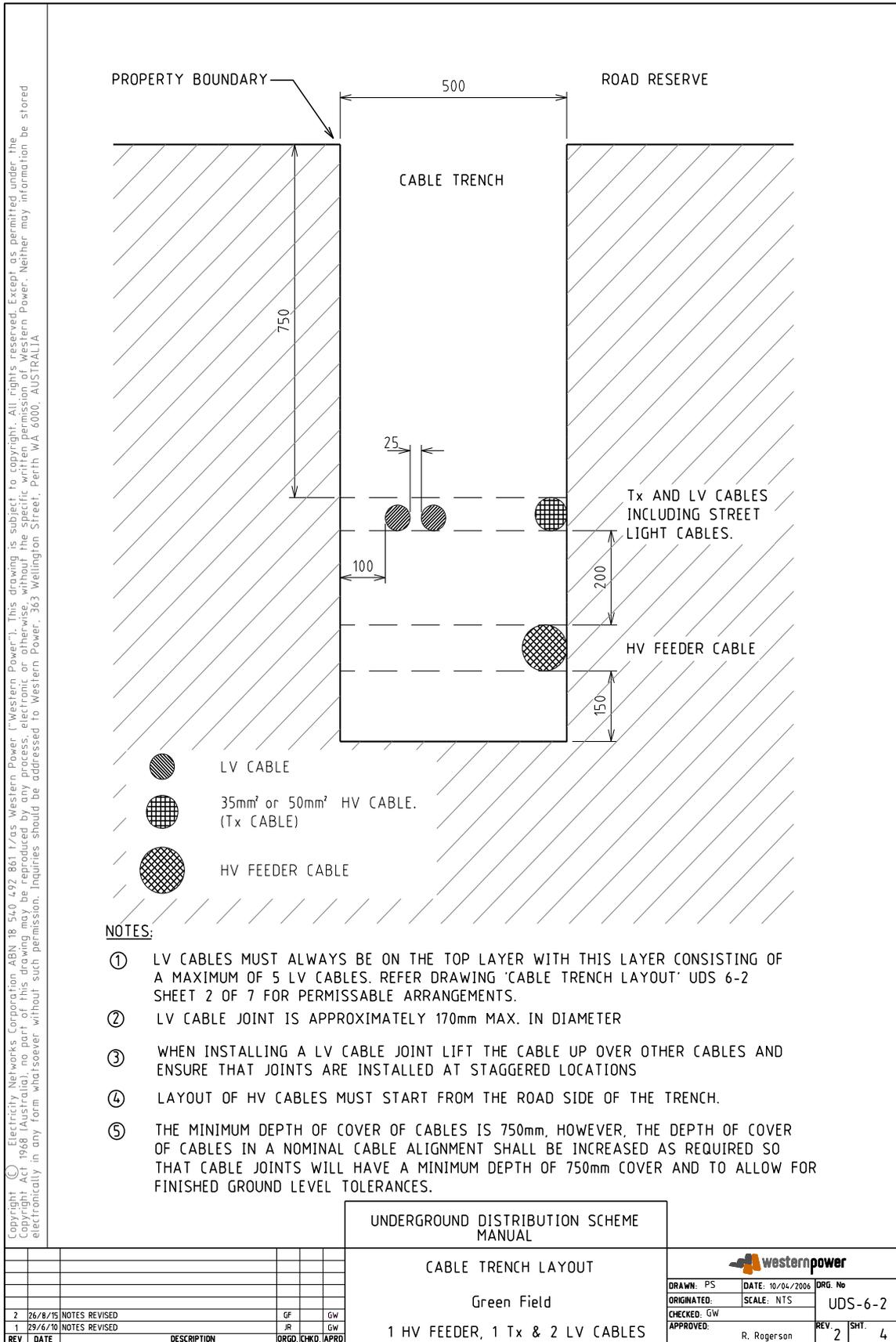


Figure 17: Cable trench layout (sheet 4 of 7)

8.7.11 Cable trench layout (sheet 5 of 7)

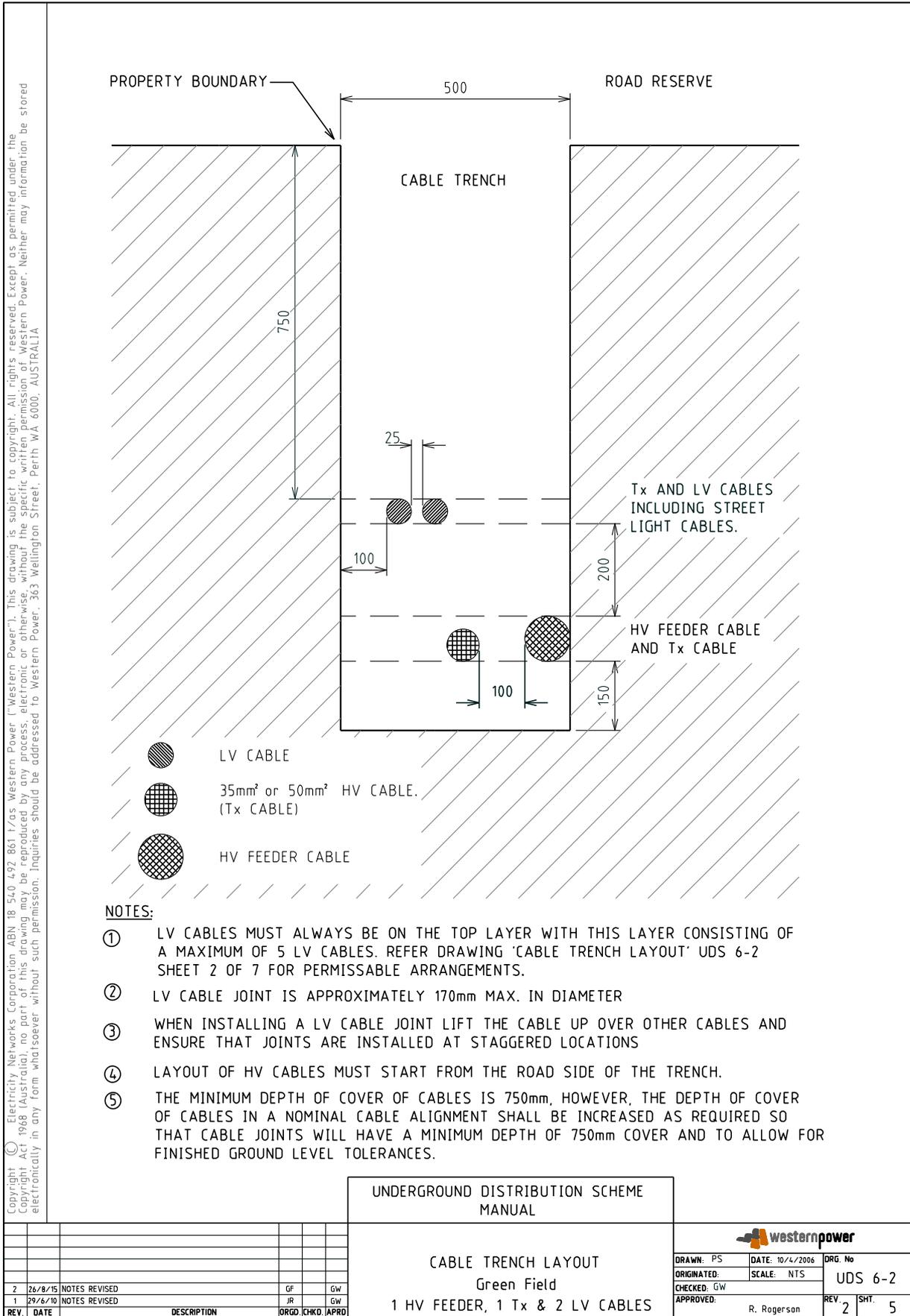


Figure 18: Cable trench layout (sheet 5 of 7)

8.7.12 Cable trench layout (sheet 6 of 7)

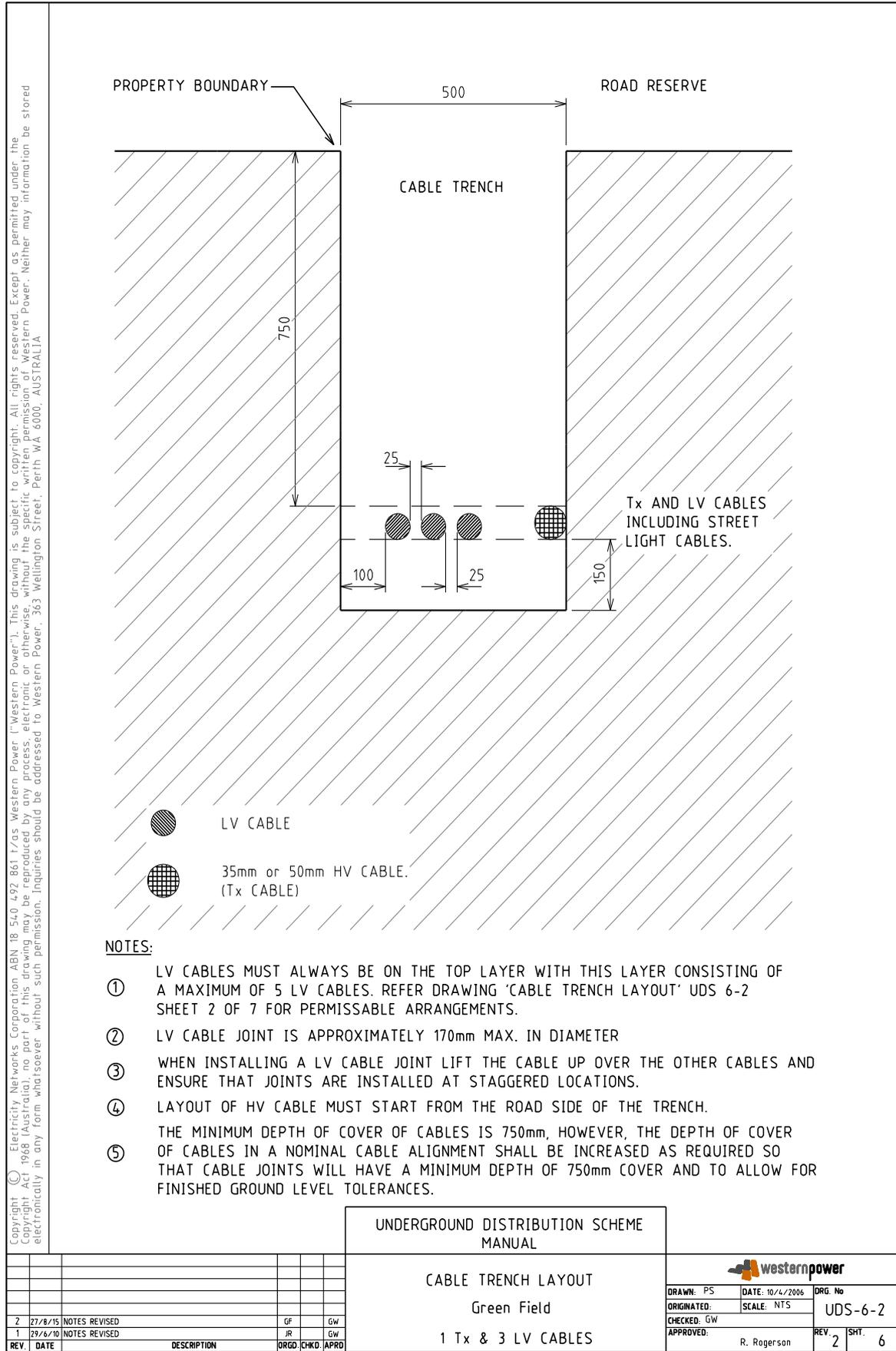


Figure 19: Cable trench layout (sheet 6 of 7)

8.7.13 Cable trench layout (sheet 7 of 7)

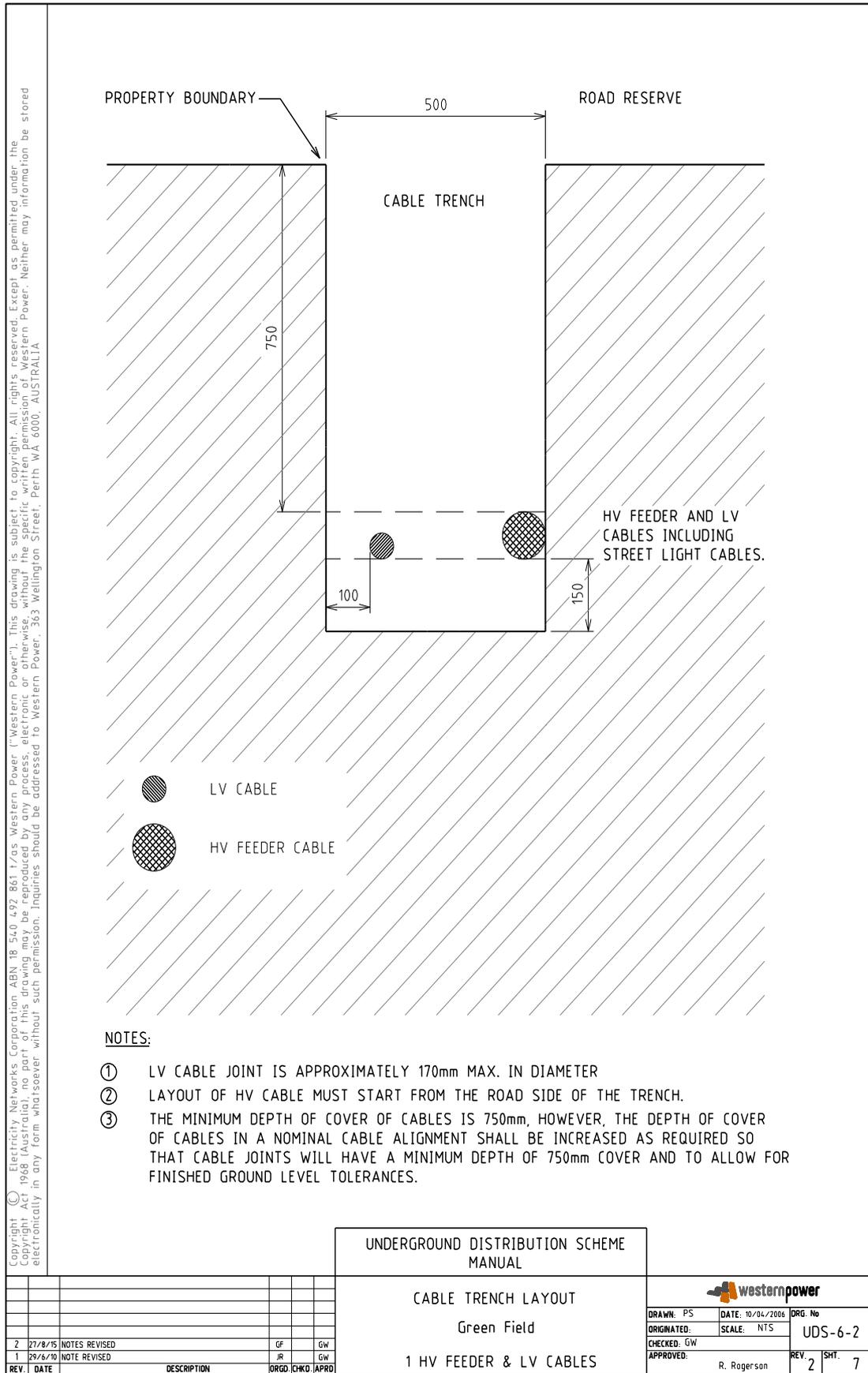


Figure 20: Cable trench layout (sheet 7 of 7)

8.7.14 Cable and duct placements on truncations

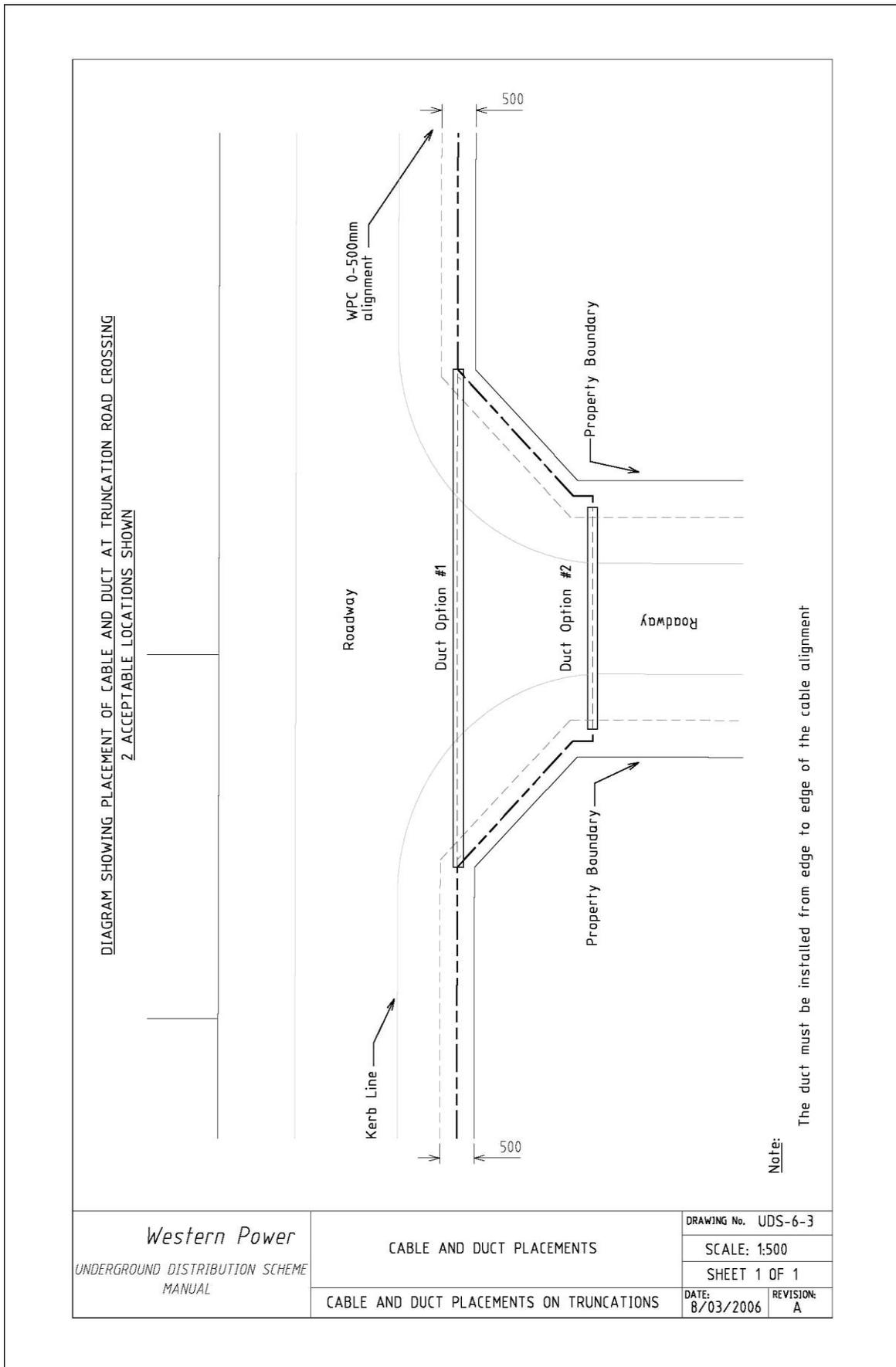


Figure 21: Example drawing of cable and duct placement on truncations

8.7.15 Placement of duct where cable crosses water course or open drain

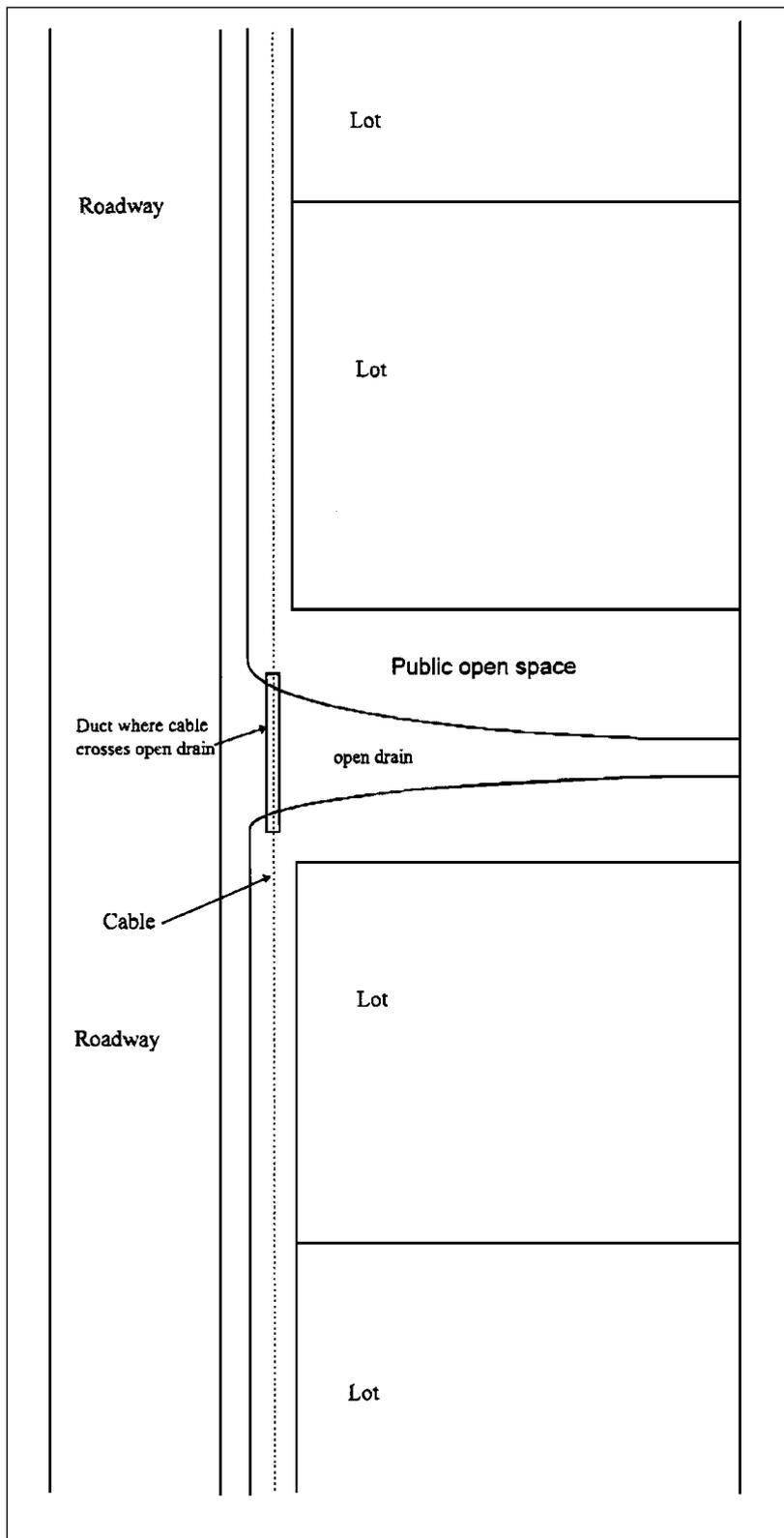
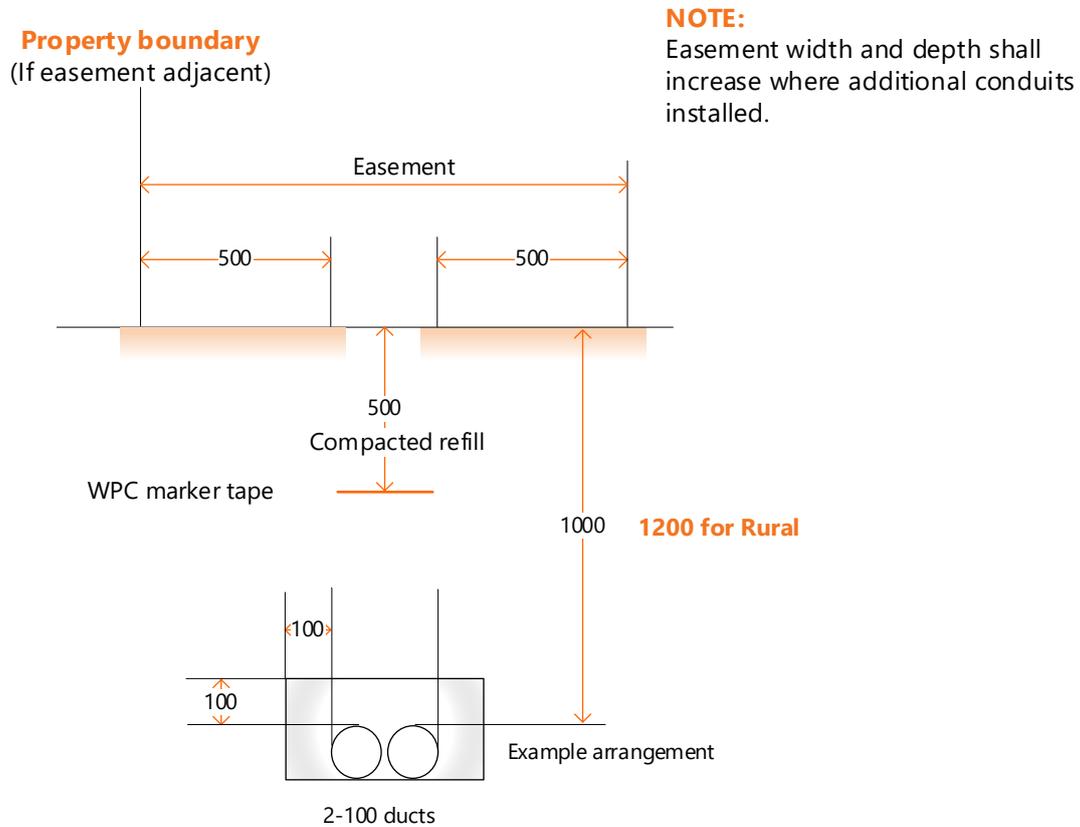


Figure 22: Placement of duct where cable crosses water course or open drain

Note: Unless specified otherwise by Western Power, ducts *shall* have a minimum cover of 750mm below the bottom of the water course or open drain.

8.7.16 Cross section details of cable encasement



NOTE:

- If heavy duty conduit is used then concrete encasement is not required.
- Concrete encasement is required where light duty conduit was previously used.

Figure 23: Cross section details of cable encasement

8.7.17 Shared driveway service pillar access

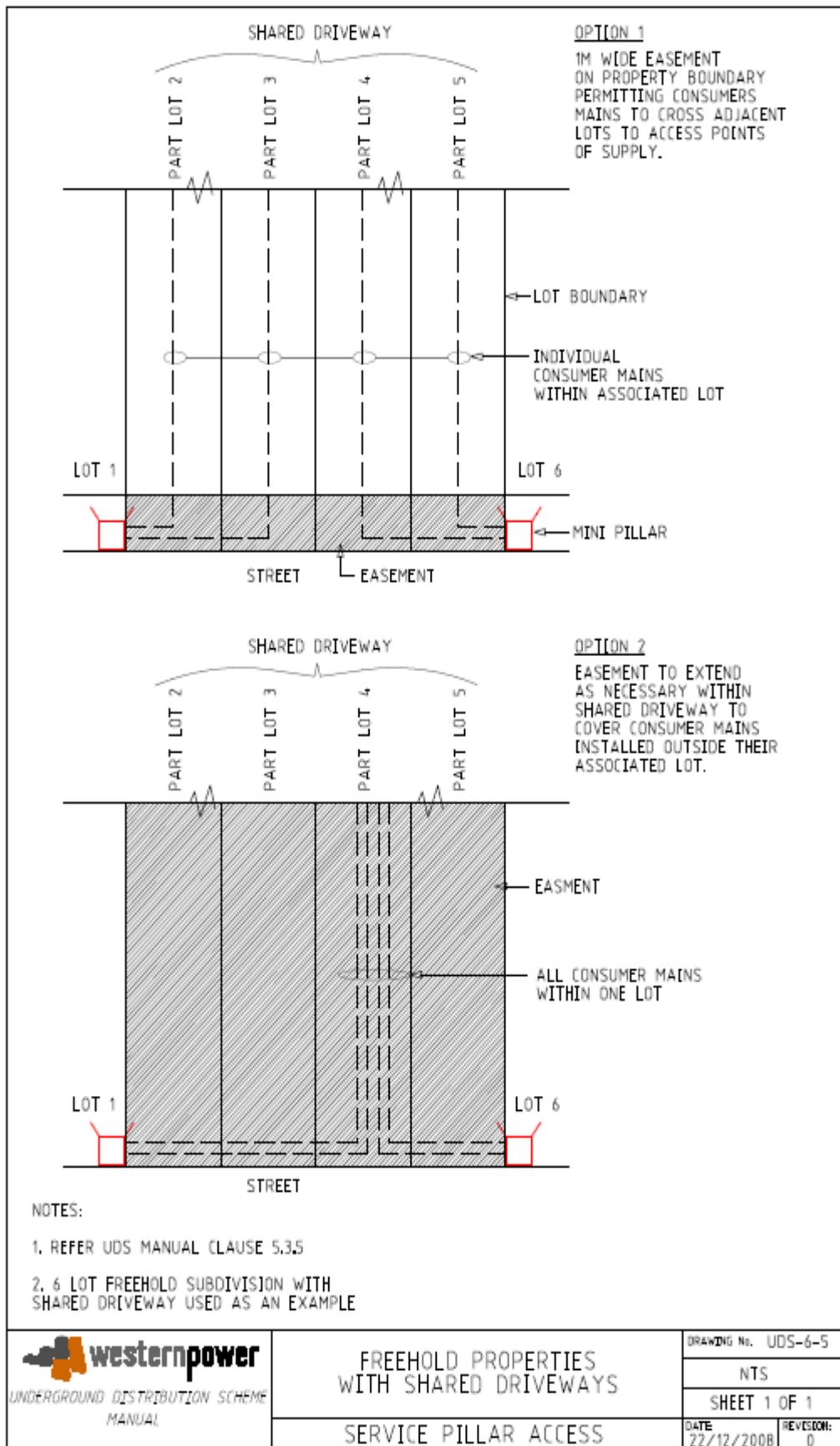


Figure 24: Shared driveway service pillar access

8.7.18 Service pillar location and installation requirements

Service-mini pillars and pits shall be installed in accordance with these UDS requirements inclusive of but not limited to [clauses 5.3.5, 6.2.8.19](#) and [WASIR](#) clause 12.5

The drawings below indicate retaining wall, service connection locations and conduit provisions for lots with retaining walls for Western Power cable access.

Note: location of pillars behind retaining walls is subject to an FSA assessment.

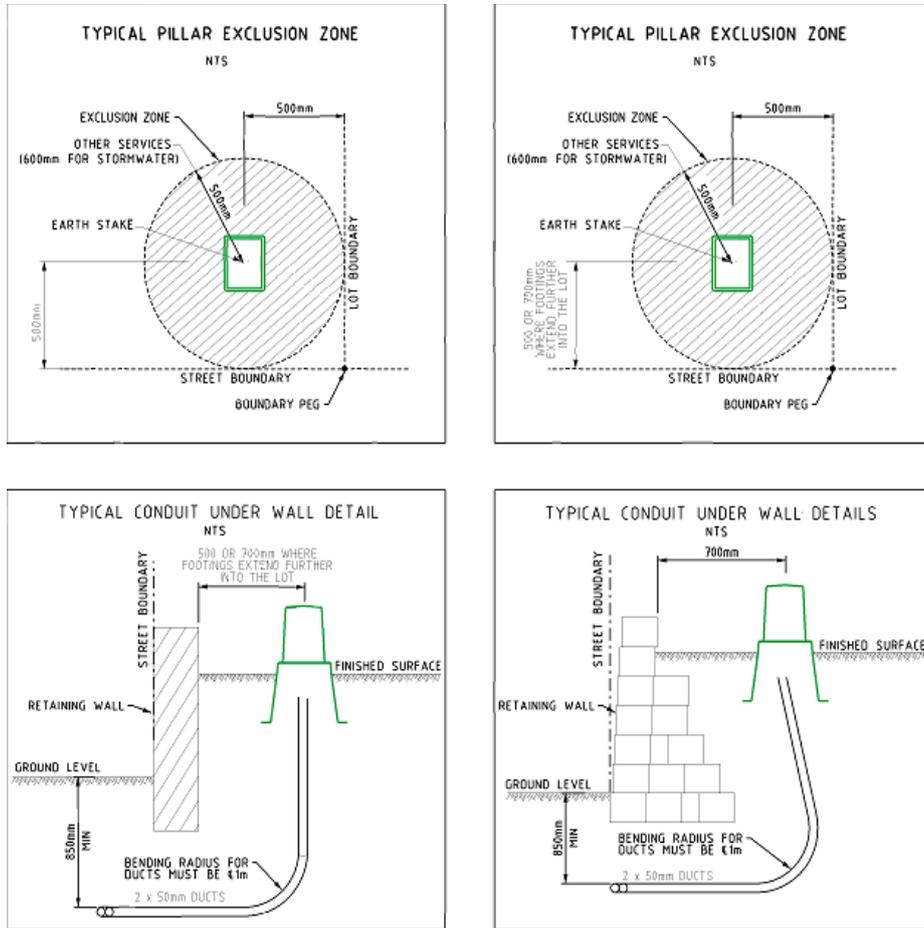


Figure 25: Service pillar location and installation requirements

8.7.19 Extended substation site

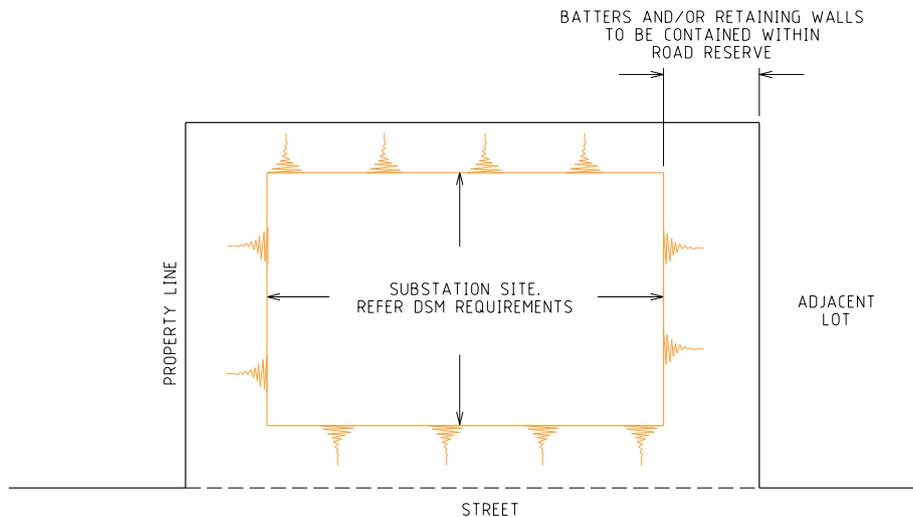


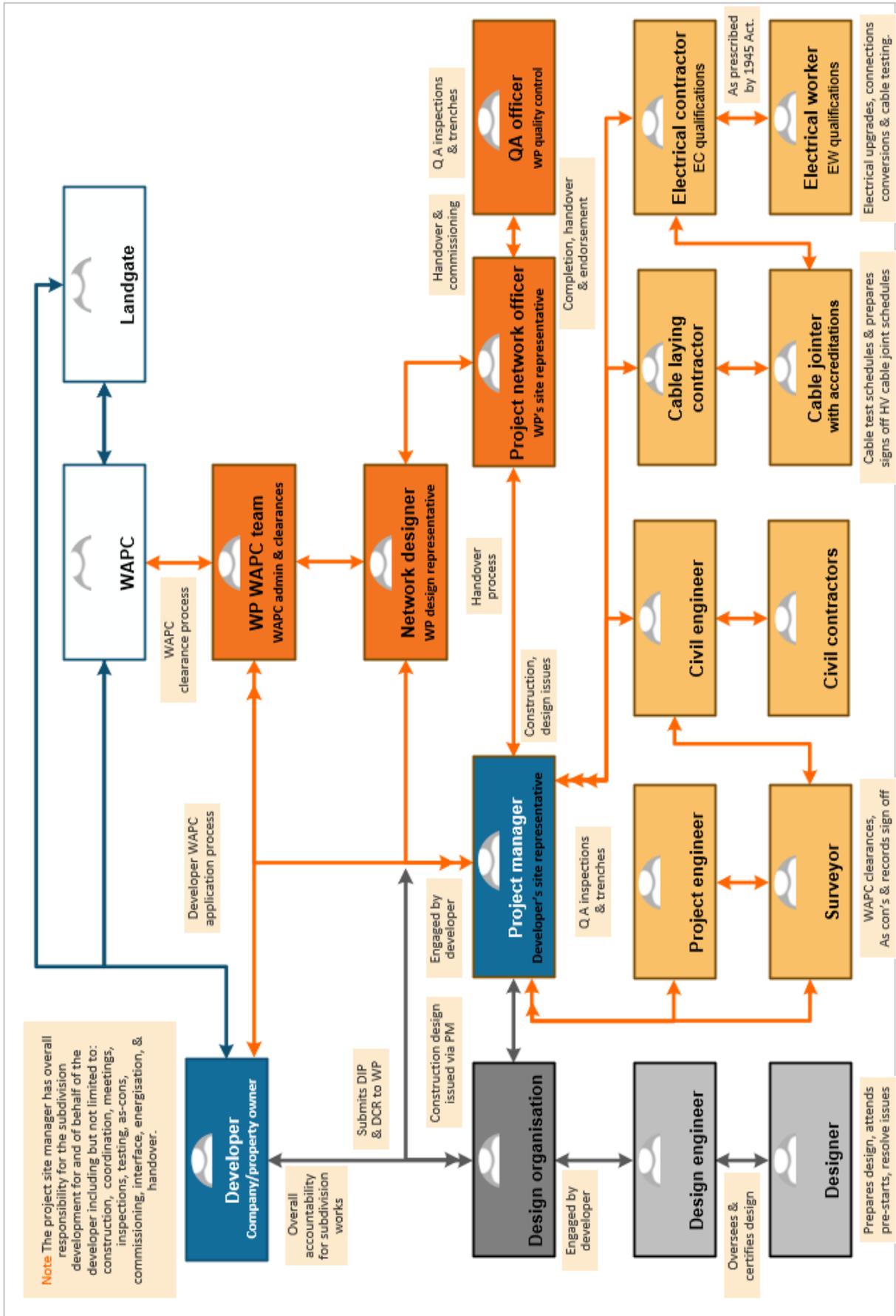
Figure 26: Extended substation site

Appendix 1: Map of the South West interconnected system



Figure 27: Map of the South West interconnected system

Appendix 2: UDS structure



Appendix 3: UDS manual amendments register

Initial Publication			
Date of Publication:		November 1995	
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Page	Clause	Reference	Amendment
All	All	All	New edition published

Document end