CURTIN BENTLEY CAMPUS

DEVELOPER TECHNICAL REQUIREMENTS (DTR)

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Details of revisions

Level	***Details***	***Date***	***Initial***
	Review	May 2023	LS
	Review	July 2024	LS

DEFINITIONS AND ABBREVIATIONS

Abbreviation	Description
Campus	Curtin's Bentley Campus
CMD	Contract Maximum Demand
CNC	Curtin Nominated Contact
CUIM	Curtin Infrastructure Manager
Curtin	Curtin University
CWS	Central Water Service
DBYD	Dial Before You Dig
Developer	Includes the Developer and their employees or agents including builders, consultants, sub/contractors, designers, and any other specialists or parties engaged or contracted by the Developer
DFES	Department of Fire and Emergency Services
DN	'Diameter Nominal'
DWS	Drain, Waste and Vent
EWIS/OWIS	Emergency Warning and Intercommunication System
ERAWA	Economic Regulation Authority Western Australia
Services	Electrical, Mechanical, Hydraulic, Communications, Security, Landscape and Open Space
FOBOT	Fibre-optic Break-out Terminal/tray
Greenstar	GBCA Greenstar Communities Rating
HV	High Voltage
LV	Low Voltage
LWMS	Local Water Management Strategy
NCC	National Construction Code of Australia
NER	National Engineering Register
SCADA	Supervisory control and data acquisition
UWMP	Urban Water Management Plan
VC	Vitrified Clay
WADCM	Western Australian Distribution Connections Manuals
WAER	Western Australian Electrical Requirements

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1. PURPOSE OF THE DOCUMENT

To remain globally relevant for students, industry and the community, Curtin established a transformational vision that is the Greater Curtin Masterplan. The physical development of the campus is an integral part of the future success of Curtin, and private sector development and partnerships are an important part of this.

The purpose of this guideline is to Curtin's requirements for connection to Curtin's service networks, systems and infrastructure. Developers prepare and submit forms, drawings, calculations and other required documentation to comply with

1.1. CONTEXT

1.1.1. THE LOCATION

Located 6 km south-west of the Perth CBD, Curtin's Bentley Campus comprises over 114 ha of education, research, commercial, retail, student accommodation and sporting facilities. The Campus is within the Town of Victoria Park Local Government Area.

1.1.2. COMPLIANCE WITH CURTIN'S PLANNING AND PROJECT DOCUMENTS

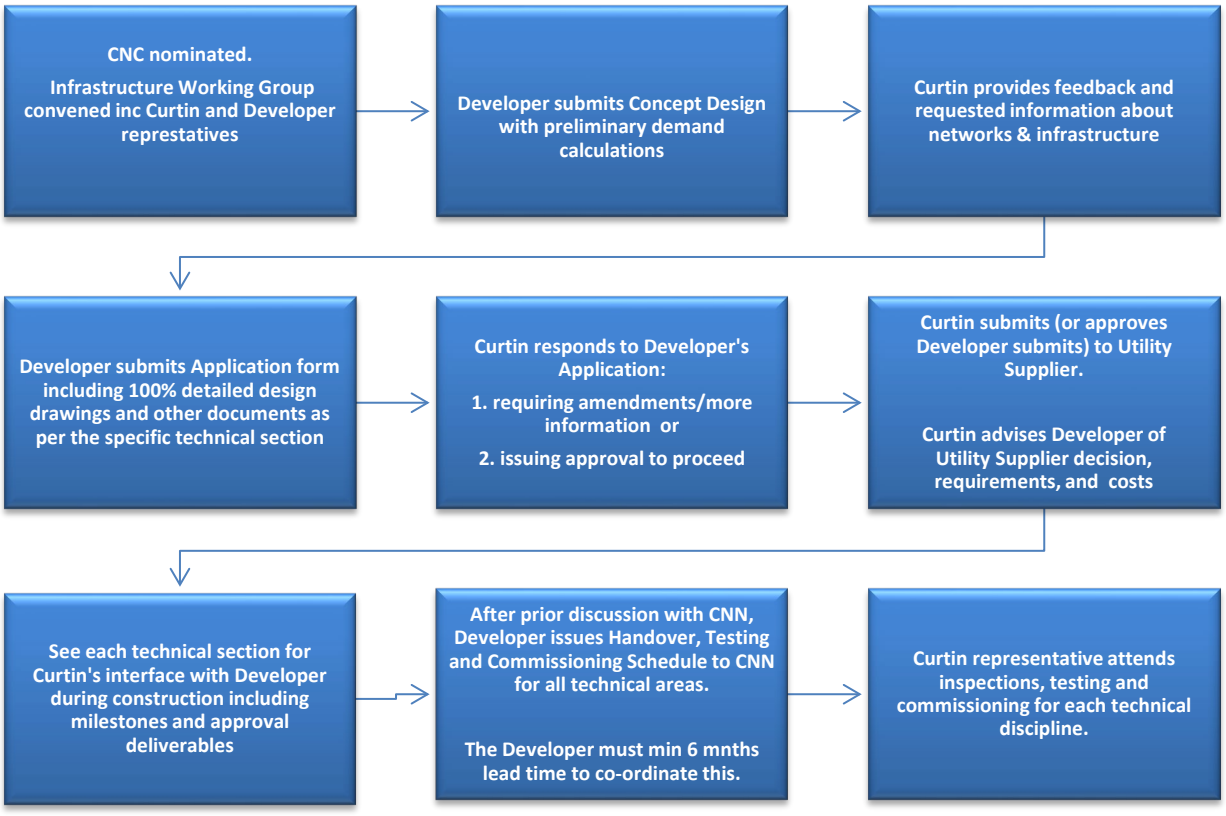
Developers must comply with the requirements of Planning and Project documents as per Appendix A.

It is the responsibility of the Developer to clarify any discrepancies or contradictions to confirm which document/obligation has precedence.

1.1.3. PROCESS, TIMING AND APPROVAL

The following steps outline the submission and approval process required. The application process is available within the relevant technical section.

Figure 1 –Application Process Overview



2. REQUIREMENTS FOR WORKING AT CURTIN

Specific requirements that relate to working at Campus are identified below and must be resolved during the project planning and programming and complied with and during the Developer's Works.

2.1. CURTIN CONTACT

The Developer will be assigned a principal contact, referred to as the 'Curtin Nominated Contact' (CNC) who may nominate their delegated representative/s for all technical matters to ensure compliance with the requirements in the DTR.

2.2. AVAILABLE INFORMATION

Documents, drawings, forms and processes referenced in the Development Technical Requirements are available using the link below.

https://properties.curtin.edu.au/working-with-us/

This link also contains planning and project documents used by Curtin to deliver their own developments. These are available for reference noting the Development Technical Requirements have primacy unless the CNC confirms a departure in writing.

2.3. WORKING HOURS

The working hours at Curtin are between 6.30am and 5.00pm, Monday to Friday.

The Developer's programme and works must mitigate impact and disruption to teaching and research during semesters and trimesters. In addition, the Developer's programme and works must mitigate impact and disruption to the residential accommodation, hotel and various tenants who trade on weekends and after normal business hours.

The Developer's programme must be reviewed and approved by the CNC at project inception to ensure this is accommodated, and the programme is subject to regular review for the same reason.

2.4. EXAMINATION PERIODS & SPECIAL EVENTS

The Developer is responsible for obtaining the necessary information and instructions regarding examination periods, special events and the like from the Curtin website or the CNC.

https://www.curtin.edu.au/students/essentials/academic-calendar/

For any development adjacent or close to the academic core, the Developer must incorporate a three-week period of 'no noise work' within their construction programme during Curtin's key examination periods and study periods typically held in June and November. Other exams are scheduled outside of key exam periods (for example trimester exams and supplementary exams) and the CNC will advise if special consideration is required for these dependent on the location of development activity.

Developers are to refer to Section 3.2 for details on noise and vibration.

The Developer must programme their works and do everything necessary to avoid noise and disruption (including impact to access pathways and major pedestrian disruptions) during special events that may arise from time to time but as a minimum will include Summer and Winter Graduations and Open Day.

Curtin may alter the dates for examination periods and special events at any time.

2.5. SITE AND SET OUT DETAILS

Curtin has established survey points ('Datum') on the Bentley Campus that are to be utilised by the Developer when setting out the site. Further detail on the Curtin Campus Survey Control Network is available by email request to drawingservices@curtin.edu.au

2.6. SITE CONDITIONS AND OTHER PROJECTS

The Developer must request the CNC provide them with any known prevailing conditions in and around the site prior to and during the works, noting that the Developer is responsible for completing their own due diligence.

The Developer must familiarise itself with these other works and consider all site conditions when developing its own construction methodology, access and management strategies.

2.7. COMPANY REGISTRATION AND INDUCTIONS

Only companies that have completed Curtin's contractor pre-qualification and induction process are permitted to work on Curtin's infrastructure assets.

The following entities must complete their company registration:

- The Developer
- The Developer's Head Contractor Project Director/Construction Manager, Project Manager, Site Engineer(s), Site Manager and Site Supervisors
- All contractors and sub-contractors who are approved to work on campus prior to the Developer being granted Site possession (e.g. geotechnical contractors)
- All contractors and sub-contractors working on behalf of the Developer who are approved to work on Curtin infrastructure e.g electrical contractors connecting to Curtin's HV network.
- All contractors and subcontractors working on behalf of the Developer who are conducting any work outside of the Site.

All personnel of the entities listed above must complete Curtin's induction before commencing work.

Company registration and induction application forms and information is available at https://properties.curtin.edu.au/working-with-us/registration-inductions/.

2.8. DEVELOPER'S SITE-SPECIFIC INDUCTION

The Developer is responsible for preparing their own site specific induction for all their personnel, including employees, consultants and sub/contractors.

This induction is required to address all Curtin related matters as detailed in the Curtin Online Induction (refer to Section 2.7) and as outlined in these DTR to the satisfaction of Curtin. The induction must include Curtin requirements when working at or outside the Developer's site boundary, and in particular must specify the Developer (and associated contractors/subcontractors) must comply with Curtin's permit process (refer

to Section 2.13.4**Error! Reference source not found.**).

In addition, the site-specific induction must ensure that all contractors are:

The Developer is solely responsible for controlling the Site, including ensuring that all persons entering onto its construction site complete the site-specific induction.

2.9. CONSTRUCTION MANAGEMENT

2.9.1. STATUTORY DOCUMENTS

The Developer must submit all documentation required by statutory or utility authorities to the CNC prior to any submission to the authorities. The complexity of the Developers Works will affect the lead times required by Curtin to review the documentation. The lead times will be agreed at the Infrastructure Working Group meeting but the Developer must assume a minimum 12-week period is required unless otherwise agreed.

2.9.2. DOCUMENTS

As a minimum and consistent with standard industry practice, the Developer must submit the following documents to the CNC prior to commencement of any works:

(a) Construction Management Plan incorporating:

i. Site Access Management Plan;

ii. Traffic Management Plan;

iii. Safety Management Plan;

iv. Environmental Management Plan;

v. Hoarding Plan;

vi. Dilapidation Survey;

(b) All other detailed submission documents.

The Developer bears all costs relating to the preparation and submission of these documents.

As well as detail pertaining to compliance with all Statutory requirements and applicable specifications, laws, regulations and standards, the following specific matters will need to be addressed in the site-specific Management Plans.

2.9.3. CONSTRUCTION MANAGEMENT PLAN

(a) A Construction Management Plan detailing how the Developer intends to manage the works;

(b) Construction Staging Plan, including details of site access, site facilities (office, amenities, ablutions, fuel storage, etc.), layover areas, truck wash down areas (if required), waste material storage, storage of materials and equipment,

parking arrangements for the contractor and subcontractors and site fencing plans;

(c) Risk Register;

(d) Traffic Management Plan(s), including vehicle, bicycle and pedestrian management;

(e) Quality Management Plan; and

(f) Communications Management Plan.

2.9.4. ENVIRONMENTAL MANAGEMENT PLAN

(a) Soil and Groundwater Management Plan;

(b) Acid Sulphate Soils Management Plan;

(c) Dewatering Management Plan;

(d) Dust Management Plan;

(e) Noise Management Plan;

(f) Vibration Management Plan;

(g) Drainage and Stormwater Management Plan.

(h) Waste Management and recycling; and

(i) Vegetation Protection

2.9.5. SAFETY MANAGEMENT PLAN

(a) Accident/incident reporting;

(b) Accident/incident investigation;

(c) Hazard identification, risk assessment and risk control including routine inspection processes;

(d) Plant/equipment register and maintenance processes;

(e) Emergency response and evacuation procedures;

(f) Hazardous substances exposure register and management;

(g) Roles and responsibilities – identification of individuals who has a specific WHS responsibility in relation to the site

(h) Training and Inductions

(i) Site Safety rules – describes the arrangements for ensuring all persons on or visiting Site are informed of the rules

(j) Application of 'Permits to Work' in accordance with Principal's requirements

2.10. MANAGEMENT OF WORKS

2.10.1. SITE MANAGEMENT

The Developer is responsible for administering, coordinating, supervising and generally attending upon the execution of all works. General attendance must include, but not be limited to providing all normal facilities for the proper, safe and effective performance of works within the site boundary and in accordance with the approved Management Plans and all Statutory Approvals.

In the event that the Developer intends to deviate from the approved Management Plans, the Developer shall seek prior written approval from the CNC.

The Developer must at all times comply with the regulations and restrictions imposed by Curtin relating to the storage of materials, the routing of construction traffic, the interruption of existing services and facilities and any other matters affecting the Campus or the Site.

The Developer must obtain written approval from the CNC for the formation of any temporary roads, the erection of temporary structures or any site clearing outside its designated site boundary.

The Developer must comply with the following:

(a) Do not remove or destroy any trees, shrubs or other vegetation without the written approval of the CNC.

(b) Store flammable or explosive products in accordance with the Law and as directed by Curtin.

(c) Ensure that all trucks, plant and equipment have all wheels and external surfaces properly washed down free of mud prior to leaving the site and that mud is not carried on to adjacent paved streets or other areas. Roads and pavements, if fouled by any spoil, concrete or other material, must be cleaned immediately after the fouling occurs, and deep wheel ruts and other holes must be filled and levelled as necessary to maintain the area in an even condition at all times. Any fines issued to Curtin as a result of the Developer's actions will be directed to the Developer for payment.

(d) Ensure moving vehicles transporting materials, rubbish, etc. to and from the Site are not loaded beyond their normal capacity and are properly fitted with tail-boards, suitable tarpaulins and restraint systems to eliminate the risk of materials, rubbish etc. dropping during transport.

(e) Take all reasonable precautions to:
- prevent the discharge of water, mud, dust, fumes, smoke, rubbish, etc. on to areas adjacent to the building site,
- to minimise noise, and
- avoid interruption of access to any other areas adjoining the site.

(f) Keep site secure from unauthorised access.

2.10.2. SITE FACILITIES

Developers must provide all Site facilities, including car parking, wholly within their Site boundary, constructed and maintained in accordance with all Statutory Approvals and relevant Laws and Regulations. The locating of site facilities outside of the site boundary is subject to prior approval from the CNC.

The Developer's Construction Management Plan must include procedures for the delivery, handling and storage of products recognised to be flammable, hazardous and easily damaged.

The Developer must comply with all Curtin requirements and the Land and Traffic By-Laws 2020 as directed by the CNC.

The Developer and their contractor must at no time access Curtin buildings and premises without prior written approval. All parking and storage must be maintained within the site unless otherwise agreed in writing.

2.10.3. DILAPIDATION SURVEY

Prior to commencing development activities on the Site, the Developer must carry out a comprehensive survey of the land and building conditions and features including vegetation, garden beds, structures, roads, access paths and footpaths, and exposed services to the extent reasonably required by Curtin.

The survey is to include a comprehensive photographic record of existing conditions prior to the contractor having access to the site.

The Developer must submit one electronic copy of the dilapidation survey report (including photographic record) endorsed by all relevant parties to the CNC no later than 7 Days after the Developer is granted access to the site and prior to commencement of any works.

2.10.4. PROTECTION OF PERSONS AND PROPERTY

The Developer must provide protection to persons and property throughout the duration of the works in accordance with all other Statutory Approvals.

The Developer must provide and maintain all barricades, guards, fencing, shoring, temporary roadways, footpaths, signs, lighting, watching and traffic flagging necessary for the protection of the works, other property and for the safety and convenience of the public and others

A detailed hoarding plan should be provided in the Construction Management Plan. All protection must be consistent with the recommendations in the Department of Commerce publication "Code of Practice – Construction Work". This publication is available from WorkSafe WA.

Each construction site shall as a minimum be secured with 1800mm high hoarding. In some case, there may be existing hoarding to the site which the Developer will be required to maintain so that the site is secure.

All hoardings must be of new material and finished with a Curtin approved image or graphic that markets the development outcome. Contractor signage or advertising must

be integrated with this. The hoarding concept and final design must be approved by the CNC.

Curtin reserves the right to use sections of the hoarding to display other promotional material relevant to the precinct's development.

The Developer must keep clean and refinish the hoarding if the finish deteriorates. Any damage to the hoarding must be rectified within 24 hours.

Fences must be of a high-quality standard and covered with an approved dust control fabric.

Hoardings and fences must not obstruct access, exit routes from any adjacent facility in case of an emergency evacuation, way-finding, CCTV cameras or any other Campus operations.

All hoarding, barricades, guards, fencing, shoring, temporary roadways, footpaths, signs, lighting, watching and traffic flagging shall be removed when no longer required.

The Developer must ensure all trucks, plant and equipment do not track excessive amounts of mud, slurry, sand or materials onto adjacent Pedestrian Pathways, Curtin University 'Shared Zones' or Roads. If spillage is reported or observed, it must be cleaned up as soon as reasonably practicable. Note that any fines issued to the Developer as a result of waste or spills by a Subcontractor, all relevant costs for remediation will be directed to the offending Subcontractor for renumeration.

2.10.5. MANAGEMENT OF ACTIVITIES OUTSIDE SITE BOUNDARY

The Developer must preserve all access and freedom of movement to areas in the vicinity of the Site, including but not limited to access for pedestrians, cyclists, public transport, vehicles and parking, disabled car bays, and drop off or delivery areas

If the Developer identifies any possible disruption or change to freedom of movement to areas in the vicinity of the Site, the Developer must request approval from the CNC no later than 10 Working Days prior to the disruption or change. This applies to both vehicle and pedestrian movement and will enable appropriate liaison and communication with the affected parties.

For the duration of the disruption or change, the Developer must erect and maintain appropriate signage in the affected area which:

(a) gives 10 working days' notice of the proposed disruption or change;

(b) notifies the purpose of the disruption of change, which may include details of the project and work being undertaken;

(c) shows the alternative routes available; and

(d) confirms the duration of the disruption or change.

2.11. COMMUNICATIONS

2.11.1. PROJECT CO-ORDINATION AND GOVERNANCE

Developers must regularly coordinate and communicate with the CNC which as a minimum includes establishing and attending:

(a) A Project Control Group (PCG) meeting, scheduled fortnightly for the duration of the project unless otherwise agreed with the CNC;

(b) Design meetings, frequency and milestones to be confirmed with the CNC, but as a minimum at:

- pre and at concept design;
- during Schematic Design and Design Development, noting this may be split into discipline specific sessions as agreed between the Developer and the CNC;

(c) Meetings with authorities as necessary (including services & council) including the CNC unless otherwise agreed by the CNC;

(d) Communications meeting

Other regular meetings may be required. A request for a meeting with the CNC and respective Curtin stakeholders must be submitted by the Developer at least 14 days prior to the proposed meeting date.

2.11.2. SITE SIGNAGE

a) The Developer must not erect or procure the erection of any signage for the site which has not been previously reviewed and approved by the CNC.

b) Curtin may from time to time direct the Developer to erect any signage which Curtin considers is necessary for the purposes of public communication.

c) Curtin may at any time direct that any signage be removed.

2.11.3. COMMUNICATIONS PLAN

The Developer shall submit a Communications Plan to the CNC for approval at the commencement of development. The Communications Plan must specify the protocols required for managing communications between the Developer and Curtin, as well as a framework for communicating with internal and external stakeholders, including the media.

The Communications Plan must include:

a) the Developer's purpose, methodology and resourcing for managing communications when dealing with affected stakeholders including but not limited to:

i. stakeholders directly impacted who are adjacent the development i.e. adjoining building occupants including staff, student, tenants, residents, and visitors;

ii. the larger campus community directly and indirectly impacted by works e.g. parking;

iii. the local community adjacent to Curtin;

iv. special interest and neighbourhood groups;

v. the media; and

vi. Curtin's Executive or Governance Committees.

b) protocols with Curtin in the event of accidents or emergencies within the site or externally to the site that affect the Project;

c) all Promotional and Public Relations strategies and programmes including potential award submissions, both during and post-construction;

d) defined roles and responsibilities for the Developer's Personnel involved in implementing the Communications Plan;

e) a statement of the Developer's communication objectives in relation to the Developer's activities and the works;

f) a communications program;

g) protocols, procedures and/or flow charts for:

i. the management of public enquiries and complaints, including response time and close-out targets on a priority basis;

ii. media liaison management;

iii. prior notification of construction activity impact;

iv. conducting site tours;

v. development and approval of all information and materials relating to Developer actions. The Developer is to make available to Curtin all information, material and images available including collateral such as fly-throughs and renders if produced.

h) any other relevant information that ensures the Developer and Curtin are aligned in communication of Project specific information.

Nothing in the Communications Plan must permit the Developer to directly communicate with any other member of the public or media, without the prior written approval of Curtin.

2.11.4. CURTIN'S CAMPUS IMPACTS GROUP

Curtin's Campus Impacts Group convenes weekly. Its purpose is to co-ordinate the multiple projects simultaneously occurring at the Campus. It consists of the following key representative areas:

(a) Health and Safety

(b) Maintenance

(c) Capital works projects and development

(d) Security

(e) Events and Exams

(f) Any other relevant matters that may affect campus life for all users.

The Developer will be required by the CNC to attend Campus Impact meetings, unless advised otherwise by the CNC. The Developer will also be required to complete the

Campus Impact notification proforma. Particular aspects of the Developer's management plans will from time to time, be tabled at the meeting and may require amendment by the Developer as reasonably required by the CNC.

2.12. ROADS AND TRAFFIC MANAGEMENT

Curtin roads and pathways are classified as privately owned and controlled. In addition, Curtin has a 'pedestrian first' approach which Developers must accommodate in their planning and documentation.

Curtin typically has lower speed limits than outside the campus. These are signposted and range between 10 – 30 kms/hr.

The timing of Deliveries must be defined and approved by the CNC in the Construction Management Plan.

Compliance with speed limits and all other traffic regulations on the Campus is required and infringements will be issued by Curtin for any non-compliance.

A **minimum 10 days' notice** is required for any known or planned disruption to Curtin's access and road network. All users must be considered when developing traffic management and communications plans, including people with disabilities, cyclists, buses, taxis, as well as pedestrians and all other vehicle types.

2.13. SITE SERVICES

2.13.1. USE OF EXISTING SERVICES

Curtin may approve the use of one or more of the Existing Services on a temporary basis, and subject to compliance with the relevant technical section. An application form for the connection and disconnection of each of these services must be submitted. The Developer must minimise the frequency and duration of interruptions to Existing Services. The Developer must notify Curtin in advance of connection, disconnection or interference with Existing Services, and obtain necessary Work Permits.

If the Existing Service is to be continued, the Developer must repair, divert or relocate as required. If such a service crosses the line of a required trench, or may lose support when the trench is excavated, the Developer must provide permanent support for the existing service.

The Developer must record the condition of Existing Services as soon as exposed, arrange for an inspection by the CNC and comply with any subsequent requests or instructions.

2.13.2. PROTECTION OF SERVICES

At the point a construction road, or construction traffic may affect existing underground service (of any type), the Developer must provide adequate and ongoing protection to prevent damage to the service. The protection must be designed to include the following requirements as a minimum:

(a) Construction loads;

(b) Duration of construction traffic;

(c) Location and type of existing service;

(d) Existing ground conditions; and

(e) Vibration.

The Developer must remove all temporary protection works at the completion of the Works and restore the area to its original condition.

2.13.3. VERIFICATION OF EXISTING SERVICES

Prior to commencing any works, the Developer is to take a verification survey to confirm the location of any existing services within the site boundary. When existing services are identified, the Developer must record the condition of Existing Services and arrange for an inspection by the CNC and comply with any subsequent requests or instructions.

The Developer is liable for any losses or costs arising out of, or as a consequence of, disruption caused by damage and unplanned interruption to Existing Services.

The Developer must repair any damage to the Existing Services to the satisfaction of Curtin. Where the damage arose due to failure to take all reasonable steps to identify and isolate existing services, then the Developer must rectify the damage and provide temporary services at no cost to Curtin.

2.13.4. WORKS REQUIRING PERMITS, APPROVALS AND LICENCES

The Developer will be required to apply for Curtin's 'Permits to Work' to demonstrate appropriate due diligence as per the following or as directed by the CNC:

- when the Developer is working on Curtin infrastructure or assets
- when the Developer's works has the potential to impact on Curtin's campus, including infrastructure and assets, outside the site boundary (e.g crane sweep paths, hot works)
- when the Developer will impact on Campus operations (e.g. access for deliveries)

The Developer must apply for Work Permits from Curtin for activities identified at https://properties.curtin.edu.au/working-with-us/permits/

The Developer must engage with potentially impacted stakeholders when planning works under the permit to obtain further information to inform work methodology to best address the risks of the works and impact mitigation.

The Developer must ensure works are done in accordance with the submitted permit documents and the conditions listed in the issued Permit to Work. Should there be changes to the risk profile or change required to the work methodology, the Developer is to cease works, notify the Permit Manager and seek direction.

The Developer is to notify the Permit Manager following the completion of works pertaining to the Permit.

Where applicable, the Contractor is to submit all relevant documentation to the Permit Manager to close the Permit to Work.

All permits are to be submitted online with the CNC nominated as 'Permit Manager'.

2.14. CURTIN DRAWING SERVICES AND DOCUMENTATION

Requests for access to Curtin's drawing and document database can be made via email to DrawingServices@curtin.edu.au.

No access to Curtin's drawing and document database will be granted without the approval of the CNC.

Detailed documentation of all new development on Campus must be issued to Drawing Services.

Requirements for documentation standards and conventions are specified in Curtin's *Documentation Deliverables Guidelines (DDG)* which can be obtained from https://properties.curtin.edu.au/working-with-us/guidelines/. If there is an omission in the guideline, consult with the CNC, noting it is likely that relevant Australian design and construction standards will be recommended in this circumstance.

As a summary of the DDG, the following documentation requirements apply:

(a) Developers must complete all drawings in accordance with Australian Standards AS 1100.

(b) Developers must provide documentation in relation to in-ground services surveyed in accordance with AS.5488 and the processes and requirements set forth in the DDG.

(c) Developers must comply with Curtin's building, numbering and 'street address' requirements. Curtin requires Developers use the floor numbering convention 1, 2, 3, 4 rather than starting at ground floor.

(d) Developers shall transmit electronic copies of all Evacuation Diagrams. Evacuation Diagrams for all developments shall be produced in accordance with processes and requirements set forth in the DDG.

(e) Developers shall transmit electronic copies of all "Issued for Construction" design documents, including drawings and specifications to *DrawingServices@curtin.edu.au*.

(f) Prior to occupancy, Developers shall transmit electronic copies of all "As Constructed" documentation to DrawingServices@curtin.edu.au.

(g) As part of the 'As Constructed' documentation, the Developer must submit Warranties, Certificates, Approvals, and Operation and Maintenance Manuals.

Contact Drawing Services via email at DrawingServices@curtin.edu.au for all queries or to request additional information regarding Curtin's documentation requirements.

3. ENVIRONMENTAL REQUIREMENTS

There are specific requirements in relation to environmental matters when working at Curtin.

Developers must submit a copy of their Environmental Management Plan (EMP) prior to commencing Works and prior to any submission to a Statutory Authority.

3.1. ASBESTOS

Curtin has a complete register of the locations of products known to contain asbestos.

If a Developer suspects that an asbestos containing material (ACM) has been disturbed, then the following steps are to be taken:

(a) Immediately liaise with the CNC in relation to the find; and

(b) Treat the ACM in accordance with the relevant Statutory Requirements.

Asbestos products or asbestos based materials must not be used and the Developer must ensure that contractors, sub-contractors, suppliers and others comply with this restriction.

Curtin will not be liable for any losses related to asbestos being brought on to the Site. Costs of removal of any such asbestos or consequential damages will be the sole responsibility of the Developer.

3.2. NOISE AND VIBRATION –

The Developer must at all times take adequate measures to minimise noise resulting from works under construction and to comply with guidelines as set out in Australian Standard AS2436 – 'Guide to noise and vibration on construction, demolition and maintenance sites'; and the Environmental Protection (Noise) Regulations 1997 (WA).

For the purposes of noise management, the constraints within Table 1 below apply.

Table 1 - Noise Limits Table

Time of Day	**Noise Level Limit $L_{Aeq,15min}$ (dB)**
Monday to Friday 7.00am to 7.00pm	70
Saturday 7.00am to 7.00pm	70
Evening 7.00pm to 10.00pm	Per legislative requirement or by order of an authority
Night 10.00pm to 7.00am	Per legislative requirement or by order of an authority

On occasions for emergency reasons, Curtin may direct that all noise on the site ceases or be reduced. The Developer must direct all its contractors on site to meet the requirements.

Curtin requires that heavy construction work including demolition, excavation, explosive fixings, continuous mechanical hammering or excessively noisy deliveries and the like be scheduled outside of normal working hours whilst also considering if the quiet enjoyment of other residential or other tenants will be unacceptably impacted.

No heavy construction work (including demolition, excavation, explosive fixings, continuous mechanical hammering), noisy deliveries, access pathway disruptions or major pedestrian diversions to examination venues during study weeks and examination periods are permitted.

The Developer is required to communicate with affected stakeholders, neighbours and residents before and during the construction period to keep them informed of and for the type, duration and location of the works, the potential impact of noise emissions and vibrations related to the works. A list of persons consulted and the steps taken must be documented and provided, as requested, to the CNC.

4. SAFETY AND HEALTH REQUIREMENTS

There are specific requirements in relation to safety and health matters when working at Curtin. The Developer shall prepare a detailed Health and Safety Management Plan to Worksafe Standards that highlights the need to maintain a safe operating environment for Curtin Staff, Students and the Public at all times.

4.1. SAFETY IN DESIGN

The requirement to identify and manage risks is a legal obligation under HSE legislation. Developers shall have an appropriate Safety In Design (SID) process in place. The Developer must ensure that all works are undertaken in accordance with the Code of Practice, Safe Design of Structures issued by the Department of Energy, Mines, Industry Regulation and Safety.

4.2. THIRD PARTY SAFETY AUDITS

Before commencement of work on site, the Developer is to arrange for the Developer's Safety Management Plan to be audited and certified by a third-party auditor who is qualified, reputable, and is able to demonstrate their experience with projects of similar scale and complexity. The Developer will arrange for monthly site inspections/audits by the qualified third party auditor. It will immediately undertake all actions required to maintain the safety of the site as advised by the auditor.

The Developer's responsibility, and that of the auditor, extends beyond the site boundary and must include public safety including day to day issues such as access past the site.

The third-party auditor's monthly audit report will be an agenda item at Project Control Group meetings and must be sent to the CNC on a monthly basis.

4.3. NEAR MISS /HAZARD / INCIDENT / INJURY REPORTING

Developers are responsible for reporting and recording hazards, near-misses, incidents and injuries that occur on the worksite in accordance with statutory provisions.

A notifiable incident is defined as a near miss or incident, within or outside the Site. A notifiable incident may relate to any person – whether an employee, contractor or member of the public. Statutory definitions can be found at Incident notification - guide (www.wa.gov.au) & What is a dangerous incident? | Department of Energy, Mines, Industry Regulation and Safety (commerce.wa.gov.au).

All near misses and incidents shall be reported to the CNC by phone as soon as practical.

The Developer may be contacted by the HSEM Advisor, the CNC or a Curtin Safety and Health Representative to assist in the reporting of a notifiable incident. As stipulated in the Work Health and Safety Act WA 2020, Curtin and the contractor shall report certain injuries to Work Safe WA.

The third-party auditor's monthly audit report will be an agenda item at Project Control Group meetings and will be available to Curtin on request

4.4. EMERGENCY MANAGEMENT

In the event of an emergency (ambulance, police or fire service requirement), dial 000 from a mobile or 0 000 from a Curtin landline and contact Curtin Safer Community on 9266 4444.

This is essential as the Curtin's Safer Community team has protocols in place with all emergency services to escort them to locations with the campus on arrival.

5. INFRASTRUCTURE SERVICES

5.1. GENERAL

Curtin owns and operates all infrastructure services on the Campus with [exceptions] noted below. Services include:

- Electricity (HV with SCADA and LV)
- Potable water
- Natural Gas [ATCO owned assets are limited. Discuss with CNC.]
- Fire water
- Stormwater
- Sewer/Wastewater mains [Curtin's infrastructure connects to Water Corporation sewers traversing the site.]
- Recycled Water
- Communications infrastructure
- IT networks [ISP services use internet assets owned by various 3rd parties e.g NBN, Telstra]
- Mechanical services (HVAC)
- Security infrastructure
- Irrigation water

The charges for the services are based on metered consumption and are charged at gazetted retail tariffs.

5.2. OBTAINING APPROVAL FROM 3RD PARTY UTLITY SUPPLIERS ('3rd Party's')

When a Developer must connect directly to a 3rd Party's asset and require the 3rd Party's approval to do so, the Developer must liaise with Curtin to obtain all necessary permits and approvals. The exception to this is with internet asset providers and ISP service providers as outlined in Section 8.

The process for this is outlined below and any departure from these requirements must be approved by the CNC in writing:

- Curtin must be the first point of contact prior to the Developer engaging with any 3rd Party.
- Curtin will review all correspondence to be issued to 3rd Party prior submitting this to the third party.
- On behalf of the Developer, Curtin must submit the documentation for approvals and permits to connect to 3rd Party assets. Developers are responsible for providing all information in the required format and detail.
- All meetings organised between the Developer and a 3rd Party must include a Curtin representative.

5.3. DESIGN REQUIREMENTS

The Developer must comply with the latest relevant Australian Standards,

industry/utility standards and guidelines, and Curtin's Guidelines. In particular, the Utility Providers Code of Practice for Western Australia form the basis of design for services installed external to the development/lot boundary, in the road reserve or across roads.

The Developer shall seek approval for design parameters from Curtin at project inception.

Notwithstanding specific requirements outlined in the subsequent sections, it is a universal requirement that all designs must be accompanied by calculations that clearly determine the demands of each development/lot for each service, including but not limited to:

i. maximum electrical power demand (conventional and renewable) and projected load profiles

ii. peak and average potable or non-potable demand and profile as requested

iii. peak and average sewer/wastewater discharge

iv. total annual potable and non-potable water consumption

v. total annual sewage/wastewater discharge

vi. stormwater balance including stormwater discharge rates

vii. wet fire demand

viii. special communications demands.

With respect to adequacy and approval of design proposals, the acceptance and decision of Curtin is final and binding.

5.4. UTILITY METERS

The Developer shall install a meter to record consumption at any connection to electricity, natural gas, potable water and fire water services. Once installed, programmed, validated and handed over, all utility meters shall become the property of Curtin.

All utility meters shall have a minimum three (3) year guarantee and shall meet the following minimum criteria:

- be National Measurement Institute "Pattern Approved" and/or "Type Tested". This means their metrology accuracy and method of construction has been proven by the National Measurements laboratory for Australian Conditions (www.measurement.gov.au). Copies of certification documents shall be provided at handover to Curtin.
- as required for invoicing standards, be NATA calibrated and come with NATA endorsed test certificates. This means that the meter nominated in the calibration report must be calibrated to traceable Australian and International Standards. Copies of calibration documents shall be provided at handover to Curtin.
- Meters must hold at least 400 days of data in the meter.
- have digital networking and communications capability and the Developer must pay for costs to integrate it with the Curtin / IBMS system.

Developers are to refer to the Curtin Services Metering Guidelines, located within the

Working With Us webpage (link below), for information on specific metering requirements, prequalified suppliers and products and other relevant technical information.

https://properties.curtin.edu.au/working-with-us/guidelines/

Developers are to ensure that the location of physical meters are to be accessible by Curtin at ground level (i.e. not at height)

5.5. SERVICE PIT LIDS

Pit lids require a higher rating classification than may be typical in other location as they need to be trafficable given the permeability of the campus.

As a minimum, all pit lids must be:

- Class D load rated as per Australian Standards, with a higher rating if required by the Developers operations or the Department of Fire and Emergency Services.
- flush with the level of the surrounding area
- heel and trip safe
- slip resistant, with the classification as per Australian Standards
- designed and installed to aesthetically integrate with the specific location surrounds which includes continuation of surface type and pattern unless otherwise approved. Reference *External Pit Lid Guidelines,* located within Curtin's project delivery guidelines https://properties.curtin.edu.au/working-with-us/guidelines/ for examples.
- Located in discreet locations and in trafficable areas i.e not in gardens.
- approved by Curtin for maintainability and access (including the ability to easily lift the lids post installation.)

5.6. CURTIN PREQUALIFIED CONSULTANTS AND LICENSED CONTRACTORS

All works to be completed outside of the development lot boundary for connection to Curtin's infrastructure must be carried out by a contractor from Curtin's prequalified contractors list or must be submitted the CNC for Curtin's approval at their discretion. This applies to all work including installation, modification, maintenance and operation works. Developers must contact the CNC for a current list of prequalified contractors.

5.7. CURTIN COMMISSIONING, HANDOVER AND TRAINING

Prior to obtaining Practical Completion with their builder, or agreed stage handover as agreed with the CNC, the Developer must submit a completed Handover Certificate, consistent with the format provided in Appendix E and provide appropriate technical personnel to instruct Curtin on the correct operation and maintenance of systems, networks, or assets that interface with or will be handed over to Curtin. Curtin will not grant Project Completion (or whatever the contractual equivalent is as specified in the Development Deed or Agreement) until all relevant documentation is received from the Developer.

The Developer must liaise with the CNC a minimum of 6 months in advance of the forecast Practical Completion date to schedule this training with Curtin technical personnel.

6. ELECTRICAL

6.1. SYSTEM OVERVIEW

Curtin owns, operates and maintains a private high voltage (HV) network on the Bentley Campus. The High Voltage Distribution network drawing is available on request from drawingservices@curtin.edu.au

The connection point for the Campus is supplied at 22,000 V (22 kV) via four dedicated feeder cables from Western Power's Bentley Zone Substation. Each feeder cable is rated to a maximum of 15 MVA. Four fire-segregated HV switch rooms each house a Western Power intake switchboard, Curtin HV switchboard and associated ancillary equipment. The four HV switch rooms are referred to as Zones 1, 2, 3 and 4.

Curtin is metered at HV (22 kV) by its retailer under a contract maximum demand (CMD) arrangement. The meter is located in each of the respective Western Power HV switchboards.

Curtin distributes both 22 kV and 11 kV around the Bentley Campus. The 22 kV network is supplied from the HV switchboards at the terminal substation. The 11 kV network is supplied from the same connection point but the voltage is stepped down via four 22/11 kV 5/6.5 MVA (oil natural/air forced) power transformers, which are also located at the terminal substation.

The 22 kV network is configured as two HV network rings, which extend to the northern and southern sections of the Campus. They are referred to as the Northern and Southern HV Rings.

The Academic 11 kV network is distributed via three HV network rings, which are reticulated through the core of the Campus. There are numerous distribution substations located on the 22 kV and 11 kV rings. The purpose of the distribution substations is to provide a low voltage (LV) supply to local or remote buildings and to other small electrical loads. The supply at each of the distribution substations is stepped down by transformers from either 22 kV or 11 kV to 230/400 V AC (50 Hz).

6.2. POWER SUPPLY

While the network is designed to be resilient, Curtin cannot guarantee continuity of supply, since the supply is subject to both planned and unplanned outages. This applies to the provision of temporary power supplies during construction and any permanent power supplies.

Every effort will be made to minimise such outages. For planned outages, a notice period of seven days will be provided, though for all unplanned outages or emergencies Curtin is unable to guarantee any notice. Developers are also required to provide a 7-day period of notice should they require a network outage to facilitate works.

If there is a high reliance on continuous supply of electricity to run critical equipment, it is important that the Developer considers integration of permanent standby generators or deployment of temporary generators to minimise business risk.

6.3. ROLES AND RESPONSIBILITIES

Table 2 - Electrical Roles and Responsibilities

Role	Curtin Responsibility	Developer Responsibility
Determine load requirement and load forecast		X
Design internal lot Infrastructure and connections to Curtin network		X
Assess Design and load forecast for connection	X	
Select preferred contractor		X
Pre-approval of cut in works	X	
Grant Access and Permits	X	
Cut into existing Curtin Infrastructure		X
Costs for connection to network		X
Installation and connection of metres to Curtin's digital metering system	X	
Maintenance of Curtin owned network	X	
Meter reading	X	
Attends commissioning and energisation	X[1]	X
Notify of outages for planned works	X	X

1. Witness commissioning works

6.4. POWER SUPPLY ARRANGEMENT

The typical power supply arrangements are as follows:

LV Metered

- Type 1 – LV metered power supply from existing distribution substation
- Type 2 – LV metered power supply (multiple transformer) shared connection within building.

Power Supply Arrangement diagrams are included at **Appendix B**.

The Developer may propose an alternative power supply arrangement for consideration by Curtin. This must be communicated to Curtin as part of the power supply application process.

HV Metered

- Type 3 – HV metered power supply sole use connection within building.

Refer to **Appendix B** for the Power Supply Arrangement diagrams.

The Developer may propose an alternative power supply arrangement for consideration by Curtin. This must be communicated to Curtin as part of the power supply application process.

6.5. COMMON SERVICES AND PUBLIC REALM

Servicing of Common areas within the development lot shall be the responsibility of the Developer. Public Realm shall be the responsibility of Curtin. The Developer is responsible for providing the public realm switchboard as part of the development. The preferred location for the switchboard is external to the building, unless it is required internal to the building for other reasons relating to the design.

Curtin will own, operate and maintain the public realm switchboard following handover from the Developer. All energy charges associated with the public realm areas will be the responsibility of Curtin unless otherwise advised by Curtin.

6.6. RESERVING AND RELINQUISHING CAPACITY

Curtin will not allow capacity to be reserved by the Developer. Curtin reserves the right to allow exceptions to capacity reservation only on the basis of extraordinary circumstances and only with prior written approval of Curtin. The Developer must fully utilise the power supply capacity that has been requested as part of the power supply application process within a period of two years otherwise the unused portion will be relinquished, at Curtin's sole discretion. All requests and approvals for additional capacity shall be wholly at the Developer's cost.

Curtin may elect to carry out a load survey at its cost on an annual basis to determine if the load is in line with the requested capacity.

Where there is a difference between the recorded load and the capacity, Curtin will notify the end user of their revised capacity.

6.7. POWER SUPPLY APPLICATION

It is important that early advice and sufficient time be allowed by the Developer to consult with and conclude negotiations on the conditions of supply with Curtin and to plan and implement the necessary actions to facilitate the connection.

Conditions of supply can vary substantially, dependent on whether it is a new connection, an addition or alteration to an existing electrical installation or an additional load.

These conditions may affect the configuration or design of the connection, such as the determination of point(s) or type of supply; the position of metering or service equipment; the point of attachment of a service cable or point of entry of an underground cable; or the position of any transformer or substation on a property.

Prospective Developers should not automatically assume that a connection that satisfies their expectations is available, nor should they sanction or initiate any expenditure until all negotiations with Curtin have been concluded.

Once conditional approval for connection of the Developer's load and capacity provisions is granted by Curtin, preparations for a connection can be commenced.

Temporary Power Supply – Builder's Supply

The same power supply application process applies to the provision of a temporary power supply.

Appointment of Electrical Consultant/Contractor

The Developer will enlist the services of a competent electrical consultant and/or electrical contractor to ensure that the necessary documentation and associated work is carried out in accordance with Curtin's requirements.

Failure to provide the necessary documentation will result in delays to completion of the process.

Project Management

Curtin will nominate a contact person for each power supply connection.

Curtin will appoint an electrical consultant as their representative to whom all project technical matters will be referred during the design of the work.

If documents submitted by a Developer are not to the required industry acceptable standard and need to be resubmitted and assessed, then Curtin shall seek recovery of consultant costs from the Developer.

Figure 2 - Power Supply Application Process

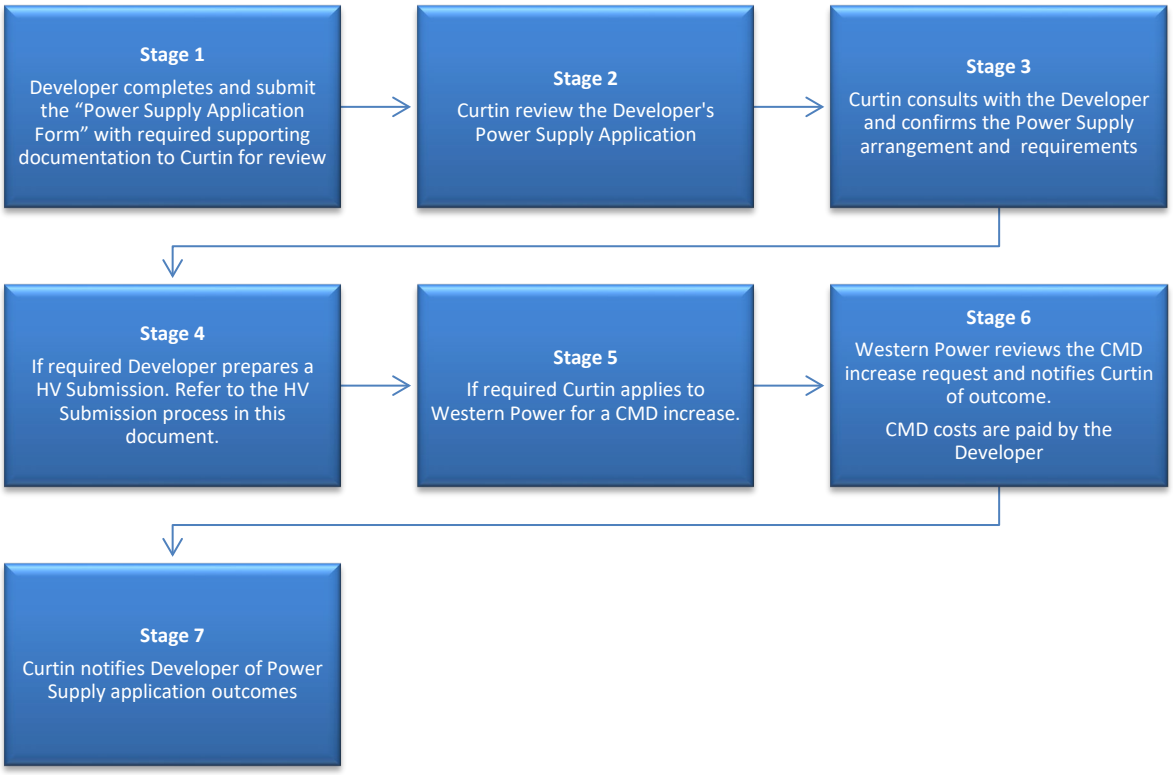
The Developer must allow sufficient time for the process described below.

A minimum of 6 weeks is required for Stage 1 to Stage 5 as it may trigger further investigation of Curtin's electrical network regarding available capacity, other power supply applications and power supply arrangements.

Curtin has no control over the timing of Stage 6.

The power supply application must be completed with all supporting information completed accurately and comprehensively. The review process is extended by any time taken to obtain clarifications and additional documentation.

Developers are to refer to Appendix C for a copy of the Power Supply Application Form.



6.8. CONNECTING TO EXISTING INFRASTRUCTURE

The Developer shall be responsible for appointing a Curtin preferred contractor to connect into existing Curtin infrastructure. The Developer shall maintain all connection to existing services and must not disturb unless approved to do so. The Developer must make good any damage to existing premises, adjacent buildings, roads, access paths and footpaths around the connection point and surfaces generally, and is liable for any other damage or injury that may be caused by execution of the connection works.

At the completion of the connection works the Developer shall make good all external footpaths, roads, crossings, landscaping etc. to Curtin requirements.

The developer is responsible for carrying out all testing and re-commissioning of all infrastructure affected by new connections to meet compliance with all relevant Australian Standards and Authority requirements.

6.9. DISRUPTION TO SUPPLY

The Developer shall make every effort to minimise outages. For planned outages, a notice period of seven (7) days must be provided. Developers wishing to undertake power isolations must comply with the Curtin Permit to Isolate Process available at https://properties.curtin.edu.au/working-with-us/permits/electrical-hv/high-voltage-systems-safety-management-plan.pdf

The isolation permit procedure and application are designed to guide parties wishing to isolate through a structured risk assessment process. Additional systems for risk assessment and analysis may also be necessary to effectively mitigate risk, particularly where higher risk services are involved. The duration of the isolation is required to be carefully considered as this has significant impact on Curtin's operations and assets, its tenants and patrons.

6.10. SUPPLY APPLICATION PROCESS OBLIGATIONS

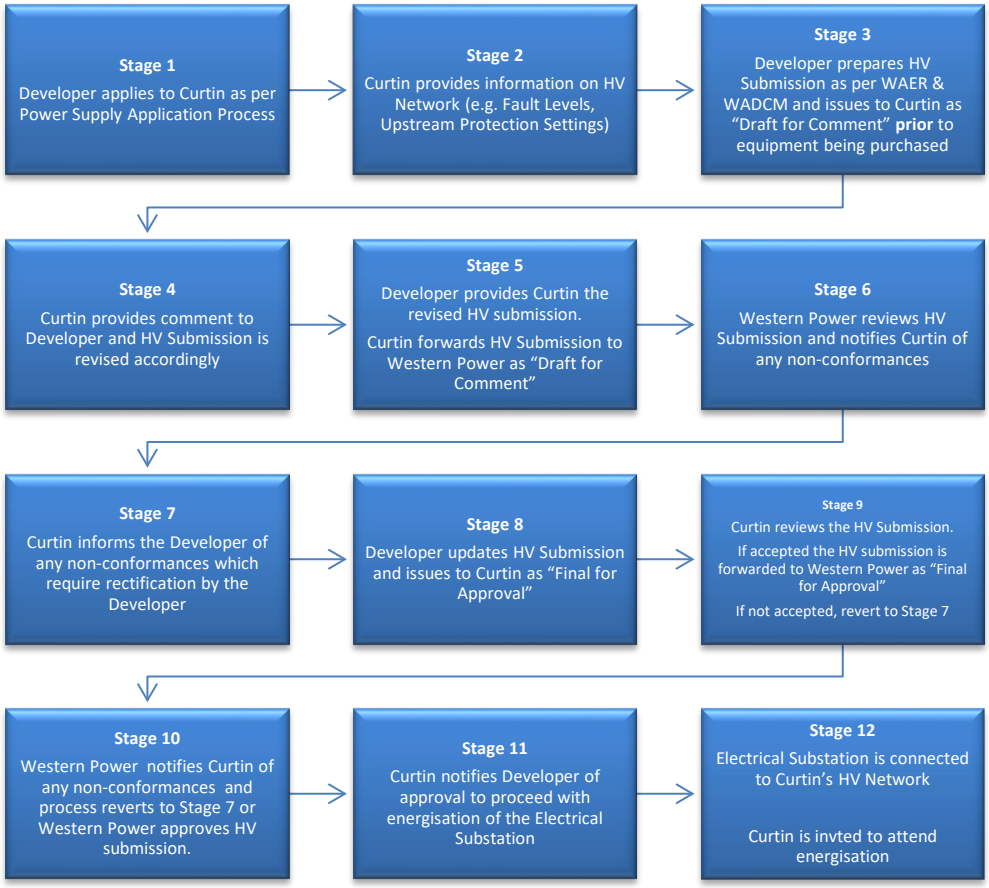
Table 3 - Power Supply Obligations

Developer	Curtin	Western Power
* Application for power supply * Design Power Supply * Supply and Install * Commissioning	* Review Submissions & Applications * Apply to Western Power for CMD (if required) * Own, operate and maintain HV connections following handover	* Review CMD increase requests * Review HV submissions
* Responsible for all costs, including CMD. * Comply with Curtin Processes including isolations, HV submissions, CMD etc.		

6.11. HIGH VOLTAGE SUBMISSIONS

All works involving the upgrade, augmentation or reconfiguration of the HV network must comply with WAER and WADCM regarding the preparation of a HV Submission. The HV Submission is to be certified by a CPEng or NPER accredited engineer at the time of the Developer submission to Curtin in readiness for the subsequent submission to Western Power. The final HV Submission shall include all commissioning and testing results for Curtin's review prior to energisation.
The process for a HV Submission is as follows.

Figure 3 - HV Submissions Process



6.12. HEADWORKS CHARGES

The Developer is responsible for costs associated with any works for the provision of a power supply connecting from Curtin infrastructure sought by a Developer. Where Curtin chooses to undertake works in excess of the minimum practical to service the Developer nominated requirements then Curtin will pay for the additional cost of the excess works. The Developer must liaise directly with the CNC regarding all associated headwork charges during the power supply application process.

6.13. GROUND BREAKING WORKS

The Developer must make their own investigations and is responsible for determining all existing services locations prior to commencing work. The Developer is responsible for rectifying any damage to existing services infrastructure.

6.14. ELECTRICAL SUBSTATIONS

6.14.1. LOCATION

The Developer must locate the electrical substation in an area that is easily accessible to Curtin for the purpose of installing and removing equipment at any point in the future. The Developer must also consider the aesthetics of the electrical substation and integrate them into the built form.

The Developer may consider the installation of an electrical substation below ground level (e.g. at basement level), but must seek approval from Curtin before proceeding. Curtin requires services to be internalised so as not to compromise ground level activation and presentation.

6.14.2. ACCESS

The Developer must allow unrestricted access to the electrical substations by representatives of Curtin. Access must be provided 24 hours a day, 7 days a week, even when the electrical substation is located within a building. The access must be via a door located on an external wall and keyed to Curtin's specification.

6.14.3. OWNERSHIP AND RESPONSIBILITIES

Building-integrated Substation

The Developer is responsible for the design and construction of a building-integrated substation structure.

The building structure such as the walls, doors and roof will be owned and maintained by the Developer. Ownership of the internal electrical equipment, including cable containment systems, earthing equipment, trench support structures, small light and power, will be transferred to Curtin following successful handover. The Developer is responsible for maintenance activities for a period of not less than 12

months following the handover date. Subsequent maintenance of the equipment will be the responsibility of Curtin.

Standalone Substation

The Developer is responsible for the design and construction of the standalone electrical substation building or kiosk enclosure up until formal handover to Curtin.

Ownership of the building/enclosure and other related structural elements will be transferred to Curtin following successful handover. The Developer is responsible for maintenance activities for a period of not less than 12 months following the handover date.

Subsequent maintenance will be the responsibility of Curtin. This includes all elements of the substation building structure. Where there are services installed on or in the electrical substation building that are directly related to the Developer, this must be communicated to Curtin during the handover process.

The ongoing responsibility for the electrical equipment that is contained within the electrical substation is dependent on the Power Supply arrangement and is detailed in **Appendix B**.

6.14.4. HIGH VOLTAGE

The Developer must base their energy metering system on Western Power's typical arrangement, including the required bus-connected HV metering cubicle and associated instrument transformers (current and voltage transformers). Where an alternative arrangement is being proposed by the Developer, this must be part of the power supply application process and is subject to receiving Curtin's approval which is at their sole discretion.

6.14.5. STAND-BY BACKUP GENERATORS

Should the Developer require the installation of local stand-by backup generators as part of their development they must ensure that the specification and location minimises the impact on the surrounding environment. Noise pollution is not acceptable to Curtin due to impact on teaching and examination venues. Visual appearance and emissions must enhance or maintain the public environment quality.

The configuration of stand-by backup generators must be configured as 'break before make', since Curtin will not allow short-term or long-term parallel power on the network.

6.15. FIRE DETECTION (DRY FIRE)

6.15.1. GENERAL PRINCIPLE

Curtin implements direct brigade alarms (DBA) in electrical substations, which are integrated with the Campus communications network to inform the onsite Security department of an alarm. This allows a rapid response in the event of an emergency. Curtin is also responsible for providing directions to emergency

services on the particular location of the electrical substation where the alarm has been initiated.

6.15.2. BUILDING-INTEGRATED SUBSTATION

For electrical substations, the Developer must comply with the following minimum requirements:

1. Fire indicator panel (common)
2. Deployment of smoke and heat detectors
3. EWIS/OWIS system
4. Site monitoring and interfacing – DFES connection (DBA)
5. Site monitoring and interfacing – graphics system (Curtin – Security)
6. Site monitoring and interfacing – network provision (Curtin – Security).

The fire detection system must be integrated with the respective building's communications infrastructure to enable the DBA and site monitoring to operate as required.

6.15.3. STANDALONE SUBSTATION

Where the Developer is responsible for the development of an electrical substation, they must refer to Western Power for the detailed requirements. For electrical substations, the Developer must comply with the following minimum requirements:

1. Fire indicator panel (local)
2. Deployment of smoke and thermal fire detection
3. EWIS/OWIS system
4. Site monitoring and interfacing – DFES connection (DBA)
5. Site monitoring and interfacing – graphics system (Curtin – Security)
6. Site monitoring and interfacing – network provision (Curtin – Security).

The Developer must liaise with the CNC regarding the location for any fire detection system that is to be integrated with Curtin communications infrastructure.

6.16. EMERGENCY LIGHTING

6.16.1. GENERAL PRINCIPLE

Curtin implements a monitored emergency lighting system in electrical substations, which is integrated with the Campus communications network to inform the onsite Properties and Facilities Management department of the system's status. This allows Curtin to respond to alarms and failures on the system, thus ensuring that the emergency lighting system is able to operate effectively when required.

6.16.2. STANDALONE AND BUILDING-INTEGRATED SUBSTATION

The Developer must refer to the relevant regulation or code regarding the applicability of an emergency lighting system for electrical substations.

Where an emergency lighting system is required, the Developer must refer to the relevant Australian Standard for the detailed requirements.

6.17. EXTERNAL LIGHTING

The Developer must ensure that all lighting provided as part of the development integrates and coordinates with the street frontage and interconnections with roadways, paths and the like. The Developer must be cognisant of and coordinate with other developments and ensure consistency.

All lighting must be configured to operate from dusk until dawn and comply with the relevant standards, including Greenstar.

6.18. UNDERGROUND INFRASTRUCTURE

6.18.1. COMMON SERVICES TRENCHES

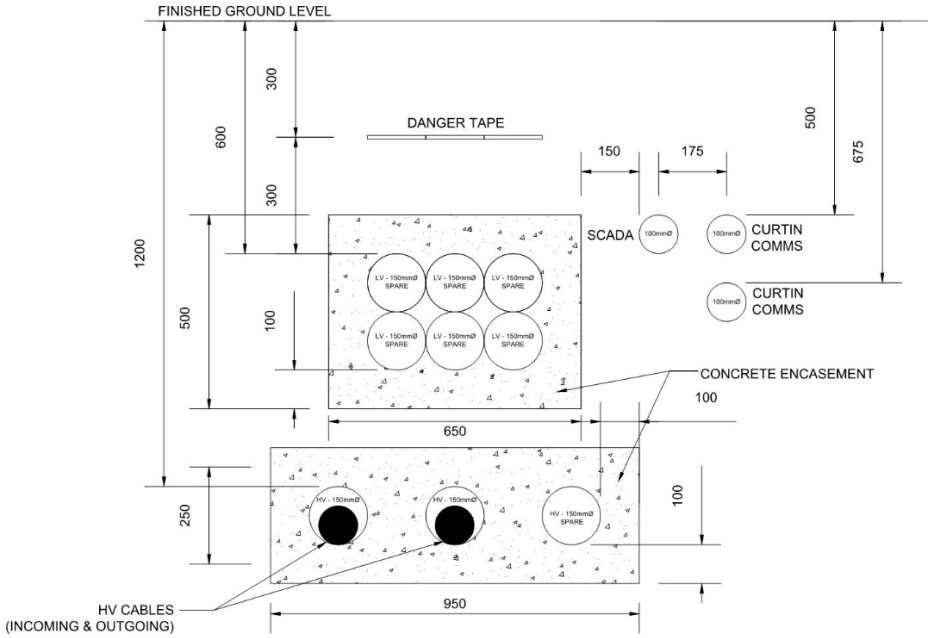
General Principle

The principle for a common services trench with the added mechanical protection via concrete encasement is to ensure the construction of a building or other structure above the infrastructure does not impede future maintenance access. Following the concrete encasement, the developer must demonstrate that the conduits are clear via a CCTV survey. Should the developer propose to address this issue through other means they must first seek written approval from Curtin before ground works commence.

Requirement

The installation of in-ground services within the lot that are associated with the electrical substation must be installed as a dedicated services trench. Where the electrical substation is located within the lot boundary, the Developer must provide spare conduits in accordance with Figure 4 below to allow for future LV and HV services.

Figure 4 – Typical Common Service Trench



The Developer must also provide cable pits every 50 metres and at each change of direction. This applies to the low voltage and SCADA in-ground services only.

6.19. CABLE PITS

6.19.1. HIGH VOLTAGE

There is no requirement for HV cable pits on a HV cable run.

6.19.2. LOW VOLTAGE

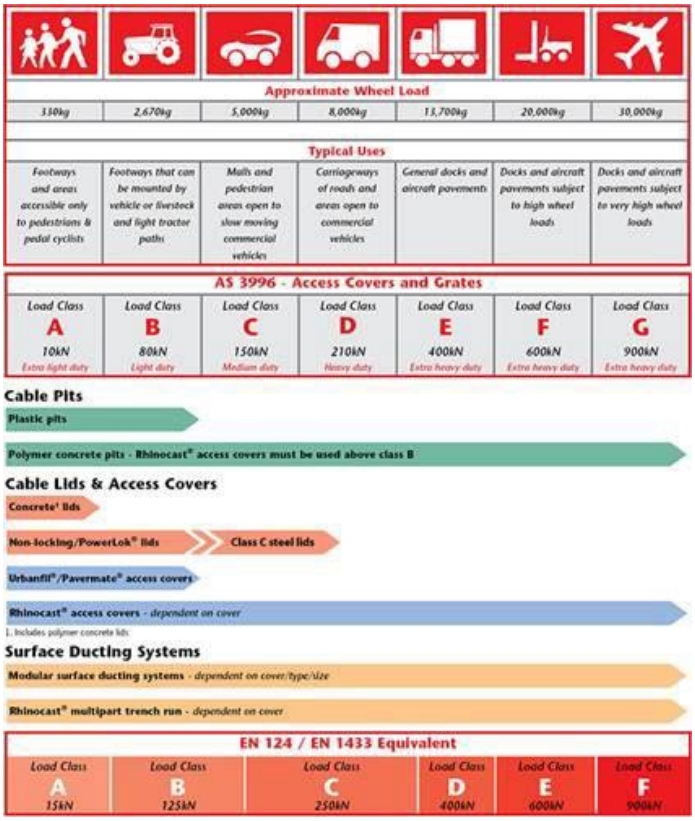
LV cable pits are to be constructed from polymer concrete and are to be provided with covers rated for their intended location, such as footpaths, grass, landscaped areas, roadways and car parks.

The depth of the LV cable pit must consider the burial depth of the service. All conduit entries within the pit are to be sealed to prevent ingress of water or vermin.

The lid of the LV cable pit is to be provided with a brass or stainless steel ID plate indicating the service within and is to be securely fixed to the lid using fasteners. The use of glues or epoxy for fixing the ID plate to the lid will not be accepted.

The following guideline (Figure 5) is to be used when determining the required LV cable pit.

Figure 5 – Cable Pit Class



6.19.3. SCADA

SCADA pits are to be constructed from polymer concrete and are to be provided with covers rated for their intended location, such as footpaths, grass, landscaped areas, roadways and car parks.

The depth of the SCADA pit must consider the burial depth of the service. All conduit entries within the pit are to be sealed to prevent ingress of water or vermin.

The lid of the SCADA pit is to be provided with a brass or stainless steel ID plate indicating the service within and is to be securely fixed to the lid using fasteners. The use of glues or epoxy for fixing the ID plate to the lid will not be accepted.

Refer to the previously stated guideline (Figure 5) for determining the required SCADA pit.

6.20. HV SYSTEM – SCADA

6.20.1. GENERAL

The SCADA system is controlled and monitored at the Building 156 terminal substation within the control room. The computer and communications hardware is located within the control room.

The SCADA system monitors the status of the HV switchboard's functional units, power flows and also allows the network operator to remotely open/close the functional units.

This is a safety control measure that removes the HV operator from the front of the HV switchboard, in turn eliminating the exposure of operators to arc flash hazards when utilised.

6.20.2. APPLICABILITY

The application of a SCADA system at the distribution substations is mandatory. Spatial provisions and in-ground infrastructure must be included when designing the electrical substation.

The Developer must liaise with Curtin as part of the power supply application process. The Developer must assume a SCADA system is required unless otherwise advised by Curtin.

6.20.3. SPECIFICATION

The SCADA system requires the installation of communications hardware such as a fibre termination cubicle, remote terminal unit (RTU) and compatible HV protection relays.

The Developer must ensure that the RTU and protection relays are compatible and can easily integrate with the existing SCADA system.

The SCADA system must be capable of performing the following:

1. monitoring of the switch or circuit-breaker position (Open, Close)
2. monitoring of the earth switch position (Open, Close)
3. remotely operate the switch or circuit-breaker position (Open, Close)
4. data acquisition (Amps, Volts (where applicable), kW, frequency).

6.21. PROTECTION SCHEMES

6.21.1. HV SYSTEM

The HV system must incorporate overcurrent and earth fault protection scheme as a minimum, which apply to the HV side of the transformer only. Where the Transformer rating exceeds 2MVA the developer shall employ a transformer differential / restricted earth fault scheme.

The Developer must ensure that the HV protection scheme grades with Curtin's upstream protective devices on the 11 kV or 22 kV Network. The Developer shall achieve a minimum grading margin of 250mS with the upstream device for prospective fault levels at the network location. If this cannot be achieved the developer must liaise with Curtin prior to making the HV submission.

The Developer must ensure that the HV protection scheme grades with the downstream LV protective devices on the 415 V network.

6.21.2. LV SYSTEM

The LV system must incorporate an overcurrent protection scheme. The Developer may consider the application of an earth fault protection scheme in addition to an overcurrent protection scheme.

The Developer must ensure that the LV protection scheme grades with Curtin's upstream protective devices on the 415 V, 11 kV or 22 kV networks. The LV protection scheme must grade for the full range of prospective fault levels.

The Developer must conduct arc flash hazard assessment on Low Voltage Main Switchboards and Main Distribution Switchboards.

6.22. RENEWABLE ENERGY SYSTEMS

As a general principle, Curtin supports renewable solutions that propose no risk to the integrity and stability of the Curtin network. To that end, the Developer must comply with the relevant ERAWA Technical Guidelines and submission requirements, including technical data schedules. However, if the Developer can provide evidence that the renewable design solution steps outside of the Developer Technical Requirements but poses no risk to the network, then Curtin will consider and potentially approve the solution.

The Developer must connect all of their on-site generation equipment to the Curtin internal fibre optic protection and control network.

6.23. MINIMUM REQUIREMENTS – EQUIPMENT

6.23.1. HV CABLES – PREFERRED SUPPLIERS

Curtin has a preference for the following suppliers for HV cabling:

1. Olex
2. Prysmian
3. Western Power.

Any alternative supplier of HV cable must be approved by Curtin prior to purchase.

6.23.2. HV NETWORK FEEDER CABLES

SPECIFICATION

All HV network feeder cables are to be rated for 24 kV, irrespective of the system voltage at the particular distribution substation. This allows for flexibility in the HV network and also the ability to upgrade the voltage from 11 kV to 22 kV at a distribution substation, without having to replace/upgrade the existing HV cabling.

All HV network feeder cables installed on the 22 kV network are to have red sheaths.

All HV network feeder cables installed on the 11 kV network are to have black sheaths.

All HV network feeder cables have the following specification.

Table 4 - HV Cable Specification

Cable Rated Voltage	12.7/22 kV (24 kV)
Configuration	1 x 3C
Size	240 mm^2
Material (active conductors)	Copper (Cu), Stranded
Conductor Screen	Semi-conductive XLPE
Insulation	Cross-Linked Polyethylene (XLPE)
Screen	Copper (Cu), Stranded Individually screened, coarse fault protection heavy duty screens
Termite Protection	Nylon
Additional Protection	Double Brass Tape
Armour	Steel Wire
Sheath Material	PVC – V90

INSTALLATION

Installed Underground

All underground HV network feeder cables are to be direct-buried where possible and are to be installed within heavy duty PVC conduit/polypipe for road crossings or where future access/removal is necessary. Figures 6 and 7 below illustrate the required installations.

The direct-buried HV cable is to be installed at 1,200 mm below finished ground level and is to have imported clean yellow sand as the bedding material. The use of clean fill other than imported yellow sand will not be acceptable. The direct-buried HV cable route

is to be provided with PVC covers and danger tape in accordance with Australian Standards.

The installation of HV network feeder cables utilising underground boring should be avoided where possible. Should the developer seek to use boring techniques they must seek written approval from Curtin prior to construction.

Figure 6 – HV Cable Route, Direct-buried

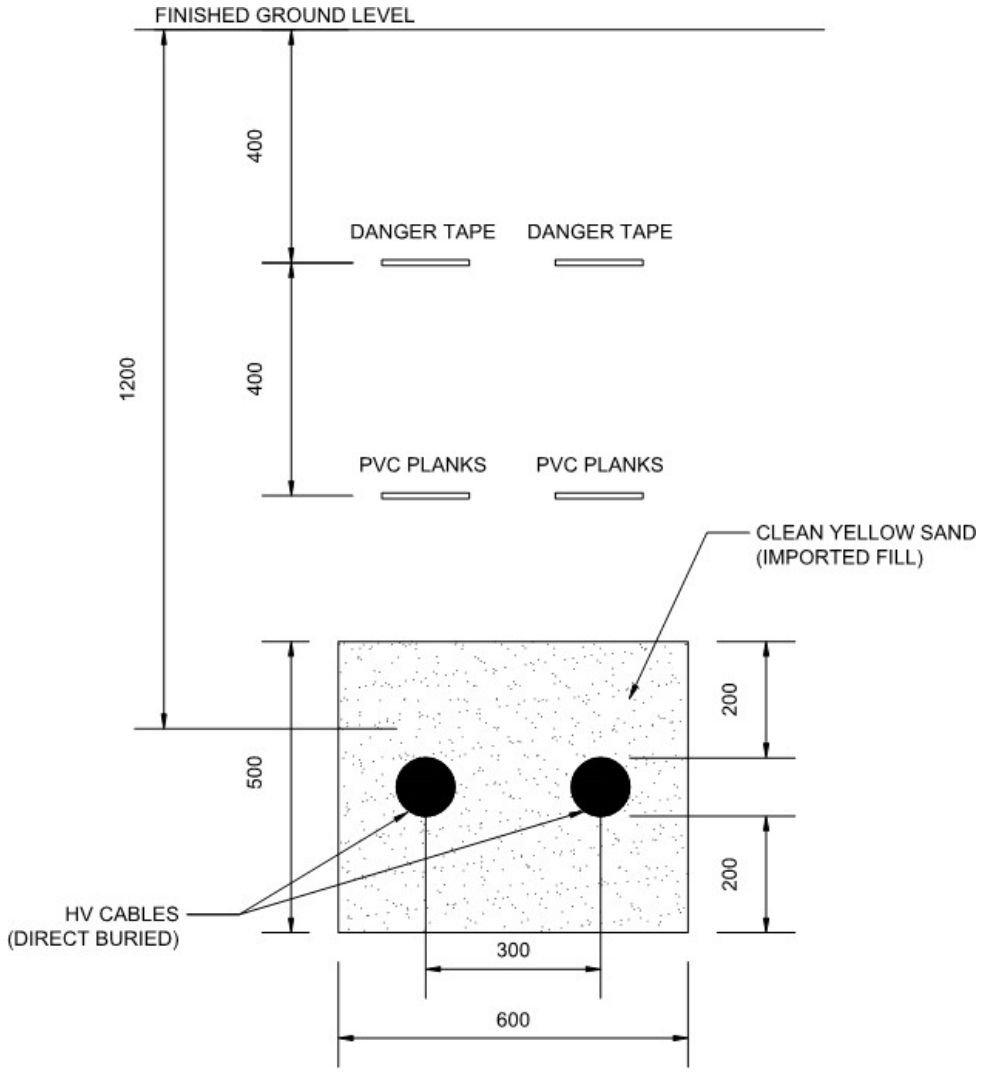
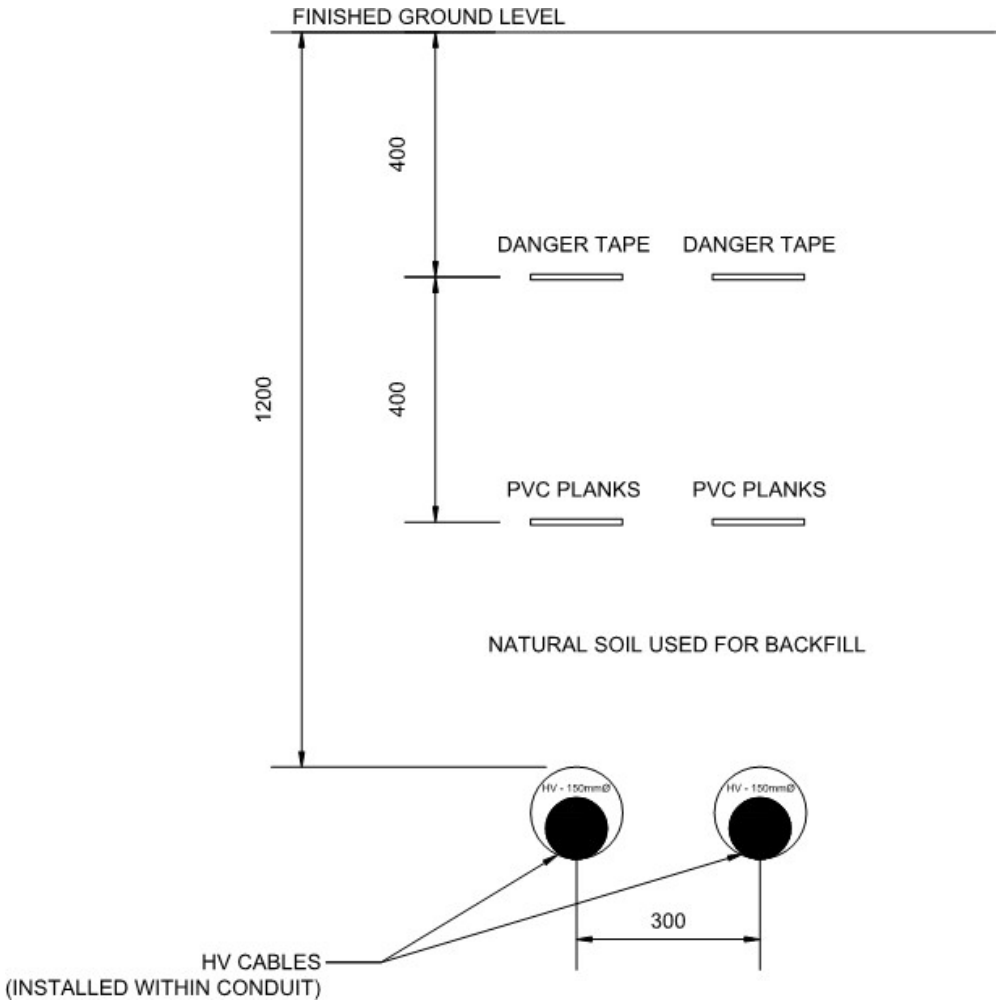


Figure 7 – HV Cable Route, Conduit



Installed within a Trench

All HV network feeder cables installed within a trench internal to a substation shall be spaced evenly to minimise the effects of derating and shall be secured direct to the floor using fault-rated stainless steel cleats. The cleats are to be spaced as per the HV cable manufacturer's recommendations to ensure they can adequately restrain the cables under the stresses generated via fault currents. The cleats shall incorporate rubber padding to protect the outer surface of the HV cable.

Where the HV cables enter the bottom of the HV switchboard, a section of uni-strut is to be installed horizontally within the trench above the floor to allow affixing of the cleats. The weight of the HV cable is to be supported as it enters the bottom of the HV switchboard to reduce the stress on the HV cable bushing. Failing to comply with this may result in premature failure of the HV cable bushing.

6.23.3. HV NETWORK INTERCONNECTING CABLES

SPECIFICATION

All HV network interconnect feeder cables are to be rated for 24 kV, irrespective of the system voltage at the particular distribution substation. This allows for flexibility in the HV network and also the ability to upgrade the voltage from 11 kV to 22 kV at a distribution substation, without having to replace/upgrade the existing HV cabling.

All HV network interconnect feeder cables that interconnect adjacent HV switchboards in the same or adjacent HV switch rooms have the following specification.

Table 5 HV Interconnection Cable Specification

Cable Rated Voltage	12.7/22 kV (24 kV)
Configuration	3 x 1C
Size	240 mm^2
Material (active conductors)	Copper (Cu), Stranded
Conductor Screen	Semi-conductive XLPE
Insulation	Cross-Linked Polyethylene (XLPE)
Screen	Copper (Cu), Stranded Individually screened, coarse fault protection heavy duty screens
Termite Protection	No
Additional Protection	No
Armour	No
Sheath Material	PVC – V90

INSTALLATION

Installed Underground

There is no requirement to install HV network interconnect feeder cables underground external to the substation building.

Where HV network interconnect feeder cables are installed between adjacent HV switch rooms within the same building they are to be installed within heavy duty PVC conduit.

Installed within a Trench

All HV network feeder cables installed within a trench internal to a substation shall be spaced evenly to minimise the effects of derating and shall be secured direct to the floor using fault-rated stainless steel cleats. The cleats are to be spaced as per the HV cable manufacturer's recommendations to ensure they can adequately restrain the cables under the stresses generated via fault currents. The cleats shall incorporate rubber padding to protect the outer surface of the HV cable.

Where the HV cables enter the bottom of the HV switchboard, a section of uni-strut is to be installed horizontally within the trench above the floor to allow affixing of the cleats. The weight of the HV cable is to be supported as it enters the bottom of the HV switchboard to reduce the stress on the HV cable bushing. Failing to comply with this may result in premature failure of the HV cable bushing.

6.23.4. HV TRANSFORMER FEEDER CABLES

SPECIFICATION

All HV transformer feeder cables are to be rated for 24 kV, irrespective of the system voltage at the particular distribution substation. This allows for flexibility in the HV network and also the ability to upgrade the Voltage from 11 kV to 22 kV at a distribution substation, without having to replace/upgrade the existing HV cabling.

All HV transformer feeder cables have the following specification.

Table 6 - HV Transformer Feeder Cable Specification

Cable Rated Voltage	12.7/22 kV (24 kV)
Configuration	3 x 1C
Size	95 mm^2
Material (active conductors)	Copper (Cu), Stranded
Conductor Screen	Semi-conductive XLPE
Insulation	Cross-Linked Polyethylene (XLPE)
Screen	Copper (Cu), Stranded Individually screened, coarse fault protection heavy duty screens
Termite Protection	No
Additional Protection	No
Armour	No
Sheath Material	PVC – V90

INSTALLATION

Installed Underground

All underground HV transformer feeder cables are to be installed within conduit/polypipe along their entire length.

The underground HV transformer feeder cables are to be installed at 1,200 mm below finished ground level and are to have clean sand fill (free of rocks and other foreign objects) as the backfill material.

Where conduits are installed, the HV cable route is to be provided with PVC covers at 400 mm above the HV cable and danger tape at 800 mm above the HV cable. The installation of PVC covers and danger tape must be installed as per Australian Standards.

Where polypipe is installed due to underground drilling, cable markers are to be provided on the surface at 30 m intervals and at each change of direction. This is a substitute for the PVC covers and marker tape that is applicable to an open trench conduit installation.

Installed within a Trench

All HV network feeder cables installed within a trench internal to a substation shall be spaced evenly to minimise the effects of derating and shall be secured direct to the floor using fault-rated stainless steel cleats. The cleats are to be spaced as per the HV cable manufacturer's recommendations to ensure they can adequately restrain the cables under the stresses generated via fault currents. The cleats shall incorporate rubber padding to protect the outer surface of the HV cable.

Where the HV cables enter the bottom of the HV switchboard, a section of uni-strut is to be installed horizontally within the trench above the floor to allow affixing of the cleats. The weight of the HV cable is to be supported as it enters the bottom of the HV switchboard to reduce the stress on the HV cable bushing. Failing to comply with this may result in premature failure of the HV cable bushing.

6.23.5. HV CABLE JOINTS

SPECIFICATION

All HV cable joints are to be Raychem or Australmold and are to be heat-shrinkable.

Cold-shrink HV cable joints are not acceptable.

The HV cable joint kit must be selected to suit the cross-sectional area and the specific construction type of the HV cable being jointed.

INSTALLATION

All HV cable joints are to be direct-buried and must not be located within six metres of conduit entries/exits or on a bend.

HV cable joints are to be installed at the same burial depth as the rest of the HV cable.

HV cable joints are to be installed by a preferred contractor. Refer to the CNC for the most up to date list of preferred contractors.

6.23.6. HV CABLE TERMINATIONS

SPECIFICATION

All HV cable terminations are to be Raychem or Australmold and are to be heat-shrinkable.

Cold-shrink HV cable terminations are not acceptable.

Touch-safe HV cable termination kits are to be used.

The HV cable termination kit must be selected to suit the cross-sectional area and the specific construction type of the HV cable being terminated.

INSTALLATION

All HV cable terminations are to be located within a purpose-built cable termination cubicle, either in the HV switchboard or transformer.

All HV cable terminations must be supported within the trench and within the cable termination cubicle such that the weight of the HV cable doesn't cause excessive stress on the bushing, causing it to prematurely fail.

HV cable terminations are to be installed by a preferred contractor. Contact your CNC for the most up to date list of preferred contractors.

6.23.7. HV SWITCHBOARDS (RING MAIN UNITS)

PREFERRED SUPPLIERS

Curtin has a preference for the following supplier:

1. Eaton – Xiria-E.

Curtin has standardised the range of HV switchboards to improve interchangeability and maintainability of HV switchboards in the HV network, should a situation arise where a HV switchboard needs to be taken out of service due to failure. This allows a much faster response time and subsequent restoration of power supply.

Should the Developer wish to propose an alternative supplier, this must be nominated in the draft HV submission and written approval from Curtin must be received prior to proceeding with purchase of non-standard equipment. Curtin may accept or reject the non-standard equipment at its sole discretion.

SPECIFICATION

All HV switchboards are to be type tested according to Australian and IEC Standards relevant to the proposed installation. Non-type tested HV switchboards will not be accepted. The HV switchboard manufacturer must provide evidence of type testing by issuing the certificates during the procurement phase and prior to delivery onsite.

All HV switchboards (ring main units) are to be of metal-clad construction and modular and shall be SF_6 free.

All HV switchboards are to be rated for 24 kV, irrespective of the system voltage at the particular distribution substation. This allows interchangeability of HV switchboards in the HV network and also the ability to upgrade the voltage from 11 kV to 22 kV at a distribution substation, without having to replace/upgrade the existing HV switchboard.

All HV switchboards are to be specified with downward exhaust kits, where installed on a trench.

The HV switchboards are to consist of load break isolators and circuit-breakers as the functional units. The use of fuse switch units for transformer HV protection will not be accepted.

The final configuration of the HV switchboard with regards to functional units is to be designed to cater for the specific project and allow for future provisions. The typical arrangements are noted as follows:

- Single Transformer Installation, with no future Transformer proposed
- Single Transformer Installation, with future Transformer (remote) proposed
- Dual Transformer Local Installation (HV Switchboard 1 and HV Switchboard 2).

In each case, the configuration of the HV switchboards should include the following:

1. Minimum of two load break isolators (typically 630 A)
2. Minimum of one circuit-breaker (typically 200 A)
3. Left- or right-hand extensible.

Note: where there is a requirement to install more than two transformers, additional circuit-breakers (typically 200 A) are to be installed on the HV switchboard. There is no requirement to install more than two HV switchboards to accommodate further transformers.

The Developer must allow for the future extension of the HV switchboard by one functional unit when designing the substation building.

INSTALLATION

Internal

All HV switchboards located internally are to be installed above a trench and securely fastened to the floor or structural frame within the trench using heavy-duty fasteners. Electrical installations must be located away from hydraulic risers.

The HV switchboard is to be positioned such that the HV cables enter from the bottom.

The HV switchboard must be positioned such that the minimum egress requirements are complied with.

The HV switchboard must be located nearest to an egress path/doorway to facilitate safe emergency egress.

External

The default location for HV switchboards is internal to buildings within an electrical substation. However, under some circumstances, Curtin may accept an external installation. Where an external HV switchboard is being proposed by the Developer this must be approved by Curtin before proceeding.

The Developer must liaise with the CNC regarding the placement and screening requirements that may be applicable.

All HV switchboards located externally are to be installed within a weatherproof outdoor cubicle/kiosk that is type tested according to Australian and IEC Standards.

The HV switchboard is to be positioned such that the HV cables enter from the bottom.

The HV switchboard must be positioned such that the minimum egress requirements are complied with.

6.23.8. TRANSFORMERS

Curtin has standardised the range of transformers to improve interchangeability and maintainability of transformers in the HV network, should a situation arise where a transformer needs to be taken out of service due to failure. This allows a much faster response time and subsequent restoration of power supply.

Curtin has a preference for the following suppliers.

Table 7 - Transformer Suppliers

Oil-filled Transformer	Dry Type/Cast Resin
Western Power – Standard Kiosk Transformer	ABB
ABB – GMT Plus Transformer	Grant Transformers

Written approval from Curtin must be received prior to proceeding with purchase of non-standard equipment.

SPECIFICATION

All transformers are to be type tested according to Australian and IEC Standards. Non-type tested transformers will not be accepted. The transformer manufacturer must provide evidence of type testing by issuing the certificates during the procurement phase and prior to delivery on site.

The transformers are to utilise mineral oil as the insulating medium. The use of less combustible oil can also be employed, where it may be considered as a requirement to reduce fire risk.

All transformers are to be of metal construction and compact.

All transformers are to have the following minimum IP ratings.

Table 8 - Transformer IP Rating

	Internal	External
HV Termination Cubicle	IP56	IP56
LV Termination Cubicle	IP56	IP56
Tank	IP66	IP66

All transformers are to have a vector group of Dyn1. This allows interchangeability of transformers in the HV network.

All transformers are to have aluminium HV and LV windings. The use of aluminium decreases the overall weight of the transformer as compared to copper, so lifting devices and supports do not need to be excessively oversized.

Transformers can either be sealed units or provided with oil sampling facilities (e.g. a valve).

INSTALLATION

Internal

All transformers are to be installed and secured to the floor using heavy-duty fasteners.

The transformers are to be positioned such that the HV and LV cable termination cubicles are directly above or below a trench or penetration allowing the cables to be installed vertically without bends.

The transformers can be bottom- or top-connected for the HV and LV cable termination cubicles.

The transformers are to be positioned within the room such that the installation/removal of the transformer doesn't impact or require the removal of any other equipment.

All oil-filled transformers are to be installed and secured to the floor using heavy-duty stainless steel fasteners. Oil containment shall be provided in accordance with Australian Standards.

External

The default location for transformers is internal to buildings within an electrical substation. In exceptional circumstances Curtin may accept an external installation. Where an external transformer is being proposed by the Developer, this must be approved by Curtin before proceeding.

The Developer must liaise with the CNC regarding the placement and screening requirements at the development application phase.

All oil-filled transformers are to be installed and secured to a concrete plinth or culvert using heavy-duty stainless steel fasteners. Oil containment shall be provided in accordance with Australian Standards.

The transformers are to be positioned such that the HV and LV cable termination cubicles are directly above a trench or penetration allowing the cables to be installed vertically without bends.

The transformers are to be bottom-connected for the HV and LV cable termination cubicles.

The transformers are to be positioned externally such that the installation/removal of the transformer can be undertaken by driving a truck/crane to its location allowing easy lifting.

6.24. MINIMUM REQUIREMENTS – TESTING AND COMMISSIONING

6.24.1. HV TESTING REQUIREMENTS

Type Testing

All HV equipment is to be type tested according to Australian and IEC Standards. Non-type tested HV equipment will not be accepted. This applies to the following HV equipment:

1. HV cables
2. HV switchboards
3. Transformers.

The HV equipment manufacturer must provide evidence of type testing by issuing the certificates during the procurement phase and prior to delivery on site.

Factory Acceptance Testing

All HV equipment is to be routinely factory tested according to Australian and IEC Standards.

All HV equipment is to be tested at the factory of the manufacturer/supplier prior to being despatched for delivery. The routine factory testing is typically undertaken by the manufacturer/supplier without third party witnesses. Where the HV equipment is considered a critical asset for Curtin a Curtin representative is required to witness the routine factory testing.

The routine factory testing inspection and test plan is to be provided by the manufacturer/supplier to Curtin and/or the engineer prior to carrying out the tests.

Site Acceptance Testing

All HV equipment is to be site acceptance tested according to Australian and IEC Standards.

All HV equipment is to be tested at the time of being delivered to the Campus as part of the site acceptance testing. The site acceptance testing is typically undertaken by the manufacturer/supplier under witness by Curtin, the engineer and the Developer where applicable. The Developer is also able to undertake the role of the manufacturer/supplier to carry out site acceptance testing; in that case, the manufacturer/supplier is required to be the witness.

The site acceptance testing is typically a repeat of the routine factory test and demonstrates that the HV equipment has been packaged, delivered and unloaded satisfactorily and no damage has been encountered.

The site acceptance testing inspection and test plan is to be provided by the manufacturer/supplier or Developer to Curtin and/or the engineer prior to carrying out the tests.

Commissioning Tests

All HV equipment is to be commissioning tested according to Australian and IEC Standards.

All HV equipment is to be tested at the time of commissioning, prior to final energisation. The commissioning testing is typically undertaken by the Developer under witness by Curtin, the engineer and the manufacturer/supplier where applicable.

The commissioning testing is typically a repeat of the routine factory test and demonstrates that the HV equipment has been installed and configured satisfactorily and no damage has been encountered.

The commissioning testing inspection and test plan is to be provided by the Developer to Curtin for approval and/or the engineer prior to carrying out the tests. CNC should be invited to witness all commissioning and testing and shall be provided a minimum of 7 days' notice.

6.24.2. TYPES OF TESTING – HV CABLING

HV Network Feeder Cables

The following tests are required on the HV network feeder cables as a minimum:

1. Phase Rotation
2. Megger Testing (5 kV)
3. Very Low Frequency (VLF)
4. Sheath Integrity

5. Tan Delta
6. Partial Discharge.

The following tests are required on HV network feeder cables that interconnect adjacent HV switchboards in the same or adjacent HV switch rooms as a minimum:

1. Phase Rotation
2. Megger Testing (5kV).

HV Transformer Feeder Cables

The following Tests are required on the HV Transformer Feeder Cables as a minimum:

1. Phase Rotation
2. Megger Testing (5 kV).

HV Switchboard

1. Conductivity Main Circuit Resistance
    a. Busbars to cable terminal, including circuit-breakers closed and in service position.
2. HV Power Frequency Voltage Withstand Test
    a. HV test (50 Hz) main circuit at 100 per cent (80 per cent for all subsequent tests) of the standard withstand test voltage for 1 minute.
3. Insulation Resistance
    a. Megger busbar (HV) system with 5 kV Megger before and after HV Power Frequency Voltage Withstand Test
    b. Megger secondary wiring with 500 V Megger before and after HV Power Frequency Voltage Withstand Test.
4. Circuit-breakers
    a. Mechanical interlocking
    b. Manual and electrical close, trip and spring charge
    c. Electrical protection trips and interlocks
    d. Minimum operating volts, close and trip.
5. Earth Switches
    a. Check operation and interlocking
    b. Resistance of earthing circuit.
6. Current Transformers
    a. Polarity test
    b. Ratio test – current transformers.
7. Electrical Function – Relays, Metering and Control

a. Accuracy test by checking at one point of trip curve
b. Functional test by primary injection.

8. Fuse Switches, Isolators, Miniature Circuit-breakers and Fuses
    a. Check operation, interlocking and indication.

6.25. TRANSFORMERS

6.25.1. OIL-FILLED

1. Measurement of winding resistance
2. Measurement of voltage ratio and check of phase displacement
3. Measurement of short-circuit impedance and load loss
4. Measurement of no-load loss and current
5. Measurement of zero-sequence impedance(s)
6. Tests on off-load tap-changers — operation test.

Annual testing is required on transformers that have oil sampling facilities (e.g. a valve) in order to determine if there have been any internal faults. This is achieved through dissolved gas analysis and is undertaken by a specialist laboratory. This remains the Developers responsibility for HV metered applications.

6.25.2. DRY TYPE/CAST RESIN

1. Measurement of winding resistance
2. Measurement of voltage ratio and check of phase displacement
3. Measurement of short-circuit impedance and load loss
4. Measurement of no-load loss and current
5. Measurement of zero-sequence impedance(s)
6. Tests on off-load tap-changers — operation test.

6.26. MINIMUM REQUIREMENTS – HANDOVER

6.26.1. TESTING AND COMMISSIONING

The Developer must liaise and engage with their CNC throughout all phases of testing and commissioning works concerning the electrical substation or other electrical equipment. This is required to aid in the handover process, thus ensuring Curtin is trained in operating the installed electrical equipment after it has been placed into service.

Failure to comply with this requirement will result in delaying the process for providing the power supply connection.

6.26.2. SURVEYING OF UNDERGROUND CABLES

All underground cables are to be electronically surveyed, irrespective of whether they are existing or new cables.

Where existing cables are diverted or modified such as by the inclusion of a joint, they must be surveyed. The cable joint is also to be identified on the survey plan.

The extent of survey of existing cables along the route that remains unchanged will be decided upon on a case-by-case basis.

The survey information is to be provided to Curtin for inclusion in the Master Plan drawing database within five working days of reinstatement.

6.26.3. HANDOVER CERTIFICATE

All new equipment that is to be handed over to Curtin must be formally accepted by Curtin through the process outlined below. The Developer is required to initiate this process with the CNC and remains responsible for the equipment until the Handover Certificate is signed by both parties. A copy of the Handover Certificate can be found in Appendix E.

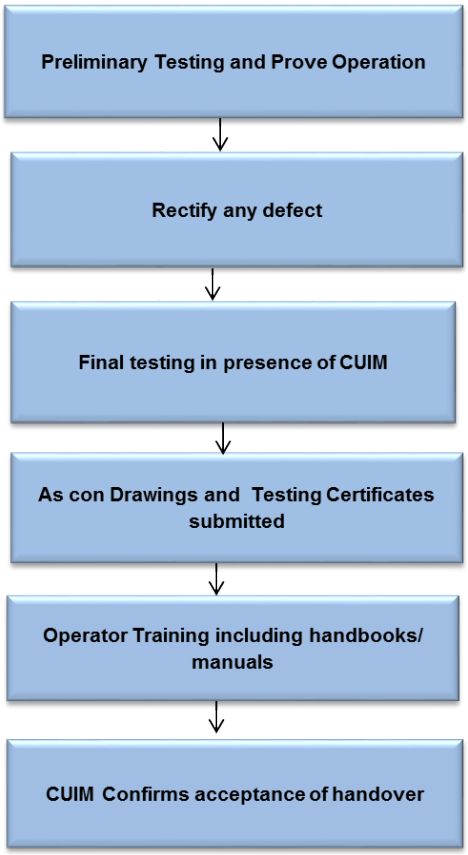
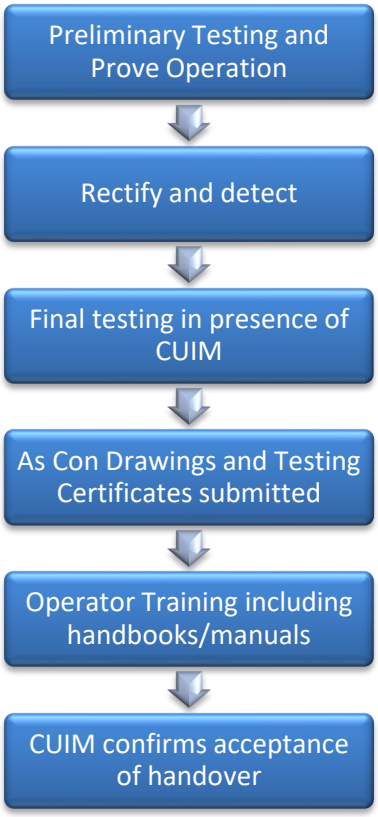


Figure 8 Handover Process Flow Chart



7. HYDRAULIC SERVICES INFRASTRUCTURE

The Developer shall inform itself on the location, capacity and conditions of the existing hydraulic services infrastructure within and outside the Bentley Campus.

For all hydraulic services connections, Developers must submit the Developer Application Form for Curtin's review, and Curtin will subsequently request approval from the relevant utility supplier.

7.1. POTABLE WATER SERVICE INFRASTRUCTURE

Bentley Campus is serviced via the Water Corporation's metered water connections as follows:

- 150 mm domestic water meter located on Manning Road: Meter No. NK1800005 - OP51821
- 100 mm domestic water meter located on Hayman Road (Brand Drive): Meter No. KK2130016 - OP57417
- 100 mm domestic water meter located on Kent Street: Meter No. KK2130016 - OP57417.

Within the Bentley Campus Curtin's own potable water mains network interconnects with the Water Corporation's 3 supplies.

Irrespective of the current pressure values, the Developer shall not rely upon static pressure greater than 15 metres head at each of Water Corporation's meters (upstream the backflow prevention device).

The potable water connection to the development lot shall be fitted with a Utility Meter sized to meet the development's requirements as set out on the Developer Application Form. The Developer may be required to have an acceptable flow restrictor installed based on the water flow rate required.

Section 7.11 specifies the process for requesting connection to potable water networks.

7.2. SEWER/WASTEWATER SERVICE INFRASTRUCTURE

Bentley Campus is serviced by Water Corporation's gravity sewer mains. Developer's are to request updated plans from the Water Corporation, as required.

Within the Bentley Campus, Curtin's own sewer mains network connect and discharge into the Water Corporation's sewer mains.

Section 7.11 specifies the process for requesting connection to sewer networks and trade waste discharges (including the installation and operation of grease traps, dilution traps etc)

The Developers sewer discharge flow rate needs to be reviewed by the Universities' Civil Engineer to determine the capacity of the existing infrastructure and the Water Corporation's gravity sewer. Should the discharge flow rate exceed the capacity of the existing infrastructure, then the Developer should be responsible for upgrading the infrastructure to meet their demand requirements. Note this may also require upgrading of the Water Corporation's gravity sewer which would be determined by the Water Corporation in consultation with the Universities' Civil Engineer.

7.3. NATURAL GAS SERVICE INFRASTRUCTURE

CU will substantially reduce the use of natural gas across the Bentley Campus and may partially or completely disconnect from the natural gas grid. Curtin's strategy and programme for this is pending. The Developer must liaise with Curtin pre-concept design to confirm the feasibility of relying on Curtin's gas supply and connectivity.

The Bentley Campus is serviced via ATCO's natural gas connections as follows:

- 207821-MTS880 Exchange
- 201671-MTS101 B300
- 202321-MTS907 B117
- 207431-MTS720 B155-B500

Within the Bentley Campus there is a network of Curtin's own natural gas mains that **do not** interconnect ATCO's four (4) supplies.

If natural gas is required, the development lot is to be supplied via a 180 mm PE100 supply main for 5.0 kPa pressure.

The natural gas connection to the development lot shall be fitted with a Utility Meter sized to meet the development's requirements as set out on the Developer Application Form.

Section 7.11 specifies the process for requesting connection for natural gas connection.

7.4. FIRE WATER SERVICE INFRASTRUCTURE

The Campus is serviced via Water Corporation's unmetered water connections as follows:

- 150 mm fire service connection located on the Hayman Road & Brand Drive boundary.
- 150 mm fire service connection located on the Kent Street boundary.

Within the Campus, Curtin's own un-boosted fire water mains network interconnects with the Water Corporation's supplies noted above.

The Developer shall have all the required fire protection systems within the development lot fully compliant based on sole supply from the un-boosted fire water connection.

Irrespective of the current pressure values, the Developer shall not rely upon static pressure greater than 15 metres head at each of the unmetered connections to Water Corporation's mains.

The un-boosted fire water connection to the development lot shall be fitted with a Utility Meter sized to meet the development's requirements as set out on the Developer Application Form.

The Developer shall have Bentley Campus' existing fire booster block plans updated to DFES' satisfaction to display the new and/or modified fire water services.

Section 7.11 specifies the process for requesting un-boosted fire water connection.

There are no street hydrants provided for Developers. The Developer's design consultant

engineers are to allow for all necessary fire systems within the development lot to meet compliance with Australian Standards requirements. Make-up infill to fire storage tanks will be supplied from the Curtin non-boosted fire water main lot boundary connection. A drawing showing the location of this service is available by request from

In-ground hydrants have been provided to the 200mm non-boosted fire main to allow Developers in proximity to University Boulevard to carry out flow and pressure testing to the non-boosted main for design of the development lot fire systems. These in-ground hydrants are indicated on the Curtin Infrastructure base plans.

Development lot non-boosted fire water boundary connections are to be fitted with meters sized to meet the Developer's requirements. Individual lot service connections are to be documented as outlined in Section 2.14.

7.5. STORMWATER INFRASTRUCTURE

Developers must retain and dispose of all stormwater run-off within their lot boundary.

Developers must apply to Curtin for discharge of stormwater runoff into the existing reticulation using the Developer Application Form (Attachment D).

7.6. APPLICABLE STANDARDS

Developers must meet the provisions of the NCC and the requirements set out by the relevant Australian Standards, WSAA codes, utility providers (Water Corporation, ATCO) and authorities (Department of Health, Department of Water and Environmental Regulation, DFES, Town of Victoria Park, etc.) which this document does not replace.

7.7. ROLES AND RESPONSIBILITIES

Table 9 - Hydraulic Services - Roles and Responsibilities

Role	Curtin	Developer
Determine demand requirements		X
Design internal lot infrastructure and connection to the existing service		X
Submit a Notice of Intent to Curtin for connection of infrastructure including all Developer Applications Forms as applicable		X
Submit design, demand forecast and other required documents for connection to Curtin or other networks		X
Assess Design, load forecasts and other required documents (e.g. UWMS) for connection		
Select prequalified contractor		X
Pre-approval of cut-in works	X	
Grant Access and Permits	X	
Cut into existing service		X
Costs for and warranties for connection to existing service		X
Installation and connection of meters to Curtin's digital metering system		X
Metre reading and maintenance	X	
Maintenance of Curtin owned infrastructure	X	
Organise effects testing, and testing and commissioning.		X
Curtin attends witness testing and commissioning, Developer provides advance notice.	X	
Developer notifies of outages for planned works, and Curtin reviews content and scope before permit application.	Review	X

7.8. STORMWATER MANAGEMENT

Curtin's Local Water Management Strategy for the Bentley Campus satisfies regulatory requirements to sustainably and holistically manage water supply and demand to support future development.

Developers shall demonstrate their compliance with the requirements contained within the LWMS by submitting their Urban Water Management Plans (UWMP).

The LWMS sets out specific water efficiency targets, water reuse requirements and stormwater management measures for the campus and lot scale developments. It adopts a system network approach to water management for ground water, storm water, rainwater and wastewater. The LWMS does not detail on-lot initiatives which are to be contained within the UWMP.

A copy of the LWMS can be found on the Curtin Working With Us webpage:

https://properties.curtin.edu.au/working-with-us/guidelines/

7.8.1. URBAN WATER MANAGEMENT PLAN

Developers must document how they will meet best practices for water and energy conservation and as a minimum must meet the requirements and design criteria for energy and water efficiency as required by the NCC, the Local Water Management Strategy (LWMS), Curtin's Greenstar commitments and other Curtin guidelines specified by the CNC.

Developers will be required to demonstrate their compliance with these documents by producing an Urban Water Management Plan in line with the requirements of Better Urban Water Management (Department of Planning). The UWMP must provide detailed information on how Developers will deliver the targets and initiatives outlined in the LWMS and other documents referenced above, including sustainability initiatives that deliver efficiencies in water demand and supply including water recycling and harvesting opportunities. The UWMP is submitted as part of the development approval process.

It is the responsibility of the Developer to obtain all necessary approvals from relevant authorities for licensing and maintaining these systems after having received Curtin's written approval for direct engagement with authorities.

7.9.SYSTEM DESIGN BRIEF

The Developer must submit to Curtin a hydraulic services design brief for the development that provides a detailed description of the proposed development and provides as a minimum the following information which Curtin will rely on for current and future infrastructure planning:

- size of potable water Utility Meter
- lot boundary water service peak instantaneous flow rate
- estimated annual water consumption for the development lot
- size of un-boosted fire water Utility Meter
- lot boundary fire service flow rate
- fire hydrant/hose reel systems including fire storage tanks, pump sets and booster

cabinets

- lot property sewer connection size and estimated peak flow rate
- lot property sewer estimated discharge percentage rate
- re-use / recycling infrastructure metering
- size of gas Utility Meter
- lot natural gas pressure requirement and total Mj/hr demand
- lot natural gas diversified total gas demand in Mj/hr
- lot natural gas estimated annual consumption
- industrial waste discharges requiring an industrial waste permit as set out under the Water Corporation's industrial waste discharge guidelines
- Lot boundary rainwater and stormwater discharge flows and volumes.
- detailed design drawings to indicate the proposed connections to the existing service infrastructure

7.10. DEVELOPMENT LOT SERVICE CONNECTIONS

Development lots have not been provided with hydraulic fire, water and gas service connections. Hydraulic services infrastructure are generally installed in service corridors along roads as indicated on site infrastructure base plans.

Developers must submit the Developer application form with proposed locations, capacity requirements, calculations for sizing to meet their project brief and the demands of the proposed development. The Developer's design consulting engineers are required to submit Notice of Intent forms and Developer service application forms (as provided in Appendix D) in addition to any authority applications and submissions.

Notice of Intent forms and Developer applications forms must be submitted at the earliest stage of the proposed design development process for Curtin to review and approve the request for service connections and to liaise with Curtin's authority service providers.

Developers shall design, document and install all service connections from existing infrastructure to the development lot sub-meters. On completion of the installation, Developers will be required to hand over these connections (including sub-meters) to Curtin to become a Curtin asset.

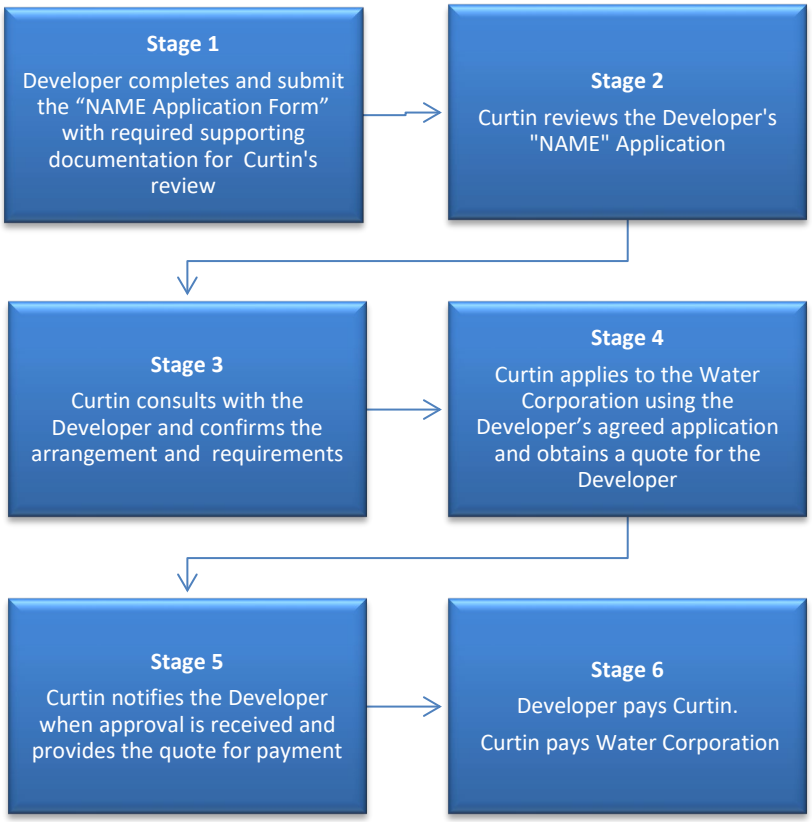
7.11. HYDRAULIC SERVICES APPLICATION

The Developer and/or licensed plumbing contractor must complete Curtin's Water Service, Fire Service, Natural Gas Service, Overland Flood Path Runoff and Property Sewer Connection applications, contained within Appendix D.

The applications enable Curtin to review demand on the Campus infrastructure and available supplies. These applications do not replace any authority applications that must be completed and submitted by the Developer subject to Curtin's prior approval.

The process for a Hydraulic Services Application is as follows.

Figure 9 Hydraulic Services Application Process



7.12. PERMITS, FEES AND REGULATIONS

The Developer's consultants or contractors will apply for water, fire, gas and sewer lot connections as the Application Process in this DTR.

The licensed contractors pay all fees for work to be completed for the Developer and upon the CNC's approval will obtain all permits including, but not limited to, the following:

- development and headworks charges levied by the Water Corporation for sewer and water as advised by Curtin
- industrial waste discharge permits
- payment of fees and charges for major plumbing fixtures approved by Curtin
- industrial training levies etc. and enterprise bargaining agreements
- Department of Energy, Mines, Industry Regulation and Safety certificates
- Payment of fees to Department of Energy, Mines, Industry Regulation and Safety for new sanitary fixtures
- Water Corporation industrial waste permits will need to be completed and submitted to Water Corporation requirements.

7.13. HYDRAULIC SERVICES - UTILITY METERS

All development lots are to be fitted with Utility Meters, installed on the incoming supply

mains and located in proximity of the development lot boundary or alternative location proposed by the Developer and approved by Curtin

All hydraulic service meters are to be installed above ground in accessible locations for reading and maintenance.

All Utility Meters are to be installed with meter identification plates stating:

- the meter identification number, provided by the CNC
- The Curtin development lot number serviced by the sub-meter.
- Identification plates are to be 250 x 150 mm with black engraved lettering.

Refer to Section 5.4 for details on utility meter requirements.

7.14. NATURAL GAS

Developers are to refer to Section 5.4 which outlines the requirements for utility meters.

The Utility Meter shall be fitted with a by-pass with an isolation valve fitted with Curtin-nominated lock.

The gas regulator shall be fitted upstream the gas Utility Meter and set to the supply pressure nominated on the Developer's gas application.

7.15. POTABLE WATER AND FIRE WATER

Developers are to refer to Section 5.4 which outlines the requirements for utility meters.

7.16. HYDRAULIC SERVICES GENERAL

7.16.1. IN-GROUND SERVICES IDENTIFICATION

All pipework below ground shall have 75 mm wide aluminium service identification tape placed directly over the service 300 mm above the top of the pipe, and turned up into clean-out/valve boxes so an electronic charge can be attached in the future to identify the pipe route with an electromagnetic detector.

Identification tape, if damaged during excavations, must be repaired by the contractor and such repairs sighted and approved by the CNC.

7.16.2. SERVICE VALVES IDENTIFICATION

All service valves are to be provided with service identification tags (Seton brass or approved equivalent) complete with custom lettering and secured with brass chain to the valve stem. Service valve tags are to be a minimum 50 mm diameter with black engraved lettering.

7.16.3. BACKFLOW PROTECTION DEVICES

Bentley Campus' boundary water supply connections are fitted with approved high-hazard boundary containment valves registered with the Water Corporation. The fire water service connections are fitted with approved medium-hazard boundary containment valves registered with the Water Corporation.

Developers shall supply and install downstream of the lot Utility Meter any required backflow prevention device and shall be responsible for maintaining and testing them to the minimum applicable requirements.

7.16.4. PROTECTION OF IN-GROUND SERVICES

Denso 500 primer paste 'Masic' and 'Tape' shall be used to protect all underground nuts and bolts on all fittings, valves, mechanical joints and tapping bands associated with the development lot boundary service connections.

All copper pipes installed in-ground are to be spirally wrapped in two layers of Petro 40 tape or an approved equivalent.

All steel pipes and fittings shall be hot dipped galvanised after fabrication.

All nuts and bolts, washers, clips etc. used in connection with any of the services shall be of non-corrosive material and compatible with the material in contact.

Surface rust, built-up scale, etc. on any component in the installation shall be removed during the progress of the works and the affected area de-scaled, brushed and treated with a compound recommenced by the manufacturer of the component.

7.17. HYDRAULIC SERVICES - PIPE MATERIALS

7.17.1. GENERAL

The Developer shall use pipe materials suitable to meet the installation criteria and as set out in this guideline.

The use of pipe materials in deviation from those specified under this clause is subject to the Developer submitting a written request to the CNC and the CNC approving the request in writing prior to installation.

7.17.2. POTABLE WATER SERVICE

Polyethylene PE100 PN 12.5 minimum pipes and fittings with butt welds or electrofusion joints shall be used for the inground pipes.

Connection to Bentley Campus main shall be via polyethylene PE100 PN 12.5 minimum injection-moulded reducing tee with extended spigots and PN16 Synoflex couplers to suit.

Copper (minimum Class Type B) pipes and fittings shall be used for the above ground pipes, i.e. the connection to the Utility Meter. In-ground copper pipes shall be wrapped in protective tape.

7.17.3. SEWER/WASTEWATER SERVICE PIPES

PVC Drain Waste Vent (DWV)non-pressure pipes and fittings shall be used for sewer pipes and vents in strict conformity with the manufacturer's recommended method for installation and the relevant Australian Standards, WSAA codes and Water Corporation's specifications and drawings.

HDPE pipes and fittings with electrofusion jointing are an acceptable alternative where specified by the Developer's designer.

Connection to Water Corporation's main or Bentley Campus main shall as a minimum comply with Water Corporation's requirements.

7.17.4. FIRE WATER SERVICE PIPES

Polyethylene PE100 PN 16 minimum pipes and fittings with butt welds or electrofusion joints shall be used for the inground pipes.

Connection to Bentley Campus main shall be via polyethylene PE100 PN 16 minimum injection-moulded reducing tee with extended spigots and PN16 Synoflex couplers to suit.

Copper (minimum Class Type A) pipes and fittings shall be used for the above ground pipes, i.e. the connection to the Utility Meter. In-ground copper pipes shall be wrapped in protective tape.

Victaulic steel piping compliant with AS2419.1 shall be used for above ground pipes which may be subject to fire.

7.17.5. NATURAL GAS SERVICE PIPES

Polyethylene PE100 PN 16 minimum pipes and fittings with butt welds shall be used for the inground pipes.

Connection to Bentley Campus main shall as a minimum comply with ATCO's requirements.

Copper (minimum Class Type A) pipes and fittings shall be used for the above ground pipes, i.e. the connection to the Utility Meter. In-ground copper pipes shall be wrapped in protective tape.

8. COMMUNICATIONS INFRASTRUCTURE

8.1. CURTIN COMMUNICATIONS PASSIVE INFRASTRUCTURE

The existing Curtin Communications Passive Infrastructure 1 ('CCPI1') is a passive fibre-ready pit and conduit network providing multiple cable pathways and spaces used to distribute Curtin's core network cabling (fibre and copper) campus wide. The Developer connects to this network so Curtin Managed Network Equipment ('CU MNE') as listed below can interface with Curtin's systems:

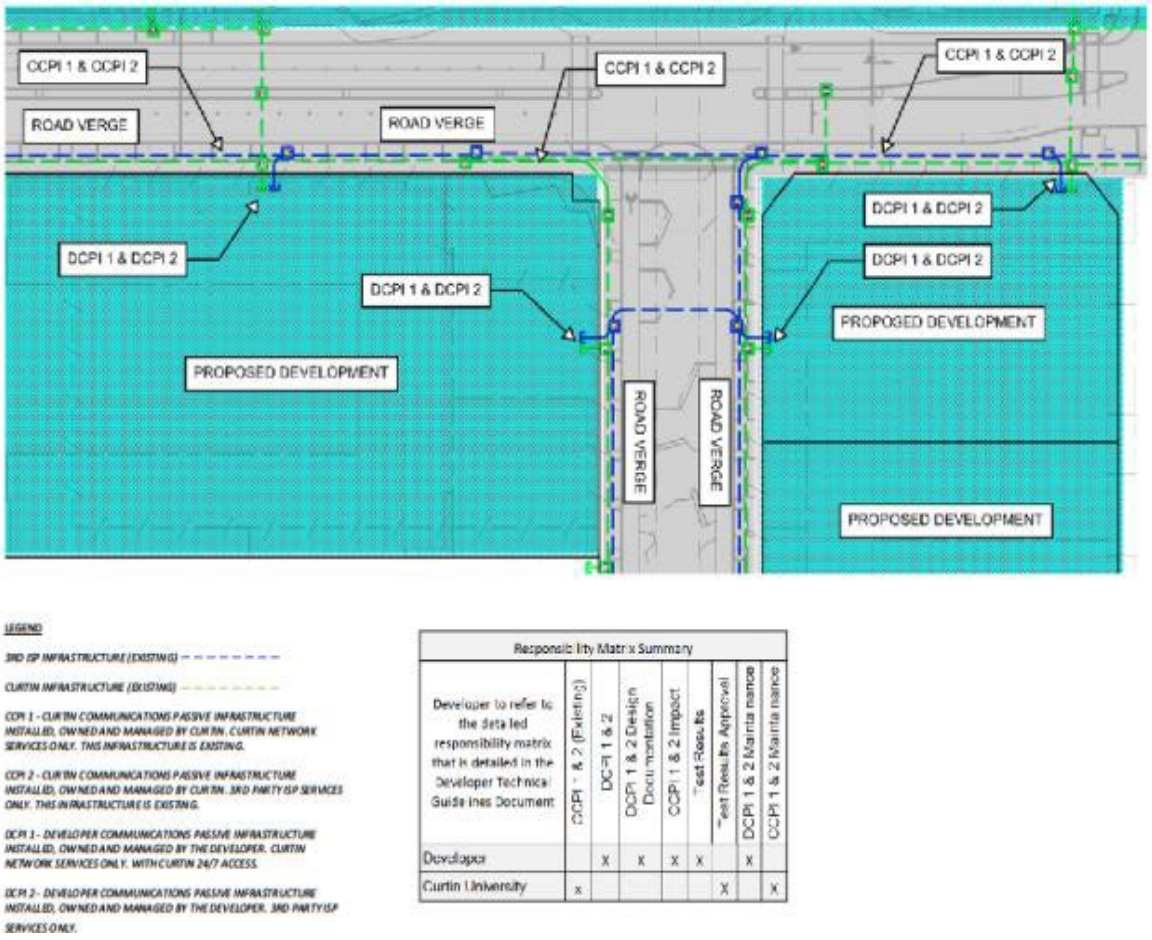
- Gallagher Access Control systems for access to plant rooms
- External perimeter meter CCTV cameras and any other CCTV camera approved for installation by Curtin and the Developer
- All utility metering devices and gateways
- Fire Indicator Panels and Direct Brigade Alarm
- Any other network interfaced equipment as agreed to by Curtin and the Developer at time of development

The other existing Curtin Communications Passive Infrastructure 2 (CCPI2) is a passive fibre-ready pit and conduit network providing multiple cable pathways and spaces used to distribute telecommunications-grade services provided by Internet Service Providers ('ISP's') campus wide. New Development lot internet service pathways must connect to CCPI2. ISP's presence on campus using CCPI2 are located in Curtin's campus data centres. Any plan to deviate from this arrangement must be agreed by Curtin at concept inception.

CCPI1 and CCPI2 facilitate the interconnection between Curtin's boundary (ISP point of entry/connection with a minimum two locations and diverse paths) and a nominated point of presence for the development lot which can then be connected to the Developer's communications passive infrastructure (DCPI). The DCPI and any interconnections are the responsibility of the Developer.

Curtin manage, maintains and operates CCPI1 and CCPI2 which are located along the road verges and within the common services easements throughout the Campus. Requirements for common services easements are depicted in **Figure 10** below:

Figure 10 – COMMUNICATIONS PASSIVE INFRASTRUCTURES



Curtin's standard communication enclosure is a dedicated communication room integrated within the built form that meets ISO 27001 standards and Curtin project delivery guideline *Data Communication Cabling Requirements reference section,* contained at https://properties.curtin.edu.au/working-with-us/guidelines/.

8.2. ROLES AND RESPONSIBILITIES

Table 10 - Communications Roles and Responsibilities

Role	Curtin Responsibility	Developer Responsibility
Determine communications requirements including ISP provider		X
Design internal lot infrastructure and connections to Curtin network		X
Assess Design and point of connection	X	

Select Preferred Contractor		X
Order active switch and associated peripherals	X	
Pre-approval of network connection	X	
Grant Access and Permits	X	
Physical connection to existing Curtin Infrastructure		X
Costs for connection to network		X
Maintenance of Curtin owned network	X	
Developer organises testing and commissioning and Curtin attendance		X
Attends commissioning and connection	X	
Provide fibre and data cabling test results		X
Patch services and install active switch	X	
Developer notifies of outages for planned works, and Curtin reviews comms content and scope before issue.	X	X

8.3. DEVELOPER SCOPE AND REQUIREMENTS

The Developer's Communications Passive Infrastructure (DCPI) must comprise of a minimum of two independent passive networks providing multiple cable pathways and spaces. For naming simplicity, the Developer's infrastructure is named DCPI1 despite it consisting of the two independent networks.

DCPI1 is managed, operated and maintained by the Developer to the point of intersection to Curtin CCPI1 and CCPI2 infrastructure. These systems shall be used to distribute the following systems:

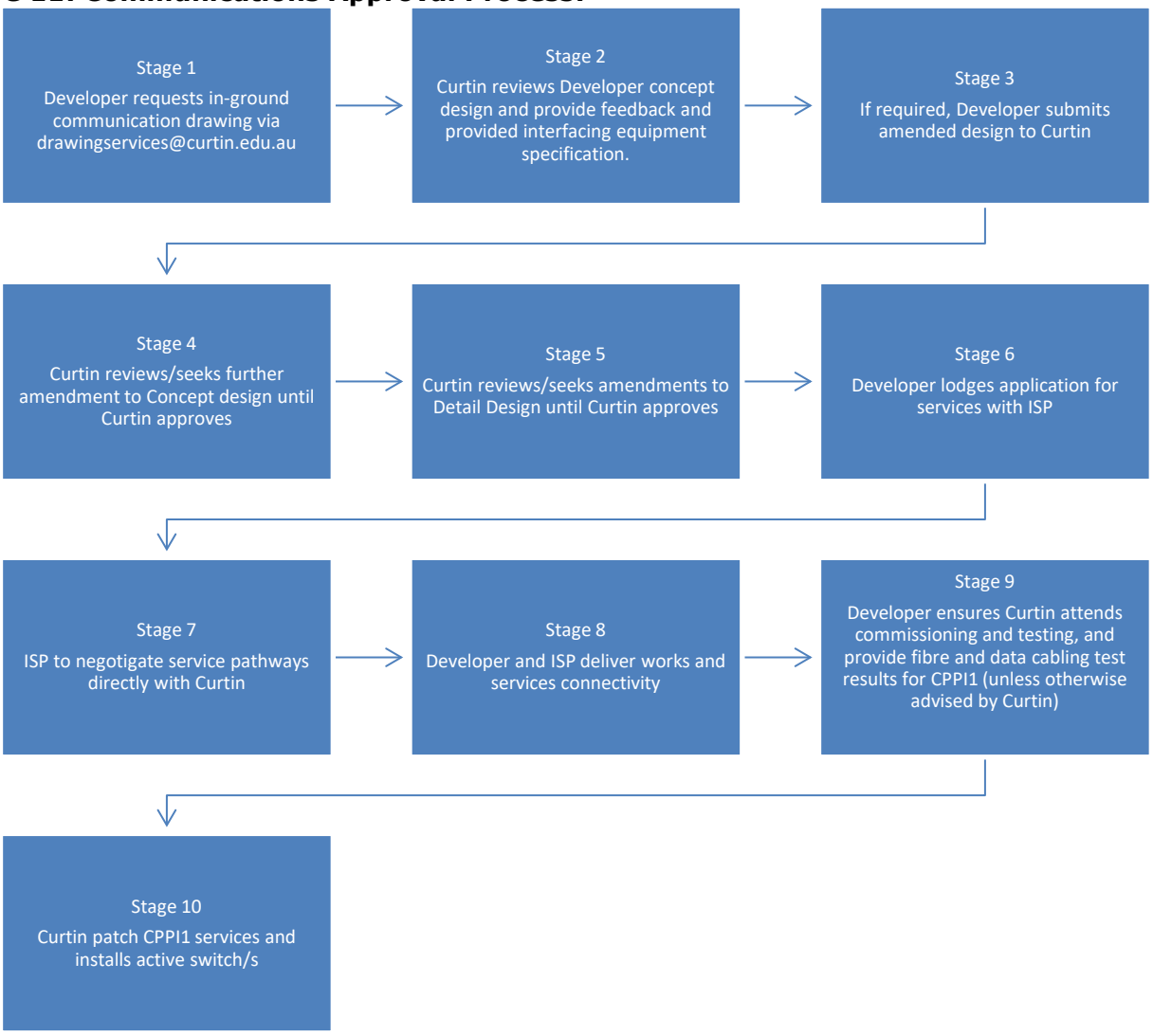
- For CPPI1, the Developer must supply and install two 100 mm diameter conduits to connect DCPI to the existing CCPI1. One of the conduits is required for business continuity reasons. Dedicated service pits must be installed every 50 metres and every change in direction.

- For CCPI2, which connects the development's independent ISP network (fibre and copper), the Developer must supply and install two 100 mm diameter conduits to facilitate external service provider lead-in conduits. Dedicated service pits must be installed every 50 metres and every change in direction.

The Developer must build an easily accessible dedicated communication room that is integrated within their built form to house the termination of equipment requiring a Curtin interface. Curtin's 24/7 access requires connection with Curtin's security system (currently Cardax Gallagher Access Control)

The Developer must liaise with the CNC to determine if there is a rare and exceptional circumstance triggered by development setbacks and the perimeter location and the lot size that means Curtin may consider if a CEC is suitable. The dedicated communication room access requirements apply to a CEC if this is approved by Curtin as its sole discretion.

Figure 11: Communications Approval Process:



8.4. CURTIN NETWORK CONNECTIVITY STANDARD

This will include but is not limited to:

- a fibre-optic cable (SMOF including a minimum of 4 pairs of spare core capacity) connected back to Curtin campus network, supplied and installed by Developer to facilitate connection to Curtin-supplied active network equipment. All Curtin equipment shall remain physically separated and secured from the developer's equipment and 24/7 access provided to Curtin and its staff.
- 2 * 48 RU equipment rack
- a fibre FOBOT, supplied and installed by Developer in accordance with relevant Australian standards
- A dedicated Cat 6A shielded copper structure cabling system that will connect CU-MNE to the Curtin private dedicated network, supplied and installed by Developer in accordance with relevant Australian standards
- a Curtin network managed switch(s), supplied and installed by Curtin.
- Communication Enclosure power, earthing and cooling requirements, supplied and installed by Developer in accordance with Australian standards.
- All fibre and copper shall be reticulated in protective cabling containment, which shall be sized to meet Australian Standards and cable requirements.
- Pits, conduit, fibre, FOBOTs, enclosures and power will be the responsibility (supply and installation) of the Developer. Media converters will be purchased and programmed through Curtin.

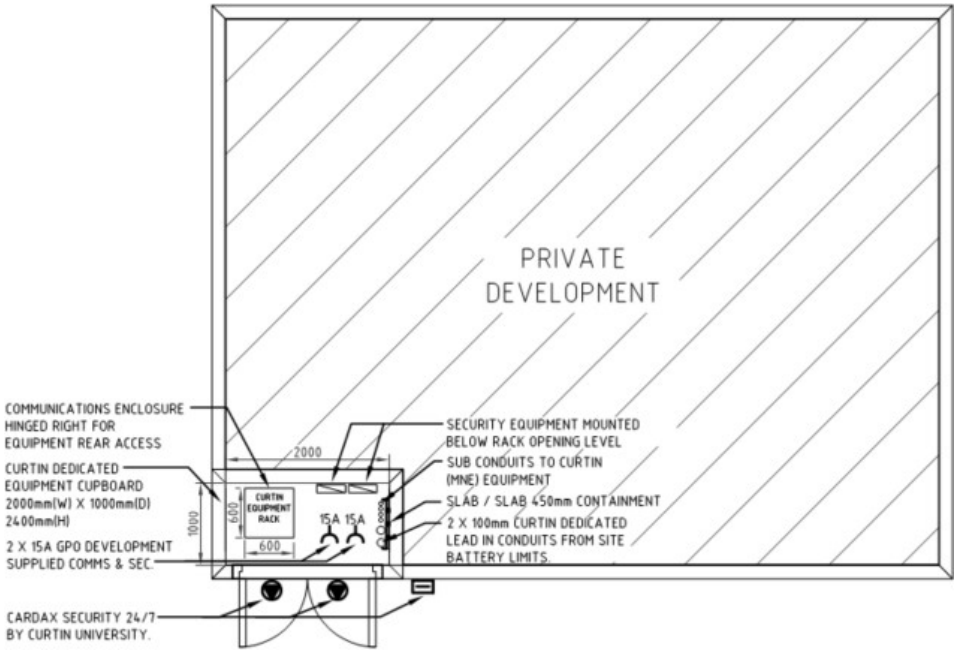
The communications room / enclosure space shall also be used to house dedicated security equipment, utility metering loggers and gateways managed by Curtin. Developers are to refer to the Security section (Section 10) of these Developer Technical Requirements for further information.

The specification for all Curtin interfacing equipment and infrastructure will be confirmed at concept design.

8.5. STANDARD CONFIGURATION FOR A CURTIN DEDICATED COMMUNICATION ROOM

Please refer to Figure 12 below:

Figure 12 – Communications Standard Development Configuration



8.6. CURTIN NETWORK CONNECTIVITY – SHARED DEVELOPMENT

Curtin requires a dedicated private fibre-optic campus network interconnection into buildings or developments where Curtin is a tenant. The delivery of this is the responsibility of the Developer. This Curtin dedicated private point of connection shall be provided at a minimum in a building dedicated/shared entrance facility (EF) or main distribution facility room (MDF) within the development.

All Curtin dedicated communications room must include the following but shall not be limited to:

- the dedicated communication rooms shall be sized in accordance with the Curtin building occupancy percentage. The minimum required shall include a dedicated lead-in conduit provided to this location.
- a fibre-optic cable connected back to the Curtin campus network, supplied and installed by the Developer
- a fibre FOBOT, supplied and installed by the Developer
- a dedicated Cat 6A shielded copper structure cabling system that will connect all CU-MNE to the Curtin private dedicated network, supplied and installed by the Developer
- a Curtin network managed switch(s), supplied and installed by Curtin
- Power, earthing and cooling requirements, supplied and installed by the Developer.
- all Curtin equipment shall remain physically separated and secured from building/tenant equipment.
- A dedicated private network connection (dark fibre) that will be connected between the Curtin dedicated communication room within the development

EF/MDF and Curtin's data centre so network connected assets can be monitored managed and operated by Curtin.

- A dedicated copper connection that will connect Curtin's dedicated enclosure (within the development's EF/MDF) and Curtin's network campus data centre/RDH – Library Building – Curtin's approved PSTN/analogue services exchange. This service is provided to facilitate Curtin analogue connectivity, i.e. essential fire, security and lift remote management, monitoring and control (MNE).
- Approved access and interconnection will be required between Curtin's network equipment located in the dedicated/shared EF/MDF room and the development's communications integrated backbone and horizontal structured cabling system. This approved interconnection shall facilitate connectivity between Curtin network equipment and the development's field devices and equipment (MNE).
- Fibre-optic/CAT 6A shielded system ties shall be provided between the Curtin dedicated equipment cabinet and the Developer's passive structured cabling equipment cabinet to facilitate Curtin network connectivity to CU-MNE located throughout the development.
- Pits, conduit, fibre, FOBOTs, enclosures and power will be the responsibility (supply and installation) of the Developer. Network active equipment will be purchased and programmed through Curtin.

8.7. THIRD-PARTY INTERNET SERVICE PROVIDER

The Developer is solely responsible for all ISP services, contract/s, and works including.

- Paying or making good any damage to Curtin in-ground or above-ground assets and infrastructure and wholesale telecommunications ISP services caused by their development works.
- selecting a regulated and licenced telecommunication/internet services provider/wholesaler.
- ensure there is no disruption to Curtin's communication services under any circumstances.

8.8. COMMISSIONING, MANAGEMENT AND ACCEPTANCE OF CURTIN EQUIPMENT

All equipment that will be managed and operated by Curtin within the Developer's area requires testing in accordance with the relevant Australian Standards for the equipment and equipment class prior to it being transferred to Curtin ownership.

Curtin will be present for all commissioning and testing on CPPI1. All commissioning and testing documents must be provided to Curtin as part of the Developer's hand over process.

All testing shall be completed in accordance with Australian Standards and these Development Technical Requirements.

If commissioning and/or testing documentation is inaccurate, incomplete or cannot be validated, Curtin will not accept handover and require the Developer to remediate as instructed. Curtin will not accept handover if the dedicated communications room is untidy, unclean or inaccessible..

9. MECHANICAL INFRASTRUCTURE

9.1. SYSTEM OVERVIEW

The existing Academic Heart chilled and heating water system is designed and sized to only accommodate the needs of Curtin's Academic Heart and does not have capacity to support third party development.

Therefore, third party developments must provide their own air conditioning solutions but must achieve specified energy consumption targets if specified by Curtin.

9.2. ROLES AND RESPONSIBILITIES

Table 11 - Mechanical Roles and Responsibilities

Role	Curtin	Developer
Determine mechanical requirements		X
Design internal lot infrastructure		X
Liaise with CNC if Curtin mechanical requirements identified e.g. comms room.		X

10. SECURITY SERVICES INFRASTRUCTURE

10.1. SECURITY SYSTEM OVERVIEW

Curtin has two main systems:

1. the Security Management System (SMS) and
2. the Digital Video Management System (DVMS).

The Curtin SMS integrates all electronic security infrastructure, including Access Control Systems (ACS), Intrusion Detection and Alarm Systems (IDS), and IP Intercom Systems, referred to as Curtin Campus Assistance Points (CAP). The SMS and the DVMS integrate to trigger the CCTV response in the event of an incident.

10.2. NETWORK OVERVIEW

All security systems rely on the Curtin Local Area Network (LAN) to provide security infrastructure with the physical link between field devices and the control equipment, servers and monitoring systems.

The cabling system is the physical link between the active network equipment, such as routers, switches and hubs; and terminal equipment such as network interface cards and telephones. Usually a structured cabling system (SCS) comprises unshielded/shielded twisted pair (UTP or F/UTP) cable or optical fibre cable, or a combination of both.

To facilitate the day-to-day operations of the devices that form the Security Management System or Digital Video Management System, the installed network must be designed and installed in accordance with the requirements specified in this document in the section *Communication Infrastructure* (Section 8).

10.3. CURTIN SECURITY EQUIPMENT AND CONNECTING TO CURTIN

Two development scenarios are considered in Table 12. The below Curtin Security Equipment List applies to both development scenarios.

Discussion about Curtin's security requirements, design and the below Curtin Security Equipment List is invited during the Developer's concept design stage.

The Curtin Security Equipment List and associated Requirements are noted as follow:

1. Curtin will procure and the Developer must install Curtin's CCTV on the façade of any building where there is minimal set back from the boundary and/or where Curtin identifies a CCTV camera is required to appropriately protect public safety.
    a. Curtin will supply the Developer with the necessary specifications at concept design.
    b. Curtin will liaise with the Developer to determine where and how to install a Curtin CCTV camera post practical completion if required to protect public safety.
2. Curtin will procure and the Developer must install Curtin's CCTV in electrical plant rooms, Communication/server rooms, and Fire Rooms.

a. Curtin will supply the Developer with the necessary specifications at concept design.

3. Curtin will procure and the Developer must install Curtin Security Access devices and connection to any services plant rooms, risers or cupboards containing Curtin equipment e.g. communications rooms, electrical plant rooms, fire rooms including:

    a. electric lock, card reader, reed switch, door sounder, door closer or as specified during design;

4. Curtin will procure equipment as per 3a above and the Developer must install this equipment to ensure the main entry door (and other doors if required) has dual access control that connects the Developer's SMS and Curtin's SMS so that Curtin has access to dedicated services plant rooms or other spaces as agreed during design (e.g. the Developer's communication room).

5. Curtin will procure and the Development must install a Curtin data rack.

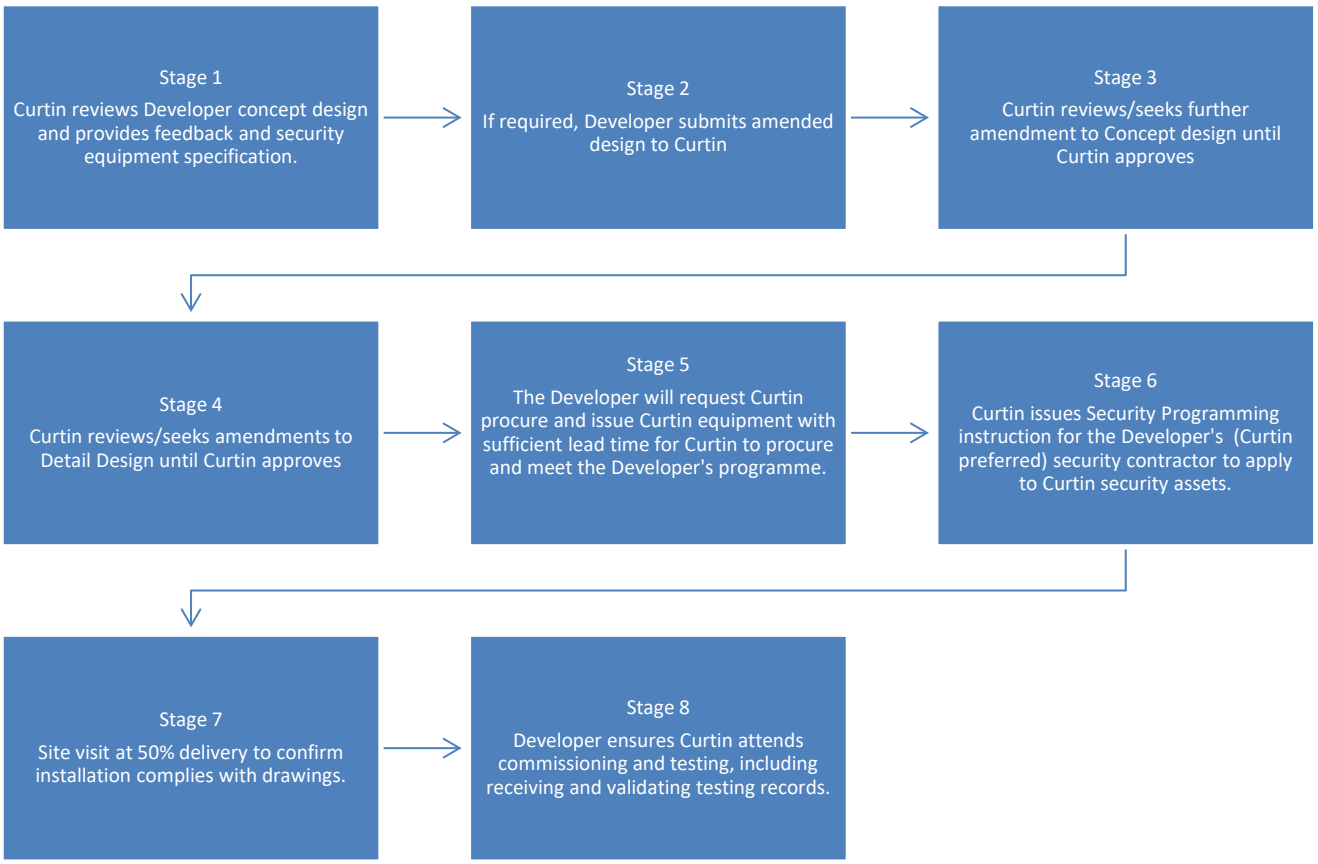
Table 12 - Security Infrastructure Connectivity Requirements by Development Scenario

Development Scenario	Developer Connection Requirements
Developer managed asset on Curtin land without Curtin as tenant	Include space for the installation of a Curtin network data rack which may be included in a Curtin communications room or in the Developer's communication rooms with the Developer allowing dual access to the Developer's communication room. Sharing of a split rack with separate security for Curtin and the Developer can be considered at concept design. And Design, document, procure and install all equipment and requirements listed in the Developer Technical Guidelines in this section.
Developer managed asset with Curtin as tenant	As above and Curtin tenancy requirements as per Security Design Standard (refer to Project Delivery Guidelines) and Security Infrastructure Specification (full access control/CCTV/Campus Assistance Points)

10.4. ROLES AND RESPONSIBILITIES

Developer is to refer to Figure 13 below which outlines the required process for implementation of security infrastructure:

Figure 13 – Security Infrastructure Implementation Process



Any development on Curtin's campus must ensure adequate security infrastructure coverage is attained for the campus as well as the Developer's building as per the Table 13 below.

Table 13 – Security Infrastructure Roles and Responsibilities

Role	Curtin	Developer
Design submission of internal lot security and interface with Curtin's public realm, including CCTV coverage, access control selection, alarm response selection and emergency access considerations.		X
Assess Design including proposed connectivity to Curtin security and emergency systems.	X	
Select preferred contractor		X
Grant Access and Permits	X	
Maintenance of security systems, hardware and network internal to development lot or premises		X
Maintenance of security network and devices servicing public realm (including if mounted on or at the development lot's perimeter)	X	
Attend 'commissioning' of Curtin security interfaces	X	
Notify of any outages for planned works	X	X

10.5. MAINTENANCE RESPONSIBILITY

Refer to Table 14 below that outlines the respective maintenance responsibility for security infrastructure:

Table 14 - Security Maintenance Roles and Responsibilities

Development Type	Curtin	Developer
Developer managed asset on Curtin land without Curtin as tenant	Maintenance, repair and monitoring of Curtin Security Equipment.	All security infrastructure and systems including third-party monitoring of the development for all internal and external areas excluding Curtin maintenance responsibility.
Developer managed asset with Curtin as tenant	Maintain and repair and monitoring of Curtin Security equipment and all Curtin security infrastructure within the Curtin tenancy.	All security infrastructure and systems including third-party monitoring of the development for all internal and external areas excluding Curtin maintenance responsibility.

11. LANDSCAPE AND OPEN SPACE DESIGN

11.1. GENERAL REQUIREMENTS

All Landscaping design must include the principles and requirements documented in Curtin's Living Knowledge Stream Design Guideline which provides direction regarding material and planting palettes, how to honour indigenous stories, water management typologies and design including swales, and plant species.

In addition, the Developer's design will interface and relate to the existing landscape themes/identity as expressed at the development's location.
With respect to open space design, Developers must match the existing materials and layouts of Curtin's newest streets and public realm interfaces to create a seamless public realm.

Historically Curtin's landscaping included exotics and non-native planting. Curtin now requires landscaping that is native or preferably of local provenance. However, protection and maintenance of Curtin's existing trees – including non-natives such as pine trees - is mandatory for all projects. In addition, the Developer must allow to relocate trees otherwise removed by the Developer's works if the species and condition permits.

All queries relating to landscape themes and design shall be directed to the CNC.
Whilst the selection of furniture or other public realm assets (e.g. games) are not strictly technical, these design elements will be also be evaluated when Landscaping and Open Space design drawings are submitted.

11.2. ROLES AND RESPONSIBILITIES

Please refer to Table 15 for details on the roles and responsibilities as it relates to Landscape and Open Space Design.

Table 15 - Landscape Roles and Responsibilities

Role	Curtin	Developer
Design submission of internal lot landscaping and interface with Curtin public realm, including irrigation demand and profile forecasts.		X
Submission of irrigation design certification		X
Design submission of landscaping external to development lot.		X
Assess Design and load forecasts.	X	
Select preferred contractor		X
Pre-approval of tree removals/relocations and infrastructure connection/impacts.	X	
Approval of landscape external to development lot	X	
Grant Access and Permits	X	
Maintenance of landscaping internal to development lot		X
Maintenance of Public Realm external to development lot	X	
Meter reading for irrigation / water	X	
Attends planting milestones and 'commissioning' of Curtin interface	X	
Notify of any outages for planned works	X	X

11.3. PLANT SELECTION AND DESIGN

The selection of species must include or respond to the following design elements that are part of the *Living Knowledge Stream Guideline*:

- they must be drought tolerant.
- add to the enjoyment and use of public realm amenity (whilst reducing the heat island effect) by providing shade canopy.
- add colour and beauty.
- facilitate the preservation of ecosystems and biodiversity at Curtin, such as the Carnaby Cockatoo.

Other specific design outcomes must include:

a. All substations, water tanks and industrial areas along busy road and pedestrian frontages must be screened with landscape elements.
    - These landscape elements must enhance scenic amenity and be a combination of canopy trees, screening shrubs and understory planting. Mounding can be used as part of the buffer to increase height and act as sound attenuation.

b. Crime prevention through environmental design (CPTED) principles must apply to all landscaping design so that safety and security is enhanced.
    - Landscaping must not offer concealment, visual obstruction of or climbing aids to persons seeking to undertake unlawful activities.

c. The preservation of safety and sightlines for multiple users
    - maintain sight distance for vehicle, cycle and pedestrian crossings and ensure head height sight clearance.
    - Pedestrian crossings must not be obscured by tree placement.
    - Any obstructions immediately adjacent to accessible paths of travel must conform to Curtin's *Disability and Inclusion Plan.*
    - Sightlines in roundabouts must be maintained to satisfy Department of Main Roads Standards.

      The setback of trees or artwork from the road edge must be located outside clear zone requirements and must comply with the Department of Main Roads Standards.

d. The inclusion of street furniture and related assets (e.g. games, umbrellas etc) that:
    - Integrate with the landscaping theme and material palette
    - Contribute to creating destinational appeal by providing people:
        - somewhere to comfortably stop, pause, sit, relax…perhaps recline?
        - Offering them small moments of fun by creative selection of furniture, games, lighting or play equipment.

11.4. EROSION AND SEDIMENT CONTROL

Control measures are required during both the construction phase and maintenance phase to prevent the erosion, siltation and pollution of adjacent lands, watercourses and downstream pipe drains.

Drawings submitted for all developments must include details of erosion and sediment control measures.

Sediment control devices, water flow directions and discharge locations must be included in landscape drawings or by specific reference to the civil works drawing number.

11.5. IRRIGATION

Curtin holds a *License to Take Water* with the Department of Water & Environmental Regulation (DWER) and Curtin complies with the set limit. There is no headroom available for development lots.

Therefore, Developers are not permitted to connect into Curtin's Curtin bore or irrigation network. They must allow for their own water capture infrastructure, use of recycled water or scheme water supply.

An irrigation design that has been completed by a certified irrigation designer must be submitted to the CNC for written approval prior to construction.

Spraying patterns of sprinklers must be designed so that paths or roads do not have water spray onto them and do not produce potential health and safety risks.

Irrigation should be designed with hydro zoning in place.

Developers must refer to the Department of Water and Environmental Regulation for relevant watering restrictions and applicable watering days.

11.6. LANDSCAPE MAINTENANCE

Landscape design must incorporate all requirements for ongoing maintenance to be undertaken by an experienced contractor. Landscaping must be maintained to the same standard as the campus landscape.

11.7. SERVICE PITS IN THE PUBLIC REALM

Please refer to Section 5.5 of this document.

12. CIVILS

12.1. DISPOSAL OF CLEARED MATERIAL

The developer will be responsible to dispose of all excavated material off-site at the developer's expense.

12.2. TEMPORARY DEWATERING & SEDIMENT

The developer shall provide equipment and facilities to make and keep the development area dry of both surface and sub-surface water and to remove sediments from water before it leaves the development lot area.

12.3. STORMWATER RETENTION

Developers shall allow for all stormwater to be contained on site with design rainfall intensities based on AEP 1% (ARI 100 years). Overland flood paths are to be designed for discharge off site to the University road drainage system. Overland flood path design flows are to be submitted to Curtin for review and approval.

13. APPENDICES

Appendix A – Planning Documents Summary

Appendix B – Power Supply Arrangements

Appendix C – Other Electrical Documents

Appendix D - Hydraulic Application Forms

Appendix E – Handover Certificate

13.1. APPENDIX A CURTIN DOCUMENTS AND GUIDELINES

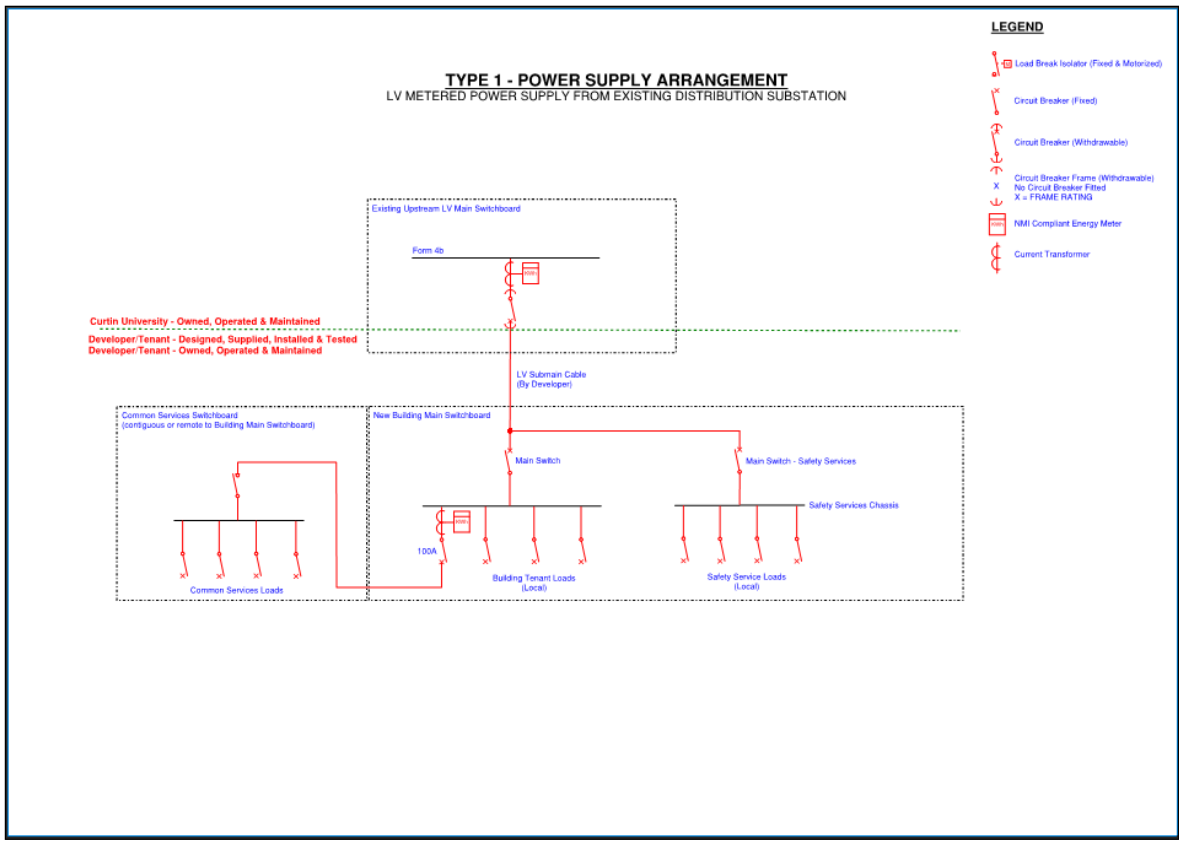
Documents referenced in the Development Technical Requirements can be accessed using the link below.

https://properties.curtin.edu.au/working-with-us/

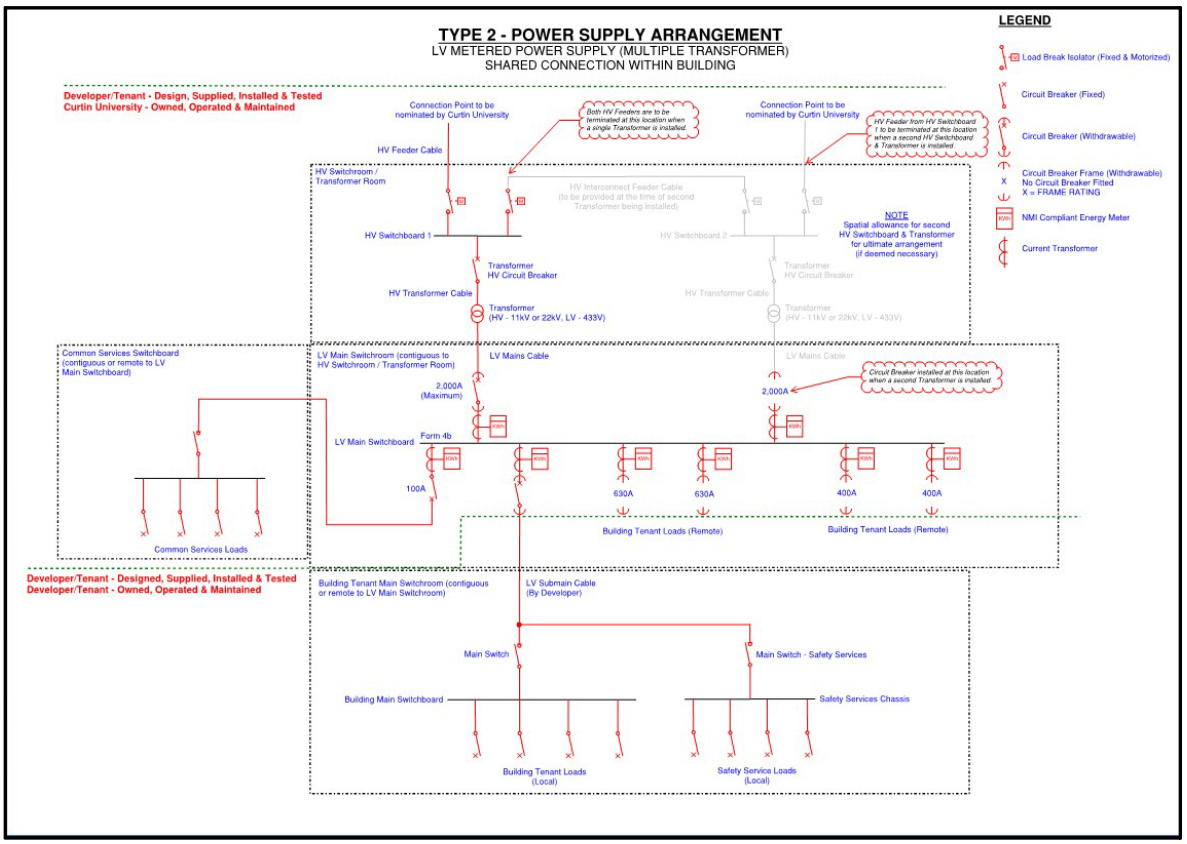
This link also contains planning and project documents used by Curtin to deliver their own developments. These are available for reference noting the Development Technical Requirements have primacy unless the CNC confirms a departure in writing.

13.2. APPENDIX B – POWER SUPPLY ARRANGEMENTS

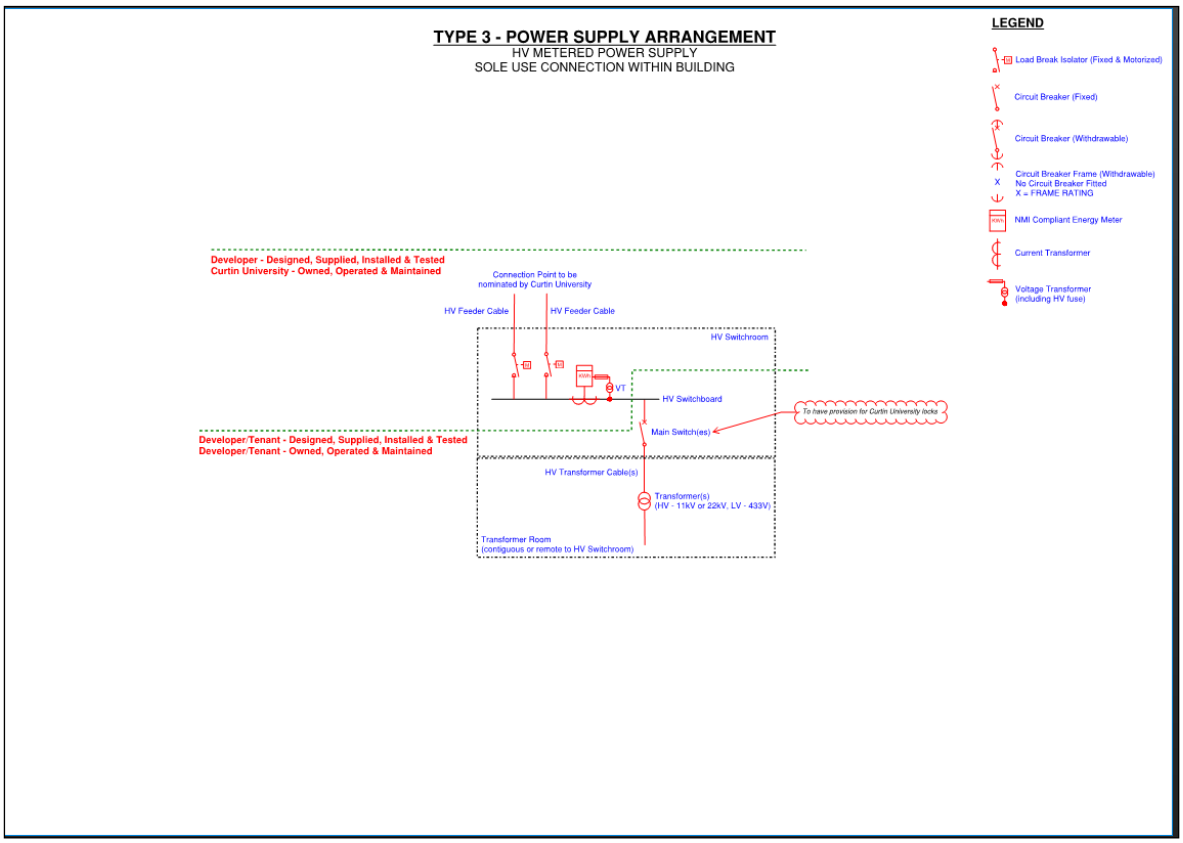
Type 1 – LV Metered Power Supply from Existing Distribution Substation



Type 2 – LV Metered Power Supply (Multiple Transformer) Shared Connection Within Building



Type 3 – HV Metered Power Supply Sole Use Connection Within Building



13.3. APPENDIX C – POWER SUPPLY APPLICATION FORM

Power Supply Application Form

Contact Details

Developers Name _____

Title _____

Given Name(s) _____

Family Name _____

Email Address _____

Contact Number _____

ABN _____

Address _____

Electrical Consultant / Electrical Contractor

Business / Company Name _____

Electrical Licence Number _____

Address _____

Contact Person _____

Contact Number Email _____

Connection Details□

Temporary Supply □

New Permanent Supply □

Upgrade Existing Supply Power Supply □

Arrangement:

□ Type 1 □ Type 2 □ Type 3 □ Other

Maximum Demand (kVA):

Method used to estimate load: □ AS/NZS 3000 □ Volt amps (VA)/m^2 □ Other

Type of Network Connection

□ Domestic □ Commercial □ Other :

□ Multi Residential □ Industrial

13.4. APPENDIX D – HYDRAULIC APPLICATION FORMS

13.4.1. DEVELOPER APPLICATION FOR POTABLE WATER AND FIRE WATER SERVICE CONNECTIONS

UNIVERSITY LOT NUMBER_____

PROJECT NAME IF APPLICABLE_____

DEVELOPER NAME

_____

ABN_____

ADDRESS_____
_____CONTACT_____PHONE_____
_____

STATE TYPE OF PROPOSED DEVELOPMENT_____

_____

_____

ESTIMATED START DATE_____

ESTIMATED CONSTRUCTION COST_____

ESTIMATED COMPLETION DATE_____

WATER SUPPLY REQUIREMENTS

METER SIZE_____FLOW RATE _____L/MIN

WATER SERVICE ESTIMATED ANNUAL CONSUMPTION_____Kilolitres

FIRE SERVICE SUPPLY REQUIREMENTS

BOUNDARY CONNECTION SIZE _____

FLOW RATE L/MIN _____

SERVICE LOCATIONS – DEVELOPER TO SUBMIT APPLICATION WITH UNIVERSITY SITE INFRASTRUCTURE BASE PLAN INDICATING FIRE AND WATER SERVICE BOUNDARY CONNECTIONS.

IRRESPECTIVE OF THE CURRENT PRESSURE VALUES, THE DEVELOPER SHALL NOT RELY UPON STATIC PRESSURE GREATER THAN 15 METRES HEAD AT:
EACH OF WATER CORPORATION's FLOW METERS (POTABLE WATER SERVICE) AND
EACH OF THE UNMETERED CONNECTIONS TO WATER CORPORATION's MAINS (UNBOOSTED FIRE WATER SERVICE)

13.4.2. DEVELOPER APPLICATION FOR SEWER CONNECTION

UNIVERSITY LOT NUMBER_____

PROJECT NAME IF APPLICABLE_____

DEVELOPER
NAME_____ABN_____

ADDRESS_____

CONTACT_____PHONE_____

STATE TYPE OF PROPOSED DEVELOPMENT_____
ESTIMATED START DATE_____

ESTIMATED CONSTRUCTION COST_____

ESTIMATED COMPLETION DATE_____

WASTE WATER REQUIREMENTS

NUMBER OF EXISTING TOILETS _____

NUMBER OF EXISTING TOILETS REMOVED _____

NUMBER OF ADDED TOILETS _____

ESTIMATED WASTEWATER DISCHARGE_____%

WILL THIS PROJECT REQUIRE AN INDUSTRIAL WASTE APPLICATION__Y/N

IF YES PLEASE ATTACH COPY OF COMPLETED INDUSTRIAL WASTE APPLICATION.

13.4.3. DEVELOPER APPLICATION FOR NATURAL GAS CONNECTION

UNIVERSITY LOT NUMBER_____

PROJECT NAME IF APPLICABLE_____

DEVELOPER NAME_____ABN_____

13.4.4. DEVELOPER APPLICATION FOR OVERLAND FLOOD PATH RUNOFF

UNIVERSITY LOT NUMBER_____

PROJECT NAME IF APPLICABLE_____

DEVELOPER
NAME_____ABN_____

ADDRESS_____

CONTACT_____PHONE_____

STATE TYPE OF PROPOSED DEVELOPMENT_____
ESTIMATED START DATE_____

ESTIMATED CONSTRUCTION COST_____

ESTIMATED COMPLETION DATE_____

OVERLAND FLOOD PATH REQUIREMENTS

SUBMIT PLAN SHOWING POINT OF OVERLAND FLOOD PATH DISCHARGE

FROM DEVELOPMENT LOT: _____

PROVIDE ESTIMATE OF DISCHARGE FLOW RATE: _____

ADDRESS_____

CONTACT_____PHONE_____

STATE TYPE OF PROPOSED DEVELOPMENT_____

_____

_____

_____ESTIMATED START DATE_____

ESTIMATED COMPLETION DATE_____

REQUESTED PRESSURE ----- --1.25 KPA_____2.75KPA_____OTHER_____

WHAT APPLIANCES WILL BE CONNECTED

NUMBER	MJ/HR	APPLIANCES
		STORAGE HOT WATER SYSTEM
		CONTINUOUS HOT WATER SYSTEM
		POOL/SPA HEATER
		COOKTOP/OVEN
		MECHANICAL BOILER
		ROOM HEATER FLUED
		BAYONET POINT – INTERNAL HEATER
		BAYONET POINT – EXTERNAL (BBQ)
		OTHER

TOTAL MJ/hr _____

TOTAL DIVERSIFIED LOADING MJ/HR _____

METER SIZE------- AL6_____AL12_____OTHER_____

SERVICE LOCATIONS – DEVELOPER TO SUBMIT APPLICATION WITH UNIVERSITY SITE INFRASTRUCTURE BASE PLAN INDICATING GAS METER AND SERVICE BOUNDARY CONNECTION.

13.5. APPENDIX E - HANDOVER CERTIFICATE

Project Title: _____

Location:

As of date: _____ and time: _____

the: _____

_____

(Apparatus being handed over)

which has previously been controlled by: _____

(Company Name)

is now handed over to Curtin with the following exceptions and comments:

_____

_____

_____

_____

_____

Any further work on the apparatus can only be carried out with the permission from the appropriate Curtin representative and subject to the issue of appropriate work permits.

Handed over by: _____(sign)

Accepted by: _____(sign)

Required Attachments

- □ HV Submission
- □ Completion Notices
- □ Operation & Maintenance Manual
- □ Commissioning Reports
- □ As Constructed Drawings
- □ Surveyor Drawings