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## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus</td>
<td>Curtin University’s Bentley Campus</td>
</tr>
<tr>
<td>CMD</td>
<td>Contract Maximum Demand</td>
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<tr>
<td>CNC</td>
<td>Curtin Nominated Contact</td>
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<tr>
<td>CUIM</td>
<td>Curtin University Infrastructure Manager</td>
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<td>CWS</td>
<td>Central Water Service</td>
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<tr>
<td>DBYD</td>
<td>Dial Before You Dig</td>
</tr>
<tr>
<td>Developer</td>
<td>Includes contractors, designers, consultants and other specialists</td>
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<tr>
<td>DFES</td>
<td>Department of Fire and Emergency Services</td>
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<tr>
<td>DN</td>
<td>‘Diameter Nominal’</td>
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<tr>
<td>DWS</td>
<td>Drain, Waste and Vent</td>
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<tr>
<td>EWIS/OWIS</td>
<td>Emergency Warning and Intercommunication System</td>
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<tr>
<td>ERAWA</td>
<td>Economic Regulation Authority Western Australia</td>
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<tr>
<td>FOBOT</td>
<td>Fibre-optic Break-out Terminal/tray</td>
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<tr>
<td>Greenstar</td>
<td>GBCA Greenstar Communities Rating</td>
</tr>
<tr>
<td>HV</td>
<td>High Voltage</td>
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<tr>
<td>LV</td>
<td>Low Voltage</td>
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<tr>
<td>LWMS</td>
<td>Local Water Management Strategy</td>
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<tr>
<td>NCC</td>
<td>National Construction Code of Australia</td>
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<tr>
<td>NPER</td>
<td>National Professional Engineering Register</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory control and data acquisition</td>
</tr>
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<td>UWMP</td>
<td>Urban Water Management Plan</td>
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<td>VC</td>
<td>Vitrified Clay</td>
</tr>
<tr>
<td>WADCM</td>
<td>Western Australian Distribution Connections Manuals</td>
</tr>
<tr>
<td>WAER</td>
<td>Western Australian Electrical Requirements</td>
</tr>
</tbody>
</table>
CONTENTS

GREATER CURTIN ............................................................................................................. 1
CURTIN UNIVERSITY BENTLEY CAMPUS ................................................................. 1
CONTENTS ......................................................................................................................... 4

1. INTRODUCTION ........................................................................................................... 11
  1.1 CONTEXT .................................................................................................................. 11
    1.1.1 THE LOCATION ................................................................................................. 11
    1.1.2 PLANNING DOCUMENTS ............................................................................... 11
    1.1.3 PROCESS, TIMING AND APPROVALS ......................................................... 12

2. REQUIREMENTS FOR WORKING AT CURTIN UNIVERSITY .14
  2.1 CURTIN UNIVERSITY CONTACT ....................................................................... 14
  2.2. EXAMINATION PERIODS & SPECIAL EVENTS ............................................... 14
  2.3 NORMAL WORKING HOURS .................................................................................. 14
  2.4 SITE AND SET OUT DETAILS .............................................................................. 14
  2.5 OTHER CONSTRUCTION WORKS ........................................................................ 15
  2.6 COMPANY REGISTRATION AND INDUCTIONS .............................................. 15
  2.7 SITE SPECIFIC INDUCTION ................................................................................ 15
  2.8 CONSTRUCTION MANAGEMENT PLANNING AND IMPLEMENTATION ............... 16
    2.8.1 DOCUMENTS .................................................................................................. 16
    2.8.2 CONSTRUCTION MANAGEMENT PLAN .................................................... 16
    2.8.3 ENVIRONMENTAL MANAGEMENT PLAN ................................................ 17
    2.8.4 SAFETY MANAGEMENT PLAN ..................................................................... 17
  2.9 MANAGEMENT OF WORKS .................................................................................... 17
    2.9.1 SITE MANAGEMENT ....................................................................................... 17
    2.9.2 SITE FACILITIES ............................................................................................ 18
    2.9.3 DILAPIDATION SURVEY ............................................................................... 19
    2.9.4 PROTECTION OF PERSONS AND PROPERTY .......................................... 19
    2.9.5 MANAGEMENT OF ACTIVITIES OUTSIDE SITE BOUNDARY .................... 20
  2.10 COMMUNICATIONS ............................................................................................... 20
    2.10.1 SITE SIGNAGE .............................................................................................. 20
    2.10.2 COMMUNICATIONS PLAN ........................................................................... 21
    2.10.3 CURTIN UNIVERSITY OPERATIONS MANAGEMENT GROUP ................... 22
2.11 ROADS AND TRAFFIC MANAGEMENT ................................................................. 22
2.12 SITE SERVICES .................................................................................................... 23
  2.12.1 USE OF EXISTING SERVICES ....................................................................... 23
  2.12.2 PROTECTION OF SERVICES ......................................................................... 23
  2.12.3 VERIFICATION OF EXISTING SERVICES ...................................................... 24
  2.12.4 WORKS REQUIRING PERMITS, APPROVALS AND LICENCES .................... 24
2.13 DOCUMENTATION ............................................................................................... 24

3. ENVIRONMENTAL REQUIREMENTS ................................................................. 26
  3.1 ASBESTOS .............................................................................................................. 26
  3.2 NOISE AND VIBRATION ...................................................................................... 26

4. SAFETY AND HEALTH REQUIREMENTS ....................................................... 28
  4.1 SAFETY IN DESIGN ............................................................................................. 28
  4.2 THIRD PARTY SAFETY AUDITS .......................................................................... 28
  4.3 HAZARD / INCIDENT / INJURY REPORTING ...................................................... 28
  4.4 EMERGENCY MANAGEMENT ............................................................................. 29

5. INFRASTRUCTURE SERVICES .......................................................................... 30
  5.1 GENERAL ............................................................................................................. 30
  5.2 GENERAL DESIGN REQUIREMENTS .............................................................. 30
  5.3 CAMPUS UTILITY METERING .......................................................................... 31
  5.4 CURTIN PREFERRED CONTRACTORS ............................................................. 32
  5.5 CURTIN HANDOVER AND TRAINING ............................................................. 32

6. ELECTRICAL GUIDELINES ................................................................................. 33
  6.1 SYSTEM OVERVIEW ......................................................................................... 33
  6.2 POWER SUPPLY ................................................................................................ 33
  6.3 ROLES AND RESPONSIBILITIES ....................................................................... 34
  6.4 POWER SUPPLY ARRANGEMENT .................................................................. 35
  6.5 COMMON SERVICES & PUBLIC REALM .......................................................... 35
  6.6 RESERVING AND RELINQUISHING CAPACITY ............................................... 35
  6.7 POWER SUPPLY APPLICATION ...................................................................... 36
  6.8 CONNECTING TO EXISTING INFRASTRUCTURE ............................................. 37
  6.9 DISRUPTION TO SUPPLY ................................................................................ 37
  6.10 SUPPLY APPLICATION PROCESS OBLIGATIONS ......................................... 38
  6.11 TIMEFRAME FOR INITIAL ASSESSMENT ..................................................... 38
6.12 HIGH VOLTAGE SUBMISSIONS ............................................................. 39
6.13 HEADWORKS CHARGES ................................................................. 40
6.14 GROUND BREAKING WORKS ............................................................ 40
6.15 ELECTRICAL SUBSTATIONS ............................................................. 40
   6.15.1 LOCATION ........................................................................... 40
   6.15.2 ACCESS .............................................................................. 40
   6.15.3 OWNERSHIP AND RESPONSIBILITIES ................................... 40
   6.15.4 HIGH VOLTAGE ................................................................. 41
   6.15.5 STAND-BY BACKUP GENERATORS ....................................... 41
6.16 FIRE DETECTION (DRY FIRE) ............................................................ 41
   6.16.1 GENERAL PRINCIPLE ......................................................... 41
6.16.2 BUILDING-INTEGRATED SUBSTATION ....................................... 42
   6.16.3 STANDALONE SUBSTATION ................................................. 42
6.17 EMERGENCY LIGHTING ................................................................. 42
   6.17.1 GENERAL PRINCIPLE .......................................................... 42
6.17.2 STANDALONE AND BUILDING-INTEGRATED SUBSTATION ....... 43
6.18 EXTERNAL LIGHTING ................................................................. 43
6.19 UNDERGROUND INFRASTRUCTURE .............................................. 43
   6.19.1 COMMON SERVICES TRENCHES ......................................... 43
6.20 CABLE PITS .............................................................................. 44
   6.20.1 HIGH VOLTAGE ................................................................. 44
   6.20.2 LOW VOLTAGE ................................................................. 44
   6.20.3 SCADA .............................................................................. 45
6.21 HV SYSTEM – SCADA ................................................................. 46
   6.21.1 GENERAL ........................................................................... 46
   6.21.2 APPLICABILITY ................................................................... 46
   6.21.3 SPECIFICATION ................................................................. 46
6.22 PROTECTION SCHEMES ................................................................. 46
   6.22.1 HV SYSTEM ....................................................................... 46
   6.22.2 LV SYSTEM ....................................................................... 47
6.23 RENEWABLE ENERGY SYSTEMS .................................................. 47
6.24 MINIMUM REQUIREMENTS – EQUIPMENT .................................... 47
   6.24.1 HV CABLES – PREFERRED SUPPLIERS .............................. 47
   6.24.2 HV NETWORK FEEDER CABLES ......................................... 47
6.24.3 HV NETWORK INTERCONNECTING CABLES ............................................51
6.24.4 HV TRANSFORMER FEEDER CABLES ..................................................52
6.24.5 HV CABLE JOINTS ..............................................................................53
6.24.6 HV CABLE TERMINATIONS .................................................................54
6.24.7 HV SWITCHBOARDS (RING MAIN UNITS) .........................................54
6.24.8 INSTALLATION ...................................................................................55
6.24.9 TRANSFORMERS ...............................................................................56
6.24.10 INSTALLATION ...............................................................................57
6.25 MINIMUM REQUIREMENTS – TESTING AND COMMISSIONING ........58
6.25.1 HV TESTING REQUIREMENTS .............................................................58
6.25.2 TYPES OF TESTING – HV CABLEING .................................................59
6.26 TRANSFORMERS ..................................................................................61
   6.26.1 OIL-FILLED ......................................................................................61
   6.26.2 DRY TYPE/CAST RESIN .................................................................61
6.27 MINIMUM REQUIREMENTS – HANOVER ..............................................61
   6.27.1 TESTING AND COMMISSIONING ....................................................61
   6.27.2 SURVEYING OF UNDERGROUND CABLES .....................................62
   6.27.3 HANOVER CERTIFICATE ...............................................................62
7. HYDRAULIC SERVICES INFRASTRUCTURE .................................64
7.1 EXISTING HYDRAULIC SERVICES INFRASTRUCTURE .....................64
   7.1.1 DOMESTIC WATER SERVICES .........................................................64
   7.1.2 SEWER DRAINAGE ........................................................................65
   7.1.3 NATURAL GAS SERVICES ..............................................................65
   7.1.4 FIRE HYDRANT SERVICES ..............................................................66
   7.1.5 STORMWATER RETENTION SYSTEM .............................................67
7.2 AUSTRALIAN AND AUTHORITY STANDARDS ....................................67
7.3 REFERENCED DOCUMENTS .................................................................67
7.4 ROLES AND RESPONSIBILITIES ..........................................................68
7.6 URBAN WATER MANAGEMENT PLAN ...............................................69
7.7 SYSTEM DESIGN BRIEF .......................................................................69
7.8 DEVELOPMENT LOT SERVICE CONNECTIONS ....................................70
7.9 DEVELOPMENT LOT BOUNDARY SERVICE APPLICATIONS ................71
7.10 UNIVERSITY PREFERRED PLUMBING CONTRACTORS ......................72
7. 11 REGULATIONS AND PERMITS ...........................................................72
7.11.1 REGULATIONS .............................................................................................................72
7.11.2 PERMITS .....................................................................................................................72
7.12 HYDRAULIC SERVICES SUB-METERING .........................................................................72
7.12.1 SUB-METERING ...........................................................................................................72
7.12.2 SUB-METERS ...............................................................................................................73
7.12.3 LOCATION OF METERS ..............................................................................................73
7.12.4 SUB-METER IDENTIFICATION .....................................................................................73
7.13 SERVICES GENERAL ..................................................................................................73
7.13.1 IN-GROUND SERVICES IDENTIFICATION .................................................................73
7.13.2 SERVICE VALVES IDENTIFICATION ..........................................................................73
7.13.3 BACKFLOW PROTECTION DEVICES .........................................................................74
7.13.4 PROTECTION OF IN-GROUND SERVICES .................................................................74
7.14 SERVICE PIPE MATERIALS ...........................................................................................74
7.14.1 GENERAL .....................................................................................................................74
7.14.2 DOMESTIC WATER SERVICE PIPES – SUPPLY PIPES .............................................74
7.14.3 SEWER, SANITARY AND SOIL PIPES .......................................................................75
7.14.4 FIRE SERVICE SUPPLY MAIN EXTERNAL TO BUILDING IN GROUND ...............75
7.14.5 GAS SERVICES SUPPLY PIPES IN GROUND EXTERNAL TO BUILDINGS ..........75

8. COMMUNICATIONS INFRASTRUCTURE .................................................................76
8.1 OVERVIEW .......................................................................................................................76
8.2 SCOPE OF WORKS ..........................................................................................................76
8.3 ROLES AND RESPONSIBILITIES .....................................................................................76
8.4 AUSTRALIAN STANDARDS ..............................................................................................77
8.5 PREFERRED CONTRACTORS ............................................................................................77
8.6 CURTIN UNIVERSITY EXISTING COMMUNICATIONS INFRASTRUCTURE ...............78
8.7 APPROVED EQUIPMENT ................................................................................................78
8.7.1 EQUIPMENT – PRE-ACCEPTANCE TESTING ..............................................................78
8.7.2 COMMISSIONING, MANAGEMENT & ACCEPTANCE OF CURTIN EQUIPMENT. 78
8.7.3 TESTING ......................................................................................................................78
8.8 CURTIN COMMUNICATIONS PASSIVE INFRASTRUCTURE ............................................78
8.9 DEVELOPERS COMMUNICATIONS PASSIVE INFRASTRUCTURE ...............................80
8.10 CURTIN NETWORK CONNECTIVITY STANDARD DEVELOPMENT .............................81
8.11 STANDARD DEVELOPMENT CONFIGURATION ............................................................83
8.12 CURTIN NETWORK CONNECTIVITY - SHARED DEVELOPMENT ...............................83
8.13 THIRD-PARTY INTERNET SERVICE PROVIDER POINT OF CONNECTION ..........85
8.14 COMMUNICATIONS INFRASTRUCTURE RESPONSIBILITY MATRIX ...............87

9. MECHANICAL INFRASTRUCTURE ......................................................... 89
9.1 SYSTEM OVERVIEW ........................................................................... 89
9.2 CONNECTING TO GREATER CURTIN ................................................... 89
9.3 ROLES AND RESPONSIBILITIES ......................................................... 89

10. SECURITY SERVICES INFRASTRUCTURE ......................................... 91
10.1 INTRODUCTION ................................................................................. 91
10.2 SYSTEM OVERVIEW ......................................................................... 91
10.3 NETWORK ........................................................................................ 91
10.4 CONNECTING TO GREATER CURTIN .................................................. 92
10.5 RESPONSIBILITY ................................................................................. 92

11. LANDSCAPE AND OPEN SPACE DESIGN .......................................... 95
11.1 GENERAL REQUIREMENTS .............................................................. 95
11.2 ROLES AND RESPONSIBILITIES ........................................................ 95
11.3 PLANT SELECTION AND PLANTING ................................................ 96
11.4 SERVICE PITS .................................................................................. 96
11.5 PASSIVE SECURITY .......................................................................... 96
11.6 SAFETY AND SIGHTLINES ............................................................... 96
11.7 CAR PARK LANDSCAPE DESIGN ...................................................... 96
11.8 EROSION AND SEDIMENT CONTROL ............................................... 96
11.9 IRRIGATION ..................................................................................... 97
11.10 SIGNAGE ....................................................................................... 97
11.11 LANDSCAPE SCREENING .............................................................. 97
11.12 LANDSCAPE MAINTENANCE .......................................................... 97

12. APPENDICES ....................................................................................... 98

LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Application Process Overview</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Noise Limits Table</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Electrical Roles and Responsibilities</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>Power Supply Application Process</td>
<td>37</td>
</tr>
<tr>
<td>5</td>
<td>Power Supply Obligations</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>6</td>
<td>HV Submissions Process</td>
<td>39</td>
</tr>
<tr>
<td>7</td>
<td>Typical Common Services Trench</td>
<td>44</td>
</tr>
<tr>
<td>8</td>
<td>Cable Pit Class</td>
<td>45</td>
</tr>
<tr>
<td>9</td>
<td>HV Cable Specification</td>
<td>48</td>
</tr>
<tr>
<td>10</td>
<td>HV Cable Route, Direct Buried</td>
<td>49</td>
</tr>
<tr>
<td>11</td>
<td>HV Cable Route, Conduit</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>HV Interconnection Cable Specification</td>
<td>51</td>
</tr>
<tr>
<td>13</td>
<td>HV Transformer Feeder Cable Specification</td>
<td>52</td>
</tr>
<tr>
<td>14</td>
<td>Transformer Suppliers</td>
<td>56</td>
</tr>
<tr>
<td>15</td>
<td>Transformer IP Rating</td>
<td>57</td>
</tr>
<tr>
<td>16</td>
<td>Handover Process Flow Chart</td>
<td>63</td>
</tr>
<tr>
<td>17</td>
<td>Hydraulic Roles and Responsibilities</td>
<td>68</td>
</tr>
<tr>
<td>18</td>
<td>Hydraulic Submission Process</td>
<td>71</td>
</tr>
<tr>
<td>19</td>
<td>Communications Roles and Responsibilities</td>
<td>76</td>
</tr>
<tr>
<td>20</td>
<td>Communications Passive Infrastructure Diagram</td>
<td>80</td>
</tr>
<tr>
<td>21</td>
<td>Communications Standard Development Configuration</td>
<td>83</td>
</tr>
<tr>
<td>22</td>
<td>Communications Infrastructure Responsibility Matrix</td>
<td>87</td>
</tr>
<tr>
<td>23</td>
<td>Mechanical Roles &amp; Responsibilities</td>
<td>89</td>
</tr>
<tr>
<td>24</td>
<td>Security Infrastructure Requirement Table</td>
<td>92</td>
</tr>
<tr>
<td>25</td>
<td>Security Roles and Responsibilities</td>
<td>93</td>
</tr>
<tr>
<td>26</td>
<td>Landscape Roles and Responsibilities Table</td>
<td>95</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

To remain globally relevant for students, industry and the community, Curtin University has established a transformational vision that is reflected in the Greater Curtin Masterplan. The physical development of the campus is an integral part of the future success of Greater Curtin, and the University anticipates that private sector development and partnerships will be an important part of that transformation.

These guidelines have therefore been prepared by Curtin University to assist Developers involved in preparing design and contract documentation for development on the Bentley Campus. The guidelines present the University’s minimum performance criteria for design and installation of infrastructure that will connect to existing networks, systems and assets at the Bentley Campus.

Where requirements are not addressed by this document, relevant Australian design and construction standards should be adopted, in consultation with the University.

Any forms, drawings and documents referred to in this document are available from our website http://properties.curtin.edu.au/workingwithus/ or by application to the Curtin Nominated Contact (CNC).

Stage 1 is the first stage of the Greater Curtin Project vision. If reference is made to Stage 1 in this document, this will relate to infrastructure specific to that stage. Where no reference is made to a particular stage, the requirements apply across the whole of Greater Curtin.

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 in the heart of the Perth Metropolitan Area. The Campus is within the Town of Victoria Park Local Government Area, adjacent to a suburban residential community, and in proximity to a variety of institutional, recreational and knowledge-based activity centres.

1.1.2 PLANNING DOCUMENTS

The ongoing development of the Campus is supported by key planning documents, which will guide the development of the Bentley Campus into the future.

This document should be read in conjunction with other Greater Curtin Planning documents including:

a) Greater Curtin Vision
b) Greater Curtin Drivers for Change
c) Greater Curtin Masterplan
d) Greater Curtin Delivering the Vision
e) Greater Curtin Stage 1 Development Guidelines
f) GBCA Green Star Communities Rating
g) Universal Design Guideline Built Form.
h) Local Water Management Strategy

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

A summary of the current documents is available in Appendix A whilst the documents are available at http://properties.curtin.edu.au/workingwithus/.

1.1.3 PROCESS, TIMING AND APPROVALS

The University aims to provide an efficient and effective assessment and determination process to progress the development of lots at the Bentley Campus. The following steps outline the general submission and approval process required for development within the campus. Further detail of the application process for individual infrastructure services is available within the relevant section.
Figure 1 – Application Process Overview
2. REQUIREMENTS FOR WORKING AT CURTIN UNIVERSITY

There are specific requirements that relate to working at Curtin University’s Bentley Campus that may be unique when compared to any other location. These requirements are identified below and must be considered during the development of any design and should be followed during construction works.

2.1 CURTIN UNIVERSITY CONTACT

The Developer will be assigned one contact, referred to as the ‘Curtin Nominated Contact’ (CNC) or their delegated representative for all matters relating to the interface with the University throughout design and construction and the responsibilities in these Guidelines. The Developer is responsible for liaison with the CNC to ensure the requirements outlined in these guidelines are suitably addressed. The CNC will assist the Developer in navigating and dealing with the various infrastructure areas of Curtin University.

2.2. 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 University website http://students.curtin.edu.au/administration/dates/index2017.cfm

For any development adjacent or close to the academic core, the Developer will incorporate a two-week period of ‘no work’ within their construction programme during the University’s key examination periods typically held in June and November for a 2-week period each year. The Developer will need to confirm exact dates with the CNC.

Other exams are scheduled outside of key exam periods (for example supplementary exams) and the CNC will advise if special consideration is required for these dependent on the location of development activity and the exams.

Regardless of proximity to the academic core, no heavy construction work (including demolition, excavation, explosive fixings, continuous mechanical hammering) or noisy deliveries is permitted during the key exam periods.

The Developer must programme the works, and do everything necessary to avoid noise and disruption during special events that may arise from time to time.

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

2.3 NORMAL WORKING HOURS

The works must be undertaken during normal working hours, except where this is approved in writing by the CNC.

Normal hours of business at the University are between 6.30am and 9.00pm, Monday to Friday.
2.4 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.

2.5 OTHER CONSTRUCTION WORKS
Construction works may be occurring on adjoining land. The CNC will advise the Developer of any prevailing conditions in and around the site prior to and during the works. The Developer will need to familiarise itself with these other works and take into consideration all site conditions when developing its own construction methodology, access and management strategies.

2.6 COMPANY REGISTRATION AND INDUCTIONS
Curtin has an established company registration and induction process for all contractor and sub-contractors working across their campuses. Only companies which have completed Curtin University’s contractor pre-qualification process are permitted to work on Curtin-Owned infrastructure assets at the Bentley campus.

The Developer is required to be registered with the University and the Developer’s Representative must be inducted in to the Curtin system.

Company registration and induction application forms and information is available at https://properties.curtin.edu.au/workingwithus/inductions.cfm

Only sub-contractors working directly on Curtin owned infrastructure assets on behalf of the Developer will be required to complete the Curtin inductions. However, the Developer must ensure that all contractors:

a) are familiar with and comply with all policies and standards set out by Health, Safety and Emergency Management (HSEM), including information relating to Health and Safety available on the Curtin University website http://healthandsafety.curtin.edu.au/;

b) are provided with and trained to use appropriate personal protective equipment.

2.7 SITE SPECIFIC INDUCTION
The Developer is responsible for preparing a site specific induction for all personnel that will work on the project. The induction will cover all Curtin related matters as outlined in these Guidelines to the satisfaction of Curtin University and give due consideration to Curtin requirements when working outside your site boundary as detailed in the Curtin Online Induction. The Developer is solely responsible for ensuring that all persons entering onto its construction site complete the site specific induction.

Where contractor personnel will be working outside the Developer’s lot and interfacing with Curtin assets, those personnel will also be required to complete the Curtin inductions.
2.8 CONSTRUCTION MANAGEMENT PLANNING AND IMPLEMENTATION

The Developer will be required to submit relevant documentation as required by statutory authorities to Curtin University prior to any submission to authorities for their subsequent comment or approval. The following section outlines the expected documentation outputs, contents and relevant University matters that must be integrated in to these statutory submissions.

Curtin will review and endorse any documentation to ensure that it appropriately addresses relevant University matters prior to submission.

2.8.1 DOCUMENTS

As a minimum and consistent with standard industry practice, the Developer must submit the following documents to the University 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 is to bear all costs relating to 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.

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

(e) Safety Management Plan;

(f) Quality Management Plan; and

(g) Communications Management Plan.

2.8.3 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; and

(g) Drainage and Stormwater Management Plan.

2.8.4 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;

2.9 MANAGEMENT OF WORKS

2.9.1 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 there is to be a deviation from the approved Management Plans, approval is required to be sought from the University before implementation.

The Developer must at all times comply with the regulations and restrictions imposed by the University relating to the storage of materials, the routing of construction traffic, the interruption of existing services and facilities and any other regulations in force on the site.

The Developer must obtain written approval from the University 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 specific requirements:

(a) Not remove or destroy any trees, shrubs or other vegetation without the written approval of the University.

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

(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 the University as a result of the Developers 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 to avoid interruption of access to any other areas adjoining the site.

(f) Keep site secure from unauthorised access.

2.9.2 SITE FACILITIES

Developers are to 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 approval from the University.
The Developer must include in the Construction Management Plan procedures for the delivery, handling and storage of products recognised to be flammable, hazardous and easily damaged.

The Developer may use paid parking spaces on the Curtin University Premises, provided that the Developer complies with all Curtin University requirements and the Land and Traffic By-Laws 2008.

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

2.9.3 DILAPIDATION SURVEY

Prior to commencing the development activities on the site, the Developer must carry out a comprehensive survey of the land and building conditions and features (including garden beds, structures, roads, access paths and footpaths) to the extent required by the University (acting reasonably).

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

The survey must include the recording by adequate means as necessary to accurately show the condition then existing hard and soft landscape areas, roads, etc. Include photographic records of existing paths for deliveries and the access.

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.

2.9.4 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 “Construction Work and the Public”. 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 depicting the development outcome. Contractor signage or advertising must be integrated with the development outcome image and approved by 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, way-finding, CCTV cameras or any other essential University related operations.

Hoardings and fences must not obstruct exit routes from any adjacent facility in case of an emergency evacuation.

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

2.9.5 MANAGEMENT OF ACTIVITIES OUTSIDE SITE BOUNDARY

The Developer must preserve access to the freedom of movement in the area in the vicinity of the site.

If the Developer identifies any possible disruption or change to freedom of movement in the area in the vicinity of the site, 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) notifies of the proposed disruption or change;

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

(c) indicates the alternative routes available; and

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

2.10 COMMUNICATIONS

2.10.1 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 University.

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

c) The University may at any time direct that any signage be removed.
2.10.2 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 the University, as well as a framework for communicating with internal and external stakeholders, including the media. The Communications Plan is to be complementary and subservient to the University’s communications strategy for the Project.

The Communications Plan must include:

a) the method for assisting the University to manage communications when dealing with:
   i. the media;
   ii. adjoining building occupants (staff, student, public); and
   iii. the University’s students, staff and tenants;
   iv. community and interest groups;

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

c) the strategies to inform those on campus and the local community, including the public, media, neighbourhood groups, local community and adjoining neighbours, of construction or other works that may impact those on campus and the community;

d) all Promotional and Public Relations strategies and programmes;

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

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

g) identification of and purpose for communication with the University’s interest groups;

h) a communications program;

i) 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 the University all information, material and images that are readily at hand (i.e. material required to be specifically developed such as fly-throughs and models is excluded); and
vi. Curtin University Governing body enquiries, which procedures and/or flow charts must detail response times and must include the provision of regular advice to the University;

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

k) 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 the University.

l) Nothing in the Communications Plan must permit the Developer to directly communicate with utility providers unless otherwise directed by the University.

2.10.3 CURTIN UNIVERSITY OPERATIONS MANAGEMENT GROUP

The University has an established Operations Management Group that oversees the traffic management and communications of works at the Bentley Campus. The Operations Management Group consists of the following key representative areas:

(a) Health and Safety

(b) Maintenance and Operations

(c) Car Parking

(d) Capital works

(e) Sport and Recreation

(f) Security

The Developer may be required to attend these meetings to discuss changes in site access management and traffic management arrangements. Developer prepared management plans will be tabled at these forums. These meetings are scheduled either fortnightly or monthly. The CNC will facilitate the Developers attendance at these meetings as required.

2.11 ROADS AND TRAFFIC MANAGEMENT

Curtin University roads and pathways are classified as privately owned and controlled. In addition, Curtin University has ‘pedestrian first’ approach which is reflected in the Vehicle Access Management Plan (VAMP) that applies to the academic core.

Of particular note is a street typology called ‘Shared Spaces’ which has a speed limit of 5km/hr. In Shared streets, pedestrians and vehicles co-mingle and pedestrians have an absolute right of way.

Deliveries are required to take place outside of peak traffic hours, which occur during semester between 0730 – 0900 and 1600 – 1730. Uninterrupted and safe access is required at all times.
Compliance with speed limits and all other traffic regulation on the Bentley Campus is required and infringement notices and fines will be issued by the University for any non-compliance.

It is essential to note that a minimum 10 days’ notice is required if there is to be any disruption to Curtin’s access and road network, and 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.

2.12 SITE SERVICES

2.12.1 USE OF EXISTING SERVICES

Curtin University may approve the use of Existing Services on a temporary basis, and subject to compliance with the relevant section of the Developer Technical Guidelines. An application form for the connection and disconnection of each of these services must be submitted. Further detail regarding application for temporary construction services can be found within the relevant Developer Technical Guideline.

The Developer must minimise the frequency and duration of interruptions to Existing Services. The Developer must notify the University 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 will lose support when the trench is excavated, the Developer must provide permanent support for the existing service.

Where Existing Services at or adjacent to the site are in non-optimum condition, 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.

2.12.2 PROTECTION OF SERVICES

At any point at which a construction road, or construction traffic, crosses the line of existing underground service (of any type), protection to the service from damage shall be provided. The protection must be designed to take into account 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.

All temporary protection works must be removed at the completion of the works and the area restored to its original condition.
2.12.3 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. In the event that 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, to the satisfaction of the University any damage to the Existing Services. 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 the University.

2.12.4 WORKS REQUIRING PERMITS, APPROVALS AND LICENCES

The Developer will be required to apply for permits to work in relation to particular activities on the campus to demonstrate appropriate due diligence.

The Developer must apply for Work Permits from the University for the activities identified at http://properties.curtin.edu.au/contractors/workpermits.cfm:

The requirement for Work Permits for the following activities is emphasised:

(a) Dig/Excavation;

(b) Isolations (Fire and Building and Site Services); and

(c) Craneage and Lifting.

All permits are to be submitted online at http://properties.curtin.edu.au/contractors/workpermits.cfm with the CNC nominated as ‘responsible officer’.

2.13 DOCUMENTATION

The University maintains details of all the buildings and assets on its campuses to assist with the preparation of campus maps, venue hiring and space planning as well as communications, infrastructure, security and emergency management.

Details of any new facilities on the campus will need to be provided to the University’s Building and Services Data Portfolio who are the central point for data retention.

The following documentation requirements will be applicable:

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

(b) Developers must provide documentation in relation to in-ground services surveyed in accordance to AS.5488;
(c) Developers must comply with Curtin’s building, numbering and ‘street address’ requirements. Curtin would strongly prefer that Developers use the floor number convention 1, 2, 3, 4 rather than starting at ground floor. Further detail is available from the University’s Building and Services Data Portfolio by emailing drawingservices@curtin.edu.au.

(d) Developers must forward electronic copies of all “As Constructed” documentation to the University’s Building and Services Data Portfolio for storage at drawingservices@curtin.edu.au before occupancy.

(e) As part of the ‘As Constructed’ documentation, the Developer must submit Warranties, Certificates, Operation and Maintenance Manuals.
3. ENVIRONMENTAL REQUIREMENTS

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

Developers are required to submit a copy of their Environmental Management Plan (EMP) prior to commencement of construction works on site and prior to submission to any Statutorily Authorities.

3.1 ASBESTOS

Developers are advised that the University has an asbestos management program for the identification, assessment and control of asbestos related products on all Curtin University land. A complete register of the locations of products known to contain asbestos is held by the University.

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

(a) 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 in any part or parts of the building or its services and the Developer must ensure that contractors, subcontractors, suppliers and others are advised of this restriction.

The University shall 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).

Operations must not be carried out on the site if it causes the sound emitted (as determined by the sound level at the site boundary) to exceed:
<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Sound Level Decibels (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday to Friday 7.00am to 7.00pm</td>
<td>80</td>
</tr>
<tr>
<td>Saturday 7.00am to 7.00pm</td>
<td>70</td>
</tr>
<tr>
<td>Evening 7.00pm to 10.00pm</td>
<td>65</td>
</tr>
<tr>
<td>Night 10.00pm to 7.00am</td>
<td>55</td>
</tr>
</tbody>
</table>

**Figure 2 Noise Limits Table.**

On occasions for emergency reasons, the University 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. The University 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.
4. SAFETY AND HEALTH REQUIREMENTS

There are specific requirements in relation to safety and health matters when working at the University. The Developer shall prepare a detailed OH&S Management Plan to Worksafe Standards that highlights the need to maintain a safe operating environment for University 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 Buildings and Structures issued by the Commission for Occupational Safety and Health.

4.2 THIRD PARTY SAFETY AUDITS

The Developer is to arrange for the Developer’s Safety Management Plan to be audited and certified by a qualified third party auditor before commencement of work on site. 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 is to consider public safety including day to day issues such as access past the site.

4.3 HAZARD / INCIDENT / INJURY REPORTING

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

All incidents shall be reported to:

(a) the CNC

(b) the Health, Safety and Emergency Management (HSEM) Department via the online Incident/Hazard reporting system at https://healthandsafety.curtin.edu.au/,

The Developer may be contacted by the HSEM Advisor, the CNC or a University Safety and Health Representative to assist in the investigation of the incident. As stipulated in the Occupational Safety and Health Act 1984, the University and the contractor shall report certain injuries to Work Safe WA.
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 Security on 9266 4444. The Curtin Security 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 University generally owns and operates all infrastructure services on the Campus. These services include:

- Electricity
- Potable and non-potable water
- Gas
- Fire services
- Stormwater
- Sewer
- Potable Water
- Recycled Water
- Communications infrastructure
- IT networks
- Mechanical services (HVAC)
- Security infrastructure
- Irrigation main lines.

The charges for the services are based on metered consumption and are charged at gazetted retail tariffs. Where Developers connect to Curtin University Infrastructure, Curtin will be responsible for all correspondence with third party supply providers, e.g. Water Corporation. However, Developers are responsible for providing all information needed to assist Curtin in obtaining relevant approvals. Where a Developer must connect directly to a third party asset, the Developer will be required to liaise with both Curtin and the third party asset owner to obtain all necessary permits and approvals. The exception to this is communications with private internet providers as outlined in Section 5.

Where a Developer is constructing the work, the designer shall seek design parameters from the University. With respect to adequacy of design proposals and their subsequent approval, the acceptance and decision of Curtin University shall be final and binding.

5.2 GENERAL DESIGN REQUIREMENTS

The Developer must refer to the latest relevant Australian Standards, industry/utility standards and guidelines and Curtin University’s Standards. In particular, the Utility Providers Code of Practice for Western Australia must form the basis of design where services are being installed external to the lot boundary, in the road reserve or when crossing roads.
Notwithstanding the requirements outlined in the subsequent sections, it is a universal requirement that all designs must be accompanied by design calculations that clearly state the utility demands of each development, for example, but not limited to:

i. maximum electrical power demand
ii. peak potable and recycled water consumption
iii. total annual potable and non-potable water consumption for whole of lot;
iv. peak and average sewage discharge
v. site water balance including stormwater discharge rates
vi. special communications demands.

5.3 CAMPUS UTILITY METERING

All services at Curtin University’s Bentley campus are metered. When connecting into Curtin University Infrastructure, Developers shall install a meter to record consumption. The meter must meet the following minimum criteria:

- A utility meter must 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)
- All meters shall 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.
- Meters must hold at least 400 days of data in the meter.
- Meters must have pulse inputs available for logging water/gas/heat (air-conditioning) data in the meter. This allows Curtin to have a completely integrated system.
- Electricity meters shall be NEMMCO approved for the contestable electricity market.
- Meters must have networking and communications capability and integrate with the Curtin / IBMS system.
- Electrical meters must include Modbus serial (EIA 485) or Modbus/TCP communications capability.
- Meters must include a local (faceplate) LCD display for viewing parameters and for validation purposes.
- All meters shall have a minimum three (3) year guarantee.
- Once installed and handed over, all meters shall become the property of the University.
Curtin has specific requirements for electrical meters for billing requirements. These are documented in Curtin University Project delivery Guidelines for electrical services available at http://properties.curtin.edu.au/local/docs/guidelines/000312-electrical-services-guidelines-r1.pdf

Once installed, meters shall be programmed and validated. Copies of certification documents shall be provided at handover to Curtin.

5.4 CURTIN PREFERRED CONTRACTORS

All works to be completed outside of the development lot boundary for connection to the University’s infrastructure must be carried out by a contractor from the University’s preferred contractors list. This work includes all installation, maintenance and operation works. Developers should contact their CNC for a current list.

5.5 CURTIN HANDOVER AND TRAINING

Prior to Practical Completion the Developer is to provide appropriate technical personnel to instruct the University on the correct operation and maintenance of assets that will be handed over to the University. Practical Completion will not be granted until all relevant documentation is received.
6. ELECTRICAL GUIDELINES

6.1 SYSTEM OVERVIEW

Curtin University 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 University HV switchboard and associated ancillary equipment. The four HV switch rooms are referred to as Zones 1, 2, 3 and 4.

Curtin University 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 University 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 University 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 University 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>
<thead>
<tr>
<th>Role</th>
<th>Curtin Responsibility</th>
<th>Developer Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine load requirement and load forecast</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Design internal lot infrastructure and connections to Curtin network</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Assess Design and load forecast for connection</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Select preferred contractor</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pre-approval of cut in works</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Grant Access and Permits</td>
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<td></td>
</tr>
<tr>
<td>Cut in to existing Curtin Infrastructure</td>
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<td></td>
</tr>
<tr>
<td>Costs for connection to network</td>
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<td>X</td>
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<tr>
<td>Maintenance of Meter</td>
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<tr>
<td>Maintenance of Curtin owned network</td>
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<td></td>
</tr>
<tr>
<td>Meter reading</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Attends commissioning and energisation</td>
<td>X&lt;sup&gt;1&lt;/sup&gt;</td>
<td>X</td>
</tr>
<tr>
<td>Notify of outages for planned works</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

1. Witness commissioning works

**Figure 3 Electrical Roles and Responsibilities**
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 University. This must be communicated to Curtin University 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 University. This must be communicated to Curtin University 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 University. 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 University 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 University unless otherwise advised by Curtin University.

6.6 RESERVING AND RELINQUISHING CAPACITY

Curtin University will not allow capacity to be reserved by the Developer. The University reserves the right to allow exceptions to capacity reservation only on the basis of extraordinary circumstances and only with prior written approval of the University. 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 the University’s sole discretion. All requests and approvals for additional capacity shall be wholly at the Developer’s cost.

Curtin University 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 University 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 University 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 University have been concluded.

Once conditional approval for connection of the Developer’s load and capacity provisions is granted by Curtin University, 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 University’s requirements.

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

Project Management

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

The University 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.
6.8 CONNECTING TO EXISTING INFRASTRUCTURE

The Developer shall be responsible for appointing a Curtin University preferred contractor to connect into existing Curtin University 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 University 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 University Permit to Isolate Process available at https://properties.curtin.edu.au/local/docs/contractors/isolation_guide_electrical_HV.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 University operations, assets, its tenants and patrons.

6.10 SUPPLY APPLICATION PROCESS OBLIGATIONS

<table>
<thead>
<tr>
<th>Developer</th>
<th>Curtin University</th>
<th>Western Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Application for power supply</td>
<td>- Review Submissions &amp; Applications</td>
<td>- Review CMD increase requests</td>
</tr>
<tr>
<td>- Design Power Supply</td>
<td>- Apply to Western Power for CMD (if required)</td>
<td>- Review HV submissions</td>
</tr>
<tr>
<td>- Supply and Install</td>
<td>- Own, operate and maintain HV connections following handover</td>
<td></td>
</tr>
<tr>
<td>- Commissioning</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Responsible for all costs, including CMD.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Comply with Curtin Processes including isolations, HV submissions, CMD etc.</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5 Power Supply Obligations

6.11 TIMEFRAME FOR INITIAL ASSESSMENT

The Developer is required to prepare and submit the power supply application to Curtin University. The Developer must allow up to four weeks for Curtin University to initially process the application, as it may trigger further investigation of Curtin University’s electrical network regarding available capacity, other power supply applications and power supply arrangements. During this time, Curtin University will engage with the Developer to confirm the power supply arrangement before providing a final response.

The power supply application must be completed with all supporting information; with the review process extended by any time taken to obtain clarifications and additional documentation.
6.12 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 University in readiness for the subsequent submission to Western Power. The final HV Submission shall include all commissioning and testing results for the University’s review prior to energisation.

The process for a HV Submission is as follows.

Stage 1
Developer to apply to Curtin University as per Power Supply Application Process

Stage 2
Curtin University to provide information on HV Network for use by Developer (e.g. Fault Levels, Upstream Protection Settings)

Stage 3
Developer to prepare HV Submission as per WAER & WADCM and issue to Curtin University as “Draft for Comment” prior to equipment being purchased

Stage 4
Curtin University provides comment to Developer and HV Submission is revised accordingly

Stage 5
Developer provides Curtin University the revised HV Submission. Curtin University forwards HV Submission to Western Power as “Draft for Comment”

Stage 6
Western Power reviews HV Submission and notifies Curtin University of any non-conformances

Stage 7
Curtin University informs the Developer of any non-conformances which require rectification by the Developer

Stage 8
Developer updates HV Submission and issues to Curtin University as “Final for Approval”

Stage 9
Curtin University reviews the HV Submission and if deemed acceptable the HV Submission is then forwarded onto Western Power as “Final for Approval”

Stage 10
Western Power reviews HV Submission and notifies Curtin University of any non-conformances

Stage 11
Curtin University notifies Developer of approval to proceed with energisation of the Electrical Substation

Stage 12
Electrical Substation is connected to Curtin University’s HV Network

Figure 6 HV Submissions Process
6.13 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 the University chooses to undertake works in excess of the minimum practical to service the Developer nominated requirements then the University may, at its sole discretion, elect to contribute to the cost of the works. The Developer must liaise directly with the CNC regarding all associated headwork charges during the power supply application process.

6.14 GROUND BREAKING WORKS
The Developer must make his own investigations and is responsible for determining all existing services locations prior to commencing work. The Developer shall be responsible for rectifying any damage to existing services infrastructure.

6.15 ELECTRICAL SUBSTATIONS

6.15.1 LOCATION
The Developer must locate the electrical substation in an area that is easily accessible to Curtin University 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 address them in accordance with the Greater Curtin Stage One Development Guidelines.

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

6.15.2 ACCESS
The Developer must allow unrestricted access to the electrical substations by representatives of Curtin University. 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 the University’s specification.

6.15.3 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 the University 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 the University.

**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 University.

Ownership of the building/enclosure and other related structural elements will be transferred to the University 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 the University. 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 University 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.

**6.15.4 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 communicated to Curtin University as part of the power supply application process.

**6.15.5 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 University due to impact on teaching and examination venues. Visual appearance and emissions must be considered when placed in a public environment.

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

**6.16 FIRE DETECTION (DRY FIRE)**

**6.16.1 GENERAL PRINCIPLE**

Curtin University 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 University is also responsible for providing directions to emergency
services on the particular location of the electrical substation where the alarm has been initiated.

**6.16.2 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 University – 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.

**6.16.3 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 University – 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.

**6.17 EMERGENCY LIGHTING**

**6.17.1 GENERAL PRINCIPLE**

Curtin University 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 University to respond to alarms and failures on the system, thus ensuring that the emergency lighting system is able to operate effectively when required.
6.17.2 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.

6.18 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.

6.19 UNDERGROUND INFRASTRUCTURE

6.19.1 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 the University 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 1 below to allow for future LV and HV services.
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.

6.20 CABLE PITS

6.20.1 HIGH VOLTAGE

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

6.20.2 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 2) is to be used when determining the required LV cable pit.

**Figure 8 – Cable Pit Class**

### 6.20.3 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 2) for determining the required SCADA pit.
6.21 HV SYSTEM – SCADA

6.21.1 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.

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

6.21.3 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).

6.22 PROTECTION SCHEMES

6.22.1 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 University'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 the university 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.

**6.22.2 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 University’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.

**6.23 RENEWABLE ENERGY SYSTEMS**

As a general principle, Curtin University supports renewable solutions that propose no risk to the integrity and stability of the network. To that end, the Developer must comply with the relevant [ERAWA Technical Guidelines](#). However, if the Developer can provide evidence that the renewable design solution steps outside of the Technical Guidelines but poses no risk to the network, then Curtin will consider and potentially approve the solution.

**6.24 MINIMUM REQUIREMENTS – EQUIPMENT**

**6.24.1 HV CABLES – PREFERRED SUPPLIERS**

Curtin University 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 the University prior to purchase.

**6.24.2 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>
<thead>
<tr>
<th>Cable Rated Voltage</th>
<th>12.7/22 kV (24 kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>1 x 3C</td>
</tr>
<tr>
<td>Size</td>
<td>240 mm$^2$</td>
</tr>
<tr>
<td>Material (active conductors)</td>
<td>Copper (Cu), Stranded</td>
</tr>
<tr>
<td>Conductor Screen</td>
<td>Semi-conductive XLPE</td>
</tr>
<tr>
<td>Insulation</td>
<td>Cross-Linked Polyethylene (XLPE)</td>
</tr>
<tr>
<td>Screen</td>
<td>Copper (Cu), Stranded</td>
</tr>
<tr>
<td></td>
<td>Individually screened, coarse fault protection heavy duty screens</td>
</tr>
<tr>
<td>Termite Protection</td>
<td>Nylon</td>
</tr>
<tr>
<td>Additional Protection</td>
<td>Double Brass Tape</td>
</tr>
<tr>
<td>Armour</td>
<td>Steel Wire</td>
</tr>
<tr>
<td>Sheath Material</td>
<td>PVC – V90</td>
</tr>
</tbody>
</table>

**Figure 9 HV Cable Specification**

**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 3 and 4 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 the University prior to construction.

Figure 10 – HV Cable Route, Direct-buried
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.

**Figure 11 – HV Cable Route, Conduit.**
6.24.3 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>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Rated Voltage</td>
<td>12.7/22 kV (24 kV)</td>
</tr>
<tr>
<td>Configuration</td>
<td>3 x 1C</td>
</tr>
<tr>
<td>Size</td>
<td>240 mm²</td>
</tr>
<tr>
<td>Material (active conductors)</td>
<td>Copper (Cu), Stranded</td>
</tr>
<tr>
<td>Conductor Screen</td>
<td>Semi-conductive XLPE</td>
</tr>
<tr>
<td>Insulation</td>
<td>Cross-Linked Polyethylene (XLPE)</td>
</tr>
<tr>
<td>Screen</td>
<td>Copper (Cu), Stranded</td>
</tr>
<tr>
<td></td>
<td>Individually screened, coarse fault protection heavy duty screens</td>
</tr>
<tr>
<td>Termite Protection</td>
<td>No</td>
</tr>
<tr>
<td>Additional Protection</td>
<td>No</td>
</tr>
<tr>
<td>Armour</td>
<td>No</td>
</tr>
<tr>
<td>Sheath Material</td>
<td>PVC – V90</td>
</tr>
</tbody>
</table>

Figure 12 HV Interconnection Cable Specification

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.

**6.24.4 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>
<thead>
<tr>
<th><strong>Cable Rated Voltage</strong></th>
<th>12.7/22 kV (24 kV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration</strong></td>
<td>3 x 1C</td>
</tr>
<tr>
<td><strong>Size</strong></td>
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<td><strong>Material (active conductors)</strong></td>
<td>Copper (Cu), Stranded</td>
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<tr>
<td><strong>Conductor Screen</strong></td>
<td>Semi-conductive XLPE</td>
</tr>
<tr>
<td><strong>Insulation</strong></td>
<td>Cross-Linked Polyethylene (XLPE)</td>
</tr>
<tr>
<td><strong>Screen</strong></td>
<td>Copper (Cu), Stranded</td>
</tr>
<tr>
<td></td>
<td>Individually screened, coarse fault protection heavy duty screens</td>
</tr>
<tr>
<td><strong>Termite Protection</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Additional Protection</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Armour</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Sheath Material</strong></td>
<td>PVC – V90</td>
</tr>
</tbody>
</table>

**Figure 13 HV Transformer Feeder Cable Specification**
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.

6.24.5 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.

6.24.6 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.

6.24.7 HV SWITCHBOARDS (RING MAIN UNITS)

Preferred Suppliers
Curtin University has a preference for the following suppliers:

1. Schneider – RM6
2. Eaton – Xiria-E.

Curtin University 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 University must be received prior to proceeding with purchase of non-standard equipment. The University 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.
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.

6.24.8 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 University may accept an external installation. Where an external HV switchboard is being proposed by the Developer this must be approved by Curtin University 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.

6.24.9 TRANSFORMERS

Curtin University 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 University has a preference for the following suppliers.

<table>
<thead>
<tr>
<th>Oil-filled Transformer</th>
<th>Dry Type/Cast Resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Power – Standard Kiosk Transformer</td>
<td>ABB</td>
</tr>
<tr>
<td>ABB – GMT Plus Transformer</td>
<td></td>
</tr>
</tbody>
</table>

Figure 14 Transformer Suppliers

Written approval from Curtin University 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>
<thead>
<tr>
<th></th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>HV Termination Cubicle</td>
<td>IP56</td>
<td>IP56</td>
</tr>
<tr>
<td>LV Termination Cubicle</td>
<td>IP56</td>
<td>IP56</td>
</tr>
<tr>
<td>Tank</td>
<td>IP66</td>
<td>IP66</td>
</tr>
</tbody>
</table>

Figure 15 Transformer IP Rating

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).

6.24.10 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 the University may accept an external installation. Where an external transformer is being proposed by the Developer, this must be approved by Curtin University 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.

6.25 MINIMUM REQUIREMENTS – TESTING AND COMMISSIONING

6.25.1 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 University a Curtin University 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 University 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 University, 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 University 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 University, 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 University 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.

**6.25.2 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

**HV Transformer Feeder Cables**

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

1. Phase Rotation

**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.

6.26 TRANSFORMERS

6.26.1 OIL-FILLED

1. Measurement of winding resistance
2. Measurement of voltage ratio and check of phase displacement
4. Measurement of no-load loss and current
5. Measurement of zero-sequence impedance(s)

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.

6.26.2 DRY TYPE/CAST RESIN

1. Measurement of winding resistance
2. Measurement of voltage ratio and check of phase displacement
4. Measurement of no-load loss and current
5. Measurement of zero-sequence impedance(s)

6.27 MINIMUM REQUIREMENTS – HANDOVER

6.27.1 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 University 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.
6.27.2 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 University for inclusion in the Master Plan drawing database within five working days of reinstatement.

6.27.3 HANDOVER CERTIFICATE

All new equipment that is to be handed over to the University must be formally accepted by Curtin University 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.
Figure 16 Handover Process Flow Chart
7. HYDRAULIC SERVICES INFRASTRUCTURE

7.1 EXISTING HYDRAULIC SERVICES INFRASTRUCTURE

The existing hydraulic services information is provided as a brief introduction to the existing campus supply services to the Greater Curtin development lots. The Developer is advised to make allowances in designs for all necessary internal services to meet their specific project demands based on the infrastructure information contained in these clauses. Specific Stage One Greater Curtin technical guidelines are included in this section.

7.1.1 DOMESTIC WATER SERVICES

The University Bentley Campus is serviced via Water Corporation of Western Australia boundary water service connections as follows:

- 150 mm boundary domestic water meter located on Conlon Street: 07466-112
  Meter No. - NK-0900018
- 150 mm boundary domestic water meter located on Hayman Road (Brand Drive): 09479-249 Meter No. - KK-0900127
- 100 mm boundary domestic water meter located on Kent Street: Meter No. - KM-0600018.

Boundary meter pressures vary as follows:

- Conlon Street  482–520 kPa
- Brand Drive  434–480 kPa
- Kent Street  550590 kPa.

Stage 1 development lots are to be supplied with water via a 200 mm polyethylene PN12.5 domestic CWS ring main connected into the existing University Campus supplies at Road 3 and the Kent Street boundary main. This links Stage 1 to the Water Corporation existing boundary meter supplies.

- The Stage 1 water main has been documented to be fitted with isolation valves to separately isolate sections of the main for future water connections and maintenance.
- Individual development lot Developers will need to apply to the University for water connections in locations nominated by the Developer and sizes based on peak instant flow rate requirements, using the Developer application forms. Note that developments more than 15 metres from the development Lot boundary water connection (ground level to roof level) will require their own storage tank and pump systems to service the lot water requirements, which is no different from development lots that are supplied directly from the Water Corporation mains. Make-up infill to these tanks will be supplied from the University water main lot boundary connection.
Development lot water boundary connections are to be fitted with sub-meters sized to meet the Developer’s requirements and fitted with flow restrictors based on the application flow requirement.

### 7.1.2 SEWER DRAINAGE

The University Bentley Campus buildings are currently serviced by Water Corporation gravity sewers, which are located within the Campus lot, consisting of the following:

- 300 mm HDPE from the Kent Street boundary to the Central Plant area
- 230 VC from 300 mm HDPE Car Park 33 along Dumas Road to south of the hockey stadium
- 230 VC from the hockey stadium heading east to Hayman Road.

There are several Curtin University private sewer mains that connect and discharge to the Water Corporation sewer. Plans showing the location of these are available by request to drawingservices@curtin.edu.au.

Greater Curtin Stage 1 works allowed for the realignment of a section of the Water Corporation sewer through proposed Roads 1 and 2. The VC sewer has been replaced with 225 mm PVC installed to set alignments within the internal road reserves and protected by an easement to allow for Water Corporation access.

A number of 150 mm property sewer connections have been included, as shown on the Stage 1 sewer reticulation drawings.

Lots F01, F02 and F03 are unlikely to be able to gravity discharge into the main sewer based on surface levels. These will need to be serviced by a private pump station and pressure main. A 225 mm sleeve has been allowed along Road 1 to install a pressure main and discharge to the gravity sewer. The Developer’s design consulting engineers and licensed installing contractors will need to progress installation of the pressure main outside the development lot boundary.

The arrangement of internal sewers for each lot and how they connect to property connections needs to be determined by the Developer’s design consulting engineers and licensed installing contractors.

Property connections of 150 mm have been provided, as shown in the Stage 1 reticulation drawings. These are Curtin University assets and discharge to the Water Corporation sewer located in Road 2.

The Developer’s design consulting engineers will need to apply to the University to connect to the property connections and advise of proposed wastewater discharge rates by completing the University application for sewer connection and submitting to the CNC. The Developer’s design consulting engineers will also need to advise proposed wastewater discharge rates in order for Curtin to gain approval from the Water Corporation.

### 7.1.3 NATURAL GAS SERVICES

If gas is required, the development lots are to be supplied with natural gas via a 180 mm polyethylene 7.0 kPa supply main, which is supplied from the pressure reduction station connected via a 160 mm polyethylene main.
A 45 kPa main to the boundary gas meter set is proposed to be installed in the future on the Hayman Road boundary. Note that the University boundary gas meter set cannot be installed/upgraded until the Developer has submitted the University Developer Gas Application Connection form at Appendix D, which lists the development lot gas supply requirements.

Individual lot Developers will need to apply for approval to the University for natural gas connections in locations nominated by the Developer and in sizes based on total Mj/hr demand with diversity loading, using the Developer application forms. Development lot gas boundary connections are to be fitted with gas sub-meters with regulators to reduce supply pressures to 1.25 kPa or 2.75 kPa. Higher supply pressures, if required at the lot boundary must be approved by the University. Refer to the Developer’s documentation requirements for individual lot service connections.

### 7.1.4 FIRE HYDRANT SERVICES

The University Bentley Campus is serviced via Water Corporation of Western Australia boundary fire water service connections as follows:

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

Boundary meter pressures vary as follows:

- Brand Drive 434–480 kPa
- Kent Street 550–590 kPa.

Stage 1 development lots are to be supplied with fire service water via a 200 mm polyethylene PN16 non-boosted fire main connected into the existing University Campus supplies at Road 3 and the Kent Street boundary main. This links the Main Street to the Water Corporation existing boundary fire service supplies.

The Stage 1 non-boosted fire main has been documented to be fitted with isolation valves to separately isolate sections of the main for future water connections and maintenance. Refer to the University infrastructure base plan for the locations of isolation valves.

Individual lot Developers will need to apply for approval to the University for non-boosted fire water connections in locations nominated by the Developer and in sizes based on the individual development lot fire system requirements, using the Developer application forms. Note that there are no street hydrants provided in the Greater Curtin development area. 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 University non-boosted fire water main lot boundary connection. A drawing showing the location of this service is available by request from drawingservices@curtin.edu.au. In-ground hydrants have been provided to the 200mm non-boosted fire main to allow Developers 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 University Infrastructure base plans.
Development lot non-boosted fire water boundary connections are to be fitted with sub-meters sized to meet the Developer’s requirements. Individual lot service connections are to be documented as outlined in Section 2.

Note that the Developer’s design consulting engineers and licensed installing contractors will be required to upgrade the two University fire booster block plans to indicate the development lot fire connection and system to meet with DFES requirements.

7.1.5 STORMWATER RETENTION SYSTEM

The existing University Campus buildings’ stormwater run-off is contained in onsite concrete soak wells located in close proximity to the buildings being serviced. Stormwater run-off from development lots is to be retained within the development lot boundary and comply with relevant council, Greenstar Communities, LWMS and Australian Standard requirements for stormwater retention.

7.2 AUSTRALIAN AND AUTHORITY STANDARDS

Developers must meet the Deemed to Satisfy provisions of the Building Code of Australia, relevant Australian Standards and authority requirements. These guidelines do not replace the requirements of these standards.

7.3 REFERENCED DOCUMENTS

The following lists standards referenced in the hydraulic technical guidelines:

- Building Code of Australia National Construction Code
- AS/NZS3500.1 Water Services
- AS/NZS3500.2 Sanitary Plumbing and Drainage
- AS/NZS3500.3 Stormwater Drainage
- AS/NZS3500.4 Heated Water Services
- AS2419.1 Fire Hydrant Installations
- AS2441 Installation of Fire Hose Reels
- AS/NZS5601 Gas Installations
- Water Corporation of Western Australia Industrial Waste Guidelines
- Water Corporation of Western Australia Backflow Contamination Guidelines.

It is the responsibility of the Developer to ensure services are installed to meet the Deemed to Satisfy provisions of the current Australian Standards and regulations applicable to the project requirements.
### 7.4 ROLES AND RESPONSIBILITIES

<table>
<thead>
<tr>
<th>Role</th>
<th>Curtin Responsibility</th>
<th>Developer Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine demand requirement</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Design internal lot infrastructure and connections to Curtin network</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Assess design and demand forecast for connection</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Select contractor from Curtin list</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pre-approval of cut in works</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Grant Access and Permits</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cut in to existing Curtin Infrastructure</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Costs for connection to existing infrastructure network</td>
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<td>X</td>
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<tr>
<td>Maintenance of Meter</td>
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<td></td>
</tr>
<tr>
<td>Maintenance of Curtin owned network</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Meter reading</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Attends commissioning and energisation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Notify of outages for planned works</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Figure 17 Hydraulic Roles and Responsibilities
7.5 LOCAL WATER MANAGEMENT STRATEGY

Curtin has prepared a Local Water Management Strategy for the Bentley Campus to satisfy regulatory requirements and to sustainably and holistically manage water supply and demand to support future development. Developers will need to 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, rain water and wastewater. The LWMS does not detail on-lot initiatives which are to be contained within the UWMP.

7.6 URBAN WATER MANAGEMENT PLAN

The University is committed to environmental sustainability and requires Developers to document how it will meet best practices for water and energy conservation. Developers are, as a minimum, required to meet the requirements and design criteria for energy and water efficiency as required by the Building Code of Australia, the Local Water Management Strategy (LWMS), Development Guidelines and Curtin’s Greenstar commitments.

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, including sustainability initiatives that deliver efficiencies in water demand and supply including water recycling and harvesting opportunities. The UWMP will need to be approved by CU 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 approval for direct engagement with authorities.

7.7 SYSTEM DESIGN BRIEF

The Developer must provide the University with a development hydraulic services design brief that provides a brief description of the proposed development and provides the following information, to be used by the University for current and future infrastructure demands on the Campus:

- lot boundary water service size and required peak instantaneous flow rate
- estimated annual water consumption for the development lot
- lot boundary fire service size and flow rate
- lot property sewer connection size and estimated peak flow rate
- lot property sewer estimated discharge percentage rate
- lot boundary gas meter size
- 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
- fire hydrant/hose reel systems including fire storage tanks, pump sets and booster cabinets
- Lot boundary rainwater and stormwater discharge flows and volumes.
- detailed design drawings to indicate how connections to service infrastructure are to be made

7.8 DEVELOPMENT LOT SERVICE CONNECTIONS

Development lots have not been provided with hydraulic fire, water and gas service connections. Developers are to determine the locations and capacity requirements to meet the demands of the proposed development. Hydraulic services infrastructure has been installed in service corridors along proposed development lot boundaries and is indicated on the University site infrastructure base plans available from drawingservices@curtin.edu.au. This service information is to be reviewed by the Developer for location, size and capacity to meet their project brief requirements. The Developer’s design consulting engineers are required to submit Notice of Intent forms and applications as set out in these Developer Technical Guidelines in addition to any authority applications and submissions.

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

Notice of Intent forms and service application forms are available at Appendix C of this document.

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

The process for a Hydraulic Submission is as follows.
The Developer and/or licensed plumbing contractor must complete the University’s Water Service, Fire Service, Natural Gas Service and Property Sewer Connection applications. Copies of these applications are available at Appendix D. The applications are required to enable the University to review demand on the Campus infrastructure and make alterations to available supplies with the University’s service providers. These applications do not replace any authority applications that must be completed and submitted by the Developer.
7.10 UNIVERSITY PREFERRED PLUMBING CONTRACTORS

All works required to be completed outside of the development lot boundary for connections to the University’s supply infrastructure are to be carried out by the Developer’s Curtin preferred licensed plumbing contractor. This list is available from your CNC.

7. 11 REGULATIONS AND PERMITS

7.11.1 REGULATIONS

Developers are to document for all works to be carried out by suitably qualified and licensed operatives. All installations are to meet the Deemed to Satisfy provisions of the Building Code of Australia, Australian Standards, Water Corporation bylaws, Public Utilities Office regulations and Health Department requirements.

7.11.2 PERMITS

Developers are to document for licensed contractors to make application and pay all fees for work to be carried out under the proposed project and 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 the University
- industrial waste discharge permits
- payment of fees and charges for major plumbing fixtures approved by the University
- industrial training levies etc. and enterprise bargaining agreements
- Office of Energy gas certificates
- University Developer Applications for water, fire, gas and sewer lot connections
- Water Corporation industrial waste permits will need to be completed and submitted to Water Corporation requirements.

7.12 HYDRAULIC SERVICES SUB-METERING

7.12.1 SUB-METERING

All development lots are to be fitted with domestic water sub-meters, non-boosted fire service sub-meters and natural gas sub-meters, installed on the incoming supply mains and located within 600 mm the development lot boundary. Developers are to allow for gas regulators to be fitted prior to the gas sub-meter and flow restrictors fitted prior to the water service sub-meters. The gas regulator is to be set to the supply pressure noted in the Developer’s gas application. The water flow restrictor is to be set to the peak flow rate nominated on the water application.
7.12.2 SUB-METERS

Domestic water and non-boosted fire service sub-meters shall be Elster M110 for sizes 15–40 DN and Elster H4000 Woltmann 50–150 DN designed for the measurement of cold potable water and compliant with Australian Standards. Meters are to be fitted with remote electronic reading connections with magnetically operated T-probe meters. Sub-meters in the 15–40 DN size range are to have disconnection unions fitted to inlet and outlet connections for the removal and replacement of meters. Isolation valves are to be installed on inlet and outlet connections. Meters in the 50–150 DN size range are to have flanged bolted connections for removal and replacement and isolation valves on inlet and outlet connections. Natural gas sub-meters shall be All Controls turbine meters with filters or Gallus diaphragm meters, complete with electronic reading connections.

All water and fire sub-meters are to be fitted with a meter by-pass to allow for replacement of, and maintenance to, the sub-meter. Isolation valves on the meter by-pass are to be the lockable type and fitted with the University-nominated locks.

7.12.3 LOCATION OF METERS

All hydraulic service sub-meters are to be installed in accessible locations for reading and maintenance. Sub-meters are not to be installed in the ground.

7.12.4 SUB-METER IDENTIFICATION

All sub-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.

7. 13 SERVICES GENERAL

7.13.1 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.

7.13.2 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.
7.13.3 BACKFLOW PROTECTION DEVICES

The University’s boundary water supply connections are fitted with approved high-hazard boundary containment valves registered with the Water Corporation. The fire service water supply connections are fitted with approved medium-hazard boundary containment valves registered with the Water Corporation. Development lot design engineers and licensed plumbing contractors are required to provide all zone and individual backflow protection devices to comply with the Australian Standards downstream of the University development lot sub-meters. Developers are responsible for maintaining and testing all backflow prevention devices within their development, to the minimum requirements set out in the Australian Standards.

7.13.4 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 steelwork 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.

7.14 SERVICE PIPE MATERIALS

7.14.1 GENERAL

The Developer’s hydraulic design engineers will be required to specify the appropriate service pipe materials suitable to meet the installation criteria and as set out in this guideline. Alternatives to the listed materials under this clause will need to be referred to the CNC for consideration and written approval to be obtained before installation.

7.14.2 DOMESTIC WATER SERVICE PIPES – SUPPLY PIPES TO BUILDING DEVELOPMENT LOTS

In-ground water service supply pipes external to the building development lot from the University infrastructure main are to be installed in PE100 PN12.5 with electrofusion fittings and copper (minimum Class Type B) to rise and connect to the lot sub-meter. In-ground copper pipe is to be wrapped in protective tape. Connection to the University main is to be made using Acu-Tech Acu-Flow DCI tapping bands with threaded outlet branch take-off for branches up to 50 mm. Branch pipes above 50 mm are to be made with an Acu-Tech electrofusion branch saddle.
7.14.3 SEWER, SANITARY AND SOIL PIPES

All underground sewer pipes and fittings are to be installed in DWV with solvent cement joints, in strict conformity with the manufacturer's recommended method for installation and the relevant Australian Standards. HDPE pipes and fittings with electrofusion jointing are an acceptable alternative where considered appropriate by the Developer's design consulting engineer.

7.14.4 FIRE SERVICE SUPPLY MAIN EXTERNAL TO BUILDING IN GROUND

The dedicated non-boosted fire supply main is to be installed in Acu-tech Polyethylene (PE 100 PN 16 minimum class) pipes with electrofusion fittings and copper (minimum Class Type A) to rise and connect to the lot fire sub-meter. In-ground copper pipe is to be wrapped in protective tape. Where the supply pipe to an above-ground sub-meter is subject to fire, it shall be installed in Victaulic steel piping to comply with AS2419.1. Connection to the University main is to be made with an Acu-Tech PE100 PN16 injection-moulded reducing tee with extended spigots and Acu-Tech PN16 Synoflex couplers to suit, for sizes 125 mm to 180 mm and Acu-Tech Acu-Flow DCI tapping bands with threaded outlet branch take-off for branches up to 50 mm.

7.14.5 GAS SERVICES SUPPLY PIPES IN GROUND EXTERNAL TO BUILDINGS

In-ground gas service supply pipes external to the building development lot from the University infrastructure main are to be installed in copper (minimum Class Type B) to rise and connect to the lot sub-meter. All pipes are to comply with Australian Standards and Office of Energy requirements. Connection to the University supply main is to be made with an Acu-Tech electrofusion branch saddle.
8. COMMUNICATIONS INFRASTRUCTURE

8.1 OVERVIEW
These guidelines have been prepared to assist Developers with communications services infrastructure designs and applications for development lot connections. The guidelines provide general communications infrastructure information and set out the minimum preferred standards, details and installation methods for Internet Service Providers (ISP) & Curtin network connections.

8.2 SCOPE OF WORKS
All development lots will be commissioned with dedicated Communications Conduits for the development carrier services (Minimum 2 x 100mm HD PVC) and Curtin University network services (Minimum 2 x 100mm HD PVC). All conduits shall be installed to:
- Comply with Australian Standards,
- Provide dedicated service pits every 50metres and every change in direction.
- Provide a dedicated fully equipped communications equipment cupboard with 24/7 access for Curtin network services. The minimum dimensions of the cupboard are 2000mm (W) x 1000mm (D) x 24000mm (H).

The Developer shall submit a method statement/scope of works to Curtin University that is in line with these Developer Technical Guidelines and Australian Standards for Curtin approval, prior to installation and purchasing of equipment.

8.3 ROLES AND RESPONSIBILITIES

<table>
<thead>
<tr>
<th>Role</th>
<th>Curtin Responsibility</th>
<th>Developer Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine communications requirements including ISP provider</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Design internal lot infrastructure and connections to Curtin network</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Assess Design and point of connection</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Select Preferred Contractor</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Order active switch and associated peripherals¹</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

¹Dependent on the specific needs and requirements of the development.
<table>
<thead>
<tr>
<th>Pre-approval of network connection</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Access and Permits</td>
<td>X</td>
</tr>
<tr>
<td>Physical connection to existing Curtin Infrastructure</td>
<td>X</td>
</tr>
<tr>
<td>Costs for connection to network</td>
<td>X</td>
</tr>
<tr>
<td>Maintenance of Curtin owned network</td>
<td>X</td>
</tr>
<tr>
<td>Attends commissioning and connection</td>
<td>X²</td>
</tr>
<tr>
<td>Provide fibre and data cabling test results</td>
<td>X</td>
</tr>
<tr>
<td>Patch services and install active switch³</td>
<td>X</td>
</tr>
<tr>
<td>Notify of outages for planned works</td>
<td>X</td>
</tr>
</tbody>
</table>

**Figure 19 Communications Roles and Responsibilities**

1CITS network switch provides connections for Curtin Cardax, Media converters connected to all metering devices, CCTV & WiFi.

2Witness commissioning works

3CITS will not patch any service until all fibre and data cabling test results are issued. Active switches will not be installed if coms cupboard is of an untidy/dusty nature.

**8.4 AUSTRALIAN STANDARDS**

Developers must meet the deemed to satisfy provisions of the Building Code of Australia, relevant Australian Standards and authority requirements. These guidelines do not replace the requirements of these standards.

**8.5 PREFERRED CONTRACTORS**

All works on Curtin infrastructure must be carried out by Curtin preferred contractors. Refer to your CNC for a copy of the current preferred contractor list.
8.6 CURTIN UNIVERSITY EXISTING COMMUNICATIONS SERVICES INFRASTRUCTURE

The existing communications services CCPI 1 & 2 is the description given to the existing campus supplied communications infrastructure services to the Greater Curtin development lots. The Developer shall ensure designs for development lots include all necessary internal services to meet specific project demands and consider the infrastructure information contained within this document.

8.7 APPROVED EQUIPMENT

All equipment must meet Australian Standards and Curtin University Standards. Under no circumstances shall equipment be obtained, purchased or installed prior to Curtin approval. All cable, materials, components and equipment shall be new and unused, of current manufacture and first quality, selected to ensure satisfactory operation.

A current register of approved items by manufacturer is available in the data communications cabling guideline.

8.7.1 EQUIPMENT – PRE-ACCEPTANCE TESTING

All equipment and pre-acceptance testing of equipment to be transferred to Curtin ownership shall be completed in accordance with Australian Standards.

8.7.2 COMMISSIONING, MANAGEMENT AND ACCEPTANCE OF CURTIN EQUIPMENT

All commissioning, management and acceptance of Curtin owned equipment shall be procured, supplied installed and completed in accordance with Curtin Communications Guidelines.

8.7.3 TESTING

All testing shall be completed in accordance with Australian Standards.

8.8 CURTIN COMMUNICATIONS PASSIVE INFRASTRUCTURE

The existing Curtin communications passive infrastructure 1 (CCPI1) is a passive network providing multiple cable pathways and spaces used to distribute Curtin’s core network cabling (fibre and copper) campus-wide and also to each development lot.

The existing Curtin communications passive infrastructure 2 (CCPI2) is a passive network providing multiple cable pathways and spaces used to distribute telecommunications-grade services from campus boundary to each development lot.

The CCPI1 infrastructure includes a fibre-ready pit and conduit system that is installed, managed, operated and maintained by Curtin University.

Both systems are presented along the road verges and within the common services easements throughout the Campus.
The systems will provide sufficient pathways and spaces to facilitate the interconnection between the site battery limits (ISP point of entry/connection – minimum two locations – diverse paths) and the new development lots, and a nominated point of presence, which will then be connected to the Developer’s communications passive infrastructure (DCPI) – responsibility of Developer.

The new proposed DCPI system is required to connect to and extend the existing CCPI1 and CCPI2 systems. The existing CCPI systems are installed to comply with both Curtin University and Australian standards.

The combined CCPI1, CCPI2 and DCPI systems shall facilitate Curtin University network services (copper and fibre) from Curtin University’s campus network system. The key requirements of the system include:

a) The existing CCPI1 and CCPI2 system will be owned, managed and maintained by Curtin University.

b) The combined CCPI1, CCPI2 and DCPI systems will be interconnected to provide a complete cable reticulation pathway for Curtin University private network cabling only.

c) The CCPI1 and CCPI2 system is a fibre-ready pit and conduit system and is installed to Curtin University and Australian standards. CCPI1 infrastructure is not available to Developers.

d) Curtin University has a dedicated CCPI1 system for Curtin University campus network distribution and a second dedicated CCPI2 system for third-party ISP carrier-grade services. Both systems maintain sufficient capacity for fibre and copper reticulation and both systems have the capacity to provide the development lots with diverse redundancy pathways. Both CCPI1 and CCPI2 shall remain 100 per cent independent and isolated from each other, including end-to-end connections. Under no circumstances shall CCPI1 be used for carrier-grade ISP cabling. Independent and dedicated DCPI systems (pit and conduits) shall be provided to maintain 100 per cent separation between third-party carrier-grade ISP services (fibre and copper) and Curtin University services (fibre and copper).

e) Developers shall contact drawingservices@curtin.edu.au for drawings to identify the location of the CCPI1 and CCPI2 system.
8.9 DEVELOPERS COMMUNICATIONS PASSIVE INFRASTRUCTURE

The proposed Developer’s communications passive infrastructure (DCPI) systems are made up of a minimum of two independent passive networks, providing multiple cable pathways and spaces. These systems shall be used to distribute the following systems:

a. The development’s independent Curtin University dedicated private network (fibre and copper) from the campus-nominated point of connection to the development’s dedicated Curtin University communications enclosure to facilitate the Curtin University connection point/point of presence within the development. The Developer shall liaise with the CNC for the campus point of connection. The Developer is to supply and install two 100 mm diameter conduits to facilitate a Curtin network service lead – DCPI to connect to the existing CCPI1.

b. The development’s independent ISP network (fibre and copper) from the campus battery limits to the development’s entrance facility/MDF room to facilitate the ISP connection point/point of presence. The Developer is to supply and install two 100 mm diameter conduits to facilitate external service provider lead-in conduits – DCPI to connect to the existing CCPI2.
The DCPI infrastructure shall include a minimum of two fibre-ready pit and conduit systems that are installed, managed, operated and maintained by the Developer.

The DCPI systems shall be presented within the new development lot and will interconnect with the existing CCPI1 and CCPI2 systems respectively that are located along the road verges and within the common services easements throughout the Campus.

The CCPI1 system will provide sufficient pathways and spaces to facilitate the interconnection between the Curtin regional hub/data centre (Curtin point of connection) and the new development lot’s point of presence/DCPI.

The CCPI2 systems will provide sufficient pathways and spaces to facilitate the interconnection between the site boundaries (ISP point of entry/connection) and the new development lot’s point of presence/DCPI.

The independent DCPI systems shall be installed to comply with both Curtin University and Australian Standards. The Developer is to submit the proposed DCPI system design and methodologies and associated planning documentation to Curtin University for coordination with CCPI1 and CCPI2 connection points and for approval prior to construction.

The independent CCPI1, CCPI2 and DCPI systems, shall facilitate telecommunications carrier-grade ISP services from the campus battery limits and Curtin University network services from Curtin’s network campus data centre or regional distribution hub.

a. The independent DCPI system shall be a fibre-ready pit and conduit system and shall be installed to Curtin University Standards and Australian Standards.

b. The DCPI system will be owned, managed and maintained by the Developer.

c. Curtin University has a dedicated CCPI1 system for Curtin University campus network distribution and a second dedicated CCPI2 system for third-party ISP carrier-grade services. Both systems maintain sufficient capacity for fibre and copper reticulation, and both systems have the capacity to provide the developments with diverse redundancy pathways. Both CCPI1 and CCPI2 shall remain 100 per cent independent and isolated from each other, including end-to-end connections. Under no circumstances shall CCPI1 be used for carrier-grade ISP cabling. Independent and dedicated DCPI systems (pit & conduits) shall be provided and maintain 100 per cent separation between third-party carrier-grade ISP services (fibre and copper) and Curtin University services (fibre and copper).

d. The DCPI systems shall not be procured, installed or commissioned unless documentation is provided to the CNC for coordination, review and approval prior to construction. The Developer shall liaise with the CNC for the campus point of connection.

### 8.10 CURTIN NETWORK CONNECTIVITY STANDARD DEVELOPMENT

Each development lot shall require a dedicated Curtin private fibre-optic campus network interconnection. This shall form part of the construction of the development and shall be the responsibility of the Developer.
Curtin University-managed network equipment (CU-MNE) such as plant, equipment, monitored and controlled Curtin services i.e. power, security, fire, lift management, chilled water and HVAC, shall require a dedicated Curtin University private network connection that will form part of the CITS Network (Curtin Information Technology Services). This Curtin University dedicated private point of connection shall be provided at a dedicated communications enclosure (CE)/ equipment rack (ER) located within an accessible dedicated cupboard within the development.

The CE shall be installed to comply with all relevant Curtin and Australian Standards. The Developer shall submit the proposed CE documentation, including the proposed location to Curtin University for written approval prior to construction. All Curtin equipment shall require 24/7 Cardax access to Curtin staff and Security.

All works associated with connecting CU-MNE shall be the responsibility (supplied, installed and commissioned) of the Developer. The Developer shall review all requirements and liaise with the CNC to confirm the point of connection on campus. This will include a sufficient mode fibre connection from the Curtin regional distribution hub/Curtin communications equipment cabinet through to each meter or plant/equipment location.

A fibre communications enclosure (CE) shall be installed to comply with both Curtin University Data Communication Cabling Standards and Specifications and Australian Standards minimum requirements.

This shall include but not be limited to:

a. A dedicated external small-form communications enclosure located within an equipment cupboard (refer to sketch below) shall be provided within the Developer’s scope of works to facilitate connection to Curtin-supplied active network equipment. All Curtin equipment shall remain physically separated and secured from building/tenant equipment.

b. The CE shall be sized in accordance with Curtin University Standards and shall contain the following equipment at a minimum:
   - a fibre-optic cable connected back to Curtin University campus network, supplied and installed by Developer
   - a fibre FOBOT, supplied and installed by Developer
   - 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
   - a Curtin University network managed switch(s), supplied and installed by Curtin University
   - CE power, earthing and cooling requirements, supplied and installed by Developer.

c. Communications and electrical testing as per Australian Standards and Curtin Standards. This shall be the responsibility of the Developer. All test results shall be provided to the CNC at the time of handover.

d. All fibre and copper shall be reticulated in protective cabling containment, which shall be sized to meet Australian Standards and cable requirements.
e. 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 the University.

f. The cupboard space shall also be used to house dedicated security equipment also. Refer to the Security section of these Developer technical guidelines for information.

All works associated with Curtin University network connection and CU-MNE shall not be procured installed or commissioned unless proposed planning and documentation is provided to the CNC by the Developer for coordination and approval prior to construction.

8.11 STANDARD DEVELOPMENT CONFIGURATION

Figure 21 Communications Standard Development Configuration

8.12 CURTIN NETWORK CONNECTIVITY - SHARED DEVELOPMENT

Each shared development, where Curtin University will be a tenant within the development, shall require a dedicated Curtin private fibre-optic campus network interconnection. This shall form part of the construction of the development and shall be the responsibility of the Developer. Curtin University managed network equipment (CU-MNE) such as plant, equipment, monitored and controlled Curtin services, i.e. power, security, fire, lift management, chilled water and HVAC, shall require a dedicated Curtin University private network connection that will form part of the CITS Network (Curtin Information Technology Services).
This Curtin University 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.

The dedicated/shared EF/MDF room shall be installed to comply with both Curtin University Data Communication Cabling Standards and Specifications and Australian Standards minimum requirements. The Developer is to submit the proposed EF/MDF documentation to Curtin University for coordination and approval prior to construction. All Curtin equipment shall require 24/7 Cardax access to Curtin staff and Security.

This shall include but not be limited to:

a. The dedicated/shared EF/MDF and CE(s) shall be sized in accordance with the Curtin University 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 University 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 University network managed switch(s), supplied and installed by Curtin University
   - CE power, earthing and cooling requirements, supplied and installed by the Developer.

b. A dedicated Communications Enclosure shall be provided within the new Developer’s scope of works to facilitate Curtin equipment. All Curtin equipment shall remain physically separated and secured from building/tenant equipment.

c. A dedicated private network connection (dark fibre) that will be connected between the Curtin dedicated enclosure/equipment room within the development EF/MDF and CE and Curtin’s network campus network (data centre or regional distribution hub). This service is provided to facilitate Curtin network connectivity i.e. essential power, HVAC/BMS remote management, monitoring and control as referenced above.

d. 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).

e. Approved access and interconnection will be required between Curtin University’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 University network equipment and the development’s field devices and equipment (MNE).
f. 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.

g. 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 the University.

All works associated with Curtin University network connection and Curtin dedicated equipment MNE, shall not be procured installed or commissioned unless proposed planning and documentation is provided to the CNC by the Developer for coordination and approval prior to construction.

8.13 THIRD-PARTY INTERNET SERVICE PROVIDER POINT OF CONNECTION

All Developer points of connection, telecommunications agreements and contracts will remain solely the responsibility of the Developer/development account holder. Curtin University will not take any responsibility for ISP services, including but not limited to anything indirectly related to the services, service infrastructure, the service's reliability or quality of services etc. The ISP contract and its respective service shall remain solely the responsibility of both the telecommunications carrier and the sub-tenant account holder only.

The telecommunications carrier ISP cabling shall be reticulated via both the combined CCPI2 and the respective DCPI system. Management and coordination of the telecommunications carrier ISP cabling shall be the responsibility of the Developer/development account holder only. Curtin University will not take any responsibility for this coordination. It is the responsibility of the Developer to seek approval from the University to reticulate ISP services within the CCPI2 shared (Curtin owned and operated) ISP communications infrastructure.

It shall be noted that Curtin University is not an internet services provider and does not currently wholesale telecommunications ISP services. All telecommunications services necessary for connecting all developments/tenancies to an ISP will require purchase of an ISP service from a regulated internet services provider/wholesaler. ISP Services such as voice, video, data or cloud services shall be provisioned via a licenced telecommunications carrier only.

a. In no event shall Curtin University be liable for economic loss, loss of contract/service, loss of profit or revenue, loss of data, loss of production or production termination, financing costs or expenses however characterised, increased costs and expenses of construction or operation, indirect or consequential loss.

b. If there is a requirement for expansion of the CCPI2 system to make allowance for third-party ISP communications infrastructure, both supply and installation shall remain the sole responsibility of the Developer. Once the expansion is completed, ownership of the infrastructure will be handed to Curtin University. All costs associated with additional expansion shall remain the responsibility of the Developer.
c. All CCPI2 expansion works shall ensure, at a minimum, reinstating and making good all surfaces and pavements to Curtin-required finishes. Curtin University reserves the right to ensure that any expansion or amendment works to Curtin infrastructure or any indirect impact to Curtin University assets and in-ground services shall remain the responsibility of the Developer to reinstate and make good to the satisfaction and final approval of Curtin University. This shall include but not be limited to:

- damage to Curtin University in-ground/above-ground assets and infrastructure
- disruption to Curtin University services that may result from expansion of infrastructure works directly/indirectly.
### 8.14 COMMUNICATIONS INFRASTRUCTURE RESPONSIBILITY MATRIX

<table>
<thead>
<tr>
<th>Curtin University</th>
<th>Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CCPI1 - Curtin Communications Passive Infrastructure for Curtin network cabling only / Copper Fibre. Existing Infrastructure located along development road verge.</td>
<td>• DCPI1 – Developer Communications Passive Infrastructure Interconnect with CCPI 1 to facilitate lead in Curtin network cabling only / Copper Fibre to new development. All works shall be completed during development stage and shall be supplied, installed &amp; maintained by the Developer.</td>
</tr>
<tr>
<td>• CCPI2 - Curtin Communications Passive Infrastructure for 3rd party Internet Service Provider public network cabling only / Copper Fibre. Existing CCP2 Infrastructure located along development road verge.to be assessed for compatibility prior to services applications with ISP. If upgrade is required, this shall be supplied and installed by the Developer.</td>
<td>• DCPI2 – Developer Communications Passive Infrastructure Interconnect with CCPI 2 to facilitate lead in 3rd Party ISP network cabling only / Copper Fibre to new development. All works shall be completed during development stage and shall be supplied, installed &amp; maintained by the Developer.</td>
</tr>
<tr>
<td>• Developer Works Review – proposed Communications Infrastructure installation design works for CE, DCPI1 and DCIP2 and any upgrade requirements to CCPI1 and CCPI2 shall not be completed until Curtin University has reviewed and approved all associated designs, methodologies &amp; equipment manufacturers proposed by the Developer.</td>
<td>• If the new Communications Infrastructure by Developer DCPI 1 or DCIP 2 have impact on the existing Communications Infrastructure CCPI 1 or CCPI 2. All works associated with this impact shall be assessed prior to applications with Curtin or a 3rd party ISP. If upgrade works are required, these works shall be supplied and installed by the Developer.</td>
</tr>
<tr>
<td>• Developer Works Review - Testing and Commissioning shall be provided in line with Australian Standards. All Curtin dedicated copper and fibre testing shall be provided as part of the Developer’s works. All test results shall be provided to Curtin University for approval and inspection.</td>
<td>• Standard Development Dedicated External Communications Enclosure CE with a 24/7 Curtin Cardax accessible equipment cupboard. This CE will be connected back to Curtin’s private network and will be used to manage the developments managed network equipment such as plant &amp; security etc. All works shall be completed during development stage and shall be supplied, installed by the Developer. Curtin University to supply the active network switches only</td>
</tr>
</tbody>
</table>
- Shared Development, within a Curtin/Developer shared development all Curtin requirements and dedicated communications infrastructure spaces and locations shall be proposed to Curtin University. All works associated with the shard development shall be approved, coordinated and agreed with Curtin University during the design stage.

- All 3rd party Internet Service Provider applications shall be by the Developer. All infrastructure upgrades and associated costs and charges shall be by the Developer.

- All Curtin Dedicated Network Connectivity Service applications shall be by the Developer. All infrastructure upgrades and associated costs and charges shall be by the Developer. The Developer shall ensure 24/7 accessibility to Curtin Infrastructure & Cabling is provided and form part of this guideline, this includes full access to DCPI1.

- All Equipment Installation – Testing and Commissioning shall be provided in line with Australian Standards. All Curtin dedicated copper and fibre testing shall be provided as part of the Developer’s works. All test results shall be provided to Curtin University for approval and inspection.

**Figure 22 Communications Infrastructure Responsibility**
9. MECHANICAL INFRASTRUCTURE

9.1 SYSTEM OVERVIEW

Air conditioning is achieved via a district heating and cooling system utilising a comprehensive network of in ground chilled and heating water pipe work infrastructure. The schematic diagram contained in Appendix E is indicative of the chilled water network with the heating water network effectively mirroring the chilled water system as illustrated.

The existing Academic Heart chilled and heating water system is designed and sized to accommodate the needs of the Academic Heart only. The Academic Heart chilled and heating water system does not have capacity to support the Greater Curtin development other than development lots F05, F06 and the space to the east of Building 410 to Brand Drive and bound by Road 2 to the north and Building 408 to the south. Development of land to the west of Dumas Drive will not be supported by the existing Academic Heart chilled and heating water network. Therefore, development in locations to the west of Dumas Road will need to provide for air conditioning in accordance with the requirements of the Greater Curtin Master Plan and associated development guidelines; being cognisant of energy consumption targets/limitations stated in documentation specific to those developments.

9.2 CONNECTING TO GREATER CURTIN

The provision of air conditioning services on Curtin’s Bentley campus is limited to the Academic Heart.

The University’s minimum requirements for air conditioning and ventilation systems apply to all Curtin University-owned and operated buildings. A copy of the Curtin Mechanical Services Project Delivery Guidelines that contain the minimum requirements is available at


Developers of buildings not owned and operated by the University must meet the relevant statutory requirements and Australian Standards for mechanical infrastructure.

9.3 ROLES AND RESPONSIBILITIES

<table>
<thead>
<tr>
<th>Role</th>
<th>Curtin Responsibility</th>
<th>Developer Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine mechanical requirements</td>
<td></td>
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</tr>
<tr>
<td>Design internal lot infrastructure (including connections to Curtin network Lot F05 &amp; F06 as applicable)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Task</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Assess Design and point of connection</td>
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<td></td>
</tr>
<tr>
<td>Select Preferred Contractor</td>
<td>X</td>
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</tr>
<tr>
<td>Order active switch and associated peripherals(^1)</td>
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</tr>
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<td>Pre-approval of network connection (lot F05 &amp; F06)</td>
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<td>Grant Access and Permits (Lot F05 &amp; F06)</td>
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<td>Physical connection to existing Curtin Infrastructure</td>
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<tr>
<td>Costs for connection to network</td>
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<tr>
<td>Attends commissioning and connection (^1)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Provide test results</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Notify of outages for planned works</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Lot F05 & F06 only

**Figure 23 Mechanical Roles and Responsibilities**
10. SECURITY SERVICES INFRASTRUCTURE

10.1 INTRODUCTION

These guidelines have been prepared to assist Developers with preparing design and contract documentation for security-related works at or associated with Curtin University. This document shall be used as a reference for understanding the many different integration possibilities of security infrastructure that may arise from co-habitation between Curtin University and its partners in the development and realisation of the Greater Curtin community.

10.2 SYSTEM OVERVIEW

The existing security systems used by Curtin University comprise two main systems – the Security Management System (SMS) and the Digital Video Management System (DVMS). The primary function of Curtin University’s SMS is to integrate all electronic security infrastructure, including Access Control Systems (ACS), Intrusion Detection and Alarm Systems (IDS), Digital Video Management System (DVMS), Video Analytics systems, Key Management Systems, IP Intercom Systems (referred to at Curtin University as Campus Assistance Points (CAP)), future security systems and future intelligent building management systems (BMS). The SMS shall provide the functionality for all systems and is capable of bi-directional communication with all relevant sub-systems and field equipment over the existing Curtin LAN.

10.3 NETWORK

All of the systems rely on the Curtin Local Area Network (LAN). The communications network plays a critical role in providing 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 a normal office environment and the devices that form the Security Management System or Digital Video Management System, the installed network must be capable of allowing for a high data traffic flow network, which should be capable of utilising ‘parallel transmission schemes’ whereby signals are transmitted simultaneously over multiple pairs instead of one pair.

Developers should refer to the Curtin University Data Communications Cabling Standard and Specifications for full details of the requirements for network infrastructure. This is available at

### 10.4 CONNECTING TO GREATER CURTIN

The following table provides an overview of the various asset classes that form Greater Curtin and the level of security infrastructure that Curtin University requires to be available in that area.

<table>
<thead>
<tr>
<th>Building/Area</th>
<th>Security Infrastructure Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtin-owned and -operated building</td>
<td>As per Security Design Standard and Security Infrastructure Specification (full access control/CCTV/Campus Assistance Points)</td>
</tr>
<tr>
<td>Tenanted space within Curtin-owned building (some Curtin connection)</td>
<td>As per Security Design Standard 5.7.12 Area 12 – leased, tenanted spaces (Curtin University owned)</td>
</tr>
<tr>
<td>Tenanted space within Curtin-owned building (no Curtin connection)</td>
<td>As per Security Design Standard 5.7.12 Area 12 – leased, tenanted spaces (Curtin University owned)</td>
</tr>
<tr>
<td></td>
<td>Where the tenant has a requirement for access control, it is a requirement that the tenant adopt the University’s Access Control System and operate as a separate facility. This allows for one card technology to be utilised throughout the building while allowing the tenant to be in full control of their own security system. Any intrusion detection (alarm) system is to be standalone and separate from the Curtin security infrastructure systems.</td>
</tr>
<tr>
<td>Developer-owned premises on Curtin land</td>
<td>It is mandatory that a space is made available that can accommodate the installation of a Curtin network data rack, which can be used by Curtin University for the future installation of security infrastructure to the surrounding public areas, if and when required to enhance public safety of the Greater Curtin community.</td>
</tr>
<tr>
<td>Developer-owned premises with Curtin tenants</td>
<td>Shall be treated the same as a Curtin-owned space.</td>
</tr>
</tbody>
</table>

**Figure 24 Security Infrastructure Requirement Table**

The CNC shall be kept aware and be consulted with during the design stage of any building or the development of any public space on Curtin University land to ensure adequate security infrastructure coverage is attained.

### 10.5 RESPONSIBILITY

The following table outlines the security obligations for the various types of building/area that form the Greater Curtin City.
<table>
<thead>
<tr>
<th>Building/Area</th>
<th>Curtin University/Security Infrastructure Responsibility</th>
<th>Tenants/Third-party Developer Responsibility</th>
</tr>
</thead>
</table>
| Curtin-owned and-operated building | Curtin University remains completely responsible for maintenance and repair of all security systems. | No involvement  
No responsibility |
| Tenancy within Curtin-owned building (some Curtin connection) | Curtin University remains completely responsible for maintenance and repair of the building perimeter treatments and any security infrastructure that is not directly related to the tenanted space. | Responsible for reporting any items requiring maintenance on the Curtin University-controlled areas.  
Responsible for installing, maintaining and repairing any third-party systems that form part of the tenanted space such as tenant-installed alarm systems. |
| Tenancy within Curtin-owned building (no Curtin connection) | Curtin University remains completely responsible for maintenance and repair of the building perimeter treatments and any security infrastructure which is not directly related to the tenanted space. | Responsible for reporting any items requiring maintenance on the Curtin University-controlled areas.  
Responsible for maintenance and repair of any third-party systems installed that form part of the tenanted space. |
| Developer-operated premises on Curtin land | No involvement  
No responsibility  
Curtin reserves the right to place its owned and operated CCTV cameras on the outside of all new buildings. In this instance, a space is to be provided to accommodate such an installation | Responsible for the design, installation, maintenance, third-party monitoring and repair of the internal and perimeter of building security system. |
| Developer-owned premises with Curtin tenants | Curtin University remains completely responsible for maintenance and repair of any security infrastructure that is directly related to the tenanted space. | Responsible for maintenance and repair of the building perimeter treatments and any security infrastructure that is not directly related to the tenanted space. |

**Figure 25 Security Roles and Responsibilities**
The Curtin University Security Design Standard and Security Infrastructure Specification is a controlled document. Copies shall be made available to Developers upon the signing of a confidentiality agreement. Developers should contact the CNC for further information.
11. LANDSCAPE AND OPEN SPACE DESIGN

11.1 GENERAL REQUIREMENTS

Any Curtin University street and public realm interfaces need to match existing materials and layouts to create a seamless public realm.

All queries relating to landscape themes and design shall be directed to the CNC.

11.2 ROLES AND RESPONSIBILITIES

<table>
<thead>
<tr>
<th>Role</th>
<th>Curtin Responsibility</th>
<th>Developer Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design internal development lot landscaping and interface with Curtin public realm</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Review and Assessment of Design</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Select Contractor</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Grant Access and any required permits</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Maintenance of landscaping internal to development lot</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Maintenance of Public Realm</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Meter reading for irrigation / water</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Notify of any outages for planned works</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Figure 26 Landscape Roles and Responsibilities Table
11.3 PLANT SELECTION AND PLANTING
All plant selection should comply with the Planting List outlined in Document C – *Greater Curtin Delivering the Vision*.

Landscape design is to be waterwise, maximising on-site water management and, where possible, providing a food source for the threatened black cockatoo.

11.4 SERVICE PITS
Any pit located in the pavement of public spaces should be an infill pit and the surface should match the surrounding pavement.

11.5 PASSIVE SECURITY
All landscape should be designed to ensure that safety and security is enhanced by the landscaping.

Landscaping should not offer concealment, visual obstruction of or climbing aids to persons seeking to undertake unlawful activities.

11.6 SAFETY AND SIGHTLINES
Landscape design must maintain sight distance for cycle and pedestrian crossings and ensure head height sight clearance. Pedestrian crossings must not be obscured by tree placement. Sightlines in roundabouts are to satisfy Department of Main Roads Standards.

The setback of trees, artwork and advertising signage from the road edge should be located outside clear zone requirements and should comply with the Department of Main Roads Standards.

Any obstructions immediately adjacent to accessible paths of travel must conform to the requirements of Curtin University’s Universal Access Plan.

11.7 CAR PARK LANDSCAPE DESIGN
Car park landscape arrangements should reflect the requirements outlined in Document C – *Greater Curtin Delivering the Vision*.

11.8 EROSION AND SEDIMENT CONTROL
Control measures are required during both the construction phase and maintenance phase of a development to prevent the erosion, siltation and pollution of adjacent lands, watercourses and downstream pipe drains. Drawings prepared for all developments are to include details of erosion and sediment control measures.

Sediment control devices, water flow directions and discharge locations are to be referred to in landscape drawings or supplemented with civil works drawings.
11.9 IRRIGATION

There will be no opportunity for Developers to connect in to Curtin University’s existing bore or irrigation network. Developers must use scheme/recycled water. Groundwater Bore licence applications which impact the University’s approved groundwater take up limits will not be supported by the University. The University has a preference for recycling and re-use of water for irrigation purposes.

Plant selections are to factor in watering requirements on site, including using drought-tolerant species and using recycled water as the primary water source, where practicable.

An irrigation plan is to be submitted to the CNC for written approval prior to construction.

Developers should refer to the Water Corporation for relevant watering restrictions and applicable watering days.

Spraying patterns of sprinklers are to be designed not to cover paths or roads or produce potential liability situations.

11.10 SIGNAGE

Refer to Document C – Greater Curtin Delivering the Vision for guidelines on signage to be incorporated into the design of entry features and walls.

11.11 LANDSCAPE SCREENING

All substations along busy road frontages, water tanks and industrial areas should be screened with landscape elements.

Landscape screening should be designed to 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.

11.12 LANDSCAPE MAINTENANCE

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

Appendix A – planning documents summary
Appendix B – power supply arrangements
Appendix C – other electrical documents
Appendix D - hydraulic application forms
Appendix E – chilled hot water diagram
APPENDIX A – PLANNING DOCUMENTS SUMMARY

Greater Curtin Vision

The Greater Curtin Vision document establishes the goal or vision for Greater Curtin and provides a high-level introduction to the Master Plan. Curtin University’s Vision is “To be an international leader in research and education – changing minds, changing lives and changing the world”. The Vision is underpinned by seven key objectives:

i. Governance
ii. Knowledge, Research and Training
iii. Global Influence
iv. Innovation
v. Identity
vi. City Experience
vii. Student Life.

The Greater Curtin Vision document sets out the intent for the future city through delivery of the key objectives.

DOCUMENT A – GREATER CURTIN DRIVERS FOR CHANGE

This document establishes the starting point for the Greater Curtin project, setting out the drivers for the evolution of the University into a city. It provides an understanding of the key decisions made and the rationale and outcomes sought.

DOCUMENT B – GREATER CURTIN MASTER PLAN

Any development on campus must be consistent with the Greater Curtin Master Plan. The Master Plan presents the vision and strategic framework for developing Curtin’s Bentley Campus and provides a clear direction for the growth, land use planning and development intent to 2031 and beyond.

DOCUMENT C - GREATER CURTIN DELIVERING THE VISION

The Greater Curtin Delivering the Vision document provides a detailed design direction and development guidance to Developers ensuring their developments achieve the Vision. It delivers objectives and development criteria for the precincts within Greater Curtin and within those precincts, lot-specific guidelines and key requirements for working with Curtin.

GREATER CURTIN STAGE 1 DEVELOPMENT GUIDELINES

These guidelines outline all the necessary objectives and development criteria that Developers will need to address to achieve the Greater Curtin Vision.
GREENSTAR COMMUNITIES

In 2015 Curtin University was awarded Australia’s first 5-star Greenstar Communities rating from the Green Building Council of Australia for its Master Plan, which will see the Bentley Campus developed into a ‘City of Innovation’.

The 5-star rating, which equates to 'Australian Excellence', was earned after the University Master Plan was assessed against benchmarks for governance and innovation, design excellence, environmental sustainability, economic prosperity and liveability. Curtin is the only educational institution to earn such an accolade.

All developments occurring at Curtin must demonstrate how they have addressed these criteria, as part of their development proposal.

UNIVERSAL DESIGN GUIDELINE BUILT FORM

Curtin University believes in creating equitable and inclusive access for people with a disability to our facilities, services, events and academic programs. A Disability Access and Inclusion Plan (DAIP) is in place to ensure people with a disability can access education and services in a way that facilitates independence, opportunities and inclusion at Curtin. Developers are required to make themselves familiar with the most up-to-date version of the DAIP and ensure their development reflects the DAIP strategies to improve access to services, buildings and information.

LOCAL WATER MANAGEMENT STRATEGY

Curtin University’s LWMS is a framework that identifies and integrates the objectives, targets and initiatives needed to sustainably and holistically manage water supply and demand to support future development. It is an essential part of Curtin’s vision to create an innovative and world class sustainable city.
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
APPENDIX C – ELECTRICAL DOCUMENTS

- Power Supply Application Form
- Handover Certificate
Power Supply Application

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)/m²

☐ Direct reading / load survey

☐ Other

Type of Network Connection

☐ Domestic

☐ Commercial

☐ Other :

☐ Multi Residential

☐ Industrial
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 University with the following exceptions and comments:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

Handed over by: ___________________________ Accepted by: ___________________________

                                                (sign)                                      (sign)

Required Attachments

☐ HV Submission
☐ Completion Notices
☐ Operation & Maintenance Manual
☐ Commissioning Reports
☐ As Constructed Drawings
☐ Surveyor Drawings
Appendix D

DEVELOPER APPLICATION FOR WATER and FIRE SERVICE 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_______________________________

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.

IN ALL CASES THE UNIVERSITY WILL PROVIDE A MINIMUM STATIC PRESSURE OF 15 METRES HEAD AT THE SERVICE BOUNDARY CONNECTION POINT. NO HIGHER PRESSURE SHALL BE RELIED UPON FOR ANY DEVELOPMENT PURPOSE.
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 WASTE WATER DISCHARGE________________________%  

WILL THIS PROJECT REQUIRE AN INDUSTRIAL WASTE APPLICATION__Y/N  
IF YES PLEASE ATTACH COPY OF COMPLETED INDUSTRIAL WASTE APPLICATION.
DEVELOPER APPLICATION FOR NATURAL GAS CONNECTION

UNIVERSITY LOT NUMBER ______________________

PROJECT NAME IF APPLICABLE __________________________________________________________

DEVELOPER NAME________________________________________________________ ABN________

ADDRESS________________________________________________________ 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

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>MJ/HR</th>
<th>APPLIANCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>STORAGE HOT WATER SYSTEM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CONTINUOUS HOT WATER SYSTEM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>POOL/SPA HEATER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>COOKTOP/OVEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MECHANICAL BOILER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ROOM HEATER FLUED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BAYONET POINT – INTERNAL HEATER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BAYONET POINT – EXTERNAL (BBQ)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OTHER</td>
</tr>
</tbody>
</table>

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.
APPENDIX E – Chilled Water Reticulation