# SECTION 34

# DOCUMENTATION

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| Version | Date | Authors | Summary of Changes |
|---------|------|---------|--------------------|
| 1 | 9 April 2013 | Multitech for JCU | First Edition |
| 2 | 30 September 2013 | Manager, Infrastructure Services | Revised with JCU comments |
| 2.5 | 14 August 2014 | WA for JCU | |
| 3 | 19/8/14 | | Issue to web |

## 34.0   DOCUMENTATION

### 34.1   DESIGN PROCESS REQUIREMENTS

**34.1.1   Roles and Responsibilities**

JCU does not wish to be separated from the design process, regardless of whether the project is traditionally delivered, delivered through Managing Contractor, D&C contractor or other.

34.1.1.1   Traditional Delivery

Where traditional delivery is chosen, the framework may be through a Principle Consultant (such as an Architect or Project Manager), or direct to JCU.

The Principal Consultant is to arrange workshops with the JCU Deputy Director – Planning and Development, Manager, Infrastructure Services, Manager, Asset Strategy and Maintenance and other technical staff as directed by these managers from initiation of schematic design.

34.1.1.2   Managing Contractor Framework

Arrange workshops and information issues throughout the design process with the JCU Deputy Director – Planning and Development, Manager, Infrastructure Services, Manager, Asset Strategy and Maintenance and other technical staff as directed by these managers (through the Managing Contractor and JCU's Project Manager).

34.1.1.3   Communication Arrangements

All communication with JCU is to be via the JCU Project Manager.  Minutes of any design review meetings etc. are to be provided to all participants via the JCU Project Manager.

**34.1.2   Interfaces with Other Disciplines**

Ensure that all works necessary for the complete installation and successful operation are advised to other consultants and specified as interface with other engineering disciplines, professions or specialists.

Ensure that information required to accurately design the services is obtained from other consultants as required.

**34.1.3   Non-Conformance Approvals**

All project team members (for example Consultants, D&C Contractors, Principal Consultants, Internal/External project managers, subcontractors etc.) are responsible for delivering the project in accordance with the project brief, these guidelines, user group information and other contractual documents.

Where there are sound engineering reasons to deviate from these documents, a written non-conformance request is to be submitted to the Deputy Director – Planning and Development via the JCU Project Manager.

This could apply when the project involve aspects, scope, technologies, locations or other applications that are not specifically briefed or covered by the Design Guidelines, the non-conformance request will include clear information on:

- Technical Aspect that is not covered
- A range of options to address the issue
- Time and costs implications for each option

- Effect of the aspect on the design and on other trades
- Effects on users, maintenance, access, life of plant, energy efficiency, cost
- Effects on future re-allocation of the space / system etc.
- Recommended solution to the issue

A Non-Conformance register is to be maintained by the Consultant and the details of each request plus the outcome are to be recorded.

## 34.2    GENERAL REQUIREMENTS

It is important to document all changes to JCU facilities.  JCU uses a variety of systems to track and record building work and other activities.  This includes infrastructure, services, operations, maintenance, space programming, and asset and facilities management.  Accurate information is critical for effective facilities and asset management.

Building Information Models (BIM) are used to centralise the storage of information relating to buildings.  These models are managed by the Design Office.

JCU's Geographical Information System (GIS) is the centre of information relating to site services and infrastructure.  The GIS is managed by the Design Office, JCU.

Changes to the built environment and infrastructure directly affect the day-to-day operations of the University.  The following list illustrates some of the areas that are affected by building change:
- Emergency evacuation diagrams
- Concept Safety online induction update
- Fire Wardens training
- Room Numbers
- Maintenance records
- Keys and Security
- Labels and signage
- Occupancy (Space & Timetabling)
- Chargeback (Faculty occupied areas, leased spaces)
- Fabric renewal / Maintenance schedule (Asset Management)
- Compliance with standards and codes and regulations
- GIS records
- Student Association activities and records

It is vital that all changes to the built environment are recorded and delivered to the University.  To ensure compatibility with JCU's building and infrastructure management systems, Record Documentation shall be delivered as specified in this section.

Note:    This section is not a guideline for all project documentation deliverables.  This section is focussed specifically on Record Documentation, that is, the As-Constructed or As-Built deliverables.

## 34.3    REFERENCES

This section is written with reference to the following documents:

### 34.3.1    Australian Standards:

AS 1100.101-1992 Technical drawing - General principles
AS 1100.201-1992 Technical drawing - Mechanical engineering drawing
AS 1100.301-2008 Technical drawing - Architectural drawing

AS 1100.401-1984 Technical drawing - Engineering survey and engineering survey design drawing

AS/NZS 1100.501:2002 Technical drawing - Structural engineering drawing

### 34.3.2 Open Standards:

Omniclass

### 34.3.3 Other Industry Standards, Guidelines, and Conventions:

National Public Works Council – Table of Building Elements (Australian)
AEC (UK) BIM Protocol for Autodesk Revit – V2.0
NATSPEC National BIM Guide
AIA Document E202, Building Information Modeling Protocol Exhibit

### 34.3.4 Project Documents:

Letter of Transmittal
Project Drawing Register (template)
BIM Management Plan/ BIM Execution Plan
Project File
The Brief
The Contract

### 34.3.5 System Documents:

JCU Drawing Register
JCU Organisational BIM Management Plan

## 34.4 INFORMATION EXCHANGE

### 34.4.1 General

This section describes the process of information exchange between the University and *project teams*.

Types of information exchange:

1. requesting building and infrastructure data for *JCU* property (information request)
2. submitting as built documentation to *JCU*

```
                    ┌──────────────┐
                    │ Information  │
                    │   Request    │
                    └──────────────┘
         ┌──────────────┐       ┌──────────────┐
         │ Record Model │       │ Project Work │
         │              │       │ (Local Copy) │
         └──────────────┘       └──────────────┘
                    ┌──────────────┐
                    │  Submission  │
                    │(Update Central)│
                    └──────────────┘
```
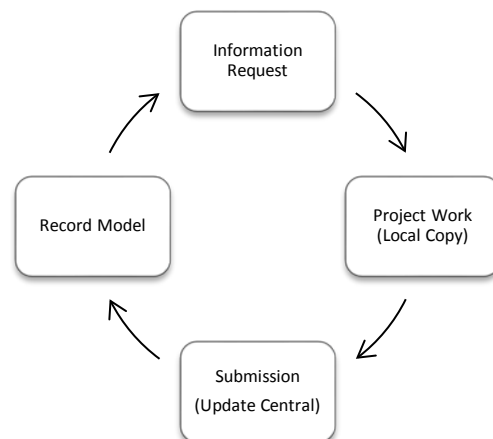
On project completion, final documents (describing as built conditions) are submitted to the Design Office for record keeping and integration with operational systems.

### 34.4.2    Information Requests (Building Records)

The building records at JCU are used to support planning projects, new building work, upgrades and maintenance to existing facilities.  The *project team* may request access to these records.

*JCU Building Records* are maintained by the Design Office.  Official requests for information may be made via the *JCU Project Manager[1]*.

JCU encourages the use of "self serve" systems where possible, including the following:

- Enlighten – Web-based GIS

    EDocs – accessible through Enlighten

The url for Enlighten:

https://secure.jcu.edu.au/enlighten3

For access to Enlighten, contact the *JCU Project Manager* to initiate creation of a user account

### 34.4.3    Site and Infrastructure Records

*JCU Site and Infrastructure Records* are maintained by the Design Office.  Official requests for information may be made via the *JCU Project Manager[2]*.  Site and infrastructure details are viewable through Enlighten.  Refer Information Requests (Building Records) for access to Enlighten.

### 34.4.4    Enlighten

Enlighten is the web-based Geographic Information System (GIS) application that enables controlled access to JCU's spatial data.  Spatial data includes building footprints, roads, parking lots, paths, creeks, cadastre, and other site features.  The system also contains information about underground assets such as communications, water, sewer, storm water, and electricity services.

All Estate Office staff, as well as Information Technology and Resources infrastructure staff, have access to this rich spatial content through Enlighten.  Users external to JCU can be trained and issued with accounts to access the system.

Enlighten can be accessed at this URL:

https://secure.jcu.edu.au/enlighten3

## 34.5    SUBMISSION INSTRUCTIONS

### 34.5.1    General

All documents, drawings and model submissions shall be in accordance with this section.

The final drawing deliverables for each project is determined at the project level.  A list of mandatory requirements is set out in section 34.9.

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[1] Project Managers may use the following email alias to make relevant requests: BuildingRecords@jcu.edu.au

[2] Project Managers may use the following email alias to make relevant requests:
GIS@jcu.edu.au

All drawing submissions shall be accompanied with:

- Letter of Transmittal and;
- Project Drawing Register

### 34.5.2   Verification

All submitted documents shall meet the required standards and integrate successfully into all Estate Office applications (e.g. MEX, BMS, GIS, FM: Systems, etc).

Submitted drawings shall be subject to verification of compliance to this standard.  Any drawing or model submission that does not substantially comply will be rejected and appropriate contract action, including withholding of payment, noting on contractor past performance reports, and/or other remedies, may be activated by *JCU*.

The *Project Team* shall not be relieved of responsibility when files are delivered if the files do not meet established requirements or are defective.

Refer to Appendix A for the Drawing Submission Checklist.

### 34.5.3   Method of Transmission

Files shall be issued to *JCU Building Records* via the *Project Manager*.

Small file sets that are less than 5mb in size may be sent to this email address: BuildingRecords@jcu.edu.au

Emails with attachments exceeding 5MBb should not be sent this way.

The handling of large file sets (those exceeding 5mb) shall be as agreed by the *project team*. Acceptable methods include:

- Use of large file transfer functions over the internet
- Shared cloud storage space
- CD or DVD
- USB stick (preferred)

Electronic files and media submitted to *JCU* must not contain computer viruses.

File transfers via the internet including cloud storage shall remain secure and confidential.

### 34.5.4   Letter of Transmittal

The Letter of Transmittal shall contain the following minimum information:

| |
|---|
| Project Number |
| Project Title/Description |
| Contract Number or Reference |
| Estate Office Project Manager or JCU contact name |
| Reason for Issue |
| Date of Issue |
| Reference to drawing register and attachments |
| Comments as required |

### 34.5.5   Project Drawing Register

The *Project Drawing Register* contains all finalised versions of models and drawings.  It is not a register for tracking revisions throughout the project, but rather a tool to capture the information relating to each model, drawing, and sheet upon handover.

All relevant fields in the register shall be filled where possible.

The *project team* shall supply **a** *Project Drawing Register* listing all finalised documents, including:

- Record Model Revit files
- Record Drawing (As-Constructed) AutoCAD files
- Record Drawing (As-Constructed) PDF files

The *Project Drawing Register* shall match the *JCU* template and shall be supplied in Microsoft Excel file format.  Proprietary document transmittals are not acceptable.

The template is available for download at:
http://www.jcu.edu.au/estateoffice/info/constructionmaintenance/index.htm

| Drawing Register Column Headers |
| --- |
| File Name |
| Building Number |
| Floor Level |
| Project Number |
| Project Title |
| Site Address |
| Client Name |
| Consultant Name |
| Discipline |
| Drawing Number |
| Sheet Title |
| Content |
| Reason for Issue |
| Author |
| Revision Number |
| Date of Original Issue |
| Date of last issue |
| Original Sheet Size |
| Sheet Sequence Number |
| Comments/Notes |

It is critical that the integrity of the Project Drawing Register is maintained.  The information in this table will be migrated to the JCU Drawing Register database (EDocs).  The columns and headings shall not be modified in any way.

### 34.5.6   JCU Drawing Register

The *JCU Drawing Register* is the master record of every drawing relating to all building work for *James Cook University*. This is managed by Design Office staff.

The register contains:
- Record Model Revit files
- Record Drawing (As-Constructed) AutoCAD files

- Record Drawing (As-Constructed) PDF files (individual sheets, not one full set)

The register does not contain:
- Ad-hoc drawings generated from record models
- The incremental developments of drawings that are generated within project phases . (This type of drawing shall be archived electronically within the project file)

Record submissions received shall be verified and migrated directly into the *JCU Drawing Register* by JCU.  Record Documents will be linked to the database (EDocs).

## 34.6    FILE FORMATS AND NAMING CONVENTIONS

### 34.6.1    General

This section defines the mandatory file naming conventions and acceptable file formats for electronic documents, drawings and models.

### 34.6.2    Project Identification Number

Each project shall be assigned a unique Project identifier by the JCU Project Manager.  At the inception of all projects the *JCU Project Identifier* should be obtained to support the proper naming of model files, content and other support files.

### 34.6.3    Discipline Code

The discipline prefix shall be the first four letters of the name as per the table below.

| Discipline Prefix table | |
| :---: | :---: |
| ARCH | Architect |
| STRU | Structural |
| CIVI | Civil |
| ELEC | Electrical |
| HYDR | Hydraulic |
| SURV | Survey |
| MECH | Mechanical |
| SPEC | Specification |
| COOR | Coordination |
| LAND | Landscaping |

### 34.6.4    Drawing file name convention

Drawings shall be submitted with file names in the following format:

[DISCIPLINE]-[ PROJECT NUMBER]-[SHEET NUMBER]-REV-[REVISION NUMBER].XYZ
 Example:  ARCH-8000-01-REV-01.pdf

### 34.6.5    Document File Naming Convention

Documents including certificates, reports and other records relating to a building shall adhere to the following file naming convention.

[DISCIPLINE]-[ PROJECT NUMBER]-[DOCUMENT NUMBER]-REV-[REVISION NUMBER].XYZ
Example: GEOT-8000-100-REV-A.pdf

Files shall be named to match equivalent native file format versions.

### 34.6.6    BIM File Naming

The convention for model names shall be as follows:

[DISCIPLINE] – [PROJECT NUMBER] – [BUILDING NUMBER] -REV-[REVISION NUMBER].rvt

Example:  ARCH-11111-D4-REV-B.rvt

### 34.6.7    CAD File Naming

CAD drawing files shall be named in the format below:

[DISCIPLINE]-[ PROJECT NUMBER]-[SHEET NUMBER]-REV-[REVISION NUMBER].XYZ

Example:  ARCH-8000-01-REV-01.dwg

### 34.6.8    Revision Sequencing

Pre-tender documents shall use a numeric revision sequence, starting from 0.

Tender and post-tender documents shall use alphabetic revision sequence, starting from A.

### 34.6.9    File Formats

It is mandatory to adhere to the prescribed file formats.  Alternative formats can only be deemed appropriate if the format can be demonstrated to be compatible with existing JCU corporate systems.  Acceptance of an alternative format is at the discretion of the Deputy Director – Planning and Development.

Table: Accepted File Formats

| Deliverable | | File format | | | | | |
|---|---|---|---|---|---|---|---|
| | | Revit | Autocad | Word | Excel | PDF | DWFx |
| Project Drawing Register | | ☑ | ☒ | ☒ | ☑ | ☒ | |
| Record Models/As Constructed | Architectural | ☑ | ☒ | ☒ | ☒ | ☑ | |
| | Furniture, Fixtures, & Equipment | ☑ | ☒ | ☒ | ☒ | ☑ | |
| | Structural | ☑ | ☒ | ☒ | ☒ | ☑ | |
| | Civil | ☑ | ☒ | ☒ | ☒ | ☑ | |
| | Electrical | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Lighting | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Data and Communications | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Fire Services | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Mechanical | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Hydraulic | ☑ | ☑ | ☒ | ☒ | ☑ | |
| | Finishes Schedule | ☑ | ☒ | ☒ | ☑ | ☑ | |
| Sustainability Report | | ☑ | ☒ | ☑ | ☑ | ☑ | |
| Energy Efficiency Report | | ☑ | ☒ | ☑ | ☑ | ☑ | |
| Room Data Sheets | | ☑ | ☒ | ☑ | ☑ | ☑ | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Operation & Maintenance Manual | | ☒ | ☒ | ☑ | ☒ | ☑ | |
| Building Design Report | | ☑ | ☒ | ☑ | ☑ | ☑ | |
| Safe Design Report | | ☑ | ☒ | ☑ | ☑ | ☑ | |
| Design Review | 3D | ☑ | ☒ | ☒ | ☒ | ☑ | ☑ |
| Site Services | | ☒ | ☑ | ☒ | ☒ | ☑ | ☒ |

### 34.6.10  Revit (RVT) File Format

The software version for models created and supplied in Autodesk Revit shall be nominated in the *BIM Management Plan*.

> Warning!
> It is critical that the version of Revit specified in the BIM Management Plan is used to ensure compatibility with all JCU's systems.  Confirm with Estate Office prior to commencement.

### 34.6.11  Industry Foundation Classes (IFC) File Format

Submission of model elements in IFC format is not acceptable to JCU at this time.

Refer to the following link for further information regarding Revit and IFC:

http://www.augi.com/library/myth-buster-revit-ifc

The IFC system is a data representation standard and file format used to define architectural and construction-related CAD graphic data as 3D real-world objects. Its main purpose is to provide architects and engineers with the ability to exchange data between CAD tools, cost estimation systems and other construction-related applications. IFC provides a set of definitions for all object element types encountered in the building industry and a text-based structure for storing those definitions in a data file.

The university supports the concept of Open BIM, however the only compatible format to date that suits current JCU systems is Autodesk Revit file format.

### 34.6.12  Portable Document Format (PDF)

Documents supplied in PDF format shall conform with the PDF/A standard.

PDF/A is an ISO-standardised version of the Portable Document Format (PDF) specialised for the digital preservation of electronic documents.

Documents shall be formatted such that sections have defined bookmarks.

### 34.6.13  Design Web Format XPS File (DWFx)

Acceptable file format for design review purposes.

Autodesk Design Review Software is free to download:

http://usa.autodesk.com/design-review/download/

## 34.7 RECORD DOCUMENTS / AS-BUILTS

### 34.7.1 General

This section outlines the minimum requirements for Record Documents and Record Models.

For the purpose of this section, the terms building record, record drawing, as-built, and as constructed are synonymous.

### 34.7.2 Record Model

Unless specified otherwise, the contract conditions shall enforce the delivery of a Record Model for any building work carried out for the University.  This applies to new buildings and renovations.

*JCU* requires Record Models to be Autodesk Revit Building Information Models (BIM).

The Record Model may be considered as a subset of the "As Constructed" documentation for the explicit purpose of facilities management.  The Record Model becomes the base information for the ongoing planning, financial management, operation and maintenance of the facility.

The *project team* is responsible for the creation, development and supply of a Record Model.

The level of development (LOD) of the Record Model shall be defined in the project specific *BIM Management Plan* (BMP) and form part of the Contract.

Refer to the JCU Organisational *BIM Management Plan* to establish starting point for individual projects.

### 34.7.3 Building Record Deliverables

The complete list of final drawing deliverables are unique to each project, and shall be defined in the *Contract*.  Typically, at each project milestone *James Cook University* requires the delivery of the current model, electronic versions of hardcopy submissions and other files that support the intent of the project.

Mandatory deliverables are listed in the following table.

| Deliverable | Responsible Party | Quantity | Format | Due Date |
|---|---|---|---|---|
| Interim BIM Model – All disciplines as per project plan | Principal Consultant | 1 set | .rvt | **3-6 months** prior to Practical Completion |
| Operations & Maintenance Manuals | Principal Consultant All disciplines | 1 set | .pdf/paper | At Practical Completion |
| Certificate of Classification | Principal Consultant | 1 set | .pdf | At Practical Completion |
| Other certification documents and dossiers (e.g. Hazardous Areas Classification) | Principal Consultant All disciplines | 1 set | .pdf | At Practical Completion |
| As-Built Services | Principal Consultant All disciplines | 1 set | .rvt/.dwg/. pdf/paper | At Practical Completion |

| As-Built Record Model | Principal Consultant All disciplines | 1 set | .rvt | 30 days from practical completion |
|---|---|---|---|---|
| As-Built Construction Set | Principal Consultant All disciplines | 1 set | .dwg/.pdf/paper | 30 days from practical completion |
| As-Built Topographic Survey - Building perimeter | Principal Consultant Contractor | 1 set | .dwg/.pdf/paper | 30 days from practical completion |
| Building Compliance Certificate | Principal Consultant Contractor | 1 set | .pdf | 30 days from practical completion |
| As-Built Site Services | Principal Consultant All disciplines | 1 set | .dwg/.pdf/paper | At Practical Completion |

### 34.7.4    Interim BIM Model

The Interim BIM Model is used by JCU to coordinate operational systems and programming for readiness prior to practical completion of the building works.

The Interim BIM Model is a current record model (or drawing) complete with room names, room numbers, room areas, floor finishes, and fire and emergency fixtures and equipment indicated.

These are to be submitted 3-6 months prior to practical completion.

### 34.7.5    As-Built Topographic Survey

A contour and detail survey 50m buffer around building perimeter recording the as-built conditions at completion of all building and landscaping works.

Surveys shall nominate and capture a minimum of one PSM, and include two real world geographical structure reference points with x,y,z coordinates annotated.  Reference points shall be external wall corners at diagonal opposite ends of the structure.Refer section Survey Drawings for more details

### 34.8    EMERGENCY EVACUATION DIAGRAMS

Legislation mandates that all required *Emergency Evacuation Signs* are in place within thirty (30) days from practical completion.  The *Interim BIM Model* shall be relied upon to prepare the signs.

*James Cook University* shall prepare all required emergency evacuation diagrams for the purpose of supplying the wall mounted *Emergency Evacuation Signs*.

A standard view template (Revit) named "Emergency Evacuation" shall be applied to a plan view within the Revit model.  This view template is available from the *JCU BIM Template file*.

Where multiple signs are required for each floor level, the dependant view function shall be used.

A standard title block shall be used to create the required sheet for each sign.  Standard sheets and symbols are available from the *JCU BIM Resources folder*.  Created sheets shall not be deleted.

Where 2D CAD drawings are supplied in lieu of a Record Model, a clean general arrangement plan shall be supplied by the *project team*.  This plan shall be free of all annotation with the exception of room tags.  A drawing is required for each level of the building.  Refer to the *CAD standards* for additional presentation requirements of CAD drawings.

Minimum information required to prepare the Emergency Evacuation Signs:

- Emergency evacuation sign mounting locations
- Main path of egress
- Path of exit
- Emergency evacuation point
- Emergency exit
- Fire hose reel
- Manual call point
- Fire indicator panel
- Warden intercom
- First aid
- Switchboard
- Hydrant
- Fire extinguisher
- Gas isolation
- Zoning

Other building features relating to the fire and emergency design solution

## 34.9    OPERATING AND MAINTENANCE MANUALS

Details of the requirements for Operations and Maintenance Manuals are given in each section of these Design Guidelines, generally under point XX.3.6.6.

In addition to the O&M Manuals, plant and equipment shall be modelled (BIM) to the Level of Development as specified in the BIM Management Plan.  Each item shall include attributes that capture make, model and serial number in the model.

## 34.10   BIM STANDARDS

### 34.10.1  General

The focus of this section is to define the required level of BIM development for *JCU*.  This section does not cover the implementation of BIM on projects in full detail.  The adoption of the NATSPEC National BIM Guide is preferred and, when used in conjunction with this standard, satisfies the requirements to JCU for BIM projects.

### 34.10.2  Methodology

The *project team* shall refer to the *NATSPEC National BIM Guide* and its supporting documents to establish the implementation of BIM on each project.

Hyperlink:  http://bim.natspec.org/

A *Project BIM Brief* shall be prepared for each project by Estate Office.  This shall form part of the project brief.

A *BIM Management Plan* (BMP), otherwise known as a BIM Execution Plan (BEP) shall be prepared for each project by the project manager.  The BMP is a formal document that defines how the project will be executed, monitored and controlled with regards to BIM.

The *JCU Organisational BIM Management Plan* shall be used for guidance when preparing the BMP.

**1**
- Confirm  BIM Uses
- Record in BMP

**2**
- Confirm Project Stages
- Select Model Development Categories (MDC) to support project stages
- Record in BMP

**3**
- Refer BIM requirements from Level of Development (LOD) tables
- Record in BMP
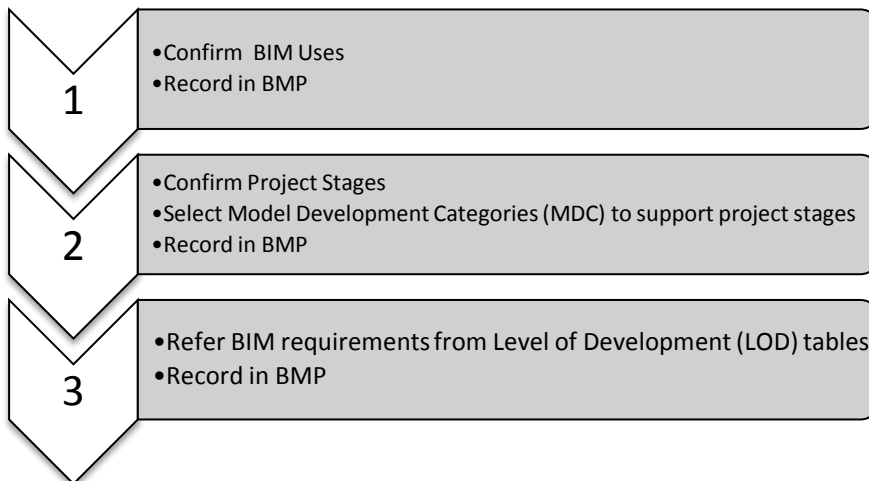
### 34.10.3  BIM Use

The nominated level of development of BIM shall support the defined uses for it.  This means that BIM data shall be prepared 'fit for purpose' taking into account how the BIM is intended to be used. It is key to understand and define what BIM uses apply to the project and further for the operation of the facility.

The current defined BIM Uses for *James Cook University* include:
- Record Models
- Space Management
- Condition Data

Further practical BIM Uses are encouraged and should be well defined within the Project BIM Brief. Typical uses include:
- Asset Management
- Maintenance Scheduling
- Record Modelling
- Space Management / Tracking
- Site Utilisation Planning
- Layout Control & Planning
- Building Systems Analysis

- Energy Analysis
- Lighting Analysis
- Mechanical Analysis
- Sustainability Evaluation
- Disaster Planning
- Existing Conditions Modelling
- Site Analysis
- Design Authoring
- Design Reviews
- Programming
- design review in regard to spatial requirements
- Cost Estimation
- Code Validation
- Engineering Analysis
- 3D Coordination (Design)
- Structural Analysis
- Phase Planning (4D Modelling)
- 3D Coordination (Construction)
- Clash detection

### 34.10.4 Model Development Methodology

Models may be created and developed over a staged process that is suitable to support the required project outcomes.  This methodology shall be defined and recorded in the BMP.

The selected overall model development category may be adjusted to accommodate a specific project or University use.

Four categories of model development are described as follows:

| | Model Development Category |
|---|---|
| I: | This model will support project planning through space and volume illustration, adjacencies, and site positioning. |
| II: | This model will include a sufficient level of development to support document and system review, clash detection and coordination, and support an as-built format for Owner use after completion. If no Model Development Category ("MDC") is identified, then MDC II will apply. |
| III: | This model will include all the benefits and requirements of the early model categories, and will provide sufficient detail to support a detailed model development of systems supporting building occupancy and facility management. |
| IV: | This model will include the benefits and requirements of the earlier model categories, and support highly detailed logistical, scheduling, and estimating efforts. |

### 34.10.5 Level of Development (LOD)

The level of development for each model <u>component</u> is based on the model content criteria established by *AIA Document E202, Building Information Modeling Protocol Exhibit*.

Hyperlink:  http://www.aia.org/contractdocs/training/bim/aias078742

The LOD shall match the minimum required use.  Note: the *minimum* LOD is preferred.  This shall be outlined in the BIM Management Plan.

The content for each level of development is described as follows:

| Levels of development | Authorised Uses |
|---|---|
| LOD 100 - Conceptual<br>Overall building massing indicative of area, height, volume, location and orientation may be modeled in three dimensions or represented by other data. | Analysis<br>Cost estimating<br>Schedule |
| LOD 200 – Approximate Geometry<br>Model elements are modeled as generalized systems or assemblies with approximate quantities, size, shape, location and orientation.  Non-geometric information may also be attached to model elements. | Analysis<br>Cost estimating<br>Schedule |
| LOD 300 – Precise geometry<br>Model elements are modeled as specific assemblies accurate in terms of quantity, size, shape, location and orientation.  Non-geometric information may also be attached to model elements. | Construction<br>Analysis<br>Cost estimating<br>Schedule |
| LOD 400 – Fabrication<br>Model elements are modeled as specific assemblies accurate in terms of quantity, size, shape, location and orientation with complete fabrication, assembly and detailing information. Non-geometric information may also be attached to model elements. | Construction<br>Analysis<br>Cost estimating<br>Schedule |
| LOD 500 – As built<br>Model elements as constructed assemblies actual and accurate in terms of quantity, size, shape, location and orientation.  Non-geometric information may also be attached to model elements. | General Usage |

Each of the model categories has an established level of model development for each building system. The level of development for each building system may be adjusted to reflect the University's requirements.  This shall be outlined in the BIM Management Plan.

Refer to the following example table showing levels of development for specific building systems. The project LOD shall be defined in the BIM Management Plan.

| Building System | Model Category/Level of Development | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Substructure | 0 | 300 | 300 | 400 |
| Structure | 100 | 300 | 300 | 400 |
| Enclosure* | 100 | 300 | 300 | 400 |
| Interior* | 100 | 300 | 300 | 400 |
| Conveying Systems | 100 | 200 | 300 | 400 |
| Plumbing | 100 | 200 | 300 | 400 |
| Mechanical | 100 | 200 | 300 | 400 |
| Fire Protection | 0 | 100 | 300 | 400 |
| Electrical | 100 | 200 | 300 | 400 |
| Equipment and Furnishings* | 100 | 200 | 300 | 400 |
| Special Construction | 100 | 200 | 300 | 300 |
| Site work | 0 | 100 | 100 | 200 |
| Site Improvements* | 100 | 200 | 200 | 300 |
| Site Utilities | 100 | 200 | 300 | 300 |

* Additional LOD descriptions are provided for these building systems.

Several building systems are composed of elements that may require separate levels of component development as described below:

| Building System Component | Model Category / Level of Development | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Enclosure | 100 | 300 | 300 | 400 |
| Exterior Walls | 100 | 300 | 300 | 400 |
| Exterior Windows | 100 | 200 | 300 | 400 |
| Exterior Doors | 100 | 300 | 300 | 400 |
| Roof Coverings | 100 | 200 | 300 | 400 |
| Roof Openings | 100 | 300 | 300 | 400 |
| Interior | 100 | 300 | 300 | 400 |
| Interior Partitions | 100 | 300 | 300 | 400 |
| Interior Doors | 100 | 300 | 300 | 400 |
| Interior Specialties | 0 | 200 | 300 | 400 |
| Stair Construction | 100 | 300 | 300 | 400 |
| Wall Finishes | 0 | 200 | 200 | 300 |
| Ceiling Finishes | 0 | 200 | 200 | 300 |
| Windows | 100 | 200 | 300 | 400 |
| Floor/Ceiling Construction | 100 | 300 | 300 | 400 |
| Equipment and Furnishings | 100 | 200 | 300 | 400 |
| Fixed Equipment | 100 | 200 | 300 | 400 |
| Moveable Furnishings | 100 | 100 | 200 | 300 |
| Special Equipment | 100 | 200 | 300 | 400 |

| | | | | |
|---|---|---|---|---|
| Fixed Furnishings | 100 | 200 | 300 | 400 |
| Site Improvements | 100 | 200 | 200 | 300 |
| Roadways | 100 | 200 | 200 | 300 |
| Parking | 100 | 200 | 200 | 300 |
| Footpaths | 100 | 200 | 200 | 300 |
| Landscaping | 0 | 100 | 100 | 200 |
| Irrigation | 0 | 100 | 200 | 200 |

The model categories should be reviewed together with the JCU defined requirements, adjusting the specific levels of development for building components to support the end-user requirements.  For example: Owner may select an MDC II model for the project, but require detailed equipment data for the mechanical system to support future expansion and systems management. The category II model would remain as stated, with the exception of the mechanical system components which may be set at a higher level of development.

### 34.10.6  Software

All software used in the development of the BIM shall be defined in the *BIM Management Plan*.

| Use | Product | Version |
|---|---|---|
| Design Authoring | Autodesk Revit | *TBC* |
| Design Review | Autodesk Design Review | *TBC* |
| Model checking | Navisworks, Solibri, other etc. | *TBC* |
| Cost Estimation | CostX, other | *TBC* |

### 34.10.7  Modeling in Revit

For BIM protocols when modelling in Autodesk Revit refer to:
**AEC (UK) BIM PROTOCOL FOR AUTODESK REVIT – V2.0**

Where a conflict occurs this standard shall be used.

### 34.10.8  Model setup and project templates

A blank Revit template consistent with this standard shall be supplied by the Design Office.  This template is a resource only, and includes the JCU shared parameters.

**JCU_BIM_TEMPLATE-V0.1.RTE**

This template includes the following:

| | |
|---|---|
| Title block<br>2 Standard versions (long edge and short edge) for each paper size in the A series. | A0 – Long Edge<br>A0 – Short Edge<br>A1 – Long Edge<br>A1 – Short Edge<br>A3 – Long Edge<br>A3 – Short Edge<br>A4 – Long Edge<br>A4 – Short Edge |
| Text styles | Arial 1.8mm<br>Arial 2.5mm<br>Arial 3.5mm<br>Arial 5.0mm |

| | Arial 7.0mm |
|---|---|
| Room Tag | JCU Standard Room Tag |
| Area schedules | |
| Shared parameter file | File name here |
| Common/standard family components | Refer resources. |
| BIM Bulletin view | |
| Geo-referenced site plan | Townsville, Cairns, Singapore |

Model naming conventions

| FILE NAME CONVENTION FOR MODELS | |
|---|---|
| DISCIPLINE - PROJECT NUMBER – BUILDING NUMBER – REVISION.rvt (example: ARCH-11111-BL001-REV-A.xyz) | |
| ARCHITECTURAL MODEL | ARCH- |
| CIVIL MODEL | CIVI- |
| MECHANICAL MODEL | MECH- |
| HYDRAULIC MODEL | HYDR- |
| ELECTRICAL MODEL | ELEC- |
| STRUCTURAL MODEL | STRUC- |
| ENERGY MODEL | ENER- |
| CONSTRUCTION MODEL | CONS- |
| COORDINATION MODEL | COOR- |

### 34.10.9  View naming conventions

Floor levels shall be named as follows:

| LEVEL | NAME |
|---|---|
| Basement | B1 |
| Ground Floor | 00 |
| First Floor | 01 |
| Second Floor | 02 |
| Third Floor | 03 |
| Fourth Floor (and so on) | 04 |
| Mezzanine | M1 |

### 34.10.10 Object naming conventions

Objects within the Model should be named in the following format:

[Object Category]-[Type]-[Subtype]-[Manufacturer]-[Description]-[Grade/LoD]. xyz
The Type, Subtype and Manufacturer fields should be used as needed.

The following is a list of examples:

Window-Double_Hung-Andersen-400Series-Arch_Top-G3.rfa

Plumbing_Fixtures-Sink-Oval-Generic-Under_Counter-G1.rfa

Note – The condition assessment being carried out by OPUS in 2012-2013 has an elemental breakdown based on the National Public Works Council (NPWC) tables.

### 34.10.11 Object property/parameter

Components shall include the following basic attribute parameters regardless of the graphical development level.

| Attribute Table |
| --- |
| Description |
| Manufacturer |
| Model |
| Serial Number |
| Asset tag number |
| Condition |
| Installation date |
| Expiry date |
| Warranty expiry date |
| NPWC Code |

The use of hyperlinks within object attributes to Operation & Maintenance Manuals, diagram schematics, test reports etc – broken links are not acceptable.

All objects shall be of the correct category, modeled to reflect the actual overall size and volume, and placed in the correct relative position (location and orientation) within the model.

For created content, refer to ANZRS – Revit family creation pack – General compliance checklist C1. http://www.anzrs.org/blog/

Also, Autodesk family style guide here:

http://usa.autodesk.com/adsk/servlet/index?siteID=123112&id=13080413

### 34.10.12 Sheets and Views

The central BIM shall contain the following sheets and views.  Other sheets and views shall be archived with the project files.

**Table: Mandatory sheets and views in the BIM (continues next page)**

| View/Sheet | Content | Responsible Party |
| --- | --- | --- |
| BIM Bulletin Board | Drafting view | All editors |
| View schedule | Schedule of all views within the BIM | |
| Sheet schedule | Schedule of all sheets within the BIM | |
| Site plan | Site boundaries | |
| | True North | |
| | Project North | |
| | Principal point of entry | |
| | Real property data | |
| Area plans | Gross floor area | |
| | Interior Gross | |
| | Room | Estate Office |
| Area schedules | Gross floor area | |
| | Interior Gross | |

| View/Sheet | Content | Responsible Party |
|---|---|---|
| | Room | Estate Office |
| Room schedules | Full building room schedule | |
| | Level by level filtered schedules | |
| | Level / Room Number / Department / Room Name / Occupancy / Area / Floor Finish | |
| Window schedule | | |
| Door schedule | | |
| Plumbing and hydraulic schedule | | |
| Electrical and data schedule | | |
| Mechanical schedule | | |
| Lighting schedule | | |
| Fire/Emergency schedule | | |
| Other equipment schedule | | |
| Floor plan | 1:100 scale | |
| | Room tags, standard | |
| | North point | |
| | Building name/number/level | |
| | Major areas annotated | |
| Emergency Evacuation plans | Refer separate standard. | Estate Office |
| | Per level/"You are here" | |
| Design Criteria | Drafting view | |
| | Summary of all major design criteria | |
| | Building Classifications | |
| | Wind Classifications | |
| | Hyperlinks to certifications | |
| | Details of any specific building compliance solutions | |
| View Templates | Fire & Emergency floor plan | Predefined |
| | Area floor plan | |
| | Clean floor plan | |
| | Architectural floor plan | |
| | Architectural section | |
| | Architectural elevation | |

### 34.10.13 Model Exchange

The method of model exchange between *project team* members shall be defined in the *BIM Management Plan (BMP)*.

Considerations: Method for hosting, transfer, file security, and access of data between technical disciplines.

### 34.10.14 Model Ownership

All model elements submitted become the property of *James Cook University*.

All content shall be free of copyright and royalty and becomes the property of *James Cook University*

## 34.11   CAD STANDARDS

### 34.11.1  General

In some instances, CAD format may be acceptable in lieu of BIM for particular projects and deliverables.  The intent of this section is to standardise the format of drawings and to ensure compatibility with existing University systems.

### 34.11.2  Plan Sets

Drawing sets shall not be bound within a single file.  Each drawing sheet shall be supplied as an individual file with a corresponding file name.

### 34.11.3  Layer Naming

Generally, the layer naming shall be structured to enable the CAD user easy control for organising and displaying drawing data.

*JCU* has adopted the method of grouping the drawing objects on layers in the syntax:

| DISCIPLINE_VIEW_OBJECT | |
|---|---|
| Architectural and Structural objects | Syntax:  A-WALL<br>All Architectural and Structural objects shall be drawn on layers with prefix "A", followed by the category (eg. "WALL"), with hyphen separators. |
| Mechanical objects | Syntax:  M-DUCT<br>All Mechanical objects shall be drawn on layers with prefix "M", and follow the same syntax as Architectural layer naming |
| Electrical objects | Syntax: E-SWITCH<br>All Electrical objects shall be drawn on layers with prefix "E", and follow the same syntax as Architectural layer |
| Hydraulic objects | Syntax:  H-DRAINAGE<br>All Hydraulic objects shall be drawn on layers with prefix "H", and follow the same syntax as Architectural layer<br>Some objects should be layered in more detail (not unlike Hatch layers) for controlling display more easily, eg. "H-WATER-COLD", "H-WATER-HOT", "H-WATER-TEPID", etc. |
| Viewports | All Viewports shall be drawn on layer "Defpoints" (not just a layer which is non-printable or switched off) unless the viewport boundary is intended to be visible, eg. A circular viewport showing a detail |
| Gridlines | "A-GRIDLINES" |

### 34.11.4  Presentation Styles

| | |
|---|---|
| Sheet Sizes | Acceptable sheet sizes as follows:<br> A0, A1 and A3<br>All sheets within a drawing set shall be of the same sheet size. |
| Titleblock | Shall be standard JCU titleblock available from this link. |
| Cross Referencing | External references (xref) files must be supplied alongside the main file.<br>Missing or broken links are not acceptable. |
| Drawing Units | Site survey plans shall be drawn in meters – Refer to the standards for GIS.<br>All other plans shall be drawn 1:1 in millimetres |
| Drawing Scales | Acceptable drawing scales to Australian Standards |
| Line styles and line weights | By Layer<br>To Australian Standards |
| Gridlines | To Australian Standards |
| Font | To Australian Standards |
| Font Size | To Australian Standards |
| Layer Colours | To Australian Standards |
| Dimensions | Styles to Australian Standards<br>Separate layer<br>Model space |
| Annotations & keynoting | In model space |
| Labelling and tagging | Room tags to be placed in model space |
| Abbreviations | To Australian Standards where available |
| Symbols | To Australian Standards where available<br>Include legend in model space |
| Representation of materials and finishes | |
| Schedules | |
| Legends | In model space<br>All service lines with unique line types and colours – refer standard block. |
| Shape files and font files | Must be supplied with the drawing files.  Missing file warnings are not acceptable.<br>Autocad file package utility is encouraged for transmission purposes. |
| Hatching | Do not explode hatching. |

### 34.11.5  Drawing Purge

The "Purge all" function should be used to minimise file sizes are and remove extraneous lines, blocks and other objects.

All content (including blocks, symbols and the like) within the drawing shall be free of copyright and royalty conditions for the immediate and future use by the University.

### 34.11.6  Exported Files

Exported drawing (.DWG) files shall adhere to the above presentation styles.

## 34.12    GEOGRAPHIC INFORMATION SYSTEM (GIS)

### 34.12.1  General

The university's GIS solution is comprised of the following elements:

- Oracle Spatial Relational Database Management System
- AutoCAD Map3D and AutoCAD Civil3D
- Munsys Applications
- Munsys Management Console
- Autodesk Infrastructure Map Server
- Enlighten 3.0

Oracle spatial data is created and edited within an AutoCAD Map3D or Civil3D workspace, facilitated by the Munsys Applications.  Munsys Applications have preconfigured business rules that ensure data quality across the whole schema.

Within the drawing workspace, objects are queried from the database and are edited using AutoCAD and/or Munsys Applications tools.  New database objects can be created from normal AutoCAD geometry with the functionality to capture attributes during data conversion.  Objects attributes (defined in this section) should therefore be attached to the geometry as either:

1. Object Data Tables within an AutoCAD drawing
2. AutoCAD block attributes in a block associated with the geometric objects
3. As spatial object attributes within a spatial (GIS) file, including:
    a. Autodesk SDF file
    b. ESRI SHP file
    c. Mapinfo file

The university will consider alternative file formats, should the above file formats be incompatible with the supplier's system.

Spatial data is styled in Autodesk Infrastructure Map Server, and access control of the data is handled by Enlighten.  Enlighten is the end-user interface for viewing, querying, analysing, and printing spatial data.

### 34.12.2  Survey Drawings

Survey drawings shall be submitted in a format enabling import to the GIS, as follows:

- Drawing units shall be in metres
- Drawings shall be in Map Grid of Australia Zone 55 Projection
- Height shall be in Australian Height Datum (AHD)

### 34.12.3  As Constructed Services Drawings

Site plans for as-constructed services shall be in the same format as survey drawings for units, projection, and height datum.

Services attributes such as pipe type, material, invert level etc are preferably captured as Object Data Tables, or as geometry attributes in a spatial file.  The following tables describe the attributes to be captured.

### 34.12.4 Water and Chilled Water Networks

The topologies for the water networks should be captured to enable network tracing.  This includes pipe locations, sizes, flow direction, and connectivity with valves and junctions (where possible).  Chilled Water and Water assets shall be captured and attributes documented using the information structure defined in the following tables.

**Points:**

| NODE_TYPE | NODE_ELEV | NODE_REF | WAT_CATEGORY | COMMENTS | MEX_ID |
|---|---|---|---|---|---|
| HYDRANT_SINGLE | 25.115 | H22 | POTABLE | | |

Note:

Please provide a logical description for NODE_TYPE.

**Lines:**

| PIPE_DIA | PIPE_MATRL | WAT_CATEGORY | COMMENTS |
|---|---|---|---|
| 100 | HDPE | POTABLE | |

Note:

Pipe material code values are predefined.  Values include:

AS      Asbestos

FC      Fibre Cement

PVC      Polyvinyl Chloride

HDPE    High Density Polyethylene

STEEL   Steel

If these values are not suitable for a feature, please use a logical code.

### 34.12.5 Sewer and Storm Water (Gravity) Networks

Invert levels for gravity sewer and storm water pipe networks shall be captured within 0.05m tolerance.  Sewer and Storm Water assets shall be captured and documented using the information structure defined in the following tables.

**Sewer Points:**

| NODE_TYPE | NODE_DEPTH | NODE_COVELEV | NODE_REF | COMMENTS | SEW_CATEGORY |
|---|---|---|---|---|---|
| MANHOLE_PUB | 0.95 | 25.225 | | | NORMAL |

**Sewer Lines:**

| PIPE_DIA | PIPE_MATRL | START_INVELEV | END_INVELEV | COMMENTS | SEW_CATEGORY |
|---|---|---|---|---|---|
| 150 | PVC | 22.945 | 22.63 | | NORMAL |

**Stormwater Points:**

| NODE_TYPE | NODE_DEPTH | NODE_GL | COMMENTS |
|---|---|---|---|
| WW | | | |

**Stormwater Lines:**

| PIPE_DIA | PIPE_MATRL | START_GL | END_GL | START_IL | END_IL | COMMENTS |
|---|---|---|---|---|---|---|
| 375 | CONC | 22.6 | 22.6 | 21.6 | 21.44 | |

### 34.12.6 Electricity Networks

High Voltage and Low Voltage electricity cables are to be captured and documented using the information structure defined in the following tables.

**Electricity Points:**

| NODE_TYPE | NODE_DESC | NODE_REF | COMMENTS | MEX_REF | CAPACITY |
|---|---|---|---|---|---|
| TRANSFORMER | WESTERN COURTS | US45 | | | 750 |

**Electricity Lines:**

| CBL_SIZE | CBL_MATRL | START_TYPE | END_TYPE | COMMENTS | AG_UG |
|---|---|---|---|---|---|
| 240 | Al XLPE | TRANSFORMER | POLE | U9501 | UG |

### 34.12.7  Communications Networks

Communications assets shall be captured and documented using the information structure defined in the following tables.

**Communications Pits:**

| COMMENTS | PIT_ID | PIT_MATERIAL |
|---|---|---|
| | 12 | CONC |

**Communications Conduits:**

| COMMENTS | CON_DIA | CON_MATERIAL | CON_DESC |
|---|---|---|---|
| | 100 | PVC | 1x100 |

### 34.12.8  Drawing Attributes Blocks

If supplying drawings in a spatial file format is not possible, attributes shall be captured using AutoCAD block attributes associated with the geometry.  Standard blocks for this purpose are downloadable from the CAD/BIM Resource page.  Each spatial layer should have a corresponding attribute block to use, for example, ATT_STORMWATER_PIPE.dwg block should only be used for stormwater pipes.  In addition, attribute blocks shall be inserted on the corresponding drawing "NOTE" layer, for example, SEWNOTE for sewer features.

The following example shows an AutoCAD drawing with associated attribute blocks for a sewer gravity pipe.  The attribute blocks are snapped to the lines' midpoints.
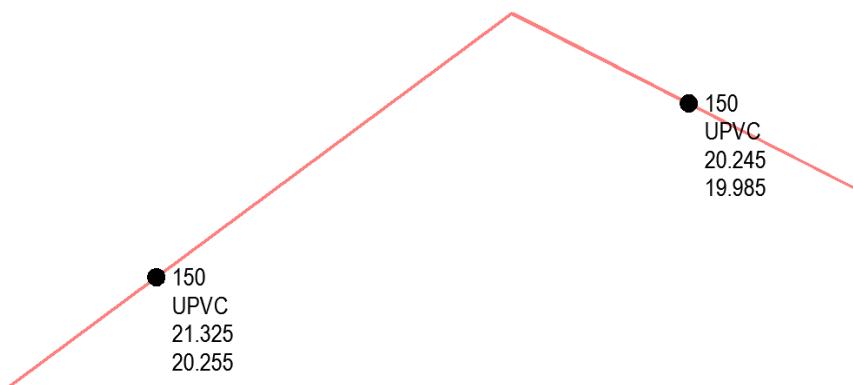


Attribute blocks for point features, such as manholes, pits, and valves, shall be inserted on top of symbol blocks.  This ensures that the point features are visible in the as-constructed drawing when the attributes layer is turned off or frozen.

### 34.12.9  Services Drawing Layers

Layers shall be organised as:

| Name | Description/Use |
|---|---|
| 0 | (System layer) |
| BLOCK | (System layer) |
| BUILDING | Building outlines |
| CMSNOTE | Cadastral notes |
| COMMS_CONDUITS | Communications |
| COMMS_PITS | |
| CONTOURS | Topographic contours |
| DAM | Dams |
| DELETED | (System layer) |
| DMSLABEL_CHANNEL | Stormwater drainage |
| DMSLABEL_CULVERT | |
| DMSLABEL_PIPE | |
| EASELINE_ | Easements |
| EASELINE_ELECTRIC | |
| EASELINE_GENERAL | |
| EASELINE_LEASE | |
| EASELINE_RAILWAY | |
| EASELINE_RESERVE | |
| EASELINE_ROAD | |
| EASELINE_SEWER | |
| EASELINE_STORM | |
| EASELINE_WATER | |
| EASELINETXT | |
| EASEPOLY | |
| EASEPOLY_ELECTRIC | |
| EASEPOLY_GENERAL | |
| EASEPOLY_LEASE | |
| EASEPOLY_RESERVE | |
| EASEPOLY_ROAD | |
| EASEPOLY_SEWER | |
| EASEPOLY_STORM | |
| EASEPOLY_WATER | |
| EASEPOLYTXT | |
| ELCABLE_ | Electrical |
| ELCABLE_EH_OH | |
| ELCABLE_EH_UG | |
| ELCABLE_HV_OH | |
| ELCABLE_HV_UG | |
| ELCABLE_LV_OH | |
| ELCABLE_LV_UG | |
| ELCABLE_SL_OH | |
| ELCABLE_SL_UG | |
| ELDIM | |
| ELDUCT | |
| ELNODE | |
| ELNODE_6.000000 | |

| | |
|---|---|
| ELNODE_AIRLINK | |
| ELNODE_BILLBOARD | |
| ELNODE_DB | |
| ELNODE_HV_JUNCTION | |
| ELNODE_KIOSK | |
| ELNODE_LV_JUNCTION | |
| ELNODE_MINI_SUB | |
| ELNODE_POLE | |
| ELNODE_PYLON | |
| ELNODE_SL_JUNCTION | |
| ELNODE_STANDARD_SUB | |
| ELNODE_STRLIGHT_POLE | |
| ELNODE_SWITCH_STATION | |
| ELNODE_TRANSFORMER | |
| ELNOTE_DIM | |
| ELNOTE_TEXT | |
| ELSERV_SC_OH | |
| ELSERV_SC_UG | |
| ELZONE | |
| FLOODLINE | Flood line |
| IMG_ | Images |
| MUNICIPALITY | Cadastral |
| PARCEL | |
| PARCEL_C | |
| PARCEL_P | |
| PATH_AREAS | Path areas |
| PSM | Permanent Survey Marks |
| RD_PARKING | Roads |
| RDAREA | |
| RDCL | |
| RDEDGE | |
| RDINT | |
| RDNOTE_NOTE_TYPE_TEXT | |
| RDWALK | |
| RIVERLINE | Riverlines and polygons |
| RIVERPOLY | |
| SEWBASIN | Sanitary and trade waste |
| SEWDIM | |
| SEWDIMNOTE | |
| SEWGLABEL | |
| SEWGPIPE | |
| SEWNODE | |
| SEWNOTE | |
| SEWRESPIPE | |
| SEWRLABEL | |
| SEWRPIPE | |
| SEWSERV | |
| SEWSYM | |
| SEWVLABEL | |
| SEWVPIPE | |

| | |
|---|---|
| SPORTSFIELDS | Sportsfields |
| SUBURB | Cadastral |
| SURVEY_MARKS | Topographic survey marks |
| SWCATCH | Stormwater |
| SWCHANNEL | |
| SWCULVERT | |
| SWDIM | |
| SWNODE | |
| SWNOTE | |
| SWNOTE_NOTE_TYPE_DIM | |
| SWNOTE_NOTE_TYPE_TEXT | |
| SWPIPE | |
| TOWN_C | Cadastral |
| TP_LANDUSE_JCUACAD | Town planning, zoning, cadastral |
| TP_LANDUSE_JCUCOLLEGE | |
| TP_LANDUSE_JCUDISCCENT | |
| TP_LANDUSE_JCUDVRES | |
| TP_LANDUSE_JCUDVSTG1 | |
| TP_LANDUSE_JCUENTPARK | |
| TP_LANDUSE_JCUNATURE | |
| TP_LANDUSE_JCUPADDOCK | |
| TP_LANDUSE_JCUROAD | |
| TP_LANDUSE_JCUSCHOOL | |
| TP_LANDUSE_JCUSPORT | |
| TP_LANDUSE_JCUUVRES | |
| TP_ZONING_AGRIC | |
| TP_ZONING_AMUSEMENT | |
| TP_ZONING_BUS_1 | |
| TP_ZONING_BUS_2 | |
| TP_ZONING_BUS_3 | |
| TP_ZONING_BUS_4 | |
| TP_ZONING_CEMETERY | |
| TP_ZONING_COMMERCIAL | |
| TP_ZONING_EDUCATIONAL | |
| TP_ZONING_EXIST_PUBLIC_ROAD | |
| TP_ZONING_GOVERNMENT | |
| TP_ZONING_IND_2 | |
| TP_ZONING_IND_3 | |
| TP_ZONING_INSTITUTIONAL | |
| TP_ZONING_MUNICIPAL | |
| TP_ZONING_PARKING | |
| TP_ZONING_PRIVATE_OPEN_SPACE | |
| TP_ZONING_PRIVATE_ROAD | |
| TP_ZONING_PROP_NEW_ROAD | |
| TP_ZONING_PUBLIC_GARAGE | |
| TP_ZONING_PUBLIC_OPEN_SPACE | |
| TP_ZONING_RES_1 | |
| TP_ZONING_RES_2 | |
| TP_ZONING_RES_3 | |
| TP_ZONING_RES_4 | |

| | |
|---|---|
| TP_ZONING_SAR | |
| TP_ZONING_SPECIAL | |
| TP_ZONING_UNKNOWN | |
| TREES | Trees |
| WARD | Cadastral |
| WATDIM_POTABLE | Water |
| WATDIMNOTE_POTABLE | |
| WATLABEL_ABANDON | |
| WATLABEL_POTABLE | |
| WATLABEL_RAW | |
| WATNODE_ | |
| WATNODE_ABANDON | |
| WATNODE_POTABLE | |
| WATNODE_RAW | |
| WATNOTE_POTABLE | |
| WATPIPE_ | |
| WATPIPE_ABANDON | |
| WATPIPE_CHILLWR | |
| WATPIPE_CHILLWS | |
| WATPIPE_POTABLE | |
| WATPIPE_RAW | |
| WATRESPIPE | |
| WATSERV_ | |
| WATSERV_CHILLWR | |
| WATSERV_CHILLWS | |
| WATSERV_POTABLE | |
| WATSERV_RAW | |
| WATSYM_POTABLE | |
| WATZONE_POTABLE | |

## 34.13   APPENDIX A - DRAWING SUBMISSION CHECKLIST

| Item | Date Received | Verified against this section |
|---|---|---|
| Check project identification number | | |
| Check file naming convention | | |
| Check revision sequencing | | |
| Check file formats | | |
| Letter of transmittal | | |
| Project document register (excel) | | |
| Interim Record Model (BIM) | | |
| Operations & Maintenance Manuals | | |
| Certificate of Classification | | |
| As-Built Services (.dwg) | | |
| As-Built Record Model – Architectural | | |
| As-Built Record Model – Structural | | |
| As-Built Record Model – Mechanical | | |
| As-Built Record Model – Electrical | | |
| As-Built Record Model – Hydraulic | | |
| As-Built Record Model – Topographic (Survey) | | |
| As-Built Construction Drawings (.dwg) | | |

## 34.14 APPENDIX B - SHEET NUMBERING CONVENTION

Drawing sheets may be numbered using the following conventions:

[Discipline Designator][Type Designator][Sequence Number]-[Sheet Title]
Example:A101-Site Plan

### 34.14.1 Discipline Designators

The following table indicates the primary (single) letter designations that may be used.

| Designator | Name | Additional Description |
|---|---|---|
|  | Cover Sheet |  |
| G | General | Sheet list, symbols, code summary, etc. |
| H | Hazardous Materials | Abatement, handling, etc. |
| V | Survey / Mapping |  |
| B | Geotechnical |  |
| C | Civil |  |
| L | Landscape |  |
| S | Structural |  |
| A | Architectural |  |
| I | Interiors |  |
| Q | Equipment |  |
| F | Fire Protection |  |
| P | Plumbing |  |
| D | Process |  |
| M | Mechanical |  |
| E | Electrical |  |
| T | Telecommunications |  |
| R | Resource | Existing conditions / buildings |
| X | Other Disciplines |  |
| Z | Contractor / Shop Drawings |  |
| O | Operations | FM |

### 34.14.2  Sheet Types

The Sheet Types designator takes the drawings of a single discipline and organises them.

| Designator | Name |
|---|---|
| 0 | General: Symbol legend, abbreviations, general notes |
| 1 | Plans |
| 2 | Elevations |
| 3 | Sections |
| 4 | Large Scale Drawings: plans, elevations, sections -- NOT details |
| 5 | Details |
| 6 | Schedules and Diagrams |
| 7 | User Defined |
| 8 | User Defined |
| 9 | 3D drawings: isometric, perspective, photos |
| 10 | Space Data |

### 34.14.3  Sequence Numbers

The final component of the sheet number is the two-digit sequence number, which is between 01 and 99. The sequence numbers do not have to be sequential so that space may be left within the set for future additions.