

UXB110 Residential Construction, Semester 1 – 2022

ASSESSMENT 2: RESIDENTIAL CONSTRUCTION PACKAGE Development project – Three Bedroom Dwelling

ISSUE DATE: Monday, 14 March 2022

DUE DATE: Sunday, 15 May 2022, before 11:59 pm to the Blackboard

MARKS: 40% of the total marks allocated to UXB110

TYPE: Individual assignment

PENALTY: Assignments submitted after the due date without an approved extension will not be marked and will receive a grade of 1 or 0%. If special circumstances prevent you from meeting the assignment due date, you can [apply for an extension](#) If you don't have an approved extension, you should submit the work you have completed by the due date and it will be marked against the assessment criteria. For more details, please refer to:
<https://qutvirtual4.qut.edu.au/group/student/study/assignments/submitting/late-assignments-and-extensions>

Major penalty for copying from the internet or plagiarism.

All material must be referenced appropriately.

- Note:**
- 1) *The skills and information necessary to complete this assignment are covered in the lectures and tutorials. It is your responsibility to watch the recorded videos that cover this material. There are over 400 students in this class. It is NOT the role of the staff to walk individual students through the entire exercise. It is the role of the staff to help you understand the material so that you can learn from the assignment.*
 - 2) *You will be given worksheets that will take you step-by-step through building a BIM model of the residence. The lecture/tutorial sequence has been structured to make the sequence as understandable as feasible. The worksheets are intended to set out a sequence of operations that reinforce your understanding of building construction. They may not be the most efficient method of building a BIM model.*

1.0 INTRODUCTION

You are employed as a cadet construction manager for a building contractor (Builder) specialising in residential construction, alteration and extension projects in the Brisbane area. You form part of a project team responsible for design, documentation and construction of a three bedroom dwelling (complete with two car garage) on a standard suburban lot. A sketch plan has been prepared and approved by the Client, and attached to this brief is the dimensioned floor plan (at 1:100 scale).

The site for the dwelling is to be chosen by each student using Queensland Globe. The site chosen should be a suburban lot within the Brisbane area. Each student will select a site with dimensions that will accommodate the clients approved floor plan (with the overall site size being no larger than 35M deep x 25M wide to fit on an A3 drawing sheet). The dimensions on your site drawing will be the same as the dimensions showing in your report at **Part 4.5 Qld Globe**.

While each student is required to have a unique site, the slope of the land for all students will be the same with an even fall of the land at 0.5M from the rear boundary to the street alignment.

NOTE – this Assessment is an individual piece of work for each student and this is reinforced by students identifying their site from Queensland Globe. **The site you chose is unique to your project – DO NOT COPY ANOTHER STUDENTS** site selection.

As well as constructing houses, alterations or extensions, this Builder generally provides the professional services associated with the procurement, either by his/her own internal professional staff or by engagement of external consultants. Such professional services may include:

- Design (Building Designer or Architect)
- Contour and detail survey of the site (Surveyor)
- Geotechnical report (Geotechnical Engineer)
- Construction drawings suitable for approvals and obtaining sub-contract prices (Building Designer or Architect)
- Estimate of cost (Quantity Surveyor or Estimator)
- Structural engineering design (Structural Engineer)
- Energy efficiency assessment (Energy Efficiency Assessment Provider)
- Building Certification under the Building Code of Australia and the Queensland Development Code (Building Certifier)
- Preparation of the building contract and contract administration during construction (Construction Manager or appropriate professional person).

You have been allocated tasks associated with the above activities so that you gain insight into procurement of a dwelling from the design stage to the end of construction. The tasks consist of preparation of selected construction drawings and an associated report. The report must consider (but is not limited to) elements of site establishment, site works, construction, materials, energy saving measures, cost estimation and the building contract.

2.0 CLIENT BRIEF

2.1 BUDGET

The Client has a Project Budget of \$270,000.

2.2 SITE

As noted in the Introduction, the site (your site) for this three bedroom dwelling should have unique dimensions for each student's site drawing – the site for your assessment will be chosen by you from Queensland Globe. Students are required to draw this site to show site boundaries and dimensions, relationship to roads and neighbouring properties, orientation (related to the cardinal points). All this information is to show in a drawing prepared by the student – see 3.1 SITE PLAN. (Refer to the dot points at 3.1 SITE PLAN for details on what to draw). Also an example site plan is provided in the tutorials to assist you. You will need to show similar information on your site plan.

A generic geotechnical report exists for your site. The site has been classified 'M – moderately reactive clay' in accordance with Australian Standard AS 2870 - 2011. The generic geotechnical report applies to all the unique sites being used for this assessment. This report advises on the types of footing to be used in the construction of the small dwelling

2.3 CLIENT REQUIREMENTS

The Client has expressed a preference for the following construction materials and systems:

- Timber-framed construction with an external brick veneer skin.

- Floor to both the dwelling and garage is a reinforced concrete slab-on-ground.
- Either coloured concrete roof tiles or prefinished (e.g. Colorbond) metal roofing and rainwater goods.
- A concrete vehicular driveway from the property boundary to the garage.
- Provision of concrete paths as necessary for convenient circulation around the dwelling, and selected areas for levelling, and returfing of all disturbed areas of the site.
- A gable roof to the dwelling and the garage.
- Provision of a solar hot water system on the roof and agreement that \$3,500 (including GST) be allowed as a Provisional Sum in the contract for supply and installation of this equipment.
- A cathedral ceiling over the Living Room. Note - This feature of the Dwelling is important for sizing the rafters as part of the Hyne Design (Section 4.4) requirements in the report

3.0 DRAWING REQUIREMENTS

Build the model of the site and dwelling accurately in Revit and then prepare sheets to show the required views of the model **at the required scales** of construction drawings as described in 3.1, 3.2, 3.3 and 3.4. Drawing 3.5 is to be drawn by hand.

3.1 SITE PLAN – REVIT DRAWING

The Site Plan comprises **one drawing** to show all existing features of the site around the dwelling within the site boundaries and for the street footpath, kerb and channel etc. The drawing is required to show the house suitably positioned on a building platform within the site.

Prepare the **site plan at a scale of 1:100** to show all the following:

- Site boundaries, footpath, concrete crossover, Real Property Description, and North point.
- Contours at 0.25M intervals, existing trees, and TBM (Temporary Bench Mark).
- A suitable location for the dwelling and garage on the site, complete with setout dimensions from the site boundaries to the roof overhang (shown as a broken line) and from the site boundaries to the outer wall line.
- BPL (Building Platform Level) and FFL (Finished Floor Level) and other relevant levels, and concrete slab set-downs, minimum step-downs, and falls.
- The Builder's site limits as agreed with the Client.
- A 2500mm wide concrete driveway extending from the curb to the garage.
- 900mm wide concrete paths and any necessary turf to areas of the site that have been disturbed by the site works.
- Stormwater drainage from new downpipes to the street kerb and channel and supplementary measures to control overland flow (i.e. contouring and surface drains for this site).

NOTE – Information from Queensland Globe specific to the standard suburban site you have chosen will give you the dimensions, orientation etc for your site drawing. Refer to the Qld Globe Report requirements (at 4.6) for information and snapshots that are required to be included in your report.

3.2 FLOOR PLAN – REVIT DRAWING

Prepare a **floor plan sheet** of the dwelling **at a scale of 1:50** to show all the following:

- Layout of rooms conforming to the Client's sketch design drawing.
- Extent of stud framed walls (size of studs to be determined from Hyne Design timber span tables), brick veneer skin, window and door openings, and thresholds.
- North point and accurate floor plan dimensions to permit the detailed setout of rooms and of window / door openings and other structural elements, including width of eaves.
- Room names, numbered (and scheduled) windows and doors, a drawing legend (with

abbreviations used for common building elements), and other relevant notation.

- Built-in fixtures e.g. kitchen cupboards, bathroom fixtures, adjustable shelving - do not show loose furniture (e.g. chairs, beds and similar items) on the drawings.
- Floor finishes, including non-slip concrete finish to external paved areas.
- Roof overhang (shown as a broken line) and location of rainwater downpipes on walls, to be consistent with in-ground drainage shown on the site plan.

3.3 CROSS SECTION – REVIT DRAWING

Prepare a **cross section sheet at a scale of 1:50** in the location shown as Section 1 on the floor plan. The cross section is to show all the following:

- Indicative earthwork profile of the finished ground line. Indicate necessary falls to apron slabs/paths against the building.
- Horizontal lines across the section at building platform level (BPL), finished floor level (FFL), and ceiling level (CL). Show the reduced levels (RL's) for each line and dimension.
- Outline of permanent surface drains to control overland flow of stormwater after construction.
- Reinforced concrete floor slab and footings complete with adjacent apron slabs/paths.
- Show the dwelling in outline to reflect walls and roof. All relevant notations and dimensions relating to building elements and materials.

3.4 ELEVATIONS – REVIT DRAWING

Prepare an **elevation sheet** of the dwelling **at a scale of 1:100** to show all the following:

- Front, Rear and Side (Bedroom End) Elevations
- Existing and finished ground lines. (**NOTE** – The relationship (the reduced levels) between the FFL (finished floor level), BPL (building platform level), and NGL (natural ground line) is required in this drawing.
- All relevant notations and dimensions relating to building materials and elements.

3.5 DETAIL – FREEHAND DRAWING

Showing CONCRETE SLAB with EDGE BEAM FOOTING, WALL FRAMING WITH BRICK VENEER SKIN up to the WINDOW SILL, and PART ROOF EAVES/ OVERHANG down to the WINDOW HEAD

Prepare a **detailed section at a scale of 1:10** to show all the following:

- Existing and finished ground lines. (**NOTE** – The relationship (the reduced levels) between the FFL (finished floor level), BPL (building platform level), and NGL (natural ground line) is required in this drawing.
- Building platform with compacted fill and moisture barrier.
- Minimum 300mm wide x 400mm deep reinforced concrete raft slab footings.
- 100mm thick reinforced concrete floor slab, including the relationship to a 75mm thick external path.
- Part wall framing with internal wall lining and external brick veneer skin up to the window sill.
- Bulk wall insulation, wall sarking and skirting board.
- Proposed termite protection methods.
- Part roof/roof framing showing overhang, roof sheeting on battens, rainwater goods, soffit framing and lining including the window head/lintel. In order to show the roof frame configuration, the drawing for the roof will extend 1,500mm from the external wall into the building.
- All relevant notation and dimensions relating to building elements and materials.

The wall and roof construction are all based on:

- Timber-framed wall, including top and bottom plates, nogging, brick-veneer skin, internal wall lining, bulk insulation and sarking.
- Timber-trussed roof frame, including truss configuration, roofing, roof battens, fascia, reflective foil insulation, bulk insulation, soffit / ceiling battens, and soffit / ceiling lining.

3.6 PRESENTATION

Drawings for **Site Plan, Floor Plan, Elevations and Cross Section** are to be **prepared in appropriate digital format (ie REVIT)**. They should be submitted as an Adobe PDF file. Drawings for the **3.5 Detail Section** are to be **prepared by manual drafting** on paper (*not REVIT*) using drawing implements as required to ensure that the drawing quality is accurate, to scale and legible.

Students are responsible for ensuring that submitted images accurately reflect their original hard copy (or digital) drawings. Distorted, blurred and/or illegible images will not achieve marks.

Marks will be allocated to the quality of presentation. Consider such items as sheet planning, title blocks (including name and student number), accuracy, legibility, and general neatness. The freehand (3.5 Detail) drawing standard is pencil (HB) on A3 graph paper at a line density suitable for scanning. For students with previous graphic experience, fine tip felt pen and ink on graph (or plain) paper is acceptable.

4.0 REPORT REQUIREMENTS

4.1 SITE WORKS AND CONSTRUCTION SYSTEMS

The Client has limited knowledge of residential construction but has expressed a keen interest in all aspects of the construction of their dwelling. To assist the Client with detailed knowledge of the site works and construction methods to be employed, you are required to prepare a photographic log showing the key components in the project by means of at least one relevant photo and 4 to 6 lines of text to explain either what the image shows or the function of that component. Take photos of actual residential building sites or choose relevant photos and/or technical sketches from other sources such as building material manufacturers' websites.

Site works, construction systems are to include:

- Required site safety measures and worker amenities, including temporary services for power and water
- Environmental protection measures for site access and site sediment control
- Temporary disposal of stormwater from roof drainage.
- Reinforced concrete floor slab including external brick veneer skin and timber frame.
- Trussed roof construction and roof covering

Note: Photos and text relating to non-residential (ie commercial/industrial) buildings will not achieve marks.

4.2 ESTIMATE OF COST

Building Contract Sum

Prepare an estimate of cost for the building works using the same methodology and showing the same key rates and level of detail for calculations as outlined in Lecture 7, including all external works and a Provisional Sum for supply and installation of the solar hot water system.

Project Cost

Add allowances of 5% for building contingency and 7½% for professional fees & statutory charges to the estimate of cost for the building works to achieve an estimate of the total project cost.

Note: Lecture Week 7 will address the process of how these estimates are to be calculated and how they are to be presented to the Client.

4.3 ENERGY SAVING INITIATIVES

Legislative requirements relating to residential energy efficiency are contained within the Building Code of Australia Volume 2 and Queensland Development Code MP 4.1. Under legislation, a 6-star energy rating is required for dwellings in the climate zone for Brisbane.

- Briefly describe **three** passive energy saving provisions that could be made to the roof, including roof sheeting and ceiling space, that will assist in satisfying the energy efficiency requirements of the Building Code of Australia. Solar panels, solar hot water systems and electrically-powered exhaust systems shall not be considered passive energy saving provisions in this context.
- Briefly describe **two** passive energy saving provisions that could be made to the external walls (including windows) that will assist in satisfying the energy efficiency requirements of the Building Code of Australia.

Illustrate each of the above five provisions with photographs and/or technical sketches and text to fully describe your proposed energy saving measures.

Note: The Week 7 Lecture will address the energy efficiency requirements of the Building Code of Australia and the Queensland Development Code MP 4.1.

4.4 SIZING OF TIMBER MEMBERS (from Hyne Design span tables)

Using Hyne Design Span Tables, students are required to identify the size, timber type/strength, and timber member position for the following members –

- a) **Studs noggings and plates**
- b) **Lintel above the double width garage door opening and the window head lintel**
- c) **Rafters creating the cathedral ceiling above the Living Room**

NOTE – part 4.4 d) is an additional exercise for students to include in this section of the report only,

Students are required to calculate **the spacing of posts** to support a suspended timber floor and **the size (including the timber type, strength, etc) for the floor bearers and floor joists**. *NOTE sizes of the bearers and joists will be governed by the spacing of the posts.*

STUDENTS are not required to draw the suspended timber floor in the drawing component of their assessment.

- d) **post spacing and timber sizes etc for an alternative floor structure** which is raised above the ground.

4.5 QUEENSLAND GLOBE (QG)

Students are required to use QG to identify the site for this assessment (Refer **Introduction 1.0**). The use of QG is explained in the audio visual presentations that are listed on Blackboard and presented at the tutorials.

The information that is required in this section of the report is 3 snapshots to show the site chosen by the student and drawn on your site plan.

The 3 snapshots required are –

- a) a view showing the site including the land boundaries, street and footpath, features which are part of the QG view and also showing the RPD for the land,

- b) **Use the QG tool** to measure the length and breadth of the site and take snapshots for each of these measurements – there are 2 measurements you are to show
- c) a view showing the area of the site.

4.6 BUILDING CONTRACT

Use the Queensland Building and Construction Commission (QBCC) New Home Construction Contract (see attached Schedule) as the written agreement between Builder and Client.

- Complete Item 1 for the Contract Price (aka Building Contract Sum) in the Schedule.
- Prepare a written explanation to the Client of what impacts could result to the Contract where the Client issues a variation asking the Builder to increase the extent of work.

Note: Lecture Week 7 will address issues relating to new home building contracts.

4.7 PRESENTATION

The report component should be neat, well-structured and presented in a professional manner. Use the same headings as the brief to introduce the different subjects addressed in your report.

5.0 ASSESSMENT CRITERIA

Refer to the Criteria Referenced Assessment (CRA).

6.0 STANDARD OF SUBMISSION

During tutorials and lectures, exercises and information will be given that relate to the standards that are expected and the extent of detailing to be provided.

7.0 WHAT TO SUBMIT

Submit **ONE single Acrobat PDF** file labelled with your name and student number (e.g. **Joe Bloggs N1234567**). This PDF file should consist of the following:

- 1) The 4 Revit sheets covering Parts 3.1, 3.2, 3.3, and 3.4 printed as Adobe PDF file at A3 size;
- 2) One A3 freehand drawing at 1:10 scale titled '3.5 Details – External Wall connection to Floor and Roof' scanned to Adobe PDF file at A3 size;
- 3) Report printed as Adobe PDF file at A4 size from standard word processing software.

Your report and attachments should be A4 in size and properly set out against the brief headings. Page 1 of the 'Schedule for QBCC New Home Construction Contract' must be included.

Use QUT self-service or equivalent commercial scanning services to convert manual A3 drawings into matching Acrobat PDF files. Students are responsible for ensuring that drawing quality and line density are suitable for their final submissions e.g. by scanning an early draft of a sample drawing to ensure clarity and legibility. Scanned or photographic representations of drawings that are distorted, blurred or illegible will not achieve marks.

It is recommended that you prepare a hard copy of drawing 3.5 for discussion with your tutors before final submission. As previously indicated, drawings produced by digital design software packages and saved as Adobe PDF file will be accepted with **prior** approval from your tutors.

Tips for scanning your drawings at QUT

<https://qutvirtual4.qut.edu.au/group/student/it-and-printing/printing-copying-and-scanning/scanning>

Tips for combining PDF files

<http://www.wikihow.com/Merge-PDF-Files>

Tips for submitting your assignment to Blackboard

<https://www.student.qut.edu.au/studying/learning-with-technology/qut-blackboard/assignments-tipsheet>

Note: Further advice will be provided in the coming weeks regarding the preparation of the model in Revit and presentation of your manual drawing 3.5 and report.

On completion, remember to ensure that your A3 drawings and A4 report are combined into ONE single Acrobat PDF file for submission.

8.0 TYPICAL REFERENCES

- The Australian House Building Manual (construction details), *Allan Staines*
- Building Your Own Home (construction details), *George Wilkie*
- Queensland Development Code MP1.2 Design and Siting Standards for Single Detached Housing – on Lots 450sqm and over www.hpw.qld.gov.au/
- Queensland Development Code MP 4.1 Sustainable Buildings Class 1 www.hpw.qld.gov.au/
- Building Code of Australia 2016 Volume 2 - Housing Provisions www.abcb.gov.au/
- Liveable Housing Australia Guidelines <https://livablehousingaustralia.org.au/design-guidelines/>
- AS 2870 – 2011 Residential Slabs and Footings
- AS 1684.4 – 2010 Residential Timber Framing Manual
- Queensland Building and Construction Commission: Building Contract for New Houses www.qbcc.qld.gov.au/
- <http://www.bluescopesteel.com.au/> (roof sheeting and roof plumbing, external wall sheeting)
- <https://www.hyne.com.au/> (timber wall framing)
- www.boral.com.au (energy efficiency, internal wall lining)
- www.gyprock.com.au/ (internal wall lining)