Design Brief for
a Residential Development
in To Kwa Wan
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**Appendix A**  Proposed site location plan  
**Appendix B**  Preliminary building floor plans and sections
1. INTRODUCTION

1.1 Objectives

The objective of this capstone design project is to provide professional training to final year students to work on civil engineering projects through synergistic teamwork within a realistic working environment. Students are required to participate in the conceptual formulation of general arrangement, foundation and structural schemes, appraisal of the schemes and construction sequence, as well as traffic impact assessment, environmental impact assessment, and drainage impact assessment where appropriate, followed by preliminary design, preparation of drawings/figures, preliminary cost estimation for the selected scheme in the first semester and also preparation of drawings and calculations for detailed design in the second semester.

1.2 Project Schedule

The schedule of the design project is set out in Table 1 below.

Table 1 Project Schedule

<table>
<thead>
<tr>
<th>Milestone Date</th>
<th>Component</th>
<th>Page Limit</th>
<th>Weight</th>
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<tr>
<td>23 Sep 2020 (Wed) by 5pm</td>
<td>Inception report</td>
<td>30</td>
<td>10%</td>
</tr>
<tr>
<td>21 Oct 2020 (Wed) by 5pm</td>
<td>Regular progress update 1</td>
<td></td>
<td>*a&amp;c</td>
</tr>
<tr>
<td>20 Nov 2020 (Fri) by 5pm</td>
<td>Draft report on feasibility study and preliminary design</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>27/28 Nov 2020 (Fri/Sat)</td>
<td>Oral presentation 1</td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>8 Jan 2021 (Fri) by 5pm</td>
<td>Report on feasibility study and preliminary design</td>
<td>100</td>
<td>25% *a</td>
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<tr>
<td>15 Jan 2021 (Fri) by 5pm</td>
<td>Poster</td>
<td></td>
<td>*a</td>
</tr>
<tr>
<td></td>
<td>Peer review</td>
<td></td>
<td>*b</td>
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<td>24 Feb 2021 (Wed) by 5pm</td>
<td>Regular progress update 2</td>
<td></td>
<td>*a&amp;c</td>
</tr>
<tr>
<td>16 Apr 2021 (Fri) by 5pm</td>
<td>Draft report on detailed design</td>
<td>100 (excl. calculations)</td>
<td>-</td>
</tr>
<tr>
<td>23/24 Apr 2021 (Fri/Sat)</td>
<td>Oral presentation 2</td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>30 Apr 2021 (Wed) by 5pm</td>
<td>Report on detailed design</td>
<td>100 (excl. calculations)</td>
<td>25% *a</td>
</tr>
<tr>
<td>03 May 2021 (Mon) by 5pm</td>
<td>Poster</td>
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<td>*a</td>
</tr>
<tr>
<td></td>
<td>Peer review</td>
<td></td>
<td>*b</td>
</tr>
<tr>
<td>See Moodle</td>
<td>Seminar reports</td>
<td></td>
<td>20%</td>
</tr>
</tbody>
</table>

* Notes:

a. The report on feasibility study and preliminary design or the report on detailed design is assessed together with regular progress updates and posters by staff tutors and moderators and progress meetings by industrial tutors in the same semester. It is also used for mark adjustment of the report in the same period among various groups working on the same project. The assessment results of various reports posted on Moodle are therefore tentative only and subject to subsequent adjustments.

b. Peer review is used for possible adjustment of individual marks among group members at the discretion of staff tutor and moderator for report on feasibility study and preliminary design or detailed design.
c. Students are required to report their progress regularly by posting the agenda and minutes of meetings and updates to project file on their Moodle website. The staff tutor and moderator will provide feedback and carry out assessment accordingly.

d. Students are required to attend regular progress meetings to report their progress and to consult the industrial tutors and staff tutors/moderators for advice. The detailed schedule is shown in the course arrangement.

2. PROJECT DESCRIPTION

2.1 Background

Aiming to create high quality and vibrant urban living in Hong Kong, the Urban Renewal Authority (URA) is partnering with a leading property developer to redevelop an old urban district to a mixed-use residential development in To Kwa Wan (refer to Appendix A for the site location). The total site area of the whole redevelopment is approximately 10,673 $m^2$, and the proposed development comprises of 5 residential towers on top of a mix-used podium.

2.2 Proposed Development

The Pilot Design for the project consists of a topside 32-storey residential development sitting on 3-storey podium of commercial / retail and residential recreational facilities, and with two levels of basement carpark (refer to Appendix B). Subject to the technical justification & design by the designers, one or multi-towers can be placed within the specified topside residential development area.

Designers are required to propose a feasible architectural & structural layout with full justification for the building. The implementation of Building Information Modeling (BIM) techniques, construction planning and sequence, general arrangement of the building, public liaison, impact on adjacent buildings and utilities, environmental, traffic, etc., should be discussed and considered in the design.

To tackle the aggravating problem of urban decay and push sustainable urban renewal forward, the innovative technologies - DfMA (Design for Manufacturing and Assembly) and IoT (Internet of things) shall be explored and presented in the feasibility study and preliminary study for the construction and project management of the proposed development. As per the client’s requirements, the designers shall provide explicitly a feasibility design by using Modular Integrated Construction (MiC) for the residential units.

2.3 General Ground Condition

The ground information of the site can be retrieved at Geotechnical Information Unit, Civil Engineering Library, LG1 of Civil Engineering and Development Building. The highest possible ground water level is taken as the ground surface.
3. **CLIENT'S REQUIREMENTS**

The project team shall meet, but not limited to, the following design requirements:

- **a.** The minimum headroom requirements and fire resistance rating of the proposed redevelopment are specified as below.

<table>
<thead>
<tr>
<th>Floor / Location</th>
<th>Usage</th>
<th>Minimum clear headroom* (m)</th>
<th>Fire resistance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/F – R/F</td>
<td>Residential Unit</td>
<td>2.5</td>
<td>1 hour</td>
</tr>
<tr>
<td>1/F - 2/F</td>
<td>Residential recreational facilities</td>
<td>3.5</td>
<td>2 hours</td>
</tr>
<tr>
<td>G/F</td>
<td>Commercial / Retail</td>
<td>4.5</td>
<td>2 hours</td>
</tr>
<tr>
<td>Basement (B1/F &amp; B2/F)</td>
<td>Car Park</td>
<td>2.5</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

* The minimum clear headroom is the floor height clear of all structures and building services. A service zone of minimum 600 mm depth shall be provided for the podium and basement floors. The elevation of the building which includes the storey height of each floor is shown in Appendix B.

- **b.** Minimum column spacing for all areas between G/F – 2/F is 8.5 m (c/c).

- **c.** Vertical structural elements are only permitted along the periphery of the residential units, and no columns/walls are permitted inside the residential units and corridor.

- **d.** No building structure, including foundation, can be built outside the boundary line.

- **e.** The proposed development shall provide not less than 480 nos. of flats (area of each flat shall be not less than 32 m²).

- **f.** Considerations and protection measures to the adjacent MTRC structure shall be provided in details in the foundation and ELS design. Besides, the development within the Scheduled Area No.3 shall comply with the requirements as specified in Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers APP-24.

- **g.** High-level technical advice for the seismic-resistant design of the building structure shall be provided in the feasibility study.

- **h.** Detailed design of the service core shall be provided but no column is permitted within the core.
4. SCOPE OF WORKS

4.1 Regular progress updates
The regular progress updates shall comprise:
   a. Meeting records (40%) - agenda and minutes of meetings
   b. Project file (60%) - it shall contain sufficient information to describe the evolution of the
design, e.g. brief descriptions, scanned copies of free-hand sketches of various schemes,
rough calculations, etc. for illustration.

   It is understood that, while the design scheme is still evolving, not all of the design requirements
will be met. The design scheme may also be revised in the process. Therefore, assessment of the
regular update is based on the progress made rather than feasibility of design scheme. The
feasibility of design scheme will be assessed with submission of the final reports.

4.2 Inception report
   a. The project team shall identify all the site constraints and the particular concerns as far as
   possible in environmental, geotechnical, structural, drainage, transportation and
   constructability aspects.
   b. The project team shall develop a feasible scheme for the new development.
   c. The project team shall report the progress of any work done.
   d. The project team shall develop a working plan and identify important milestones of the
   project with proposed dates.
   e. A task list and a duty roster indicating the apportionment of tasks among project team
   members shall be included in the report.

4.3 Report on feasibility study and preliminary design
   a. The project team shall develop a feasible scheme for the new development. The design
   scheme shall satisfy the Client’s requirements as set out in this brief.
   b. Due considerations shall be given to the suitability, construction programme, cost, material,
environment and safety.
   c. The project team shall submit a report on feasibility study and preliminary design which
   includes, but not limited to, the following details: -
      • The scope, purpose and background of the study;
      • An executive summary of the study;
      • Architectural considerations including consideration of different options;
      • Engineering considerations including consideration of different options;
      • A structural design appraisal with appropriate sketches indicating clearly the functional
framing, material, load transfer path, and vertical & lateral stability aspects of each
scheme;
      • A preliminary assessment of traffic, drainage, environmental and visual impact, and etc.;
      • Development and evaluation of alternative design solutions;
      • Schematic plans and sections showing viable structural and foundation layouts;
      • Recommendation, with sound engineering justifications, of a preferred orientation and
design for the new development;
      • Proposed project schedule for implementation;
      • Estimates of costs;
      • A project file including all letters, minutes, agenda, etc. in the Appendix;
5 July 2020

- A task list and a duty roster indicating the apportionment of tasks among project team members; and

d. The project team shall produce drawings showing the preliminary design of the new development. These include, but are not limited to, the following: -
  - General layout plan that also shows the location of the new development;
  - General building plans (architectural plans);
  - Loading key plans;
  - General arrangements (structural framing plans); and
  - Foundation layout plans and sections with geological profile.

e. The project team shall deliver a 45-min. oral presentation at the end of the feasibility study and preliminary design followed by a 15-min. question and answer session. The schedule shall refer to the course arrangement. The presentation shall set out design considerations and illustrate key findings of the feasibility study and preliminary design. The recommendation and justification for the preferred scheme shall be fully covered in the presentation for the Client’s agreement.

f. The project team shall also prepare a poster which includes the most important findings of your feasibility study and preliminary design. Format of the poster shall refer to Section 4.5.

4.4 Report on detailed design

a. The project team shall prepare a detailed design report for submission to the client. The final design report shall include, inter alia, the following items: -
  - An executive summary;
  - Design memorandum including design criteria, geotechnical parameters, loading schedule, safety, standard codes, etc.;
  - A general description of the proposed works and construction sequences;
  - Demonstration of the overall stability of the building;
  - Computer models for the wind and gravity load analysis;
  - Structural design calculation for key structural elements only;
  - Ground movements, if any, due to any geotechnical works;
  - Impact assessment reports for structure, traffic, drainage and environmental;
  - A risk assessment of the project;
  - An assessment of wind loads on the proposed building, as well as maximum top deflection and fundamental natural frequency shall be provided in details;
  - Construction method and sequence of the basement and the building;
  - Overall construction programme and cost estimation;
  - A project file including all letters, minutes, agenda, etc. in the Appendix; and
  - A task list and a duty roster indicating the apportionment of tasks among project team members.

b. The project team shall produce drawings for the development. These include, but are not limited to, the following: -
  - General layout plan that also shows the location of the new development;
  - General building plans (architectural plans);
  - Loading key plans;
  - General arrangements (structural framing plans);
  - Foundation layout plans and sections with geological profile;
• Reinforcement (for reinforced concrete structures) and connection (for steelworks) details;
• Construction sequences of the building; and
• Traffic diversion plans.
c. The project team shall deliver a 45-min. presentation at the end of the final detailed design and the schedule shall refer to the course arrangement. The presentation shall be followed by a 15-min. question and answer session.
d. The project team shall also prepare a poster which includes the most important elements of the detailed design. Format of the poster shall refer to Section 4.5.

4.5 Format of submissions

a. Just ONE PDF file shall be submitted in the sub-class Moodle site for each group. Students should combine all the materials into ONE PDF file with the consideration of the reading sequence of the markers.
b. The maximum size of normal submission is 100MB and that of Turnitin submission is 40MB in Moodle. Students should resize the PDF file before submission if the limit is exceeded.

4.6 Poster

Each group shall submit a poster after the two milestones (feasibility study and preliminary design and detailed design). The use of posters is quite common in design competitions, research conferences, exhibitions, public engagement, etc. For the Capstone Design Project, the 10 groups who are working on the same project are similar to 10 consultant firms competing for an engineering job. The judging panel would be your client and relevant experts. Posters shall include the most important findings of your report and they are used for mark adjustment of the report in the same period among various groups working on the same project.

Students shall use Microsoft PowerPoint or equivalent to design the poster with the following requirements.

a. Size - A1 (594 × 841 mm)
b. Image resolution: 300 dpi
c. Main Title: recommended font size between 54 to 60 pt
d. Sub-heading: recommended font size between 40 to 44 pt
e. Normal text: recommended font size of at least 28 pt

5. SITE VISITS

In order to familiarize with the site conditions, site visits to the proposed development shall be arranged in the early design stage, if necessary.
6. RECOMMENDED DESIGN STANDARDS AND REFERENCES

The following codes of practice, standards and references shall be used in the design of the development as applicable:

a. Hong Kong Buildings Ordinance, Chapter 123
b. Hong Kong Building (Planning) Regulations, Chapter 123F
   i. B(P)R 24 & 39 on "storey & staircase height"
   ii. B(P)R 29 to 37 on "lighting & ventilation"
   iii. B(P)R 39 to 43 on "means of escape"
   iv. B(P)R 72 on "use by persons with a disability"
c. Hong Kong Building (Construction) Regulation 1990.
e. Code of Practice for the Structural Use of Concrete 2013, Buildings Department.
f. Code of Practice for the Structural Use of Steel 2011, Buildings Department.
i. Code of Practice for Dead and Imposed Loads 2011, Buildings Department.
k. Code of Practice for Site Supervision 2009, Buildings Department.
m. Engineering Geology Practice in Hong Kong, GEO Publication No. 1/2007
r. Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP), Buildings Department.
s. Design recommendations for multi-storey and underground car parks (Fourth edition) 2011, The Institution of Structural Engineers.

7. COMMONLY USED DESIGN SOFTWARES

The following design softwares are commonly used in the industry:

a. ANSYS – structural analysis
b. ETABS – structural analysis
c. FREW – geotechnical analysis of deformation and stability of soil structures
d. MIDAS – structural analysis
e. PLAXIS – geotechnical analysis of deformation and stability of soil structures
f. REVIT – Building Information Modeling
g. PROKON – structural element design
h. SADS – structural element design
i. SAFE – analysis and design for concrete slabs and basement/foundation structures
j. SAP 2000 – structural analysis
k. SPACE GASS – structural analysis
l. STAAD Pro – structural analysis
m. STRAND7 – structural analysis
Appendix A
Figure 1 Proposed site location plan
Appendix B