

**Module: Construction Technology**

**Question 1**

**Refer to your drawings and scenario.**

**TASK:**

As the contractor's Design Manager, prepare an illustrated technical report for the Project Manager, that describes and evaluates viable options and their preferred solution for the following aspects of the development

- A) The construction of the storage building superstructure including transmission of imposed loads to a suitable substructure. **(10 Marks)**
- B) The building's environmental control systems strategy required to create an energy efficient controlled environment on the ground floor and general environmental control in other areas. **(12 Marks)**
- C) Opportunities for the incorporation of prefabrication and off-site construction for the development. **(8 Marks)**

**Indicative answers**

Markers – Please refer to the marking descriptors.

- |  |                   |
|--|-------------------|
| A) Alternative foundation systems could include types of raft foundations, piles and ground beams. Reasoned argument to justify the selected solution is required that takes account of the ground conditions and the proposed structural solution for the building. | <b>(10 Marks)</b> |
| B) Layout diagrams indicating the location and type of heaters, air intakes, air distribution ducts, air conditioning plant, heat recovery, environmental sensors, building management system. Testing and certification of the system.                              | <b>(12 Marks)</b> |
| C) Prefabrication could include 3D modular construction, toilets, prefabricated lift shaft and plantroom. Plumbing and air supply systems. Prefabricated foundation systems could be considered as there may be contaminated land present.                           |                   |

|   |                         |
|---|-------------------------|
| <p>A merit should be awarded to a report that contains reference to and makes use of the critical and key information included in the scenario and drawings that have a bearing on the technical solution proposed. (key information may include ground conditions, water table level, contamination, risk of ground movement, distribution of loads, security concerns, economic and safety concerns, site features.)</p> <p>In addition to the above a distinction should be awarded to candidates based upon the quality of the arguments and justification of the technical solutions proposed along with the quality and accuracy of the report.</p> | <p><b>(8 Marks)</b></p> |
|---|-------------------------|

### Module: Construction Technology

#### Question 2

**Refer to your drawings and scenario.**

Since the original conceptual design was developed, as shown on the drawings provided, the following events have occurred:

The price of steel has increased dramatically.

Local legislation has been introduced to encourage the incorporation of new higher standards of thermal insulation.

Grants are now available to encourage on-site energy generation for public buildings.

#### **TASK:**

As the contractor's Design Manager, prepare an illustrated technical report for the Project Manager that considers the implications for the project by changing the main structural members from steel to concrete. Your report should also consider possible improvements that can be made to the thermal insulation of the external elements. Your report should address these specific areas.

- A) The construction of the building frame and foundations using concrete construction methods compared to steel frame. Thermal insulation strategies suitable for the concrete building. **(15 Marks)**
- B) Strategies and options to increase on-site energy generation. **(10 Marks)**
- C) Compare off site precast concrete for structural members and floors to ready mixed insitu concrete on permanent steel formwork. **(5 Marks)**

#### **Indicative answers**

Markers – Please refer to the marking descriptors.

- A) Alternative foundation systems could include raft foundations, piles and ground beams, or wide reinforced strip foundations. Reasoned argument to justify the selected solution is required that takes account of the ground conditions. Sizes of the concrete members and fire protection strategies should be considered. Site handling, mechanical lifting, false work, setting times.

|  |                   |
|--|-------------------|
| Improved insulation should consider the advantages and disadvantages of external insulation and internal insulation. Insulation material selection should include thermal performance, interstitial condensation, and flammability.  | <b>(15 Marks)</b> |
| B) Consideration given to ground source heat pumps, wind generated electricity, increasing the solar, and/or photovoltaic panels. Heat recovery ventilation and recycled filtered air.   | <b>(10 Marks)</b> |
| C) Availability of precast and ready-mix suppliers. Travel distances between site and supplier. Improved quality control of precast units. Weight/size differences between precast and insitu. Pre-ordering of precast components, on site flexibility of insitu concrete, e.g., ease of forming holes on site.  | <b>(5 Marks)</b>  |
| <p>A merit should be awarded for a report that contains references to, and makes use of, the critical and key information included in the scenario and drawings that have a bearing on the technical solution proposed. (key information may include ground conditions, water table level, contamination, risk of ground movement, spans and distribution of loads, economic and safety concerns, specific relevant site features.) In addition to the above a distinction should be awarded to candidates based upon the quality of the arguments and justification of the technical solutions proposed along with excellent presentation and accuracy of the report.</p> |                   |