MODELLING A FUNCTIONAL BUILDING **HL TYPE II**

To the student: The work that you produce to address the questions in this task should be a report that can stand on its own. It is best to avoid copying the questions in the task to adopt a "question and answer" format.

As an architect you have been contracted to design a building with a roof structure similar to the one shown below.

In this task you are to model such a building and produce a report to the contractor with all necessary specifications.

(This task continues on the following page)

You are to design an office block inside a structure with the following specifications:

The building has a rectangular base 150 m long and 72 m wide. The maximum height of the structure should not exceed 75 % of its width for stability or be less than half the width for aesthetic purposes. The minimum height of a room in a public building is 2.5 m.

- Create a model for the curved roof structure when the height is 36 m.
- Find the dimensions of the cuboid with maximum volume which would fit inside this roof structure.
- Use technology to investigate how changes to the height of the structure affect the dimensions of the largest possible cuboid.
- For each height, calculate the ratio of the volume of the wasted space to the volume of the office block.
- Determine the total maximum office floor area in the block for different values of height within the given specifications.
- Given that the base remains the same (72 m × 150 m), investigate what would happen if the facade is placed on the longer side of the base.
- You now decide to maximise office space even further by not having the block in the shape of a single cuboid.
- Review your model and calculate the increase in floor area and the new volume ratio of wasted space to office block.