
SCHOOL OF ARCHITECTURE, BUILDING & DESIGN

Bachelor of Science (Honours) in Architecture

Building Structures (ARC 2522/2523)

Project 2

# Structural Analysis of a Bungalow

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## 1.0 Brief description of the project and Bungalow

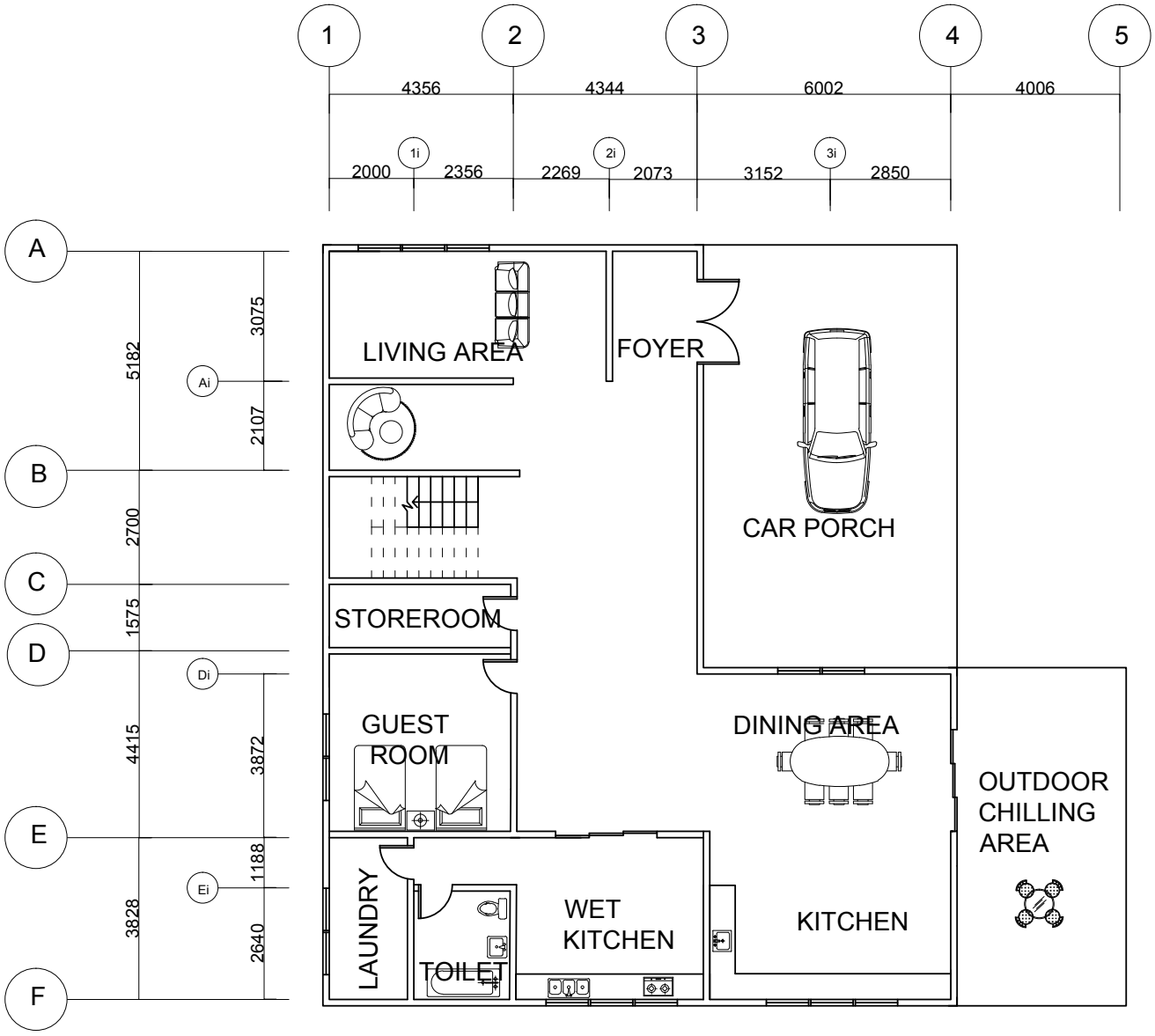
This project is divided into two parts which the first part is a group work while the second part is an individual work. In a group of three, we are required to design a 2 storey bungalow which consists of the components stated by the lecturers. We are asked to design the structural frame of the building. This project is an integration of structural theory, force calculation and basic structural proposal.

We have chosen the second building outline from Category A as the ground floor outline of our design and the third building outline from Category B as the first floor outline. Our proposed design consists of 9 rooms, 3 toilets, 3 indoor living spaces, 1 outdoor chilling space and 1 car porch.

From the information on the structural plan drawings, each of us have to calculate and identity the slab system and load distribution for the beams and columns. We are required to calculate 6 different types beams and 3 different types of columns from both ground floor and first floor.

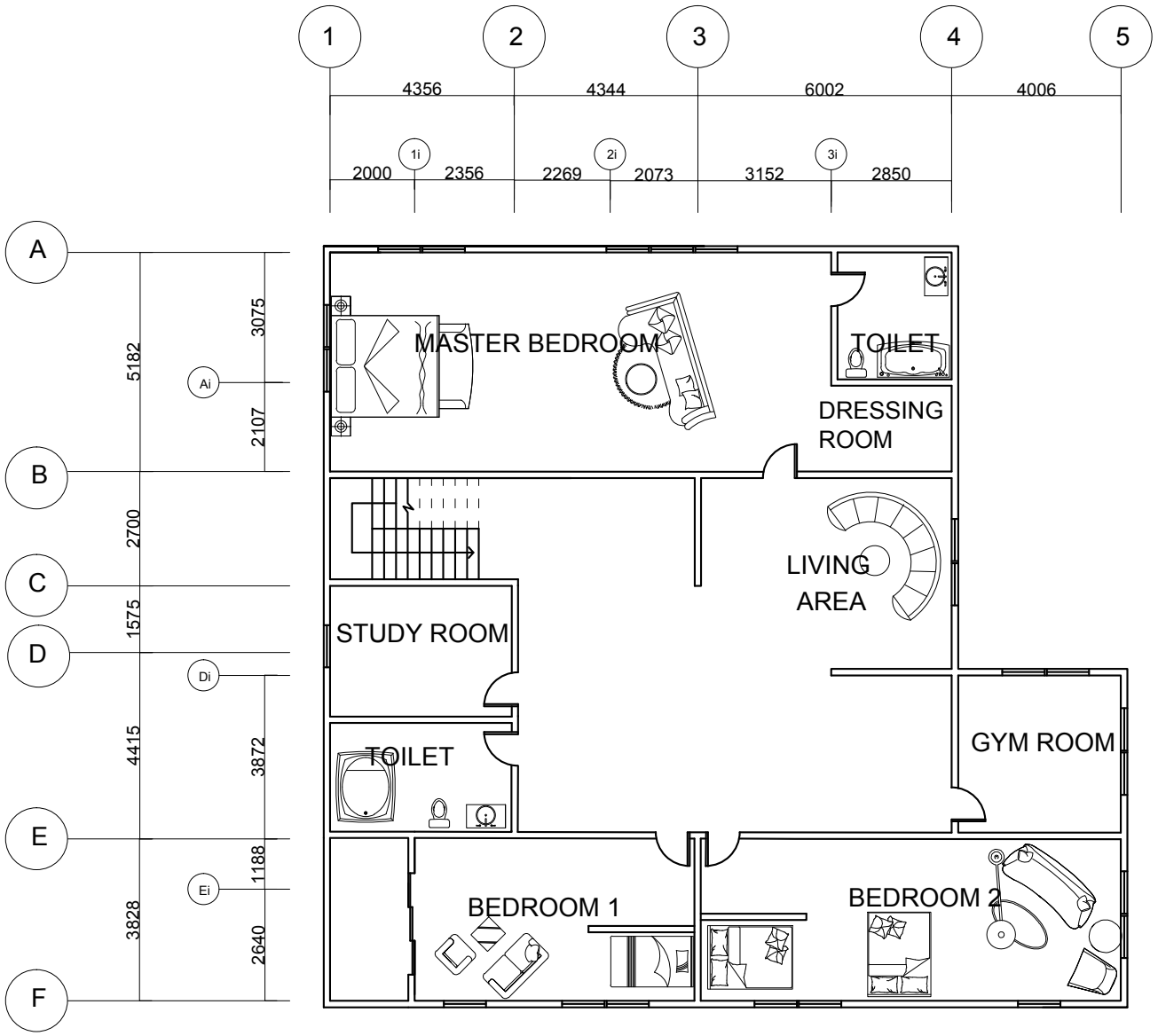
2.0 Architectural Plan

2.1 Ground Floor Plan



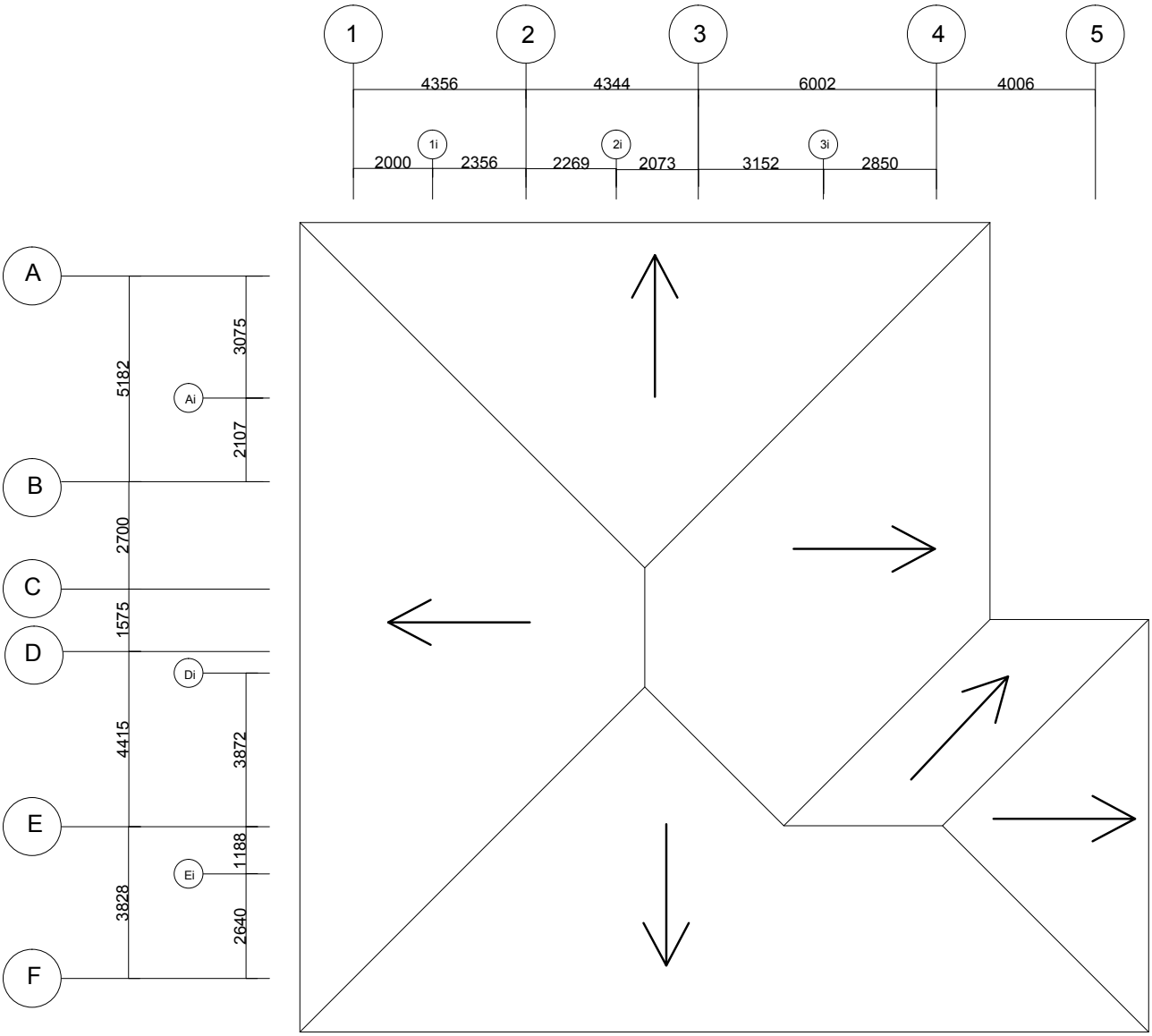

GROUND FLOOR PLAN (ARCHITECTURAL)

## 2.2 First Floor Plan




FIRST FLOOR PLAN (ARCHITECTURAL)

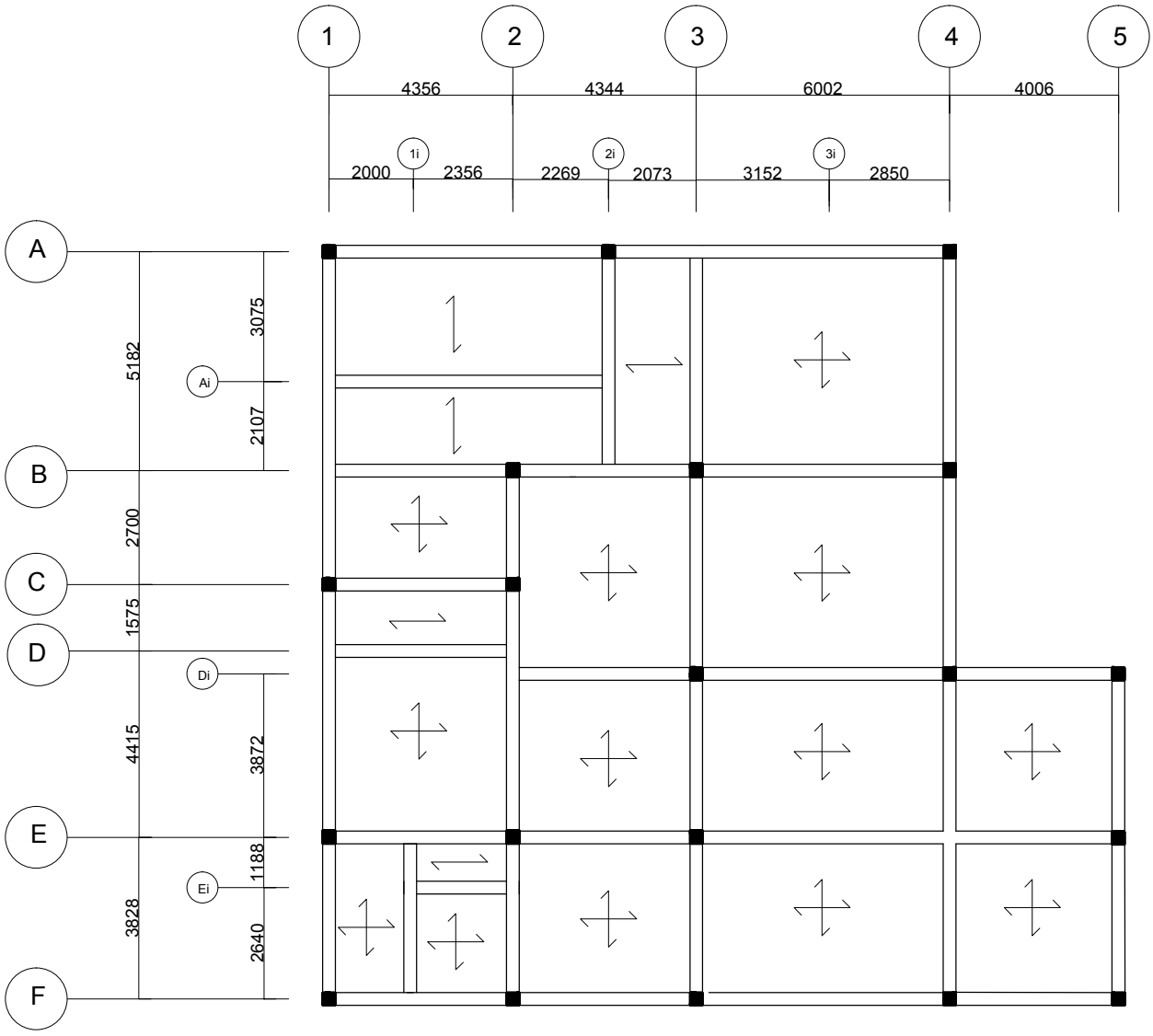
## 2.3 Roof Plan




ROOF PLAN (ARCHITECTURAL)

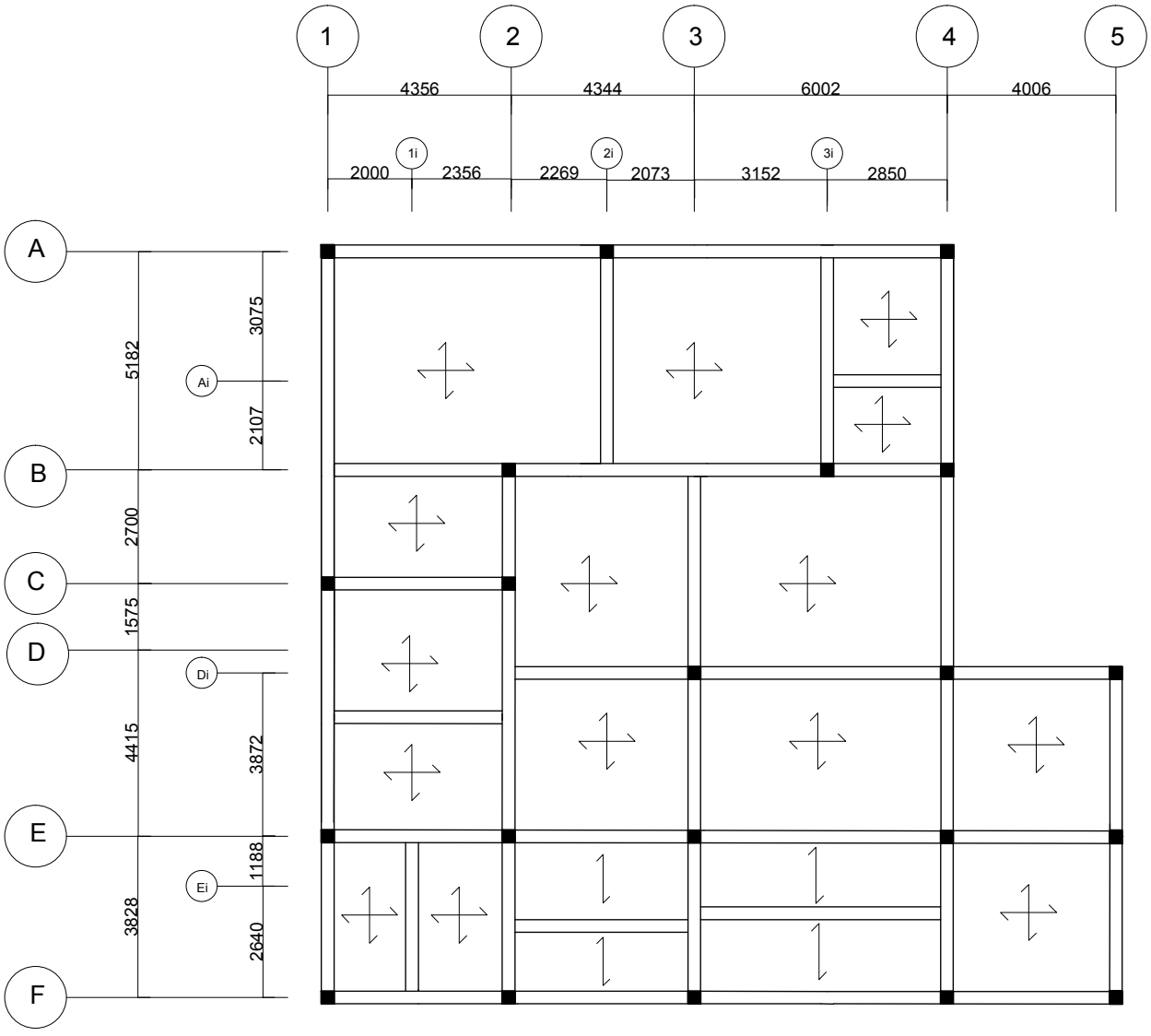
# 3.0 Structural Plan

## 3.1 Ground Floor Plan



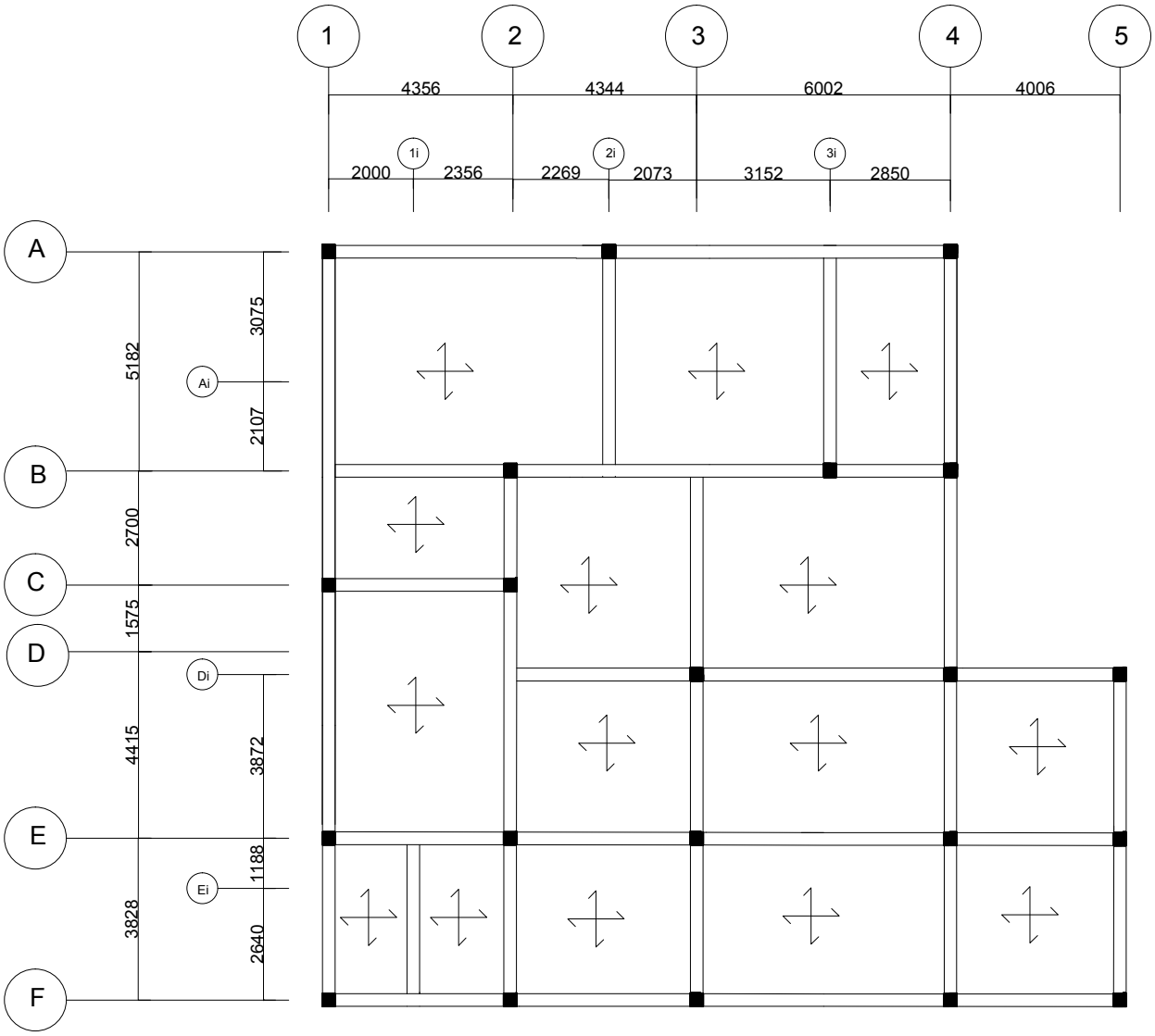

GROUND FLOOR PLAN (STRUCTURAL)

## 3.2 First Floor Plan




FIRST FLOOR PLAN (STRUCTURAL)

## 3.3 Roof Plan




ROOF PLAN (STRUCTURAL)

## 4.0 Design Brief

The bungalow design that we have proposed consists of 9 rooms which provide different function, 3 toilets, 3 indoor living spaces, 1 outdoor chilling space and 1 car porch. The material of the slab are reinforced concrete and bricks are used to construct the walls.

Specifications

UBBL

Reinforced concrete density = 24 kN/m³

Bricks density = 19 kN/m³

Quantity Dead loads acting on the Structure

1. Slab self weight
   = 0.15 x 24 kN/m³
   = 3.6 kN/m²

2. Brick wall self weight
   = 150mm x 3200mm x 19 kN/m³

3. Primary beam self weight
   = 0.3 x 0.3 x 24 kN/m³
   = 2.16 kN/m

4. Secondary beam self weight
   = 0.3 x 0.15 x 24 kN/m³
   = 1.08 kN/m

5. Column self weight
   = 0.3 x 0.3 x 3.2 x 24 kN/m³
   = 6.91 kN

Quantity Live loads acting on the Structure

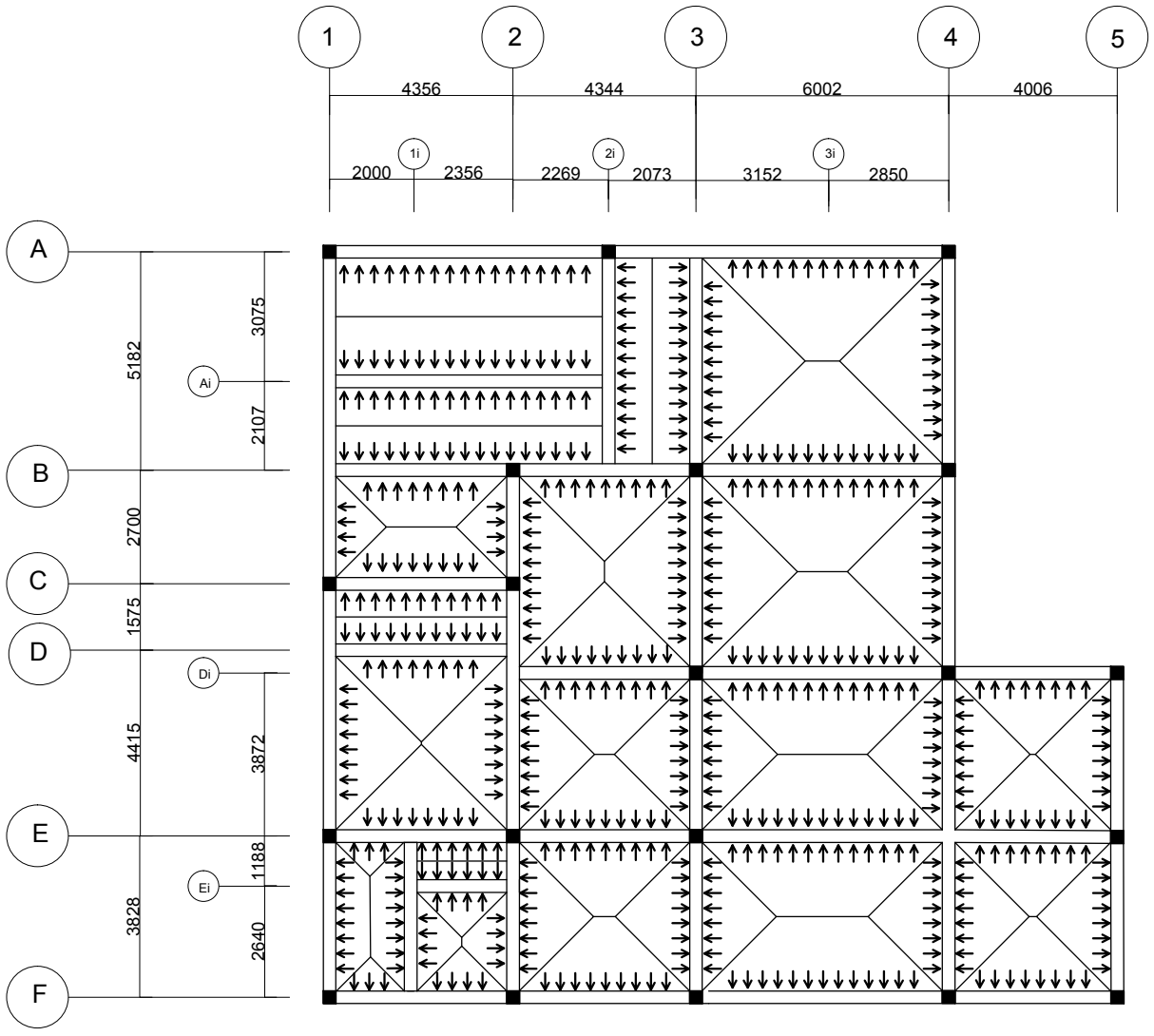
According to UBBL, all residential buildings (bungalow) live load factor should be 1.5kN/m²

Toilet : 2.0 kN/m²

Kitchen : 3.0 kN/m²

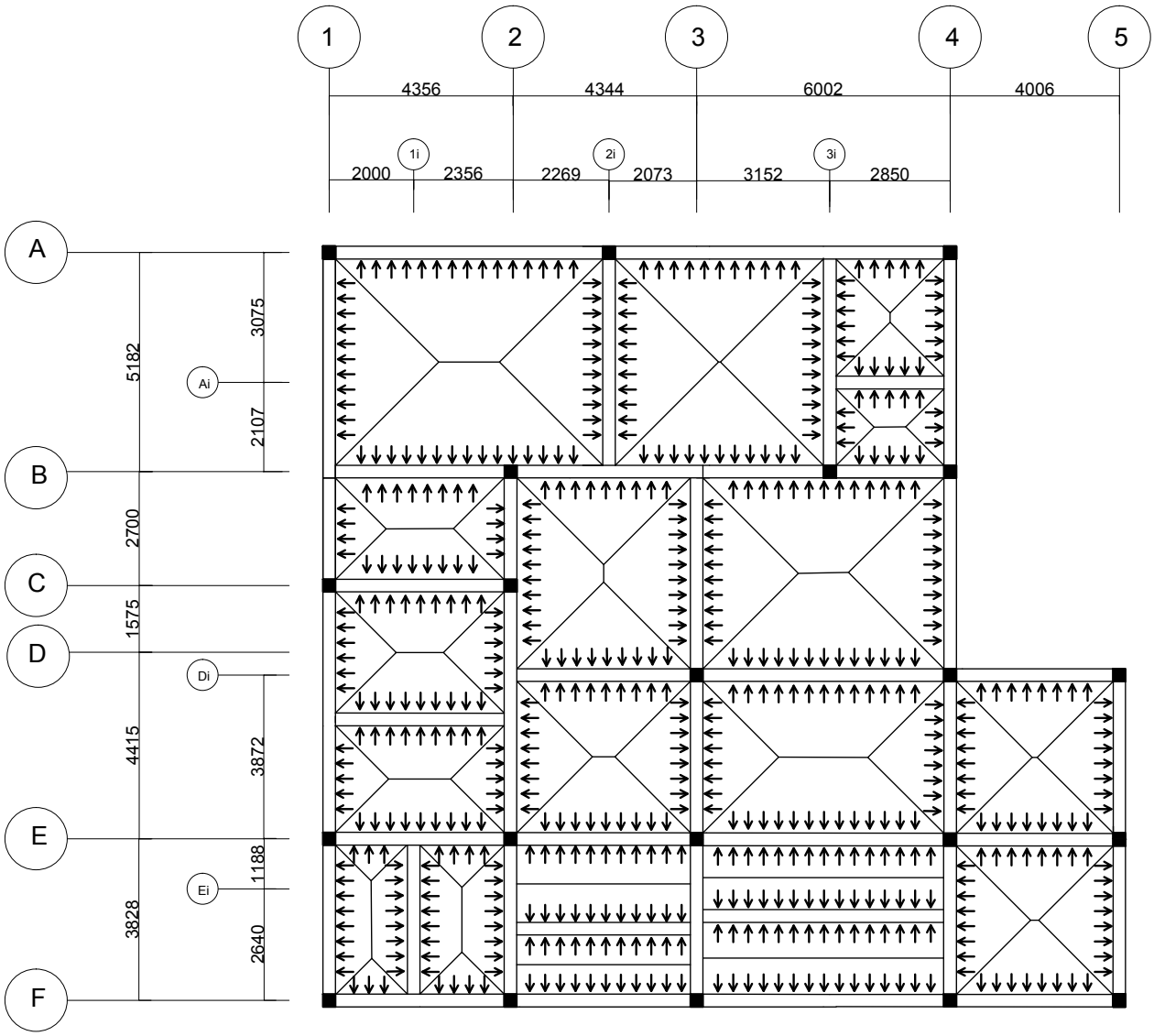
5.0 Load Distribution Diagram

5.1 Ground Floor Plan



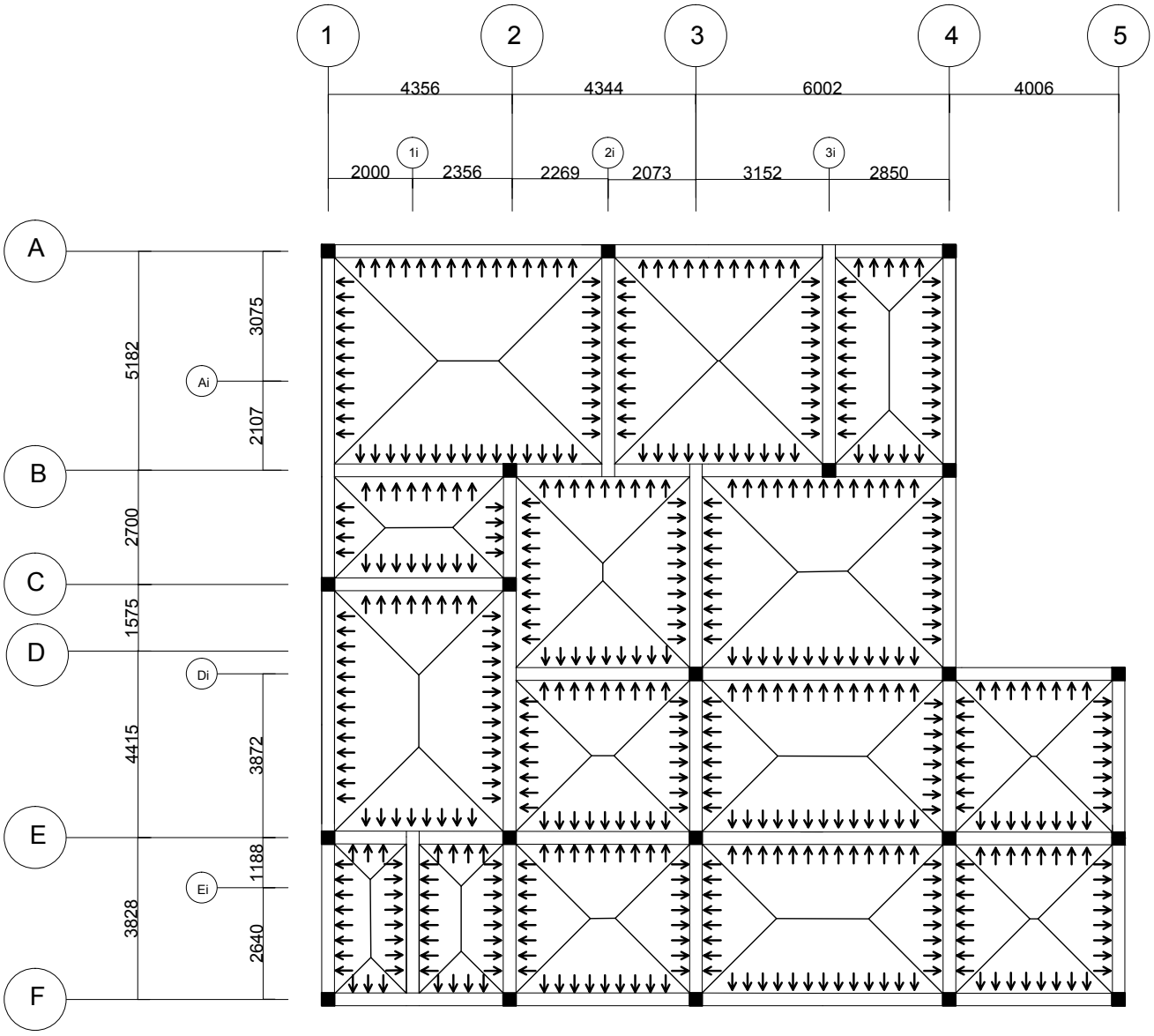

GROUND FLOOR PLAN

## 5.2 First Floor Plan



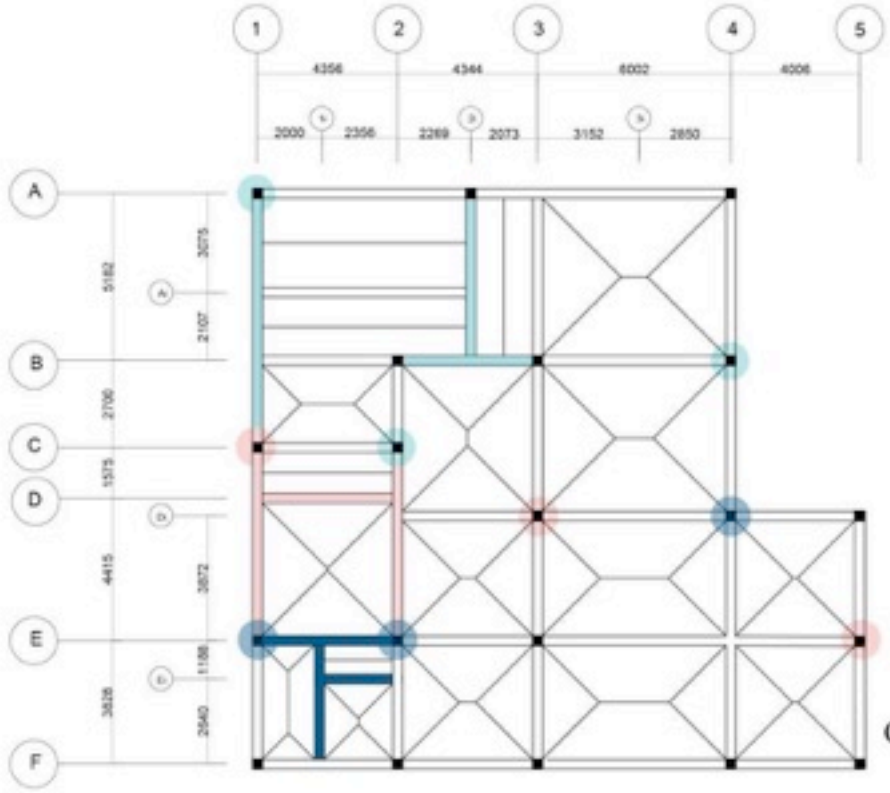

FIRST FLOOR PLAN (STRUCTURAL)

## 5.3 Roof Plan

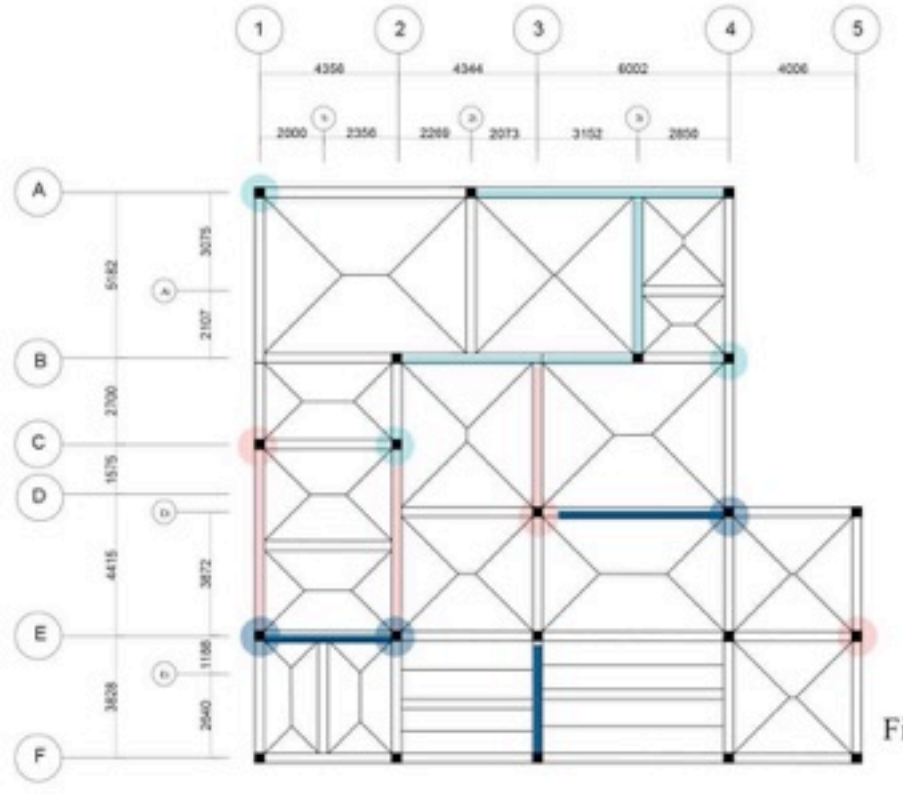



ROOF PLAN

6.0Individual Component and Analysis
Beam and Column selection




Ground Floor Plan




First Floor Plan

Lai Yik Xin

Ng Ke Ning

Saw Hwei Ying

# Column for Residential Units

In order to know whether the designed column is able to hold the load, we may use the formula below in accordance to BS 8110;

N = 0.4fcuAc + 0.8 fyAsc
N = capacity of concrete
Fcu = concrete strength (N/mm²)
Ac = cross section of concrete column
fy = yield strength of steel (n/mm²)
Ask = steel content in a column

Example: Given that flu = 30N/mm² and fy = 460N/mm². Assuming percentage of steel reinforcement in a rectangular concrete column is 2%, determine the capacity of the column.

Ac= 300 x 300 = 90000
Asc = 2% x 90000 = 1800
N = 0.4fcuAc + 0.8 fyAsc
= 0.4 (30) (90000) + 0.8 (460) (1800)
= 1080000 + 662400
= 1742400 N = 1742.4 kN

Thus, this column can sustain any ultimate load below 1742.4 kN.