THE UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF MECHANCIAL AND MANUFACTURING ENGINEERING

MECH4880 REFRIGERATION AND AIR CONDITIONING

ASSIGNMENT 1 (2016) – Part A and Part B Overview

1. Problem Statement

Your company has been commissioned by a client to design the HVAC system for a 2 storey retail complex with a basement carpark as portrayed in the attached specification using the given design conditions. Your manager has tasked you with calculating the heat loads and performing preliminary duct design and unit selection for the building.

This assignment is divided into two parts, part A accounts for the 30 % of the assignment, while part B is responsible for the remaining 70%. To submit part B, students must have already submitted part A. A professional report should be submitted, that is, the report satisfies all items listed in the important notes (listed later in this document). Note that the order of the sections can be restructured and the list is not limiting (other sections can be added or combined or structured differently) but they must all in some form be present in your submission.

The following documents should be used in conjunction with this overview:

- Assignment 1 – Building Layout and Tenancy Layout
- Assignment 1 – Project Specifications
- Assignment 1 – Assignment Helper

Part A – Due by Week 8

This section requires students to implement the heat load calculation methodology outlined in AIRAH-DA09. A detail manual calculations for shops 212 (bookshop/internet café) and 213 (restaurant) should be performed and reported for summer and winter. Manual calculations and reporting must include (**but not limited to**) following items:

(1) Design Day Selection and Specification Comprehension
(2) External Loads – Wall Specifications
(3) External Loads – Solar Transmission
(4) External Loads – Partitions
(5) External Loads – Winter
(6) Internal Loads – Summer
(7) Internal Loads – Winter
(8) Cooling and Heating Load Summary
(9) Psychrometrics (Summer only)

Part B – Due by Week 13

This part requires students to perform the cooling and heating load calculations for the entire building using CAMEL program. The submission should include (**but not limited to**) following elements:

(1) Produce conditioned/ventilated space maps and thermal zone plans
(2) Ventilated space calculations
(3) CAMEL heat load simulation
(4) Validation of heating and cooling loads performed in Part A
(5) Air schematics
(6) Duct Design
(7) Pressure loss calculations and fan selection (Ventilated spaces only)
(8) AHU selection
(9) Building improvements and suggestions

Ensure that you follow the assignment helper as it details the minimum that is expected from each submission.

2. Design Constraints

- Outside design conditions:
  - Latitude 30^0 South
  - Summer 33^0C DB / 22.9 ^{0}C WB
  - Winter 2.1 ^{0}C DB/80% RH

- Building north is defined as 30^o clockwise from true north
- Minimum supply air temperature 12^0C
- Cooling coil effectiveness, η_c 0.85
- Outside air requirements: 10 litres per second per person

3. Building Details

Location: Temperate Town. Climate zone 6.

Building Type: Class 6 Structure

Building Description: The project is a two storey shopping centre with a carpark beneath the ground floor. The building is approximately 33400 square metres containing 52 different stores. It features a courtyard centred around restaurants on the first floor and has a curved façade with shade sails on the perimeter of the food court.

4. References

- *ASHRAE Guide and Data Books* (Fundamentals), American Society of Heating, Refrigeration and Air Conditioning Engineers. (Available Online)
- AIRAH Design Manual DA09.
- Australian Standard 1668, Part 2-2015 + A1 (Search SAI GLOBAL in UNSW Library).
- Australian Standard 1668, Part 4-2012 (Search SAI GLOBAL in UNSW Library).
- NCC 2016, SECTION J- Energy Efficiency (Available Online)
- CAMEL User Guide
- Assignment 1 - Building specifications
- Assignment 1 - Assignment helper

5. Important Notes

- All calculations ***must*** be in SI units.
- All source of data etc., ***must*** be properly referenced.
- All assumptions ***must*** be listed.
- The professional report ***must*** contain at the front a tabulated summary of the results (Executive Summary).
- In both submissions, only if the calculations are repetitive, full working for a calculation can be forgone for an excel spreadsheet. The full spreadsheet can be pasted appropriately in report with informative captions. Otherwise detail calculations are always expected to be shown clearly step by step. Take care in ensuring that all steps of a procedure are provided and formulas used are listed throughout the calculation.
- The professional report ***must*** also contain Abstract, Introduction, Conclusion, drawings, a discussion of the results and comparison of the methods, and appropriate tables/figures.
- **Part A is due at 5pm Friday 16th September Week 8**
- **Part B is due at 5pm Friday 28th October Week 13**
- Both Parts ***must*** be submitted via the submission tool in MOODLE

6. Assignment Guidance

- Part A (DA09) – Saeed Tehrani
- Part B (CAMEL) – Mitchell Kazmierczak
- CAMEL Guidance – ACADS BSG (Workshop conducted in Week 6)

Issued: 16th August 2016

Dr C.Menictas

Assignment 1 – Building Layout and Tenancy Layout

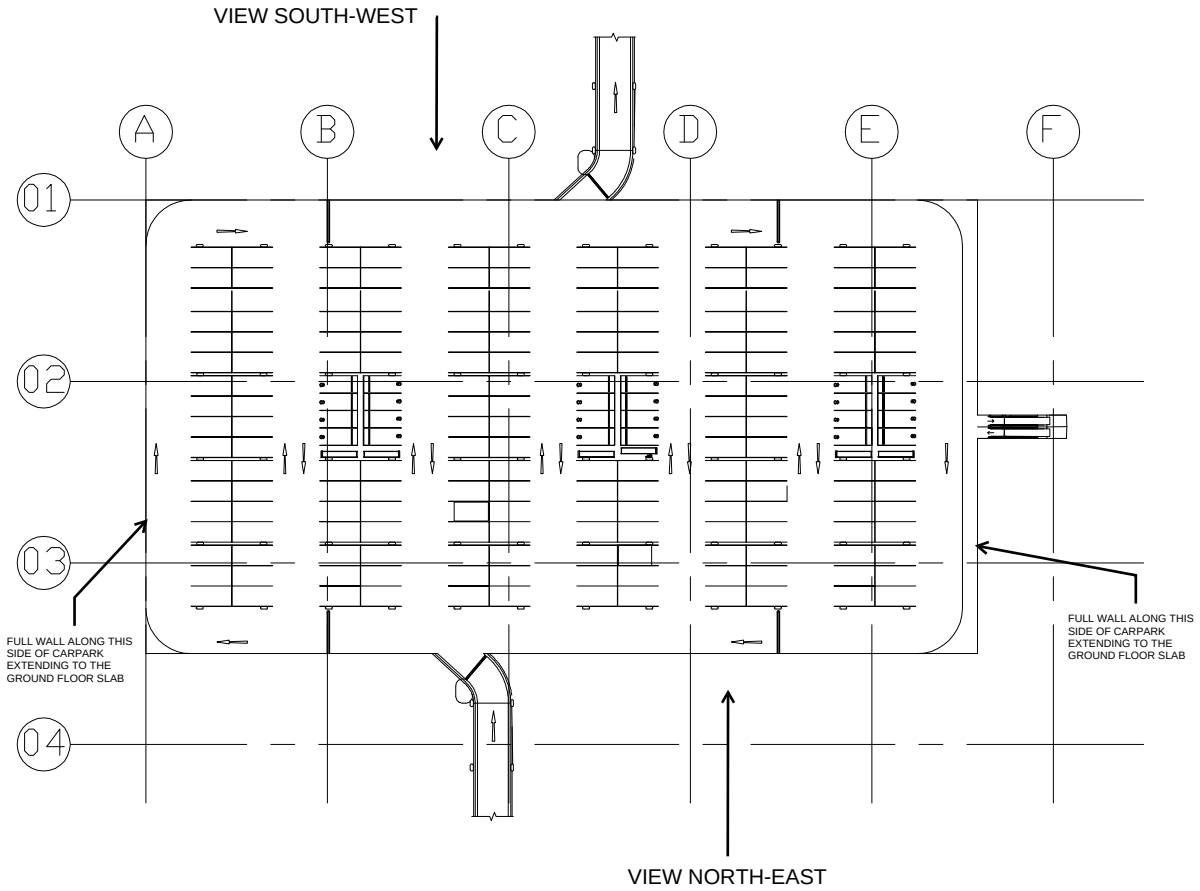
GROUND FLOOR PLAN

SCALE: 1:1000 @ A4

0m 10m 20m 30m 40m

DATE: 16-08-2016


A
B
C
D
E
F
G
H
I
J
01
02
03
04
05
06
07
AMENITIES CORRIDOR
AMENITIES
AMENITIES
201
250 sq m
202
250 sq m
203
250 sq m
204
250 sq m
MM21
748 sq m
VOID
M01
2,700 sq m
Barricade between mall and void above foodcourt
1,375 sq m
205
250 sq m
206
250 sq m
207
250 sq m
208
250 sq m
209
212 sq m
MM22
605 sq m
MM24
638 sq m
MM23
729 sq m
211
698 sq m
210
876 sq m
212
390 sq m
ALL SHOPS WITHIN THE COURTYARD ARE ASSUMED TO HAVE A DOOR TO THE COURTYARD
213
436 sq m
COURTYARD, PARTIALLY COVERED
214
375 sq m
215
600 sq m
LEGEND:
Speciality
Mini Major
Major
Mall
Food Court Outlet
Food Court
Restaurant
Cafe
Other (see specifications and annotations)
FIRST FLOOR PLAN
SCALE:
1:1000 @ A4
0m
10m
20m
30m
40m
DATE:
16–08–2016

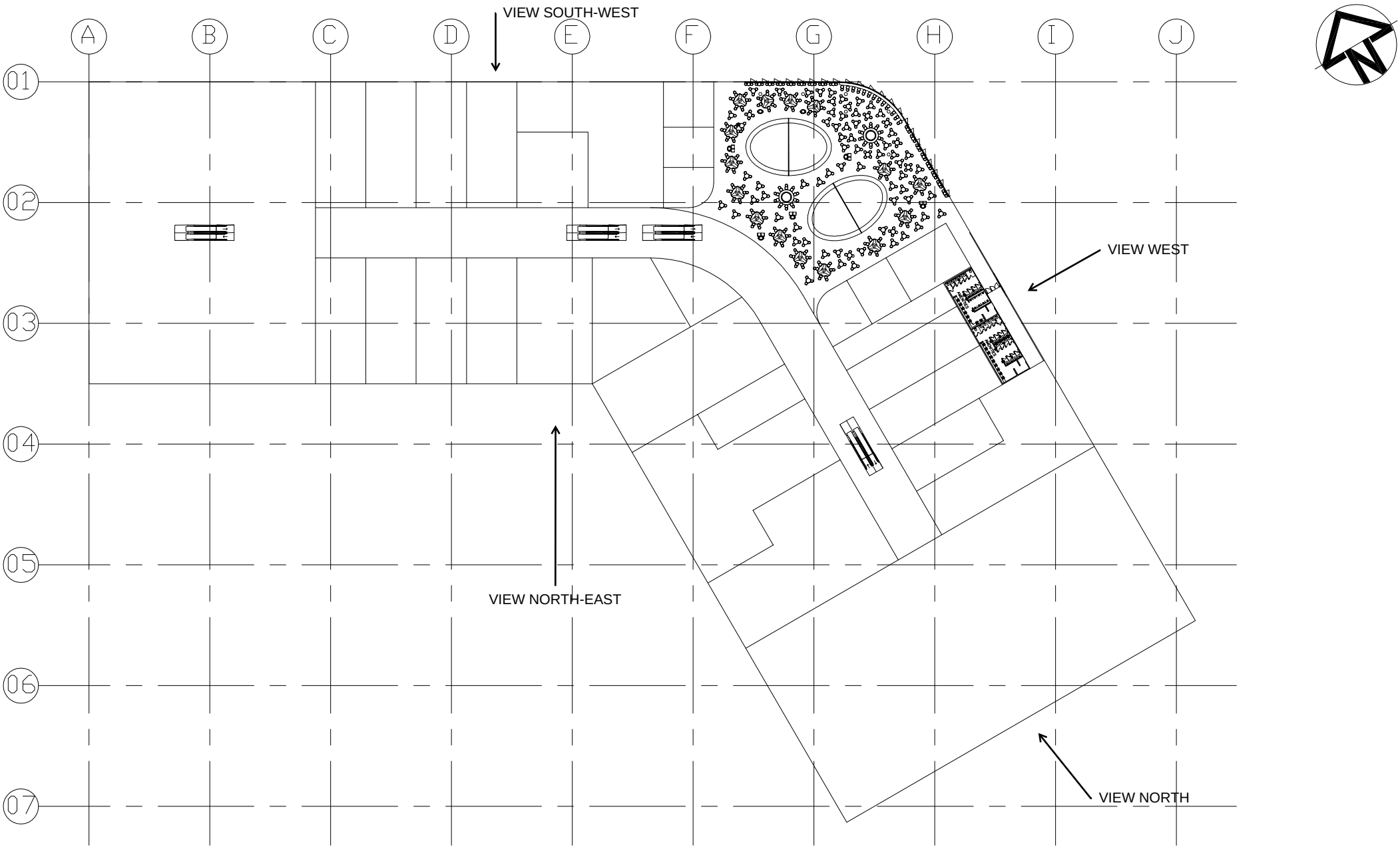


CARPARK PLAN

SCALE: 1:1000 @ A4

0m 10m 20m 30m 40m

DATE: 16-08-2016

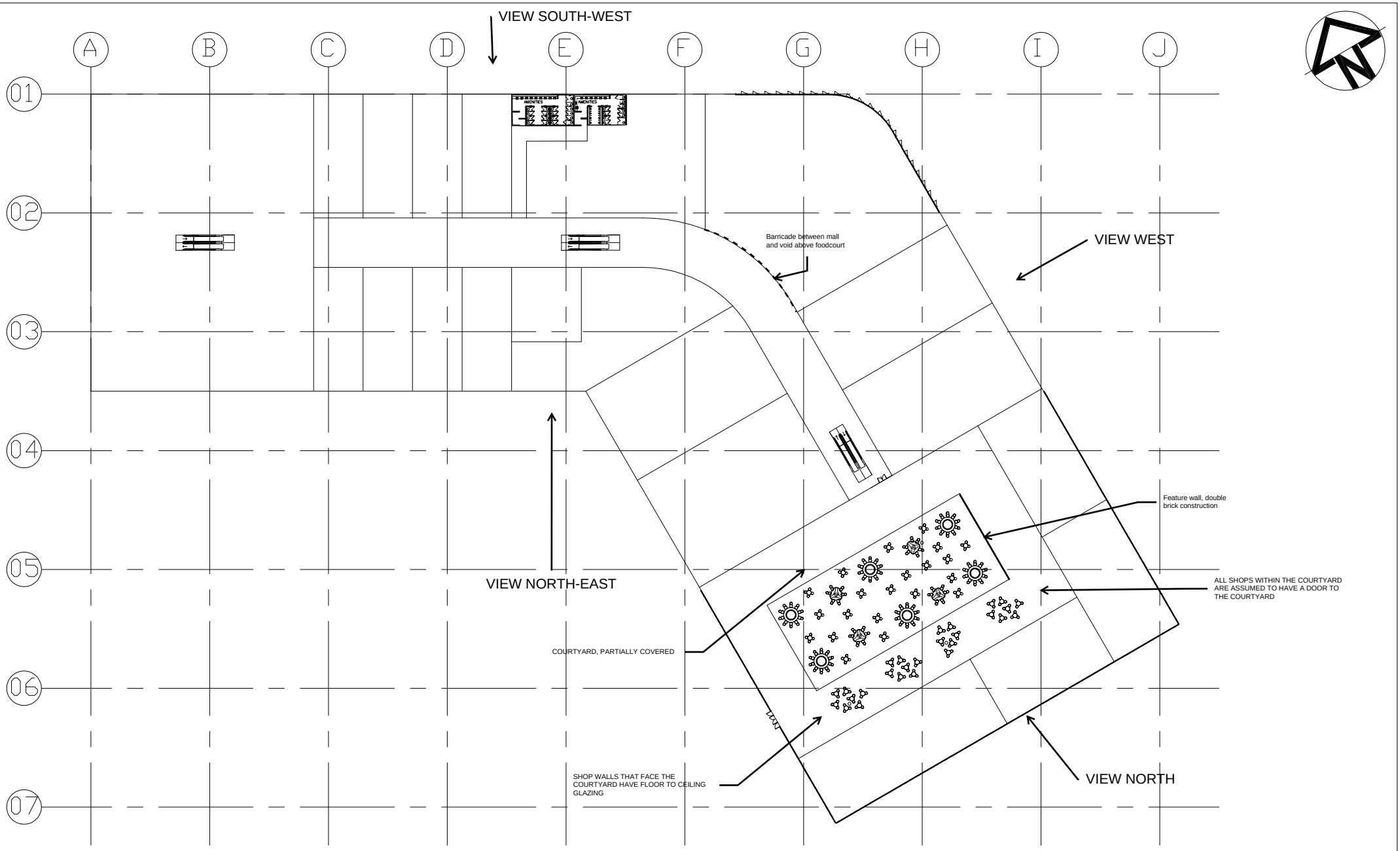


GROUND FLOOR PLAN

SCALE: 1:1000 @ A4

0m 10m 20m 30m 40m

DATE: 16-08-2016

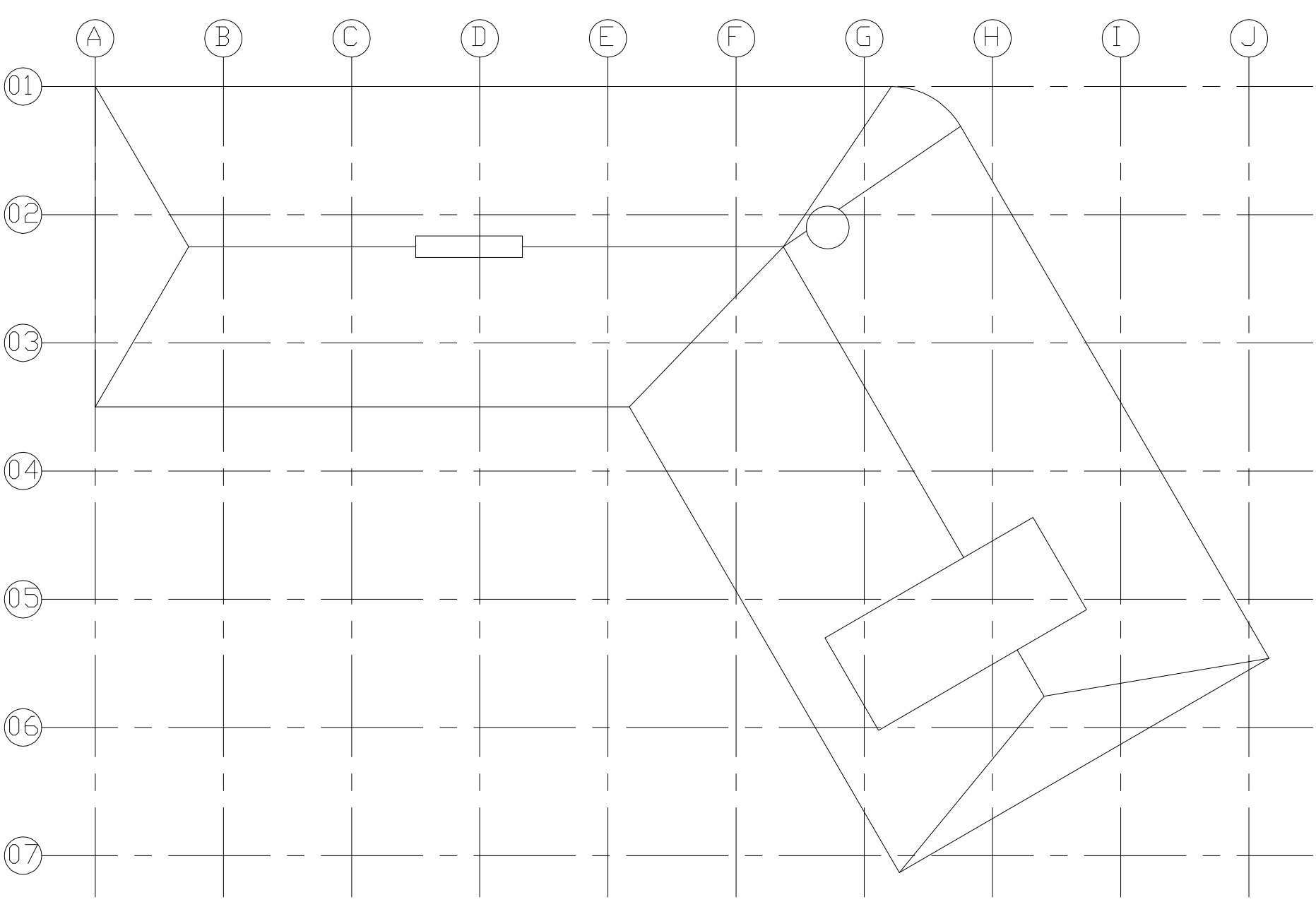


FIRST FLOOR PLAN

SCALE: 1:1000 @ A4

0m 10m 20m 30m 40m

DATE: 16-08-2016

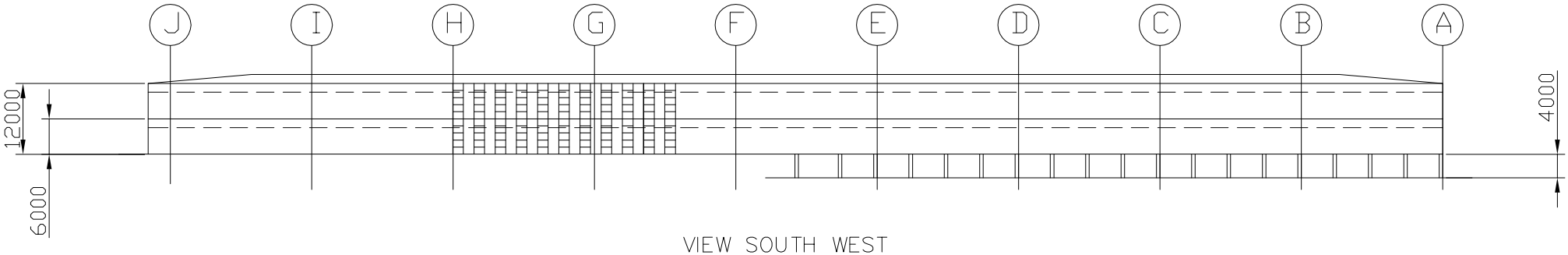


ROOF PLAN

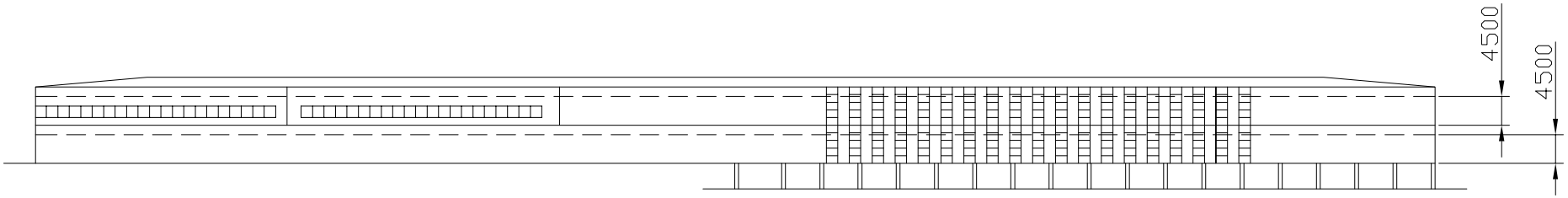
SCALE:
1:1000 @ A4

0m 10m 20m 30m 40m

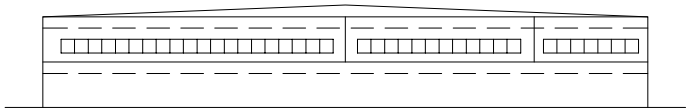
DATE:
16-08-2016



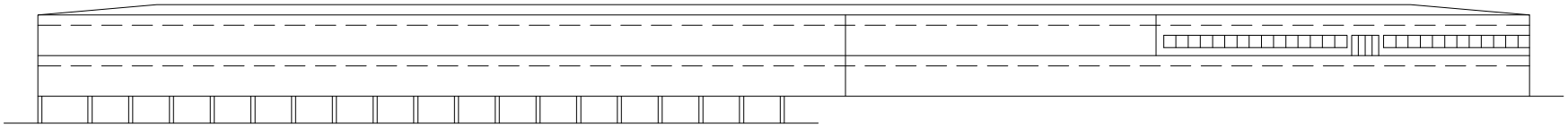
VIEW SOUTH WEST



VIEW WEST



VIEW NORTH



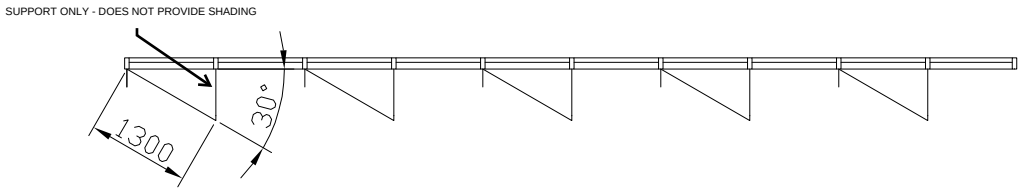
VIEW NORTH EAST

ELEVATIONAL VIEWS

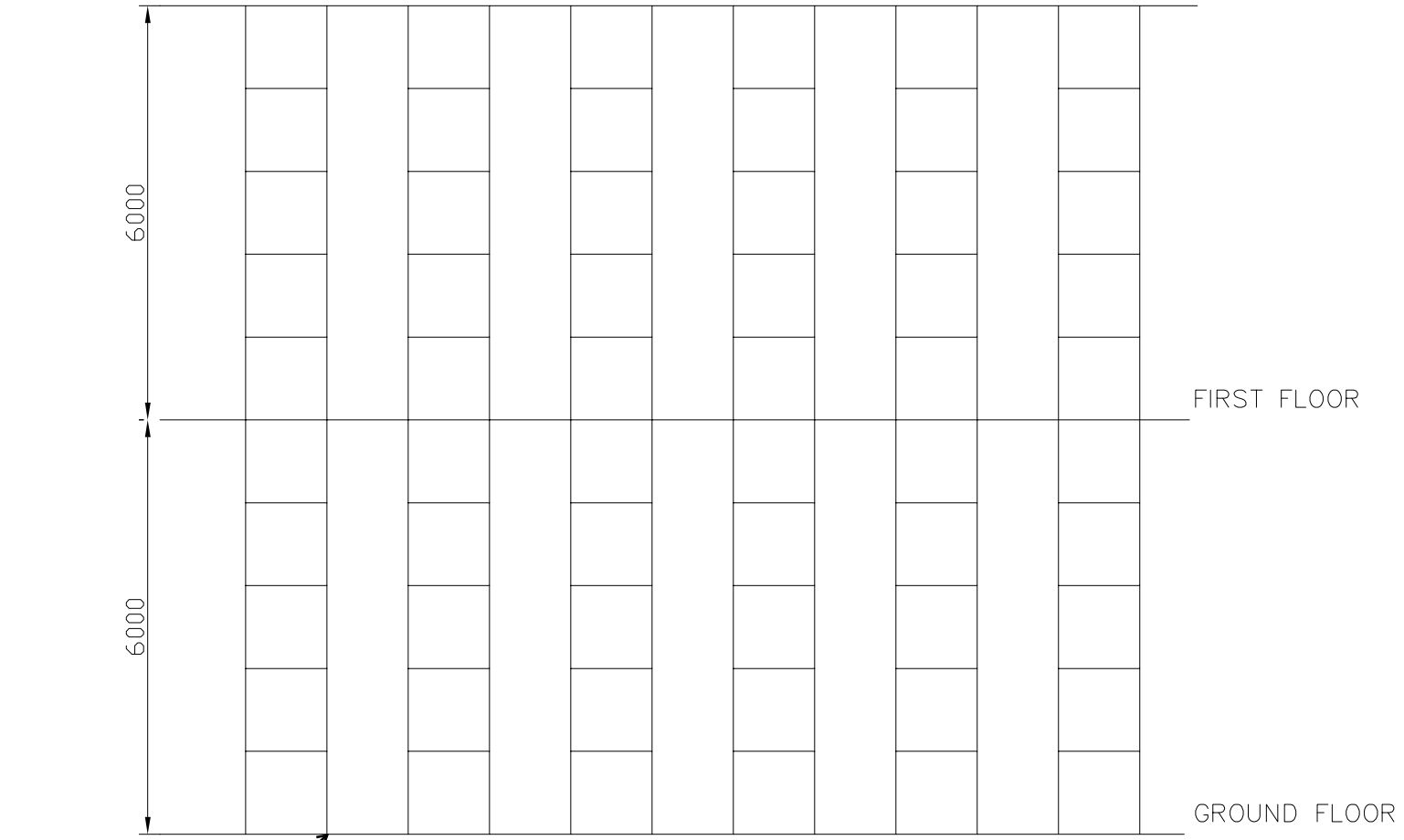
SCALE: 1:1000 @ A4

0m 10m 20m 30m 40m

DATE: 16-08-2016



TYPICAL SECTION THRU FOOD COURT FACADE



PART ELEVATIONAL VIEW OF FOOD COURT FACADE

FOOD COURT FACADE

SCALE: 1:100 @ A4

0m 1m 2m 3m 4m

DATE: 16-08-2016

THE UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF MECHANCIAL AND MANUFACTURING ENGINEERING

MECH4880 REFRIGERATION AND AIR CONDITIONING

ASSIGNMENT 1 (2016) – Project Specifications

The following specifications are to be followed unless contradicted by the building layouts or by any information given in part A of the assignment.

Air Conditioning Design Conditions

General Details:	
Latitude	30^0 South
Location	Temperate Town, Climate Zone 6
Orientation	Building north is defined as 30^o clockwise from true north
Minimum supply air temperature	12^0C
Cooling coil effectiveness	$\eta_c = 0.85$
Infiltration	For any external entrance to the mall allow 500l/s. For any external entrance to a shop allow 200l/s.

External Conditions:	
Summer	33^0C DB / 22.9 ^{0}C WB
Winter	2.1 ^{0}C DB/80% RH
External Glazing and Skylights	$Food\ court\ façade: U = 5.48\ SHGC = 0.435$ $Skylights: U = 5.26\ SHGC = 0.574$ $All\ other\ glazing: U = 5.62\ SHGC = 0.611$
External Walls, Floors and Roofing	External walls: R=2.6 Floors: R=1.5 Roofing: R=3.2 Absorbance = 0.5 (light colour) Values are as above unless the surface does not compliance with NCC2016 Section J then raise to minimum value as specified by Section J
Storage Mass	Can be assumed as $420\ kg/m^2$

Internal Conditions:	
Outside Air Requirement	$10\ l/s.person$
Internal Walls	Internal Walls and Partitions: R=1 Internal Floors and Ceilings: See External Values are as above unless the surface does not compliance with NCC2016 Section J then raise to minimum value as specified by Section J
Internal Glazing	6mm plate glass as defined in DA 09

Design Safety Factor	
Safety factor on all plant and air handling systems	No safety factor is to be applied on this project for the sizing and selection of any plant
Diversity in plant	No diversity is to be applied on this project for the sizing and selection of any plant

Unless otherwise stated use the appropriate tabulated data below with the tenancy layouts for the conditions and loading for each shop.

Speciality Shops	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$35\ W/m^2$
Occupancy	$3.5\ m^2/person$
Percentage of gross floor area assumed to be occupied	70%
Sensible/Latent Load Per person	70W / 60W

Food Court (Outlets)	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$80\ W/m^2$
Occupancy	Greater of 6 people or 1 person per $15m^2$
Sensible/Latent Load Per person	70W / 60W

Food Court (Seating)	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$10\ W/m^2$
Occupancy	$3.5\ m^2/person$
Percentage of gross floor area assumed to be occupied	80% or as per seating shown
Sensible/Latent Load Per person	80W / 80W

Restaurants	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$60\ W/m^2$
Occupancy	$1.5\ m^2/person$
Percentage of gross floor area assumed to be occupied	60%
Sensible/Latent Load Per person	80W / 80W

Cafes	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$80\ W/m^2$
Occupancy	$1.5\ m^2/person$
Percentage of gross floor area assumed to be occupied	70%
Sensible/Latent Load Per person	70W / 60W

Mini Majors	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$30\ W/m^2$
Occupancy	$3.5\ m^2/person$
Percentage of gross floor area assumed to be occupied	70%
Sensible/Latent Load Per person	70W / 60W

Majors	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$25\ W/m^2$
Occupancy	$4\ m^2/person$
Percentage of gross floor area assumed to be occupied	80%
Sensible/Latent Load Per person	70W / 60W
Special Note	Must have a dedicated AHU

Mall (include kiosks)	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$10\ W/m^2$
Occupancy	$5\ m^2/person$
Percentage of gross floor area assumed to be occupied	100%
Sensible/Latent Load Per person	70W / 60W

System Sizing

Energy efficient measures for this project will be undertaken to reach HVAC system energy reduction targets. The system designer shall not undersize or oversize system components such that it would lead to greater energy consumption. The following table is a guide to system sizing for the project and must not be exceeded without approval.

Duct Sizing	
Main Duct (AHU/FCU)	$1\ Pa/m\ or\ 7.5\ m/s\ whichever\ is\ lesser$
Branch Ducts (AHU/FCU)	$1\ Pa/m\ or\ 7.5\ m/s\ whichever\ is\ lesser$
Flexible Ducts	Not required
Grilles	$Maximum\ of\ 300\ \ l/s\ \ per\ grille$
Exhaust Ducts	$1\ Pa/m\ or\ 7.5\ m/s\ whichever\ is\ lesser$

Ventilation

All ventilation requirements are to be in compliance with AS 1668.2 + A1-2015 and AS 1668.4 2012.

Variations

The following entries are for shops with their own category; different conditions to the general conditions listed above or have been repurposed for another use. For the listed shops below, use the information provided in this section which overrides any previous information.

Shop 122

Removed as a tenancy and instead takes the role of a garbage room for the food court.

Shop M02 (Supermarket)

M02	
Summer Set Point	$22^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$20^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$25\ W/m^2$
Occupancy	$2.4\ m^2/person$
Percentage of gross floor area assumed to be occupied	75%
Sensible/Latent Load Per person	70W / 60W

Shop 208 (Jeweller)

Speciality Shops	
Summer Set Point	$24^oC\ dry\ bulb/55\%\ RH$
Winter Set Point	$21^oC\ dry\ bulb/80\%\ RH$
Lighting and Power (applicable to gross floor area)	$55\ W/m^2$
Occupancy	$3\ m^2/person$
Percentage of gross floor area assumed to be occupied	85%
Sensible/Latent Load Per person	70W / 60W

Shop 212 (bookshop/internet café) and 213 (restaurant) construction:

Calculate the U values as per follows. If the calculated values do not comply with NCC 2016- section J, add insulation in increments of R=0.5 until the U value requirement is met.

Floor: 150 mm concrete slab covered with carpet above and false ceiling space (0.4 m high) below.

Ceiling/Roof: 100 mm wood rafters, plaster below, fibreglass insulation between the rafters, topped by 25 mm wooden roof deck and covered by metal decking (clip-lock style).

East Wall (213): The wall is brick cavity, plastered outside and thin marble inside. (Windows placement as per elevation plans. Windows property as per the project specifications)

East Wall (212): The wall is brick cavity, plastered outside and thin marble inside. (Windows placement as per elevation plans. Windows property as per the project specifications)

West Wall (213): floor to ceiling glazing, door constructed the same glazing for shop front. Remainder of wall is brick veneer.

West Wall (212): floor to ceiling glazing, door constructed the same glazing.

South Wall (213): The wall is made of Crushed Rock Aggregate with 100 mm thickness, plastered both sides

North Wall (213): The wall is double brick, plastered both sides;

North Wall (212): The wall is brick cavity, plastered inside.

Internal Loads

Lighting: 30 W/m^2 (Applicable to both Shop 212 and Shop 213)

Shop 212 (Bookshop/Internet Cafe):

Occupancy: Maximum of 80 people (35 of which seated)

Equipment: 20*desktop computers (2.3 GHz processor, 3GB RAM)

15*Laptop computers (2.3 GHz processor, 3GB RAM)

1*colour A3 laser printers (speed: 24 pages per minute)

1*large plotter

1*small steam kettle (35 L)

2*Toaster (small pop-up) - 4 slice

1* Microwave oven (residential type) - 30L

2*Freezer (small) - 0.5 m3

2*Coffee maker, 10 cups

Shop 213 (Restaurant):

Occupancy: Between 60 and 90 during peak times

Equipment:

6*Barbeque (pit), 50 kg kilogram of food capacity

2*Blender- 2L

1*Coffee heater, 2 burners

1*Dishwasher (hood type, chemical sanitizing) - 1000 dishes/hour

2*Display case (refrigerated), 1.5 m3

8*Food warmer (shelf type), 1 m3

4*Griddle/grill (large), 0.5 m2

2*Ice maker (large) - 100kg/day

1*Microwave oven (heavy duty, commercial) - 20 L

1*Mixer (large) - 77 L

1*Steam kettle (large) - 200 L

2*Waffle iron- 0.05 m2

1*Broiler (conveyor infrared) - 2 m2

2*Fryer (pressurized) - 6 kg

4*Oven (pizza) - 1 m2

4*Freezer (large) - 2 m3

2*Water cooler, 30 L/h

1*Hot water urn (large) - 50 L

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MECH4880 REFRIGERATION AND AIR CONDITIONING

ASSIGNMENT 1 (2016) – Assignment Helper

Aim

The purpose of this document is to provide a more detailed and partially stepped out explanation for each section and is the minimum expectation for both Part A and Part B reports. This document outlines two main procedures to follow, these are **discuss** and **perform**. Discuss questions are designed such that you are given some direction for what to do next while developing your understanding of the concept. Discuss questions should typically be answered in a maximum of one paragraph, while the depth of your understand and research should be demonstrated in your response, keeping your answer succinct is also a critical part of explaining and reporting engineering findings. Perform questions which usually follow from discuss questions are designed to use the understanding you develop from the discuss question and complete that section of the report.

Preceding the breakdown of both parts to the assignment is a list of assumptions that have already been made for your assignment, take care in reading and understanding them as they can greatly simplify the amount of work you need to complete.

Part A

Section 1 – Design Day Selection and Specification Comprehension

Discuss: What are design days and what is their significance to heat load calculation?
Perform: Select the summer and winter design days for the project.
Discuss: What are the design conditions (Internal and external) for the project?
Discuss: The ceiling height and true floor height are not the same, why?
Discuss: Define the following terms: glazing, partition, infiltration, AHU.
Perform: Specify the daily and yearly temperature ranges you are going to use for the analysis and briefly describe why you are using those values.

Section 2 – External Loads – Wall Specifications

Discuss: What is the difference between a U-value and an R-value?
Discuss: How are U-values calculated for walls made from a series of layers of differing materials?
Discuss: DA 09 states that summer and winter U-values are different for the same material composition, why is this the case?
Perform: Calculate and report the U-values for all surfaces in shops 212 and 213.
Perform: Using NCC 2016 Volume One, determine the minimum R-values for a typical wall, roof and floor (Hint: Sections J1.3, J1.5 and J1.6).
Perform: For any surface which does not meet the minimum requirements add increments of R=0.5 insulation until the surface meets the minimum specification. Provide a list of the updated U-values for all surfaces.
Discuss: Referring to heat loads, what are storage masses and how do they effect heat load calculations?
Perform: Calculated and report the storage masses.

Section 3 – External Loads – Solar Transmission

Perform: Determine which surfaces will experience solar transmission loads.
Discuss: Surfaces external to the structure use a modified temperature difference when calculating their contribution to the heat loads, why is this used and what is its effect on the heat loads (increase/decrease)?
Discuss: How is the heat load for external glazing calculated? Provide the full formula and explain each component.
Perform: Calculate and report the heat load for all external surfaces.

Section 4 – External Loads – Partitions

Discuss: What is the difference between partitions and external surfaces and how does the heat load calculation differ between them?
Perform: Calculate and report the heat load for all partitions.

Section 5 – External Loads – Winter

Discuss: Discuss three key differences between calculating external loads for cooling (summer) and heating (winter).
Perform: Calculate and report the external loads under winter conditions.

Section 6 – Internal Loads – Summer

Discuss: Not including infiltration what are the three main forms of internal loads and how would the heat load be calculated from the provided information?
Perform: Calculate and report all internal loads and infiltration loads.

Section 7 – Internal Loads – Winter

Discuss: Discuss three key differences between calculating internal loads for cooling (summer) and heating (winter).
Perform: Calculate and report all internal and infiltration loads under winter conditions.

Section 8 – Cooling and Heating Load Summary

Perform: Report a summarized version of your findings for both shops and determine the total heating and cooling load required for the space.

Section 9 – Psychrometric Charts (Summer only)

Discuss: Discuss the features of psychrometric charts and the information they can provide.
Perform: Produce psychrometric charts for the peak summer loading cases for both shops reporting any intermediate values and clearly indicating all points on the chart and their values.
Perform: Calculate the reheat capacity (if required) and the total cooling coil load

Part B

Section 1 - Produce conditioned/ventilated space maps and thermal zone plans

Discuss: Define and compare conditioned and ventilated spaces, also give two examples of spaces/room types for each.
Perform: Using two different colours, preferably blue for conditioned and red for ventilated, produce an overlay of the building floor plans showing all conditioned spaces and all ventilated spaces. Are there any spaces on the building plan which are neither conditioned nor ventilated?
Discuss: What is thermal zoning and what information does it provide when setting up heat load calculations?
Perform: Produce and overlay of the building floor plans showing your thermal zoning plan for all conditioned spaces.

Section 2 - Ventilated space calculations

Perform: Using AS 1668.4 – 2012 determine if the carpark can be classed as naturally ventilated or if it must be mechanical ventilated. If the carpark must be mechanically ventilated calculate and report the exhaust rate using the methods outlined in AS 1668.2 - 2015.
Discuss: Consulting table 3.2 in AS 1668.2 – 2015, what is the smallest number of exhaust systems that can be installed to serve all ventilated spaces.
Perform: Using the appropriate appendices from AS 1668.2 – 2015 calculate and report the exhaust rate (L/s) for each ventilated space within the building.

Section 3 - CAMEL heat load simulation

Discuss: This project uses the comfort temperature conditions defined by CAMEL. What are the critical conditions, how are they measured and under what circumstances would you use them?
Discuss: Briefly discuss the following features of the building: where are the partitions (those that will add to the heat load), which rooms will have roof loads, how many skylights are there and which spaces to they interact with.
Perform: Simulate and report the heating and cooling loads of the building. In the body of your report provide screenshots of your CAMEL simulation which as a minimum should show the features in the above discussion question and the food court façade glazing. The results of the simulation should be placed in an appendix but a summary of your findings should be in the body of the report.

Section 4 - Validation of heating and cooling load calculations in Part A

Perform: Report both part A and part B calculations and provide a measure of their similarity.
Discuss: Comparing your calculations in part A and part B are you results the same for shops 212 and 213? If they are not, why? (Hint: there are different result types produced by CAMEL).
Discuss: The specification states that safety factors and diversity will not be used. Define each term and discuss the impacts on duct, AHU and system cost for the introduction of each.

Section 5 - Air schematics

Discuss: What is the purpose of an air schematic? What information can it provide?
Produce: Construct separate or combined air schematics for the supply (SA, RA, OA, etc.) and ventilation (exhaust). The schematic should show as a minimum the airflow into each space, all AHU's and their flow rates as well as all fans and their flow rates.

Section 6 - Duct Design

Discuss: Why are different maximum airspeeds used for main ducts and branch ducts?
Discuss: What are the pros/cons of reducing duct size for the same airflow? What are the pros/cons of increasing duct size for the same airflow?
Discuss: What is a riser, what is the purpose of a riser?
Perform Select and indicate risers as required, justifying your chosen location and size.
Perform: Construct a double line duct layout (supply, return and exhaust) as an overlay on the floor plans of the building indicating the duct size and flow rate at each change in flow rate.

Section 7 - Pressure loss calculations and fan selection (Ventilated spaces only)

Discuss: In terms of duct pressure loss calculations what is an index run (equal friction method)?
Perform: Indicate the index run on all supply and exhaust duct systems.
Discuss: Pressure losses are due to two main causes, straight duct and duct fittings, provide the formula for both and explain each term.
Perform: For ventilated spaces only, calculate and report the pressure loss (equal friction method) along the index run. Only the losses for the rigid duct should be counted i.e. ignore any pressure losses associated with intakes, grilles, flexible connections, etc. To compensate for this assumption add 100Pa pressure drop onto your final value.
Discuss: Discuss three important factors when selecting a fan.
Perform: Select and report fans for each pressure loss calculation and justify their selection based of the previous discussion question. (Hint: you only need to provide at least pressure drop and flow rate)

Section 8 - AHU selection

Produce: Select appropriate AHU's for each of your nominated thermal zones. Each unit selected should, as a minimum, meet the capacity and airflow required. All units can be assumed to be air cooled or connected to a chiller system (Note: you do not need to design or select any component of the water cooling system).

Section 9 - Building improvements and suggestions

Discuss: What are building features have the most significant heat load and what improvements could you make to mitigate their impact? (1 paragraph per feature, minimum 3 features)
Discuss: Would reducing the air off temperature (reducing the coil temperature) reduce the cooling capacity required? Why/why not?
Perform: State 3-5 improvements other than those listed in the previous discuss question to reduce the required cooling capacity of the building. Justify your suggestions by recalculating the CAMEL simulation and report the change in cooling required.

Assumptions:

- All requirements relating to fire zoning or other fire considerations are out of scope
- All kitchen exhausts are considered out of scope
- Due to the unique design of the courtyard on the first floor, the western walls of shops 212 and 213 can be considered as completely in shade
- The shape of the roof is cosmetic only and the full height (slab to slab) of the first floor can be considered to be 6000mm.
- FCU's and AHU's can be assumed to have the same function and features and so only AHU's need to be used
- All duct is assumed to be rectangular/square and in increments of no less than 50mm (e.g. 325x350mm is not allowed but 450x600mm is) and flexible duct is not required
- All grilles can provide a maximum of 300l/s