**University College Dublin**

**School of Mechanical & Materials Engineering**

MEEN10050 Energy Engineering 2013-14

Group Assignment

**Heating Energy Requirements for a Room over 7 Consecutive Days**

**by**

**Group 00**

**Student Name / Number #1**

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# Abstract

In no more than 200 words, describe the work so that someone could decide whether or not it would be worthwhile to read the report. It spells out the reason for the work, what was done and what the main results were. It is essentially an overview of the whole report.

Should include:

* Background – why the study was carried out.
* Method – how the study was done.
* Results – what were the main findings.

The abstract may contain bullet points but will generally be plain text divided into one or two paragraphs.

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# 

# Introduction

The introduction should present the objectives of the report and give a short (introductory) description of the sections that are included.

# Methodology

The methodology should tell the reader what specific objectives you set yourself and how you went about meeting them.

Should include:

* Objectives – having explained the background, you now list the specific objectives for the study on which you are reporting. For example, the Background might have explained why new solar panel technology is necessary (in general), whereas this section will document what experiments were carried out (specifically) to test the new technology.
* Procedure – having said what you want to achieve in the Objectives (eg, find the thermal conductivity of a material) you explain how the experiment was set up to do this.

Using a work flow diagram is often quite helpful like the one depicted in figure 2.1.

**Building and Room selection**

**Ambient Air Temperature calculation**

U-values and heat transfer area

Room volume and floor area

Building heat losses

Ventilation heat losses

Internal heat gains

Radiators size and number

Interior and exterior surface temperatures

***Figure 2.1:*** *Work flow diagram of the methodology followed*

## Room and building description

Do not forget to mention when the building was constructed. Also present photographs of the building and the room (depicting the external surface) and a floor plan of the room.

## External surface description

## External wall

A cross section of the wall is essential reporting all the material layers. You should cite all the sources you have used to determine the thermal conductivities of the wall materials. Tables like table 2.1 can be useful to illustrate the data used for the calculation of U-values.

***Table 2.1:*** *(Sample) Calculation of the U-value for the external wall*

|  |  |  |  |
| --- | --- | --- | --- |
| **Material** | **Thickness d (m)** | **Thermal Conductivity k (W/m\*K)** | **Thermal Resistance R (K/W) R=d/A\*k(1)** |
| Common Plaster | 0.025 | 0.87 | 0.029 |
| Brick | 0.09 | 0.52 | 0.173 |
| XPS | 0.15 | 0.032 | 4.688 |
| Brick | 0.06 | 0.52 | 0.115 |
| Common Plaster | 0.025 | 0.87 | 0.029 |
|  | **0.35** |  | **5.033** |
| Rsi | | | 0.13 |
| Rse | | | 0.04 |
| **Total Thermal Resistance RT (m2K/W)** | RT=Rsi+R1+R2+…+Rn+Rse | | **5.203** |
| **Thermal Transmittance U(W/m2K)** | **U=1/A\*RT** | | **0.192** |

*(1): for a heat transfer area of 1 m2*

## External window

A cross section of the window is essential reporting all the material layers. You should cite all the sources you have used to determine the thermal conductivities of the window materials. A table such as that shown in Table 2.1 is useful here also.

## Ambient air temperature

Report the formula used to perform your calculation explaining every variable.

## Heat losses and heat gains

Report the formula used to perform your calculation explaining every variable.

## Ventilation heat losses

Report the formula used to perform your calculation explaining every variable.

## Internal heat gains

Report the formula used to perform your calculation explaining every variable.

## Heat losses from the window

Report the formula used to perform your calculation explaining every variable.

## Heat losses from the wall

Report the formula used to perform your calculation explaining every variable.

# Results and analysis

This section is being used to tell the reader what you found.

Should include:

* Results – graphs and statements of key findings.
* Analysis – interpretation for the reader of what these findings mean.
* Discussion – explanation of errors or uncertainties that might limit these findings.

It is important to realise, when you are writing a report, that you are performing a service for the reader, you are helping them to understand. It is not good enough to just fill the report with graphs, you should prioritise these graphs, explain what each means and what conclusions they can lead to.

For example, on election night data streams into a TV studio but to most viewers it doesn’t mean anything until the experts explain the significance of each count and their overall implications. In that section visualisation of the results is very important. However, be careful to include results that are useful to the reader and do not cause confusion.

## 3.1 Heat losses

A pie chart like that of figure 3.1 provides useful information to the user. Every time you are inserting a table or a figure in your text you should introduce the reader to its contents. Of course you are expected to comment on each figure. You should discuss the findings that are presented in every graph. For example in this particular project you should – based on the results – comment on how well thermally protected is the room you have selected.

Presenting output is mainly done by charts and graphs (and not by tables). Especially for time depended variables – like most of the questions require in your project – graphs is the straightforward solution.

***Figure 3.1:*** *Heat losses (left) and heat gains (right) breakdown*

## 3.2 Interior and exterior temperatures of external building elements

## 3.3 Maximum heating load and radiator capacity

## 3.4 Additional insulation

# 4. Conclusions

The conclusions should outline the main findings. This does two things:

* it directs the reader to the most important findings, and
* as the last thing the reader sees, it helps to fix these key points in memory.

It should include several statements, one for each of the key findings. You should never introduce new material in the conclusions. They simply reiterate the most important points that have come up in the results section.

# Reference

The UCD Library website contains a very useful citing tutorial:

<http://www.ucd.ie/library/supporting_you/support_learning/cite_tutorial/>

# Appendix A

Appendix A of your report should include a summary of the contribution made by each member of the group.

# Appendix B

Any additional appendix should be used to show useful (but not vital) extra material with the main report. It should include anything that is not necessary for a reader to follow the content of the report, but which could be useful for certain readers if they wished to know more about a particular item.

For example, if you were doing a report on emission testing of cars, you may include a figure from an EU regulation on vehicle emission standards. This EU regulation could then be reproduced in full in the appendix allowing the reader to look through the rationale for the figure cited.

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**Note:** The completed report should be converted to Portable Document Format (i.e. into a “pdf” file) prior to submission through UCD Blackboard.

Pdf writing is normally offered as a “print” option. Free pdf writing software can be downloaded from several sources, including;

* <http://www.cutepdf.com/products/cutepdf/writer.asp>
* <http://www.primopdf.com/>
* <http://www.pdf995.com/>