London South Bank University

MSc Building Services Engineering

MSc Environmental & Architectural Acoustics

Building Environmental Space Assignment

(DEG-M-141)

Aims

This assignment is intended to integrate and extend work of the Building Environmental Space unit from this semester.

The work also aims to provide a vehicle for you to further explore references and to encourage a wider comprehension of this area.

Learning Outcomes

To provide a practical application and extension of skills and techniques learnt and in terms of experience of:

- development of appropriate internal & external design conditions for design purposes;
- calculation of properties for building structures;
- determination of steady state heat losses and heating load;
- assessment of condensation risk in a building;
- acoustic analysis;
- artificial lighting.

Submission Dates

The project has several interim dates at which you should have completed the scheduled stages and be properly prepared to present your work to date (ie work in an ordered folder with a list of references/resources used) if requested by a tutor. At each of these interim dates you must have reached the appropriate stage as detailed below.

21/10 Understand the location, layout, structure and use of the house. Have a sketched out personal week by week work programme. Be in a position to suggest any alterations that you believe are required to make your final solution practicable at this 'outline' design stage. (At least up to stage 3 overleaf)

11/11 (Just a guidance stage) At least up to stage 5 overleaf

2/12 Show the well advanced design heat loss for the house whilst confirming that the acoustic problems and condensation risks have been minimised.

13/1 The final written report (which should hold all the work fulfilling the requirements of the whole brief) should be handed in by **Tuesday 13th January 2004, work will not be accepted after this date**

To complete this assignment successfully you **must** attend each of the interim assessments and ensure that your progress record sheet is signed by your tutor. The final assessment will also consider your progress throughout the assignment.

Method

In order that you should successfully complete assignment work it is essential to refer to documents in addition to your unit notes. The library is the starting point but you may well find that you can use resources at work or at professional institutions such as the RIBA,

IMechE or the IoA. The world wide web should also be used as appropriate. So that you are able to trace where you discovered certain pieces of information it is important to reference your work, (see below). If your work is not properly referenced your final assessment will be penalised.

Although you are encouraged to work with colleagues you **must** work individually on your report. The work must be your own and not simply a rearrangement of anyone else's course notes, assignment or article. The University has strict guidelines regarding plagiarism.

The Building

You are acting as a consultant evaluating the feasibility of converting an old building known as an oast house to a family house located in Kent.

For the oast conversion that you have been given the following, (few), facts are known.

- It is likely to be occupied by a family of two adults and 2 children.
- The local climatic conditions may be taken as similar to those of Heathrow (although the building is located in Kent).
- The site may be thought of as being in a 'normal' exposure to the wind.

Brief

The work required is as follows:
(It may be that you can not fully complete certain stages until you have started others)

1. Draw up a schedule of rooms with dimensions, suggested design temperatures, lighting levels, acoustic criteria etc. (If you are able to use a spreadsheet or wordprocessor this will be made much easier.)
2. Determine external design conditions for use with heat loss calculations
3. Determine external design conditions that would be appropriate for use with acoustic calculations for this particular building.
4. Suggest appropriate construction details for the walls, roof, floors, windows, doors and internal partitions in order that they comply **at least** to the appropriate 2002 UK Building Regulations. There may be reasons for further improving the construction such as energy saving, improved comfort, etc. Whatever the final selected detail it is important that you justify your choice. (Your assessment should restrict itself to environmental requirements **do not** stray into structural engineering!)
5. Suggest air change rates for each of the rooms (and add them to the schedule). Most rooms are likely to have a nominal air change rate but special consideration should be given to the main living room where there is an open fire. Note that certain areas must conform to Building Regulations requirements for **mechanical** ventilation. Ensure that you consider the air movement throughout the whole house that may need some appraisal of condensation risks. (See 7 below)
6. Determine acoustic design criteria for the internal and external walls and roof. The utility room will have normal domestic appliances, which will run at night (saving money), and being situated next to the study it is envisaged that there may be acoustic problems. The same is true of the sitting room and the bedroom. You should suggest which NR curves are appropriate and what SRI is necessary for a quiet life.
7. Considering an average expected level of activity in the house assess the risk of surface and interstitial condensation. If there is a risk of condensation decide upon the most appropriate preventative measure (this may mean altering the constructions from what was previously evaluated for purely thermal requirements).
8. Calculate the heat losses for each of the rooms and the house as a whole. Check to make sure that the heat losses that you have calculated are of a reasonable value. (Compare with some 'Rules of Thumb')
9. Suggest appropriate luminaries and lamp type for each room to create the right

atmosphere and provide lighting levels that give visual comfort. Be imaginative and have awareness as to how a space is going to look and what people are going to do in the space. Produce a scheme that complements the space's architecture. A good lighting design should make people aware of the architecture by using light to reveal the characteristics of the building.

Presentation of Reports

Write up your work in a concise but ordered form (preferably wordprocessed, but **do not** waste time on wordprocessing calculations). The report would typically contain:-

Contents;

Introduction;

Sections appropriate to the above requirements. Tabulate your main findings. Graphs or sketches may well be useful to illustrate your work;

Conclusions;

References (those books, magazines, papers that have been explicitly referred to in the main report);

Bibliography (other sources that you have used in your read around the subject);

Appendices This is where you include your calculations, drawings and general supporting material. Please keep this section brief and relevant. Do NOT include whole catalogues of manufacturer's data, just photocopy the relevant sheet(s). All appendices should be clearly numbered and should be referred to from the main body of the report.

The whole project should be contained in a folder with the front cover clearly showing your name, "Building Environmental Space Assignment 2003/2004", and the date. **You must keep a copy of your work since the work that you hand in may not be returned to you.**

Interim Assessments

You will be interviewed by your tutor individually or as part of a small group. This will be to determine that you understand what you have written in your report and to confirm that it is your own work.

Assessment

Your work will be finally assessed in four areas to provide you with some feedback of your performance. You are only eligible for a final assessment if you have completed the interim assessments.

Appreciation	This considers your overall approach to the problems in the project. It would include such considerations as your time management and the way that you have logically sub divided the task.
Analysis	The methods of calculation and investigation that you employed. The range of source materials. Justification of your methods.
Development	What you have done with all those basic calculations. The conclusions you have drawn.
Communication	How clearly you have put across your arguments in written form. The proper use of structure in your report and appropriate use of referencing.

The bulk of the marks in this assignment will be directed towards analysis and development. The appreciation and communication elements will not count more than 30% towards the final mark. However your final submission should reflect a balanced approach

– it is useless to create a work of art in invisible ink!

Literature Search [1]

With all project work, almost without exception, it is necessary to conduct a literature search of relevant published information in the area of investigation. There are a number of ways of obtaining such information for a project, e.g.:

- personal communication with either your tutor, other lecturers or colleagues;
- text books;
- internet searches;
- professional journals;
- papers published by learned societies;
- library computer literature search (using key words);
- journal abstracts.

Referencing Your Work

For a complete description please refer to a copy of the South Bank University documents Referencing Using the Harvard System and Referencing Electronic Sources available form LRC or over the web at http://www.lisa.sbu.ac.uk/helpsheets/hs30.pdf and http://www.lisa.sbu.ac.uk/helpsheets/hs31.pdf

It is most important when listing references and/or compiling a bibliography to record the following, (either on a card index or on a computer file):

For Books

- author's name and initials;
- title;
- publisher;
- place of publication;
- year of publication;
- chapter and/or page to page numbers;
- ISBN number.

For Articles in journals

- author's name and initials;
- title of article;
- title of journal (most journals have a recognised abbreviation);
- volume, number, issue, page to page numbers;
- date.

Use a standard format for your references, typically as in these notes. Full details of methods of referencing are given in a handout available from the LRC.

References

1. LEGG, RC (1999) Notes on Experimentation, Third Edition, South Bank University

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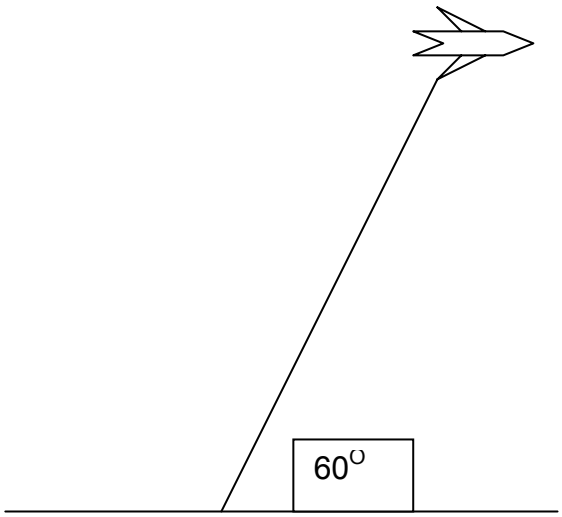
Acoustic Appendium

Planning consideration for a new airport to be built on the Hoo Peninsula at Cliffe should be considered. For planning consent the local authority would have to acoustically insulate any residential buildings effected, so that the appropriate noise requirements are met.

The airport although not never the Oast House is not close to the runways, planes will now fly overhead, circling in a stack at a height of 1000m. Calculate the sound levels in the garden and in the master bedroom of the house. The background noise levels are currently NR20 for the garden. The sound power levels for a typical Airbus 320 Rolls Royce engine, when running at full throttle, directly behind the jet is shown below.

	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Noise Level full throttle, dB	120	124	128	130	128	123	118	110

As a jet engine is not an omni-directional sound source. The following directivity index modifier should be used for a 60^{o} angle, that is the plane makes the most noise when it has past.



Note: An Airbus has 2 engines, only 50% power is required when cruising.

	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Directivity Index dB	-11	-6	-2	0	0	+8	+11	+6