



**TechnoTeachers**  
Association

# CONSTRUCTION STUDIES PROJECT GUIDE

TECHNOTEACHERS  
ASSOCIATION  
March 2010

# CONSTRUCTION STUDIES PROJECT GUIDE

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## FORWARD

Dear members,

This booklet was originally produced in 2005 for a number of Conference seminars on the Construction Studies Project. At the time it was envisaged that the new Architectural Technology syllabus would have been rolled out and the “old” project system replaced. However the implementation of the new syllabus has been shelved indefinitely. Therefore the TechnoTeachers Association National Executive felt it necessary to update this guide to reflect the changes since.

This guide should provide information to teachers of construction studies regarding the selection, management and assessment of the project work submitted for the Leaving Certificate exam.

It is a guide, compiled by our own members, to best practice, rather than a definitive instruction book and should compliment official department/exam regulations.

It should also enlighten our members and consequently our students as to the scope and variety of project work that can be undertaken.

Our wish is that this workshop and booklet will be a valuable aid to our members who teach Construction Studies

TechnoTeachers National Executive

March 2010

# DES & SEC INFORMATION

## THE SYLLABUS

*The following is an extract from the Construction Studies Syllabus. Now more than 20 years old, some aspects of the syllabus have been overtaken by SEC instructions and directives. However the section relating to the project is still largely relevant.*

*The **Instructions to Candidates** is the most relevant guide to project work. Also as result of the changes in the appeals process, joint project work can no longer be accepted as valid project work.*

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### COURSE WORK AND PROJECTS:

The aim of the course work is to develop the pupils' ability to put their knowledge of theory into practice using forms of construction and concepts outlined in the syllabus.

As part of their study of the subject, pupils are required to carry out the following two main types of workshop/laboratory work:

- (a) Experiments which are assigned and closely supervised by the teacher

*and*

- (b) Projects in which the pupils are given a degree of freedom in carrying out their tasks.

Pupils must submit:

- (a) Workshop/laboratory course work reports on assignments carried out,

*and*

- (b) The result of a project undertaken during the course.

The project may be:

- (i) A Building Detail, incorporating a minimum of three craft practices, or
- (ii) A Building Science Project relating to craft practice, or
- (iii) A Written/Drawn Project relating to the craft heritage or the architectural heritage or the built environment.

Projects must be supported by written reports in the case of (i) and (ii), and by an element of practical work in the case of (iii) e.g. a scale model or detail from the subject under investigation.

The following factors will be taken into consideration when projects and course work are being assessed:

- Manipulative skills;
- Selection, care and maintenance of equipment;
- The ability to design an appropriate plan of procedure;
- The ability to plan or carry out simple experiments to test and/or compare building materials and assembly details;
- The ability to draw conclusions from practical experience and from information produced by practical work;
- The ability to present project and course work.

As far as possible pupils should submit individual-assignments and projects. In cases where pupils undertake joint coursework, each pupil must keep records of the complete project or experimental assignment.

## SUGGESTED EXPERIMENTS:

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As a guide to teachers the following list has been compiled. It is not intended that all of these experiments must be done, nor it is intended to exclude other experiments which a teacher may find suitable. The order in which the experiments are listed here does not specify the sequence to be followed by the teacher.

- Characteristics of soft and hard woods, seasoning and storing; characteristics of manufactured boards. Grading of timber.
- Basic types of glues and adhesives and their use. Properties and requirements of glues and adhesives. Selection of appropriate glue or adhesive for a given situation.
- Pore structure of typical building materials. Methods of measuring porosity, rate of water absorption, surface tension, capillarity, permeability, saturation coefficient. Crystallisation, efflorescence, disruptive effect of sulphate action on stone, mortars, bricks and concrete. Sources of sulphates.
- Voids in granular materials, grading of sands and aggregates, effect of grading on mortar and concrete mixes. Concrete—reduction in volume on mixing; relation between (a) strength and density and (b) strength and water cement ratio.
- Setting of gypsum and portland cement as examples of hydration. Use of retarders and accelerators, heat of hydration, strength-time relation, strength tests. Setting of lime, determination of insoluble and soluble matters, fineness, soundness and hydraulic strength tests.
- Pigments tinting strength, light fastness, bleeding characteristics, particle size and shape, thermal stability. Solvents—abrasion resistance, drying time, opacity.
- Hardness—alkaline or temporary, non-alkaline or permanent hardness, water-softening processes. Electrochemical series. Vapour pressure. Comfort conditions. Humidity, condensation.
- Nature and effects of heat, transmission of heat, thermometry, calorimetry co-efficient of thermal conductivity, temperature gradients through composite constructions.
- Nature of light, reflection, refraction, photometry, daylighting, illumination, light source, measurement of light.
- Electrical circuits, measurement of electricity, generators, motors, earthing considerations.
- Acoustics, attenuation of noise at source. Reverberation.
- Other topics selected from the syllabus.

*(Syllabus - Construction Studies - Rules and Programmes for Secondary Schools, 2000)*

1. The coursework you submit for assessment must be your own individual work.
2. To enable the teacher to validate your coursework, your coursework must be executed **in school under the supervision of your class teacher**.
3. You must submit separate, distinct coursework. This is to ensure inter-candidate equity and to assist in the processing of appeals.
4. In the case of repeat candidates, new coursework must be undertaken and presented for assessment.
5. You must agree the coursework with your class teacher. The coursework must meet the requirements for coursework as specified in the syllabus for Construction Studies, outlined in the *Rules and Programme for Secondary Schools*.
6. The completed coursework submitted for assessment must consist of two items:
  - (a) *an artefact*
  - and
  - (b) *a design folio/report*.
7. Reference should be made in the design folio/report to any specialised component used or process not performed by you but necessary for the completion of the coursework.
8. Your design folio/report must include a record of **individual** experimental/laboratory work completed by you during the course. It is recommended that your experimental work be related to the coursework you submit and that **three** experiments be undertaken and recorded for assessment.
9. When using research sources, including the Internet, the sources must be acknowledged. Research material copied directly from the Internet or from other sources and presented as your own work will not receive any marks.
10. Your examination number must be clearly shown on both artefact and design folio/report presented for assessment.
11. All coursework must be completed by .... (*usually the last Friday in April*)

#### OTHER INFORMATION

- There are a number of circulars relating to project work :
  - S68/04: Certificate Examinations - Practical Coursework
  - S69/04: Leaving Certificate Examinations - Acceptance of Practical Coursework for Assessment
- Projects (coursework) are examined at Common Level. There is no separate Higher or Ordinary level marking scheme
- Project-Work is worth a total of 150 marks (25% at Higher Level, 30% at Ordinary Level)
- Projects are normally examined during the first two weeks in June in the school where the work was conducted
- Projects must be stored securely under after the appeal dates for Leaving Cert results.

# PROJECT TYPES

Unlike MTW and other subjects, a project brief is not assigned to construction studies project work. Instead the student determines his/her own brief. The requirements for the project are specified within the syllabus and the instructions to candidates. The syllabus stipulates the project areas as follows:

- A Building Detail, incorporating a minimum of three Craft Practices
- Or A Building Science Project relating to Craft Practice Or
- A Written/Drawn project relating to Craft Heritage or the Architectural Heritage or the Built Environment.

In order to fulfil the requirements of the syllabus, coursework must consist of two components:

- An artefact and a design folio/report

A practical artefact must therefore be supported by a folio/report while written/drawing coursework must be supported by a practical artefact, either a scale model or a detail from the subject under investigation. These three project areas can produce diverse and varied projects. For the purposes of examination, the SEC categorises the projects into the following groups:

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## CONSTRUCTION (K)

This category consists of all coursework relating to the construction of a building. The following list gives examples of coursework: Wet trades,

- Planning regulations,
- Scale models or details of roofs, foundations, etc
- Doors, windows, stairs,
- Timber frame construction, sectional details etc.
- Plumbing/ heating and drainage

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## FURNITURE (L)

This category includes all items of furniture including:

- Internal furniture: tables, chairs, cabinets, etc.
- External furniture: benches, garden furniture, etc.

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## HERITAGE (M)

- Buildings of historical significance,
- Dwellings in the vernacular tradition or from a particular period,
- Buildings and structures of architectural interest,
- Building restoration and conservation
- Traditional skills including furniture restoration and replication etc

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## NEW TECHNOLOGIES (N)

- Geothermal, solar, wind, MHRV,
- new insulation techniques and material
- New building methods e.g. Passive solar construction

# PROJECT SELECTION

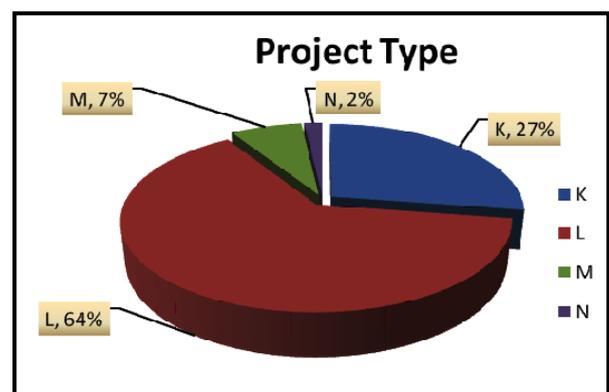
Students are completely free to decide on what type of project to select. The *Instructions to candidates* stipulate that the students' coursework must be agreed with the class teacher. There is no official start date for the project but there is an SEC completion date, usually the last Friday in April. The timing of the project start and finish date can be decided according to the teachers and schools subject plans and organization. Some teachers organize their project work to begin in Leaving Cert Year1 and end well before the official completion date while others complete the project during the Leaving Cert Year 2.

The students' choice of project can be determined by number of factors:

- The students own interests and ideas
- The students experience, skill set and ability
- The students' aims and objectives
- The factor of difficulty
- The time constraints
- Storage and space constraints

The popularity of project types selected by students are articles of

- Furniture (L) (64%),
- Construction(K) the second most popular (27%) with a small minority selecting
- Heritage (M)(7%) and
- New Technologies (N)(2%).



Pie chart showing coursework type undertaken  
Chief Examiners Report 2009

The Chief Examiners Report (2009) notes that:

*“Candidates can select from a broad range of areas within the syllabus, however, in 2009 some class groups selected a limited range of coursework. Consequently this limited the range of educational experiences encountered by candidates, especially where all candidates selected the same type of coursework. As candidates observe, discuss, and consult during class time, a diversity of coursework in a class group enhances and enriches the educational experience of all candidates. Teachers should encourage candidates to explore a wide variety of themes before deciding on a particular coursework type. Teachers are advised to make candidates aware of the rich architectural heritage in the country and in their locality and candidates should be encouraged to explore the architectural and craft heritage of their local area. Such an exploration should provide candidates with a diverse, unique and interesting range of themes for coursework. As candidates grow in visual awareness during their course of study, they should be encouraged, especially in the first year of study, to explore interesting areas of research and discovery as the source for their coursework. Candidates are advised to select their coursework only after significant reflection and should consider their own strengths and motivation and the time available to plan and complete the coursework. As is outlined in the Instructions to Candidates, candidates should consult and discuss their proposed choice of coursework with their teacher to ensure that the resources are available to complete the coursework in school under teacher supervision and within the time available for coursework. “*

These observations highlight the benefits of having a broad range of projects within the classroom and the importance of planning and preparation before students decide on their final project type.

# PROJECT PORTFOLIO

The project portfolio is where students record the development of their project from initial planning to completion and evaluation. They must also record their experimental work undertaken during the course of their project.

The Chief Examiners Report 2010 recommends that:

*“Candidates are advised to develop a design folio in tandem with the artefact and to include in the folio a contemporaneous record of work in progress. The folio should contain a record of all processes and learning from inception to completion and include written descriptions, a photographic record of work in progress as well as sketches, drawings and a final evaluation and personal reflection. Such sketches, photographs and written descriptions of work in progress all form a record that enable Examiners to readily identify that all the work submitted for assessment is the individual work of the candidate.”*

Although there is no specified format for the project folio, the folio should be a record of design and realisation process for the project. A suggested format for the project folio is described below:

## PROJECT FOLIO CHAPTERS:

1. Project planning:
2. Research & Investigation
3. Design of Artefact:
4. Realisation - Manufacture of artefact
5. Experimental work::
6. Evaluation:

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## PROJECT PLANNING:

This first section of the project folio outlines the aim and objectives of the student's project. It should include:

- **Introduction to project:**  
Students own brief for development of project
- **Aims and objectives for project:**  
Students grade aim, development of interest in area etc
- **Time management strategy**  
Gantt charts or similar time planning methods
- **Budget and material constraints**

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## RESEARCH & INVESTIGATION:

Students should record their research and investigation related to their project area. This record should contain:

- a) **Analysis of project:**  
Development of project brief, information/knowledge required to complete project
- b) **Theoretical investigation of project area:**  
Research of topic or subject area related to project
- c) **Key Findings drawn from research:**  
Evaluation of research, distillation of information gathered

Research sources can be:

- Internet, books, magazines, libraries, television programmes, site or shop visits and interviews.

This information can be presented using:

- Extracts, pictures, sketches, photographs, diagrams, notes etc.

It is very important that:

- Students interrogate, evaluate or comment on the research material they have presented.
- Any research or information presented, downloaded or otherwise, should be clearly referenced and acknowledged by the student

After presenting their research and investigation students should indicate what they have learned from process. A list of **key findings** is one method where students can draw conclusions from their research and demonstrate an understanding of their project area.

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## DESIGN OF ARTEFACT

This chapter should record the development of the student's project from initial ideas to final solution. Unlike MTW there is no requirement to present three design ideas. Instead the student should present:

- a) Design ideas for artefact:**  
A progression from initial idea to final design
- b) Working Drawings and design drawings for artefact.**  
These can be drawn (to scale) using drawing equipment or CAD software such as SolidWorks.
- c) Cutting List**  
List of materials required for manufacture of project
- d) Models/Mock-Ups, Templates and Marking-Out Boards,**  
Where necessary to manufacture the artefact

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## REALISATION - MANUFACTURE OF ARTEFACT

Students should record a detailed account of the manufacture of their project. This can be presented as a step-by-step approach or a written diary. This chapter can be presented using:

- Notes, sketches, photographs and diagrams

The key stages of the project should be explained:

- a) Preparation of materials:**  
Gluing up, cutting to size etc
- b) Marking-out:**  
Use of templates, jigs, tools etc
- c) Processing of parts:**  
Cutting-out and jointing methods. Description of specific skills, equipment or crafts employed
- d) Assembly:**  
Gluing and clamping.
- e) Finishing;**  
Preparation of surfaces, application of finishes
- f) Modifications:**  
Any changes to design should be recorded and explained. Explanation as to why changes were necessary

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## EVALUATION OF PROJECT

Students should give a personal account of his/her learning and experience gained from project. This should include:

- a) **Critical Appraisal of Project:**  
Analysing original plans, modifications made and completed artefact and folio
- b) **Personal Reflection:**  
Conclusions drawn from project experience etc.

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## EXPERIMENTAL WORK

Students are required to submit a record of three experiments that they undertook during their coursework. These experiments must be their own individual work and it is recommended that they be related to their project. The Chief Examiners Report explains:

*“Candidates who investigated aspects of the coursework, constructed a hypothesis, investigated this hypothesis and derived a conclusion succeeded in obtaining high marks. Such an approach is to be commended and candidates were rewarded accordingly..... Candidates are advised to relate the experimental work to some aspect of the coursework undertaken. This provides candidates with an opportunity to hypothesise and to analyse in detail aspects of the coursework and to record the results of such analysis. It also provides candidates with an opportunity to undertake unique experimental work. Candidates who submit derivative experimental work cannot achieve the full complement of marks. It is recommended that three experiments be undertaken by each candidate. A detailed description of each experiment, including a clearly stated objective, should be recorded in the folio for assessment. Group or class experiments do not comply with the regulations of the SEC.”*

The following is sample list of areas where students can engage in experimentation:

1. **Tests on Jointing methods for project:**
  - a. Mortise & tenon vs biscuit/domino vs dowel
  - b. Dovetail vs finger vs mitre
  - c. Nailed vs screwed vs glued only
2. **Test on moisture content of wood**
  - a. Moisture content of wood ( see next page)
  - b. Absorbance of wood (place dry wood in damp situation and test how much water it has gained). You can also test quality of exterior finish to see which one allow most moisture to soak into wood.
3. **Test on quality of finishing:**
  - a. Compare various finishes (varnish, oil, wax etc) for qualities or suitability for project.  
Compare under:
    - i. Cost
    - ii. Ease of application
    - iii. Durability (scratch resistance, heat resistance, weather resistance)
    - iv. Aesthetics (how well it looks when finished)
4. **Test on strength of structures:**
  - a. Triangulation test on roof members (model of rafters/ roof truss) the more a roof is triangulated the stronger and stiffer it should be)
  - b. Bending strengths of timbers

- i. Fix one end of sample and tie weights on other end and compare the deflection (amount of bend) of various types of timber OR compare same wood type (e.g. red deal) but compare thickness vs. width of samples (e.g. 10mm \* 5mm piece vs. 10mm \* 10mm piece vs. 15mm \* 10mm piece etc etc).

This list is by no means exhaustive. The syllabus outlines further areas where students can engage in experimentation. Specific project areas can also lead to other experiments. For example a project on domestic electricity can include experiments on electrical circuits, resistors, photovoltaic cells etc.

### **EXPERIMENT TEMPLATE**

There are many methods of recording experimental work. This structure follows closely the method that is used for Junior Cert Science.

1. Title
2. Introduction
3. Preparation & planning
4. Procedure
  - a. Diagrams & pictures
  - b. Safety precautions
5. Results
6. Conclusion & evaluation of results
7. Comments

Samples of experimental work are shown later. Evidence of the experimental work carried out by students can be provided by:

- displaying the experiment (or materials tested) along with the folio and artefact
- photographs of experiment being conducted
- sketches or diagrams

Note:

It is very important that students submit individual experiments. Derivative or dictated experiments cannot expect to achieve high marks.

# CONSTRUCTION STUDIES PROJECT EXPERIMENT SAMPLE

## TITLE

Students should record the title and date of the experiment:

## INTRODUCTION

This section should include:

- The hypothesis or aim of experiment
- Background information about the experiment.
- The theory behind the hypothesis or the experimental aim

EXAMPLE: *(Glue Testing Experiment)*

*The aim of my experiment is to find out what is the most suitable glue for putting together my table-top:*

*There are many different types of wood adhesives, each with their own advantages and uses.*

*The most important aspect associated with any adhesive is its ability to bond two surfaces together. If an adhesive has failed to bond two surfaces adequately one or more of the following may be to blame -*

- *Glue may be past its shelf life.*
- *....*

*Some factors to be considered when deciding on what type of adhesive to use in a particular situation are -*

- *Is the item of joinery to be used internally or externally.....*
- *.....*

*The main types of wood adhesives are:*

*PVA :*

*Polyvinyl acetate glue (PVA) - This is undoubtedly the most widely used woodworking adhesive, it is a thermo plastic (plastic that retains its properties after being melted and solidified) adhesive (white liquid, medium viscosity). No preparation is necessary prior to use, care must be taken however to ensure the correct type is used i.e. Internal or external PVA. PVA does not blunt the cutting edge of tools however it is good practice to wipe away excess glue using a damp cloth.....*

## PREPARATION & PLANNING

This section should record the equipment & materials required to conduct the experiment. It also should record any preparation

necessary before the experiment can be carried out.

### EXAMPLE: (*Triangulation of Roofs Experiment*)

#### Materials Needed:

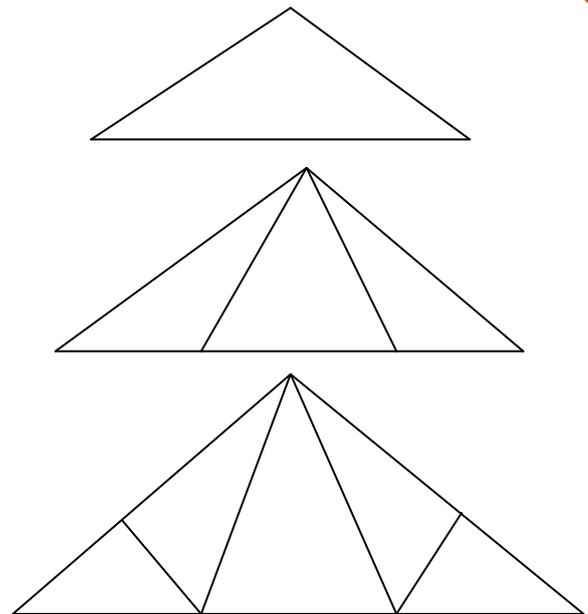
- 300 × 15 × 5mm - rafters
- 250 × 15 × 5mm - joists
- Various lengths of 15 × 5mm - struts

#### Equipment Needed:

- Hot Glue Gun
- Woodwork locker tools
- 1kg - 5kg weights
- Clamps & vise

#### Preparation:

- Glue-up triangular structures as shown:
  - Simple triangle
  - 2 strut structure
  - W or Fink truss shape



## PROCEDURE

This section should record how the experiment was conducted and what happened. It should include:

- Step by step instruction to carry out experiment:
- Diagrams and Pictures of experiment being carried out
- Safety Precautions

EXAMPLE: *(Bending/Deflection of Timber Experiment)*

Procedure:

1. Fix the red deal timber sample onto stand at mark on edge as shown
  - a. Hang 1N weight at 300mm mark and record deflection
  - b. Hang 2N weight at 300mm mark and record deflection
  - c. Continue to add weights and record the bending of the sample
2. Fix the red deal timber sample onto stand on flat as shown
  - a. Hang 1N weight at 300mm mark and record deflection
  - b. Hang 2N weight at 300mm mark and record deflection
  - c. Continue to add weights and record the bending of the sample



Health & Safety:

- Ask teachers permission before using machinery
- Follow any safety rules in workshop

RESULTS

Record the results of the experiment as accurately as possible. Use tables or diagrams to present results

EXAMPLE: *(Moisture Content of Timber Sample)*

	Wet weight	After 12 hours	After 24 hours	% moisture content = wet-dry/dry×100
Sample 1(oven method)	350gms	324gms	315gms	$35/350 \times 100 = 10\%$
Sample 2(hot press)	270gms	265gms	251gms	$19/270 \times 100 = 7\%$
Sample 3(moisture meter)	360gms	Meter reading = 13%		13%

## CONCLUSION & EVALAUTION OF RESULTS

Students can interpret their results, explaining their meaning and importance. The experiment could influence their decision making process about aspects of their project. This section should include:

- Observation and interpretation of results
- Conclusions relating to Project and/or Construction Studies
- Overall evaluation of experiment

### EXAMPLE: *(Joining Test for Corners of Doors)*

*The results of my experiment showed that the haunched mortise and tenon was the strongest joint (did not break), however it took the longest to make and didn't look neat. The dowel joint was the weakest, but the domino joint was the next strongest and was just as easy to make as the dowel. Therefore as I have to make 8 joints in total for the two doors of my cabinet I have chosen to use the domino joint because;*

- *Very fast to make*
- *Relatively strong*
- *Neat and tidy*

## COMMENTS

Any other comments to be made about the experiment, or the success or failure of the results or any personal reflection.

### EXAMPLE: *(Joining Test for Corners of Doors)*

*Modern jointing techniques such as the Festool domino are becoming more and more popular as they have the strength, speed and accuracy. However traditional methods are still important for certain jobs.....*

*I found this experiment very useful as it gave me a lot of information about the joining of my project. It also gave me an opportunity to test my skills in making various joints.....*

# PROJECT ARTEFACT.

As outlined earlier students can select their project from wide range of areas. Outlined are a number of points related to the project artefact that have been raised in the Chief Examiners Report:

General Points:

- The artefact made by the student should display the range of skills and complexity to match their abilities.
- The project must be made in school under the supervision of the teacher
- Ensure there is a balance time provision for the development of artefact, folio and experimentation
- Encourage students to explore a wide variety of project topics and types
- Students should develop their folio in tandem with their artefact
- Where there is a need for a student to do some investigative work in an out-of-school setting or to acquire a specialised component/process in order to complete the coursework, this must be done with the prior approval of the teacher

Furniture Projects:

- Avoid large, cumbersome and poorly designed furniture projects
- Students should engage in projects that demonstrate their range of abilities including creativity of design

Scale Model Projects:

- Scale models can be produced as the artefact for Constructional, New Technologies or Heritage projects
- Students should make sure to use an appropriate scale for their model
- Students should construct their models using appropriate materials, that demonstrate a high level of manufacturing, assembly and finishing skill.

## PRESENTATION OF PROJECT

The projects should be displayed for examination in numerical order, with students' exam numbers clearly marked on their folio and project (using labels provided).

Students should present all their project work in an attractive manner. This can be achieved by:

- The use of ICT, freehand sketching and rendering to help to present their folio/written work in an attractive manner
- The artefact being presented in an attractive manner. For example
  - Scale models can be labelled and displayed along with their drawings, details, marking-out boards etc.
  - Furniture projects can be displayed with their drawings, mock-ups, templates etc.