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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Design and Technology (Resistant Materials)

Full and Short Course

2010

Material accompanying this Specification

- Specimen Assessment Material
- Reports on the Examination

SPECIFICATION

AQA GCSE 3545

AQA GCSE (Short Course) 3555

The specification will be published annually on the AQA Website (www.aqa.org.uk). If there are any changes to the specification centres will be notified in print as well as on the website. The version on the Website is the definitive version of the specification.

Further copies of this specification booklet are available from:

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Or
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Contents

Background Information

1 The Revised General Certificate of Secondary Education

Following a review of the National Curriculum requirements, and the establishment of the National Qualifications Framework, all the unitary awarding bodies have revised their GCSE syllabuses for examination in 2003 onwards.

1.1 Changes at GCSE

Key Skills

All GCSE specifications must identify, as appropriate, opportunities for generating evidence on which candidates may be assessed in the "main" Key Skills of communication, application of number and information technology at the appropriate level(s). Also, where appropriate, they must identify opportunities for developing and generating evidence for addressing the "wider" Key Skills of working with others, improving own learning and performance and problem solving. Design and Technology is uniquely placed to provide opportunities for all six Key Skills.

Spiritual, moral, ethical, social, cultural, environmental, health and safety and European Issues

All specifications must identify ways in which the study of the subject can contribute to an awareness and understanding of these issues.

ICT

The National Curriculum requires that students should be given opportunities to apply and develop their ICT capacity through the use of ICT tools to support their learning. In each specification candidates will be required to make effective use of ICT in ways appropriate to the needs of the subject.

Tiering

In most subjects the scheme of assessment must include question papers, targeted at two tiers of grades, ie A* - D and C - G.

A safety net of an allowed Grade E will be provided for candidates entered for the higher tier who just fail to achieve Grade D. The questions will still be targeted at A* - D.

Citizenship

From 2002, students in England have been required to study Citizenship as a National Curriculum subject. Each GCSE specification must signpost, where appropriate, opportunities for developing citizenship knowledge, skills and understanding.

1.2 Changes to the Design and Technology Criteria

The main changes to the Design and Technology criteria are given below.

a. The Aims have been simplified to reflect the National Curriculum requirements, but it should be noted that they now include a consideration of the influences of past and present design and technology on society.

b. The Assessment Objectives have been expanded.

- AO1 consists of materials, components, processes, techniques and industrial practices.
- AO2 combines designing and making into one objective.
- AO3 evaluation of processes and products includes examining the wider effects of design and technology on society

c. Greater emphasis has been placed on ICT, particularly CAD/CAM.

1.3 Changes to the Design and Technology (Resistant Materials Technology) specification

The Design and Technology (Resistant Materials Technology) specification has been revised and updated to take account of the latest developments in the teaching of resistant materials.

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Specification at a Glance

Design and Technology (Resistant Materials Technology)

This specification is one of a suite of seven in Design and Technology offered by AQA. There are two tiers of assessment: Foundation (G-C) and Higher (D-A*).

Foundation Tier
3545F
Higher Tier
3545H

GCSE (Full Course) 3545	
Written Paper	40% of total marks
Foundation Tier	2 hours
Higher Tier	2 hours

Candidates will be tested on their knowledge and understanding of designing and making, and the three main materials: metal, plastics and wood. A Preparation Sheet will be issued to centres at the beginning of March. This Sheet is common to the Full and Short Courses and to the foundation and higher tier papers. It will give advance notice of the design context for design questions.

The paper will test all Assessment Objectives through a range of questions. All questions are compulsory.

Coursework Project	60% of total marks not to exceed 40 hours

Coursework will be internally assessed and externally moderated.

Coursework consists of a project which addresses all the assessment objectives in an integrated way. The evidence required for the project consists of a 3-dimensional product and a concise design folder and/or the appropriate ICT evidence.

Foundation Tier
3555F
Higher Tier
3555H

GCSE (Short Course) 3555	
Written Paper	40% of total marks
Foundation Tier	1½ hours
Higher Tier	1½ hours

Candidates will be tested on their knowledge and understanding of designing and making, and two of the main materials: plastics and wood. A Preparation Sheet will be issued to centres at the beginning of March. This Sheet is common to the foundation and higher tier papers and will give advance notice of the design context for design questions.

The paper will test all Assessment Objectives through a range of questions. All questions are compulsory.

Coursework Project	60% of total marks not to exceed 20 hours

Coursework will be internally assessed and externally moderated.

Coursework consists of a project which addresses all the assessment objectives in an integrated way. The evidence required for the project consists of a 3-dimensional product and a concise design folder and/or the appropriate ICT evidence.

3 Availability of Assessment Units and Entry Details

3.1	Availability of Assessment Units	Examinations based on this Specification are available in the June examination series only.
3.2	Entry Codes	Normal entry requirements apply, but the following information should be noted. The **Subject Code** for entry to the GCSE award is 3545. The **Subject Code** for entry to the GCSE (Short Course) award is 3555.
3.3	Classification Codes	Each specification is assigned to a national classification code, indicating the subject area to which it belongs. Centres should be aware that candidates who enter for more than one GCSE qualification with the same classification code, will have only one grade (the highest) counted for the purpose of the School and College Performance Tables. The classification code for this specification is 9040.
3.4	Private Candidates	This specification is not available for private candidates.
3.5	Access Arrangements and Special Consideration	AQA pays due regard to the provisions of the Disability Discrimination Act 1995 in its administration of this specification. Arrangements may be made to enable candidates with disabilities or other difficulties to access the assessment. An example of an access arrangement is the production of a Braille paper for a candidate with a visual impairment. Special consideration may be requested for candidates whose work has been affected by illness or other exceptional circumstances. Further details can be found in the Joint Council for Qualifications (JCQ) document: *Access Arrangements and Special Consideration* *Regulations and Guidance Relating to Candidates who are Eligible for Adjustments in Examination* *GCE, AEA, VCE, GCSE, GNVQ, Entry Level & Key Skills* This document can be viewed via the AQA web site (www.aqa.org.uk) Applications for access arrangements and special consideration should be submitted to AQA by the Examinations Officer at the centre.
3.6	Language of Examinations	All assessment will be through the medium of English. Assessment materials will not be provided in Welsh or Gaeilge.

Scheme of Assessment

4 Introduction

4.1 National Criteria

This GCSE Design and Technology (Resistant Materials Technology) specification complies with the following:

- The GCSE Subject Criteria for Design and Technology;
- The GCSE, GCE and AEA Code of Practice April 2007;
- The GCSE Qualification Specific Criteria;
- The Arrangements for the Statutory Regulation of External Qualifications in England, Wales and Northern Ireland: Common Criteria.
- The National Curriculum Order for Design and Technology.

4.2 Rationale

This specification allows candidates to carry out designing and making activities through metal, plastics and wood. Candidates may also use other resistant materials, such as ceramics and textiles, for project work. The specification is flexible enough to allow the use of electronics as a complement to a resistant material, but the resistant material(s) should form the dominant feature in project work.

Whilst the three main materials (metal, plastics and wood) will be examined on the full course paper, only two of these materials (plastics and wood) will be examined on the short course paper.

4.3 Prior level of attainment and recommended prior learning

The specification builds on the Key Stage 3 programme of study for Design and Technology. It is expected that candidates will have followed this programme before commencing work on this specification.

It will be beneficial for candidates to have achieved at least Level 1 in the Key Skills of *Communication*, *Application of Number* and *Information Technology* to cope with the demands of this specification.

4.4 Progression

This qualification is a recognised part of the National Qualifications framework. As such, GCSE provides progression from Key Stage 3 through Key Stage 4 to post-16 studies. It lays an appropriate foundation for further study of Design and Technology.

5 Aims

A course based on this specification should encourage candidates to:

a. demonstrate fully their design and technology capability, which requires them to combine skills with knowledge and understanding in order to design and make quality products in quantity;

b. acquire and apply knowledge, skills and understanding through:

- analysing and evaluating products and processes;
- engaging in focused tasks to develop and demonstrate techniques;
- engaging in strategies for developing ideas, planning and producing products;
- considering how past and present design and technology, relevant to a designing and making context, affects society;
- recognising the moral, cultural and environmental issues inherent in design and technology.

6 Assessment Objectives

6.1 Assessment Objectives

Candidates should be able to demonstrate their design and technology capability through acquiring and applying knowledge, skills and understanding:

a. of materials, components, processes, techniques and industrial practice;

b. when designing and making quality products in quantity;

c. when evaluating processes and products and examining the wider effects of design and technology on society.

6.2 Quality of Written Communication

Where candidates are required to produce extended written material in English, they will be assessed on the quality of written communication. Candidates will be required to:

- present relevant information in a form that suits its purposes;
- ensure that text is legible and that spelling, punctuation and grammar are accurate, so that meaning is clear.

Quality of written communication will be assessed in candidates' coursework design folders.

7 Scheme of Assessment

7.1 Full Course Assessment Units

The Scheme of Assessment for the Full Course comprises two components.

Written Paper (Full Course)		
40% of the marks		
Foundation Tier	2 hours	125 marks
Higher Tier	2 hours	125 marks

Questions will test the application of knowledge and understanding of **three** materials (metal, plastics and wood); components, processes, techniques, technologies and the evaluation of commercial practices and products. All questions will be compulsory.

A Preparation Sheet will be issued to candidates at the beginning of March in the year of the examination. This sheet is common to the foundation and higher tiers and will give advance notice of the design context for the design questions on the written papers. The same sheet will be issued for both the Full and Short Courses.

Coursework Project	40 hours
60% of the marks	95 marks

The coursework project will be internally assessed and externally moderated. Full details on coursework are given in Sections 14-20 below.

The project should address all three assessment objectives in an integrated way. Candidates are required to submit a concise design folder and/or the appropriate ICT evidence and a 3-dimensional outcome.

Throughout the project candidates should address the industrial and commercial practices, and the moral, social, cultural and environmental issues, arising from their work.

Experience has shown that candidates are often highly motivated where they devise their own project outlines. This is, therefore, to be encouraged and guidelines for the preparation of outlines are given in para 15.1. Examples of suitable project outlines are given in 15.2 which can also provide starting points for candidates.

Centres should ensure that candidates embark on projects that can satisfy the coursework requirements and be completed in 40 hours. The assessment criteria in Section 16 should be used as a guide for teachers and candidates to the type of work and the standards required.

7.2 Short Course Assessment Units

The Scheme of Assessment for the Short Course comprises two components.

Written Paper		
40% of the marks		
Foundation Tier	1½ hours	100 marks
Higher Tier	1½ hours	100 marks

Questions will test the application of knowledge and understanding of **two** materials (plastics and wood); components, processes, techniques, technologies and the evaluation of commercial practices and products. All questions will be compulsory.

A Preparation Sheet will be issued to candidates at the beginning of March in the year of the examination. This sheet is common to the foundation and higher tiers and will give advance notice of the design context for the design questions on the written papers. The same sheet will be issued for both the Full and Short Courses.

Coursework Project	20 hours
60% of the marks	95 marks

The coursework project will be internally assessed and externally moderated. Full details on coursework are given in Sections 14-20 below.

For short course projects, it is essential that an appropriate project outline or brief is selected which will allow candidates to satisfy all the requirements within the 20 hours permitted. See paragraph 14.3 for further guidance.

The project should address all three assessment objectives in an integrated way. Candidates are required to submit a concise design folder and/or the appropriate ICT evidence and a 3-dimensional outcome.

Throughout the project candidates should address the industrial and commercial practices, and the moral, social, cultural and environmental issues, arising from their work.

Experience has shown that candidates are often highly motivated where they devise their own project outlines. This is, therefore, to be encouraged and guidelines for the preparation of outlines are given in para 15.1. Examples of suitable project outlines are given in 15.2 which can also provide starting points for candidates.

The assessment criteria in Section 16 should be used as a guide for teachers and candidates to the type of work and the standards required.

7.3 Weighting of Assessment Objectives (Full and Short Course)

The approximate relationship between the relative percentage weighting of the Assessment Objectives (AOs) and the overall Scheme of Assessment is shown in the following table:

Assessment Objectives	Component Weightings (%)		Overall Weighting of AOs (%)
	Coursework	Written Paper	
1 Materials and Components	10	10	20
2 Designing and Making	40	20	60
3 Evaluation and Social Issues	10	10	20
Overall Weighting of Units (%)	**60**	**40**	**100**

Candidates' marks for each assessment unit are scaled to achieve the correct weightings.

Subject Content

8 Summary of Subject Content

9 Designing and Making Skills

Section 9 specifies the general designing and making skills required for both the full and short courses and the knowledge and understanding candidates should acquire.

10 Full Course

Section 10 specifies the Full Course content.

11 Short Course

Section 11 specifies the Short Course content.

Each course is presented under the following three broad areas of study:

Materials and Components;
Design and Market Influences;
Processes and Manufacture.

9 Designing and Making Skills

Design and Technology is a practical subject area which requires the application of knowledge and understanding when developing ideas, planning, producing products and evaluating them. The distinction between Designing and Making is a convenient one to make, but in practice the two often merge. For example, research can involve not only investigating printed matter and people's opinions, but also investigating proportions, adhesives, colour, structures, circuits and materials through practical work.

The skills which follow are common to both the Full and the Short Courses and underpin all learning and cover the programme of study for KS4 Design and Technology.

9.1 Designing Skills

Candidates should be taught:

to understand the basic design principles of line, form and colour and their application in designing;

to develop and use design briefs, detailed specifications and criteria in relation to product development;

to consider the conflicting demands that moral, cultural, economic, environmental, historical and social issues can make in the planning and in the designing of products;

to consider their own health and safety and that of makers, manufacturers, individual users and society at large;

to consider an increasing range of users of products and different societies in relation to their differing needs and values;

to anticipate and design for product maintenance;

to design for manufacturing in quantity;

to plan for quality control and quality assurance when designing products and to be aware of the difference;

to generate design proposals against stated design criteria, and to modify their proposals in the light of on-going analysis, evaluation and product development;

to use graphic techniques and ICT, including CAD to generate, develop, model and communicate design proposals;

to match materials and components with tools, equipment and processes, taking account of critical dimensions and tolerances when deciding how to manufacture the product;

to produce and use detailed working schedules that will achieve the desired objectives in the time available, setting realistic deadlines for the various stages of manufacture, identifying critical points in the making process and providing alternatives to possible problems;

to devise and apply test procedures to check the quality of their work at critical points during development, and to indicate ways of modifying and improving it when necessary;

to be flexible and adaptable in their designing, in order to respond to problems, changing circumstances and new opportunities;

to ensure that the quality of their design solution will be suitable for intended clients and consumers;

Candidates should be taught

to understand the difference between quality of design and quality of manufacture and use essential criteria to evaluate the quality of products they have made and products which have been made commercially;

9.2 Making Skills

to match materials and components with tools, equipment and processes to produce quality products;

to use tools and equipment safely, accurately and efficiently to achieve an appropriate fit, finish and reliable functioning in products that match their specifications;

to use a range of industrial applications when working with familiar materials and processes;

to manufacture products singly and in quantity, including the practical application of quality control and quality assurance techniques;

to use computer-aided manufacture (CAM) in single item production and in batch or volume production;

to simulate production and assembly lines including the use of ICT; to be adaptable in their working practices, in order to respond to changing circumstances and new opportunities;

to ensure, through testing, modification and evaluation, that the quality of their products is suitable for intended users and devise modifications where necessary that would improve performance.

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Full Course
Materials and Components

Candidates should build upon the National Curriculum Key Stage 3 Programmes of Study to develop a working knowledge of resistant materials and components appropriate to modelling, prototyping and manufacturing.

		Candidates should:	**Possible learning experiences**
10.1	Materials: Metal, Plastics, Wood		
	Properties, characteristics and combinations of metal, plastics and wood	recognise the working characteristics of the common forms of metal; understand the differences between ferrous and non-ferrous metals and how they are used; know that the properties of metals can be changed by heat treatments; know that metals can be combined to form alloys;	As a group activity, research the common forms of metal and compile a database showing their characteristics, uses, advantages and disadvantages. Share this database with another school.
		recognise the working characteristics of common forms of plastics; understand the difference between thermoplastics and thermosetting plastics and how this affects the way they are used; know that plastics can be combined with other materials to create extra strength and enhance appearance;	As a group activity, research common forms of plastics and compile a database, showing their characteristics, uses, advantages and disadvantages. Share this database with another school.
		recognise the working characteristics of the common forms of wood; know the difference between hardwoods and softwoods, and between natural wood and manufactured boards;	As a group activity, research common forms of wood (natural and manufactured) and compile a database, showing their characteristics, uses, advantages and disadvantages. Share database with another school.

	Candidates should:	Possible learning experiences
Uses of resistant materials	be aware of technological advances in resistant materials and their use in a wide range of industries;	Use the Internet to obtain more information about materials, their uses and the development of new (including 'smart') materials e.g. plastics with memory, flexible and conductive plastics, conductive foam etc. Include these on your database.

10.2 Components and Adhesives

Selection of suitable components, pre-manufactured components and adhesives	know that many fixings are available to complete the functional aspects of a product, and use safely and effectively those which are appropriate;	Compile, with other students, a notebook, with information on fasteners, fixings and hinges, e.g. nuts, bolts, screws, nails, pins, rivets, star-washers, pegs, knobs, pulls, handles, KD, etc.
	know about and use appropriate adhesives for a variety of materials and conditions;	Compile, with other students, information on common adhesives, e.g. PVA, hot-glue, metal-bonding (epoxy resins), cyanoacrylate (super-glue), plastics bonding (tensol), etc.

Design and Market Influences

Candidates should be taught how to analyse products and processes. They should consider how design and technology affects the manufacturer, user and environment, and the importance of health and safety issues.

		Candidates should:	Possible learning experiences
10.3	Product analysis		
	Analysis of designs and products	use product analysis techniques to make critical judgements about the design and manufacture of resistant materials products; use design principles, taking into consideration form, function, shape, colour, materials, texture, component parts, decoration and aesthetic appeal to evaluate suitability for purpose; consider ergonomic and anthropometric data; use this information to review and modify own designs;	Analyse commercial products as a group activity to find out how and why they work (toys, torches, personal stereos, ball pens, telephones, electric whisks, chairs, kettles, lamps, toothbrushes, electric plugs, etc.). Devise simple tests to evaluate performance; identify component parts and discuss why they were selected; discuss and write a group product report. Conduct a group brainstorming session to produce other ideas for these products.
	Image and lifestyle reflected in past and present resistant materials products	analyse aesthetic and functional requirements in relation to modern life; assess and implement these factors when designing and producing products to achieve specific functions and effects;	Look at the work of past and present designers of resistant materials products; collect photographs, cuttings etc. to use as starting points for the creation of new products.
	Comparison of own designed product to alternative products on market	compare own outcomes with other products on the market and analyse the differences;	Disassemble commercial/own designs to analyse them in the course of research, analysis and evaluation.
10.4	Evaluation Techniques		
	Checking of design proposals against design criteria	understand the design specification criteria that influence the design of commercial products;	Make a check list of client, designer, manufacturer and user needs to test the performance of a particular product.

Quality assurance of product(s), through testing and evaluation	devise simple tests to check the effectiveness of designs and evaluate against the specification criteria; use ongoing evaluation to make judgements and suggest improvements during the design and manufacture of own products;	Make models, mock-ups and prototypes as work progresses; test the performance and quality of a product(s) against its specification (operation, size, strength, weight, colour, etc.). Make simple tools, gauges for checking own work against specification (angle, length, diameter etc.).
	evaluate the effectiveness of various manufacturing techniques;	Make a jig to drill a straight line of holes repeatedly the same distance apart and evaluate its effectiveness.
Evaluation of own product	consider other peoples' views (client, designer, manufacturer, user/consumer) when refining product designs; ensure that own product(s) are of suitable quality for intended users; test against original specification and against quality of similar commercial products;	Carry out a survey to establish public preferences of a range of products against own designs. Consider designs for manufacture using fewer parts. Evaluate own product against specification. Conduct a user test to verify suitability.

10.5 Social, cultural, moral and environmental issues

Social and cultural influences on the consumer market	recognise the effects of social and cultural influences on product design;	Consider the role of the designer and the impact his/her designs may have on society and the environment.
	recognise and investigate the differing needs of individuals and groups from a variety of social, cultural and physical backgrounds;	Prepare a wall chart of the sizes of students in each year group. Consider the needs of students of different heights in a school workshop situation.
	understand that differing circumstances can influence the requirements of designing for different users;	Investigate access for wheelchair users in your school. Check on the sizes of toy parts for children of different ages.
	collect relevant data on ergonomics and anthropometrics and use them as a resource;	Investigate the heights of seats and tables in a classroom situation and compare them with collected anthropometric data.
	appreciate that sizes vary according to age, gender, culture and that products must suit the needs of the user(s);	Mock up a 'joy-stick' for a 5 year old and one for a 15 year old in polystyrene or MDF.

	Candidates should:	Possible learning experiences
Consumer choice	identify the factors involved in consumer choice; carry out market research to establish consumer preferences of target group(s);	Look at professional market research questionnaires. Write questionnaire to establish consumer preferences and record these on spreadsheet/database.
	ensure that own designs meet the requirements of the intended market;	Review collected data to check that own designs meet the requirements of the target market.
Consumer rights legislation, product maintenance and codes of practice	take legislation concerning consumer rights and safety codes of practice into account when designing own products; implement labelling of products in accordance with latest legislation and BSI;	Research and devise safety, care and maintenance labels for use on own product(s) (lubricate, polish, clean, keep dry, check tightness of fasteners, this way up, danger, etc.).
		Assess the implications of applying a finish to a child's wooden toy or the production of small plastic kit parts in terms of the manufacturer and the user.
Moral and environmental issues	understand the moral and environmental issues associated with the production of artefacts, the harmful effects of industrial pollution and the crucial need to treat and dispose of waste materials correctly;	Research 'Green Technology' and brainstorm ways to lessen pollution by designers and product manufacturers. Consider effects of 'throw-away' maintenance, manufacturing, energy costs, packaging etc.
	be aware of the financial environmental and human costs involved in processing/making common materials and products;	Investigate why packaging is needed and how it is disposed of, used or recycled.
	appreciate the importance of conservation and protection of natural resources and the need to recycle products when possible;	Research the effects of exploitation of natural resources on the landscape, e.g. timber, oil for plastics, ore for metals.

10.6 Health and Safety Issues

Identification and reduction of hazards or risks when designing and manufacturing products	understand that safety for product maker and product user is essential; assess hazard and risk factors in product manufacturing and choice and use of materials, components, tools, equipment; work with these safely and effectively;	Review safety practices in the workshop, e.g. safe use of hand tools, CNC, etc. Clean brushes or spray equipment after application in accordance with Health and Safety regulations.

	Candidates should:	Possible learning experiences
Safety in the working environment	recognise that safety of the workforce is essential; take responsibility to ensure that hazards are minimised and the working environment is safe to use; observe health and safety regulations when working with materials and equipment;	Take appropriate precautions when machining items such as steel with swarf or dusty wood on a sander. Use the correct safety clothing at the appropriate time. Hold a work piece securely whilst machining it with a guarded cutter. Discuss health and safety issues as a group with your teacher. Make posters and hazard warning notices and a list of safety rules for your workshop.
Safety for the consumer	ensure that the end product is safe for the consumer in accordance with Health and Safety regulations;	Investigate a range of suitable materials, components and surface treatments for making children's toys.

Processes and Manufacture

Candidates should be aware of and use as appropriate, manufacturing processes and techniques including CAD and CAM. They should have an industrial and commercial awareness and know about the processes involved in manufacturing for batch and mass production.

	Candidates should:	Possible learning experiences
10.7 Techniques and Processes		
Selection and usage of appropriate tools and equipment, including CAD and CAM, for metal, plastics and wood	use a range of hand-tools for marking out and making; match and use machinery and equipment appropriate to the material accurately and safely to produce quality products; prepare materials by using appropriate techniques;	Experiment with a variety of hand-tools and techniques on metal, plastics and wood. Test small samples of natural and manufactured forms of wood for splitting, drilling, gluing, finishing. Repeat similar tests on metals and plastics.
	know how to cut, shape, join and form metal, plastics and wood appropriate to the properties and characteristics of each material; rearrange material by exploiting the material properties, i.e. casting, bending, forming, cutting, laminating; drilling, machining, and use of different fasteners and finishes;	Make pendants, key fobs, dog-tags or similar in wood, metal and plastics and compare the different techniques needed for manufacture and finishing. Compare the time taken to make each product and consider how workshop batch production techniques could be applied.

		Candidates should:	Possible learning experiences
			Test small samples of natural and manufactured forms of wood for splitting, drilling, gluing, finishing. Make a small laminated spatula.
	Use of appropriate machine tools, techniques and processes	use machine tools appropriate to the material and process to cut and remove waste safely; appreciate forming and reforming techniques for metal, plastics and wood, including laminating, casting, the use of a strip heater and the processes for vacuum forming; have knowledge of blow moulding, injection moulding and the use of CNC;	Produce a small container using a vac-form mould. Compare the manufacture of a plastic drinks bottle with a metal drinks can. Laminate in wood or line bend in plastics a passport size photo frame. Cast a small piece of jewellery in metal.
		know about and use appropriately machining processes including CNC where possible, for metals, plastics and wood, including drilling, boring, lathework, use of abrasive and cutting machines and hand power equipment;	Adapt a drilling machine safely so that holes can be drilled to a set depth when making dowel joints. Make use of CAM to produce repeatedly small parts, models or artefacts.
	Range of processes used for one-offs, batch and mass production	understand how products are produced for various markets in society and the types of production systems used, including mass, batch, flow-line and one-off production;	Research various production systems, e.g. commissioned designs, ready-made furnishings, self-assembly packs etc. Investigate the role played by CAD and CAM in each system.
	Selection of appropriate process and techniques for own product	select and use the most appropriate technique(s) and process(es) to make own product;	Collect data on workshop techniques, processes and materials and compile a notebook.
10.8	Systems and Control		
	Organisation of working environment	plan an efficient and safe working environment;	As a group activity, set up and plan the equipping of a workstation / workspace, paying attention to safety regulations.
	Basic production systems	identify common components used in structural and mechanical systems; use the following basic mechanisms: cams, levers, springs, gears, cranks and pulleys;	Make models of simple action mechanisms as a group activity to perform a pre-determined task (the use of clip together kits may speed the process).

	Candidates should:	Possible learning experiences
Design, use and connection of systems and sub-systems	understand the critical stages that influence the development of a product; design and set up a system with sub-systems to make a product, ensuring efficient use of time and energy and cost effectiveness;	Plan and produce flow charts to show logical and efficient sequences of work. Produce detailed working diagrams using CAD; use CAD to produce a materials list with costs.
Quality assurance by incorporating critical checks, feedback and testing procedures	understand and implement the concept of input-process-output and incorporate quality check feedback loops during the making of a product; apply appropriate checking procedures and tests to ensure quality control; reject faulty items;	Devise 'go, no-go' feedback loops to control quality. Test own designs against original specification; use gauges, jigs, templates and measuring systems to check for dimensional accuracy between set limits (vernier callipers, micrometer, test guage etc.).

10.9 Information and Communication Technology

Computer technology and communication techniques	use ICT as appropriate to research, gather, sort and present relevant material for the planning of tasks and generation of solutions;	Use word processing software to present briefs, specifications, evaluations and reports. Use the Internet for research. Create and use appropriate databases for research of resistant materials properties as a group activity. Use spreadsheets, charts and graphs to record, present and evaluate data. Prepare materials and costs lists using ICT. Produce a flow chart or planning schedule for a set task.
Usage of CAD for graphical techniques	use relevant graphical techniques, including CAD, to generate, develop, modify, enhance, model and communicate design ideas and production plans which can be understood by others; use CAD to present accurate drawings with sizes, using 3D and 3rd angle orthographic projections and to consider alternative forms and colours when developing ideas;	Use photocopies of line drawings to present different coloured presentations. Use a digital camera to record progress of on-site data.

		Candidates should:	Possible learning experiences
	Industrial usage of CAD and CAM	recognise the economic importance and benefits of using CAD/CAM in the production of resistant materials products; have knowledge of CAM for single item, batch and mass production;	Visit a factory/watch videos to show CAD/CAM in action in the industrial workplace. Design a simple paper/card maze which can be followed using co-ordinated or distances and angles.
10.10	Industrial Practices		
	Industrial and market awareness	investigate the world of design and manufacture and understand the key roles of client, designer, manufacturer and user in the development of products for industrial manufacture;	Research the roles of client, designer, manufacturer and user in the development of a resistant materials product; arrange a class talk and discussion or watch a video with a furniture/product designer. As a group activity, devise a survey to determine the popularity of a new product.
	Planning for industrial production	understand industrial production plans, including scheduling, job sequencing and processing, time-scales and costs of production; efficient methods of batch and volume production;	Design and make a paper model and produce production plans and a flow chart to enable someone else to make identical products in a given time. Review a product with the intention of reducing parts in order to simplify its construction.
	Industrial systems for batch or volume production	understand the commercial implications of manufacturing in quantity and the effects of introducing new technologies; understand that costs are related to physical, environmental and human resources (set-up time, money, labour, site, energy, overhead, etc.);	Visit a manufacturing plant and observe and analyse the process by which products are assembled and made. Compare the advantages and disadvantages of making yoghurt pots by vacuum forming or injection moulding.
	CAD/CAM in industry	understand that repetition of quality can be assured if CAD/CAM equipment is used to aid making; understand the economic and aesthetic benefits of standardising components and materials;	Simulate cell and assembly line production in a group session (e.g. produce a simple product like a printed paper/card container for a floppy disc or CD).

	Candidates should:	**Possible learning experiences**
	understand the application of CAM to single items and small batches; understand that identical parts, if made sequentially, minimise effort and assist accuracy;	
Computer Integrated Manufacture (CIM)	have a knowledge of Computer Integrated Manufacture (CIM);	Devise a simple group game to simulate CIM production (e.g. pick, place, machine, pick, place, assemble etc. This might involve individual members completing only one task each like making a folder or stapled card and putting it in an envelope, addressing it, stamping it, etc.).
Advertising and marketing	understand the importance of advertising resistant materials products; be aware of different distribution / wholesale and retail methods, i.e. shops, supermarkets, mail order catalogues and the Internet;	Suggest ways of advertising your product. Investigate different ways, including the Internet, of selling products and the target markets involved in each.
Legislation, symbols and conventions	understand the need for and use of appropriate legislation, symbols and conventions i.e. BSI, related to product safety, use and drawing conventions.	Collect information and symbols related to product safety and use. Investigate the information held on a product bar chart.

11

Short Course
Materials and Components

Candidates should build upon the National Curriculum Key Stage 3 Programmes of Study to develop a working knowledge of resistant materials and components appropriate to modelling, prototyping and manufacturing.

For the Short Course, candidates will only be examined on plastics and wood. However, metal and other resistant materials may be used in coursework.

		Candidates should:	**Possible learning experiences**
11.1	Materials: Plastics and Wood		
	Properties, characteristics and combinations of plastics and wood	recognise the working characteristics of common forms of plastics; understand the difference between thermoplastics and thermosetting plastics and their applications; know that plastics can be combined with other materials to create composites;	As a group activity, research common forms of plastics and compile a database, showing their characteristics and uses. Share this database with another school.
		recognise the working characteristics of the common forms of wood; know the difference between hardwoods and softwoods, and between natural wood and manufactured boards;	As a group activity, research the common forms of wood and compile a database, showing their characteristics and uses. Share this database with another school.
11.2	Components and adhesives		
	Selection of suitable components, pre-manufactured components and adhesives	know that many fixings are available to complete the functional aspects of a product, and use safely and effectively those which are appropriate;	Compile, with other students, a notebook, with information on fasteners, fixings and hinges, e.g. nuts, bolts, screws, nails, pins, rivets, star-washers, pegs, knobs, pulls, handles, KD, etc.
		know about and use appropriate adhesives for plastics and wood used in different environments;	Compile, with other students, information on common adhesives, e.g. cyanoacrylate (super-glue), PVA, hot-glue, plastics bonding (tensol), etc.

Design and Market Influences

Candidates should be taught how to analyse products and processes. They should consider how design and technology affects the manufacturer, user and environments, and the importance of health and safety issues.

		Candidates should:	**Possible learning experiences**
11.3	Product analysis		
	Analysis of designs and products	use product analysis techniques to make critical judgements about wood and plastics products; use design principles, taking into consideration form, function, shape, colour, materials, texture, component parts, decoration and aesthetic appeal to evaluate suitability for purpose; consider ergonomic data; use this information to review and modify their own designs;	Investigate existing products, such as chairs, kettles, lamps, toothbrushes, electric plugs, etc, as a group activity. Identify components parts and discuss why they were selected. Have a group brainstorming session to produce a selection of alternative ideas for these products.
11.4	Evaluation Techniques		
	Checking of design proposals against design criteria	understand the design specification criteria that influence the design of commercial products;	Make a check list of client, designer, manufacturer and user needs to test the performance of a particular product.
	Quality assurance of product(s), through testing and evaluation	devise simple tests to check the effectiveness of designs and evaluate against the specification criteria; use ongoing evaluation to make judgements and suggest improvements during designing and manufacture of own product;	Make paper models, mock-ups and prototypes as work progresses; test the quality of a product against its specification.
	Evaluation of quality of own product	ensure that own product is of a suitable quality for intended users; test against original specification and against quality of similar marketed products;	Evaluate own product against fitness for purpose criteria. Compare with commercial products and use results in own analysis and evaluations.

		Candidates should:	Possible learning experiences
11.5	Social, cultural, moral and environmental issues		
	Social and cultural influences on the consumer market	recognise the effects of social and cultural influences on product design;	Consider the role of the designer and the impact his/her designs may have on society and the environment.
		understand that differing circumstances can influence the requirements of designing for different users;	Investigate the heights of seats and tables in your classroom situation and compare them with those in a junior school.
		collect relevant data on ergonomics and use them as a resource;	Investigate access for wheelchair users in your school.
	Consumer choice	identify the factors involved in consumer choice; carry out market research to establish consumer preferences of target group(s);	Write questionnaire to establish consumer preferences and record these on spreadsheet/database.
	Consumer rights legislation, product maintenance and codes of practice	implement labelling of products in accordance with latest legislation and BSI; design for product maintenance;	Collect examples of safety, care and maintenance labels on resistant materials products and devise appropriate label(s) for own product.
	Moral and environmental issues	understand the moral and environmental issues associated with the production of artefacts, the harmful effects of industrial pollution and the crucial need to treat and dispose of waste materials correctly;	Research 'Green Technology' and brainstorm ways to lessen pollution by product design manufacturers. Consider effects of 'throw-away' maintenance, manufacturing and energy costs, packaging etc.
		appreciate the importance of conservation and protection of natural resources and the need to recycle products when possible;	Research the effects of exploitation of natural resources, e.g. use of timber, oil for plastics, etc.

	Candidates should:	Possible learning experiences
11.6 Health and Safety Issues		
Identification and reduction of hazards or risks when designing and manufacturing products	understand that safety for the product maker and product user is essential; assess hazard and risk factors in product manufacturing and choice and use of materials, components, tools, equipment; work with these safely and effectively;	Review safety practices in the workshop, e.g. safe use of hand and machine tools, use of goggles and other safety wear. Make posters and hazard warning notices for your workshop.
Safety in the working environment	recognise that safety of the workforce is essential; observe health and safety regulations when working with materials and equipment;	Consideration of environmental factors (wet floors, concrete floors, poor lighting etc.). Use the correct safety clothing at the appropriate time.
Safety for the consumer	ensure that the end product is safe for the consumer in accordance with Health and Safety regulations;	Investigate a range of suitable materials, components and surface treatments for making children's toys.

Processes and Manufacture

Candidates should be aware of and use as appropriate, manufacturing processes and techniques including CAD and CAM. They should have an industrial and commercial awareness and know about the processes involved in manufacturing for batch and mass production.

	Candidates should:	Possible learning experiences
11.7 Techniques and Processes		
Selection and usage of appropriate tools and equipment, including CAD and CAM, for plastics and wood	use a range of hand-tools for marking out and making; match and use machinery and equipment appropriate to the material accurately and safely to produce quality products; prepare materials, by using appropriate techniques;	Experiment with a variety of hand-tools and techniques on wood and plastics.
	know how to cut, shape, join and form plastics and wood appropriate to the properties and characteristics of each material (i.e. use of a strip heater, vacuum	Make a pendant, key fob or dog-tag in wood and plastics and compare the different techniques needed for manufacture and finishing.

		Candidates should:	Possible learning experiences
		forming processes, blow-moulding, injection moulding); rearrange materials by exploiting the material properties, i.e. bending, forming, cutting, laminating; drilling, machining, and use of different fasteners and finishes;	
	Range of processes used for one-offs, batch and mass production	understand how products are produced for various markets in society and the types of production systems used, including mass, batch, flow-line and one-off production;	Compare the production of clothes pegs in different materials, from small scale handmade to wooden batch produced and injection moulded plastic types.
	Selection of appropriate process and techniques for own product	select and use the most appropriate technique and process to make own product;	Collect data on workshop techniques, processes and materials.
11.8	Systems and Control		
	Organisation of working environment	plan an efficient and safe working environment;	As a group activity plan the equipping of a workspace, paying attention to safety regulations.
	Basic production systems	identify common components used in structural and mechanical systems; understand the following basic mechanisms: cams, levers, gears and pulleys;	Use models of simple action mechanisms as a group activity (the use of clip together kits may speed the process).
	Design, use and connection of systems and sub-systems	understand the critical stages that influence the development of a product; design and set up a system with sub-systems to make a product, ensuring efficient use of time and energy and cost effectiveness;	Plan and produce flow charts to show logical and efficient sequences of work.
	Quality assurance by incorporating critical checks, feedback and tests	understand and implement the concept of input-process-output and incorporate quality check feedback loops to analyse whether own system is working effectively and safely during the making of the product;	Suggest "go, no-go" feedback loops to control quality. Test own design against original specification; use gauges, jigs, templates and measuring systems to check for dimensional accuracy.

		Candidates should:	Possible learning experiences
11.9	**Information and Communication Technology**		
	Usage of ICT in planning, analysis, development and evaluation	use ICT to research, gather, sort and present relevant material for the planning of tasks and generation of solutions;	Use word processing software to present briefs. Use the Internet for research. Create and use appropriate databases for research of resistant materials properties as a group activity. Use charts, spreadsheets and graphs to record, present and evaluate data. Prepare material and cost lists using ICT; produce a planning schedule or flow chart for a set task using CAD.
	Usage of CAD for graphical techniques	use relevant graphical techniques, including CAD, to generate, develop, modify, enhance, model and communicate design ideas and production plans which can be understood by others; use CAD to present accurate drawings with sizes using 3D and 3rd angle orthographic projections;	Use photocopies of line drawings to present several product colourways. Use a digital camera to record progress of on site data.
11.10	**Industrial Practices**		
	Industrial and market awareness	investigate the world of design and manufacture and understand the key roles of client, designer, manufacturer and user in the development of products for industrial manufacture;	Research the roles of client, designer, manufacturer and user in the development of a resistant materials product; arrange a class talk with a product designer. As a group activity, devise a survey to determine the popularity of a new product.
	Planning for industrial production	understand industrial production plans, including scheduling, job sequencing and processing, time-scales and costs of production; have a knowledge of efficient methods of batch and volume production;	Design and make a paper model and produce production plans and flow chart to enable someone else to make identical products in a given time. Review a product with the intention of reducing parts in order to simplify its construction.

	Candidates should:	**Possible learning experiences**
Industrial systems for batch/ volume production	understand the commercial implications of manufacturing in quantity and the effects of introducing new technologies; understand that costs are related to physical, environmental and human resources (set-up time, money, labour, site, energy, overheads etc.);	Visit a manufacturing plant (or watch a video) and record the process by which products are assembled and made. Compare the advantages and disadvantages of making yoghurt pots by vacuum forming or injection moulding.
CAD/CAM in industry	understand that repetition of quality can be assured if CAD/CAM equipment is used to aid making; understand the economic and aesthetic benefits of standardising components and materials; understand the application of CAM to single items, small batches and mass production;	Simulate cell and assembly line production in a group work session that may possibly produce a simple product (a printed paper/card container for a floppy disc or CD).
Advertising and marketing	understand the role of advertising resistant materials products; be aware of different distribution systems;	Suggest ways of advertising your product. Investigate different ways, including the Internet, of selling products and the target markets involved in each.
Legislation, symbols and conventions	understand the need for and use of appropriate legislation, symbols and conventions, i.e. BSI, related to product safety, use and drawing conventions.	Collect information and symbols related to product safety and use. Investigate the information held on a product bar chart.

Key Skills and Other Issues

12 Key Skills – Teaching, Developing and Providing Opportunities for Generating Evidence

12.1 Introduction

The Key Skills Qualification requires candidates to demonstrate levels of achievement in the Key Skills of *Application of Number, Communication* and *Information Technology*.

The units for the 'wider' Key Skills of *Improving own Learning and Performance, Working with Others* and *Problem-Solving* are also available. The acquisition and demonstration of ability in these 'wider' Key Skills is deemed highly desirable for all candidates, but they do not form part of the Key Skills Qualification. Design and Technology, however, does offer a unique opportunity for candidates to provide evidence for all six Key Skills.

Copies of the Key Skills Units may be downloaded from the QCA Website (http://www.qca.org.uk/keyskills).

The units for each Key Skill comprise three sections:

A What you need to know.

B What you must do.

C Guidance.

Candidates following a course of study based on this specification for Design and Technology (Resistant Materials Technology) can be offered opportunities to develop and generate evidence of attainment in aspects of the Key Skills of *Application of Number, Communication, Information Technology, Improving own Learning and Performance, Working with Others* and *Problem-Solving*. Areas of study and learning that can be used to encourage the acquisition and use of Key Skills, and to provide opportunities to generate evidence for Part B of the units, are signposted below.

12.2 Key Skills Opportunities in Design and Technology (Resistant Materials Technology)

The broad and multi-disciplinary nature of Design and Technology makes it an ideal vehicle to help candidates develop their knowledge and understanding of all Key Skills and to produce evidence of their application. It should be noted that, while *Working with Others* is an important aspect of Design and Technology, the work candidates submit for coursework assessment must be their own.

Application of Number Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
N1.1 Interpret information from different sources	9.1, 10.1 – 10.10, 11.1 – 11.10
N1.2 Carry out calculations	10.4, 10.8, 10.9, 11.4, 11.8, 11.9
N1.3 Interpret results and present findings	9.1, 10.4, 11.4

Application of Number Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
N2.1 Interpret information from different sources	9.1, 10.1 – 10.10, 11.1 – 11.10
N2.2 Carry out calculations	10.4, 10.8, 10.9, 11.4, 11.8, 11.9
N2.3 Interpret results and present findings	9.1, 10.4, 11.4

Communication Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
C1.1 Take part in discussions	9.1, 10.4, 10.5, 11.4, 11.5
C1.2 Read and obtain information	9.1, 10,1 – 10.10, 11.1 – 11.10
C1.3 Write different types of documents	9.1, 10.1, 10.2, 10.5, 11.1, 11.2, 11.5

Communication Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
C2.1a Contribute to discussions	9.1, 10.4, 10.5, 11.4, 11.5
C2.1b Give a short talk	10.5, 11.5
C2.2 Read and summarise information	9.1, 10.1 – 10.10, 11.1 – 11.10
C2.3 Write different types of documents	9.1, 10.1, 10.2, 10.5, 11.1, 11.2, 11.5

Information Technology Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
IT1.1 Find, explore and develop information	9.1, 10.9, 11.9
IT1.2 Present information, including text, numbers and images	9.1, 10.9, 11.9

Information Technology Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
IT2.1 Search for and select information	9.1, 10.9, 11,9
IT2.2 Explore and develop information and derive new information	9.1, 10.9, 11.9
IT2.3 Present combined information, including text, numbers and images	9,1, 10.7, 10.9, 11.7, 11.9

Working with Others Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
WO1.1 Confirm what needs to be done and who is to do it	9.1, 10.1, 10.4, 11.1, 11.4
WO1.2 Work towards agreed objectives	9.1, 10.5, 10.10, 11.5, 11.10
WO1.3 Identify progress and suggest improvements	9.1, 10.5, 11.5

Working with Others Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
WO2.1 Plan work and confirm working arrangements	9.1, 10.1, 10.4, 11.1, 11.4
WO2.2 Work cooperatively towards achieving identified objectives	9.1, 10.5, 10.10, 11.5, 11.10
WO2.3 Exchange information on progress and agree ways of improving work with others	9,1, 10.5, 10.10, 11.5, 11.10

Improving own Learning and Performance Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
LP1.1 Confirm, short term targets and plan how these will be met	9.1
LP1.2 Follow plan to meet targets and improve performance	9.1
LP1.3 Review progress and achievement.	9.1, 10.4, 11.4

Improving Own Learning and Performance Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
LP2.1 Help set short-term targets and plan how these will be met	9.1
LP2.2 Use plan and support from others, to meet targets	9.1
LP2.3 Review progress and identify evidence of achievements	9.1, 10.4, 11.4

Problem Solving Level 1

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
PS1.1 Confirm understanding of given problems	9.1, 10.4, 10.7, 11.4, 11.7
PS1.2 Plan and try out ways of solving problems	9.1, 10.4, 10.7, 11.4, 11.7
PS1.3 Check if problems have been solved and describe the results	9.1, 9.2, 10.4, 10.8, 11.4, 11.8

Problem Solving Level 2

What you must do …	Signposting of Opportunities for Generating Evidence in Subject Content
PS2.1 Identify problems and come up with ways of solving them	9.1, 10.4, 10.7, 11.4, 11.7
PS2.2 Plan and try out options	9.1, 10.4, 10.7, 11.4, 11.7
PS2.3 Apply given methods to check if problems have been solved and describe the results	9.1, 9.2, 10.4, 10.8, 11.4,11.8

12.3 Further Guidance

More specific guidance and examples of tasks that can provide evidence of single Key Skills, or composite tasks that can provide evidence of more than one Key Skill are given in the AQA specification support material, particularly the Teachers' Guide.

13 Spiritual, Moral, Ethical, Social, Cultural and Other Issues

13.1 Spiritual, Moral, Ethical, Social, Cultural and Other Issues

The study of design and technology should contribute substantially to candidates' understanding of moral, ethical, social and cultural issues. Such issues underlie all design and manufacturing activities and are explicitly referred to in paragraphs 9.1 to 11.10 of the Subject Content. These issues will be tested in all coursework and the written paper.

13.2 European Dimension

AQA has taken account of the 1988 Resolution of the Council of the European Community in preparing this specification and associated specimen papers.

13.3 Environmental Issues

AQA has taken account of the 1988 Resolution of the Council of the European Community and the Report "*Environmental Responsibility: An Agenda for Further and Higher Education*" 1993 in preparing this specification and associated specimen papers.

Environmental considerations are important to the development of all designs and products. Awareness of these issues is specifically required in all sections of the Subject Content and will be tested in all components. See Section 14 for details of coursework requirements.

13.4 Citizenship

In the Key Stage 4 programme of study for Citizenship, *Developing skills of enquiry and communication* (Section 2) and *Developing skills of participation and responsible action* (Section 3) naturally parallel candidates' actions and approaches during project work. For example, the effects of certain products or manufacturing systems on society and the individual are matters of interest in design and technology, but they also touch on Section 2(a) of the Citizenship programme of study. Similarly, the designer needs to empathise with the end user (Section 3(a)) and in the process of designing needs to negotiate with clients or during market research to determine and achieve the desired ends (Section 3(b)).

13.5 Avoidance of Bias

AQA has taken great care in the preparation of this specification and associated specimen papers to avoid bias of any kind.

13.6 Health and Safety

Health and Safety impinges on all aspects of Design and Technology and requires consideration in terms of the maker, the manufacturer, the individual user and society at large. Health and Safety and related issues should therefore be an integral part of all teaching. They are expected to be considered in coursework and will also be tested in the written paper.

Centre-Assessed Component

14 Nature of the Centre-Assessed Component

14.1 The nature of Design and Technology

The distinguishing feature of any design and technology course is its practical nature. Knowledge and understanding is to be used to satisfy the needs of clients and consumers, and to understand manufacturing in industrial and commercial contexts.

For Resistant Materials Technology candidates will need to be familiar with a range of material areas and the use of CAD/CAM in production. The main materials for full course and short course project work are wood, metal and plastics, but other materials such as textiles, ceramics and glass are not excluded. Electronics may also be incorporated into project work although it should be relatively simple or include kits, bought components, prepared PCBs etc.

Underpinning all learning are the designing, communication and making skills which make use of knowledge and understanding in order to produce outcomes which satisfy a design brief.

Designing

Designing is a process based activity involving a problem which requires thinking, creating, inventing, predicting, experimenting, decision making, constant evaluation and, where necessary, modification. Designers develop an awareness of the opportunities and constraints placed upon them by the demands of users and producers, market forces and the effects their products can have on society and the environment.

Making

The realisation of design ideas is achieved by making products where a range of materials and media may be used. In design and technology, making activities may take many forms, ranging through early experimentation, testing and trials to a final marketable product. These provide opportunities for students to develop making skills as they aim to produce high quality outcomes.

Communication

Communication is an integral aspect of the whole process and it plays three major roles in any design and technology activity.

First, it enables the designer to visualise ideas and thoughts which permit detailed analysis. Second, it provides a record which can be referred to, adapted or refined as the process progresses. Third, it provides an evaluation for others of the development of ideas from the initial concept to the outcome.

The range of communication methods has become wider through the increasing use of ICT. All or any should be used *as appropriate to the task in hand* – notes, sketches, formal drawings, photographs, computer programs, oral communication and two or three dimensional representations are all relevant in particular circumstances.

14.2 The Coursework Project (Full and Short Courses)

Candidates are required to submit a single integrated project which consists of a *concise* design folder and/or appropriate ICT evidence and a 3-dimensional outcome. The whole activity should not exceed 40 hours for the Full Course and 20 hours for the Short Course.

GCSE Design and Technology involves increased emphasis on the industrial aspects of designing and making, particularly in the use of CAD/CAM, and on the wider effects of technological activity on society and the environment. These elements should therefore be evident in candidates' projects.

Candidates wishing to work with others may do so. Centres must ensure, however, that candidates select appropriate projects and provide individual and separate evidence of their own ability to design and make a quality product from start to finish.

Candidates may use the Board-set project outlines given in paragraph 15.2 below, formulate their own briefs, use briefs set by the centre. The centre is responsible for ensuring candidates attempt projects which satisfy the coursework requirements (see Section 15 below).

Candidates may enter for any other GCSE specification at the same sitting. However the submission of the same piece of coursework for more than one specification is prohibited.

14.3 Coursework Project (Short Course)

Quality designing and quality making are requirements for any Design and Technology project. With only 20 hours available for short course projects, however, it becomes particularly important that candidates use their time in the most profitable and effective way. The following advice is given to help teachers and candidates, but teachers will find fuller guidance in the Teachers' Guide.

The identification of a suitable task is a crucial factor in managing the short course project. Candidates undertaking short course projects should be guided by teachers to smaller, more focused or less complex problems than might be expected for a full course project. It should be noted, however, that the requirement for *quality* work is the same as for the full course, regardless of the scale of the work.

Candidates may use the Board-set project outlines given in Section 15.2 below, formulate their own briefs or use briefs set by the centre. The centre is responsible for ensuring candidates attempt projects which satisfy the coursework requirements (see Section 15 below).

Time management is another important element for successful short course projects. It is recommended that, before the project period begins, teachers provide a time plan for candidates, which allows realistic and proportionate time for the various stages and activities.

Time spent on an initial analysis of the problem will help to reduce or eliminate wasteful, unfocused research. Focused research can in turn reduce the time needed for a careful analysis.

Short course candidates are not expected to generate the same quantity of ideas as full course candidates, although the same level of creative ideas is still expected. The more focused analysis and research should help in producing a workable design solution more quickly.

Making skills represent two-thirds of the project marks and this should have been taken into account in the pre-planning stage. A quality product is still expected, but it does not need to be large or complex to gain high marks. The product does need, however, to include a variety of skills, techniques and/or processes that are completed to a high standard, and which overall satisfy the design objectives.

15 Guidance on Setting the Centre-Assessed Component

15.1 Project Outlines

Separate project outlines for each of the Full and Short Courses are given below for Design and Technology (Resistant Materials Technology). Centres may use these or adapt them to meet the needs of their candidates. Centres wishing to develop their own outlines for candidates should take note of the following guidelines.

The checklist below is given to help teachers ensure that the project outlines they prepare will meet both the needs of candidates and the requirements of the specification. Prior approval of centre devised project outlines is not required.

a. Does the outline encourage an integrated approach to designing and making and represent a *level of demand* appropriate to the individual candidate's ability?

b. Has the outline or problem been so written that candidates will be able to demonstrate the highest level of their ability in each Assessment Objective?

c. Where a single outline, e.g. design and make an educational toy, is to be presented to a number of candidates covering a wide ability range, has each candidate produced a brief for him/herself that will be challenging, but not daunting?

d.
- Does the project outline offer scope for candidates to consider:
- the effects and implications of technological activity (e.g. industrial, social, moral, cultural, economic, environmental factors);
- systems and control;
- provision for product maintenance;
- repetition skills (e.g. multiple production);
- use of CAD/CAM and ICT skills in general;
- product quality;
- health and safety in relation to the maker and others?

e. Are the resources, equipment, tools, materials and media available for the potential demands of the project?

f. Can the project be completed satisfactorily in 40 hours for the Full Course and in 20 hours for the Short Course?

g. Will the task permit sufficient supervision to enable the teacher to certify that the candidate's work is his/her own?

Where candidates work with others, it must be possible to identify the individual contribution of each candidate, so that the requirements in the specification are met.

h. Is the project outline free from political, ethnic, gender and other forms of bias?

15.2 List of Project Outlines

The following list of possible projects is provided as a starting point for candidates. Candidates may use them, adapt them or devise their own.

Full Course

1. A science museum giftshop sells quality gifts which vary in price and complexity to suit customers. Some of the gifts are animated or have moving parts to add interest. Design and make a range of matching or related products aimed at teenagers or adults that could be batch produced for sale in the giftshop.
2. A jewellery shop owner would like you to design and make an exciting display to sell sports watches. He would like you to produce a presentation board of your ideas before making the prototype, which is to be manufactured for all shops in the same chain. (You might use CAM to repeat a set of interlocking parts.)
3. A firm selling candles is looking for a new matching range of candle holders in a variety of resistant materials. Materials like concrete, glass or ceramics can sometimes be used to stabilise or add interest to the designs. A typical matching range would include holders for positioning on a table, wall and floor. Design and make sample sets for different occasions in different materials that could be batch produced.
4. Special events, like Christmas, Easter, Divali etc. are celebrated in different ways and have some interesting decorative models or 3D displays. A manufacturer of novelty items has asked you to design and make such a model or display which is three-dimensional, incorporates some movement, is of high quality and easy to assemble and disassemble.
5. A manufacturer of garden accessories and tools wishes to commission a new series of products that will be aimed at the higher quality end of the market. You are asked to design the range and make up several products, paying attention to style, colour, quality and ergonomic efficiency. Consideration should also be given to the promotion of the product, using special display packaging.
6. Toys or learning activity centres are always popular with young children. Those that are most effective usually have some type of action or moving parts built in. A manufacturer of this type of product has asked you to design and make a small range of toys, one of which has an action feature and a storage system in which to store these toys.

7. You have been commissioned by an Art Gallery to design a simple, single flat-pack seat for visitors which reflects an art theme and can be batch produced. If your designs are successful the gallery will consider having them produced in quantity to be sold at its shop. You are required to make a sample seat and produce designs for its packaging. Suggest how CAD and CAM could be used to cut the parts using a flat bed router.
8. A local road safety officer is working with a manufacturer to produce a range of road safety products including temporary, self supporting warning signs which can be stored flat or packed in a very small space when not in use. As a designer, you have been asked to submit your ideas and to make up prototypes of two items. You are to design for manufacturing in quantity.
9. You have been asked to design and produce a scaled prototype of a room screen divider that could be used in a chain of upmarket tearooms found mainly in the historic towns and cities of England. Use CAD to show the scaled designs.
10. Your school has been asked to submit work to be displayed at a Technology Exhibition. Design and make a range of futuristic 3D, slot together decorative items that illustrates the use of modern materials and techniques with particular emphasis on the use of CAD/CAM.
11. Schools are working very hard to promote Numeracy and Literacy. As a designer, present your ideas for a range of linked products that could be used to improve the skills of children in both of these areas. Produce a presentation board of your ideas using CAD, and make up the products, with a view to having them mass-produced by a local manufacturer.
12. Many young people with learning difficulties can benefit from activity products. Using a range of materials and techniques, design a product that will be of some educational value to a child with learning difficulties. Design and make the jigs that would be needed to manufacture ten of the products.

Short Course

1. A science museum giftshop sells quality gifts which vary in price and complexity to suit all customers. Design and make two matching or related products for sale in the giftshop that could be batch produced.
2. A jewellery shop owner would like you to design and make an exciting display to sell sports watches. He would like you to produce a presentation board of your ideas before making the prototype, which is to be manufactured for all shops in the same chain.
3. A firm selling candles is looking for a new matching range of candle holders in a variety of resistant materials. They should include holders for positioning on a table, wall and floor. Design and make a sample set that could be batch produced.
4. Special events, like Christmas, Easter, Divali etc. are celebrated in different ways and have some interesting decorative models or 3D displays. A manufacturer of novelty items has asked you to design and make such a model or display, which is three-dimensional, of high quality and easy to assemble and disassemble.

5. A manufacturer of garden accessories and tools wishes to commission a new series of products that will be aimed at the higher quality end of the market. You are asked to design and make up one of these products, paying attention to style, colour and ergonomic efficiency.
6. Toys or learning activity centres are always popular with young children. A manufacturer of this type of product has asked you to design and make a toy, which has an action feature.
7. You have been commissioned by an Art Gallery to design and make a simple, single flat-pack seat for visitors which reflects an art theme and can be batch produced. If your design is successful, the gallery will consider having it produced in quantity to be sold at its shop.
8. A local road safety officer is working with a manufacturer to produce a self supporting road warning sign which can be stored flat or packed in a very small space when not in use. As a designer you have been asked to put forward your ideas and to make up a prototype. You are to design for manufacturing in quantity.
9. You have been asked to design and produce a scaled prototype of a room screen divider that could be used in a chain of upmarket tearooms found mainly in the historic towns and cities of England.
10. Your school has been asked to submit work to be displayed at a Technology Exhibition. Design and make a futuristic 3D decorative, slot together item that illustrates the use of modern materials and techniques with particular emphasis on the use of CAD/CAM.
11. Schools are working very hard to promote Numeracy and Literacy. As a designer, present your ideas for a product that could be used to improve the skills of children in one of these areas. Produce a presentation board of your final idea before making the product, with a view to having it mass-produced by a local manufacturer.
12. Many young people with learning difficulties can benefit from activity products. Using a range of materials and techniques, design a product that will be of some educational value to a child with learning difficulties. The product is intended for batch production.

15.3 Support Material

Further examples of project outlines are included in the *Teachers' Guide*. Other material to support teachers will be produced for the annual teachers' meetings in the Autumn Term.

15.4 Coursework Advisers

Coursework Advisers will be available to assist centres with any matters relating to coursework. Details will be provided when AQA knows which centres are following the specification.

16 Assessment Criteria

16.1 Introduction

Teachers are required to determine grades separately for the designing and making elements of their candidates' coursework. To do this they must use their professional judgement in conjunction with the Assessment Criteria given in 16.3 below.

The level of demand of a design brief should influence the interpretation of the criteria. A successful project which makes great demands on skills, cognitive abilities and breadth and depth of knowledge should be more highly rewarded than a successful project with fewer demanding aspects.

Quality of work is more important than quantity and size. For this reason no estimate of the number of pages in a design folder or of the size and complexity of the product is given. Candidates should, however, plan to produce **concise** design folders and 3D outcomes which can reasonably be completed, in total, in no more than 40 hours for the Full Course and 20 hours for the Short Course. Candidates who do not complete their projects will be assessed on what they submit.

Candidates wishing to work with others may do so. Centres must ensure, however, that candidates select appropriate projects and provide individual and separate evidence of their own ability to design and make a quality product from start to finish.

The Assessment Criteria give guidance on the expected levels of achievement in Designing Skills and Making Skills for grades G-A. Teachers should note that A* does not feature as a coursework grade. A* grades are determined arithmetically on the total marks gained for the examination and are available only for candidates who have taken a Higher Tier paper.

As in any holistic assessment, a weak performance in one aspect of a candidate's work may be balanced by a strong performance in another. The principle of "best fit" should be applied when using these criteria.

An assessment of the quality of written communication in the design folder is to be made according to the criteria given in 16.4.

Centres are strongly recommended to provide candidates with feedback as their work progresses. This can not only encourage or reward the candidates, but it can also ease the assessment burden on teachers at the end of the coursework period.

Teachers should not record their comment on candidates' work; any written comments should be recorded on the Candidate Record Form.

16.2 Assessment Procedure

An assessment of a candidate's coursework should follow the pattern given below.

a. Guided by the criteria, assess the Designing Skills in terms of a whole grade, e.g. Grade C.

b. Refine that decision to High (H), Middle (M) or Low (L). A candidate only just achieving the required standard should be given the lowest assessment in the grade, (L), while a candidate just failing to reach the grade above should be given the highest in the grade (H).

c. Repeat a. and b. above for Making Skills.

d. Record the refined grade for Designing (e.g. High B = HB) and the refined grade for Making (e.g. Mid E = ME) on page 4 of the Candidate Record Form.

e. Using the *Project Assessment Matrix* (Appendix E), derive from the two grade decisions a single mark. For example, a High B for Designing and a Mid E for Making will produce a mark of 52.

f. Record the mark derived from the matrix in the space on page 4.

g. Using the criteria below, make an overall assessment of candidates' completed design folders for the quality of written communication (QWC) and determine a mark out of a maximum of 5 marks.

h. Record the QWC mark in the space provided on page 4.

i. Add together the Matrix mark and the QWC mark and write the total out of 95 in the Total Mark box.

j. The total mark for each candidate is to be recorded on the AQA mark sheet which will be sent to centres in the Spring Term.

16.3 Assessment Criteria

Candidates will have:

Grade	Designing	Making
G	1. gathered minimal research information; 2. provided little evidence of analysis of task or research; 3. produced a simple specification; 4. produced a solution, with rudimentary forward planning; 5. attempted a superficial evaluation of the outcome of their work; 6. demonstrated very limited communication, graphical and ICT skills; 7. provided little or no evidence of having considered industrial practices and systems and control.	1. used materials, components and equipment safely under close supervision; 2. produced references to the use of CAM where appropriate; 3. produced an undemanding or incomplete outcome; 4. some evidence of QA and QC.
F	1. used more than one source to gather research information; 2. made a limited attempt to analyse the task and the research material; 3. produced a generalised specification; 4. produced at least two proposals which satisfy parts of the specification; 5. used a proposal to produce the outcome with little development and forward planning; 6. superficially tested and evaluated their work against original intentions; 7. demonstrated limited communication, graphical and ICT skills; 8. provided limited evidence of having considered industrial practices and systems and control.	1. used materials, components and equipment correctly and safely (including CAM if appropriate); 2. produced a largely complete but undemanding outcome; 3. demonstrated accuracy and finish in some parts of the product; 4. produced evidence of some QA and QC.
E	1. used a limited number of sources to gather research information; 2. made a superficial analysis of the task and most of the research material; 3. produced a specification which reflects the most obvious features of the analysis; 4. produced some proposals which satisfy most of the specification; 5. used their proposals and relevant knowledge to produce a solution which satisfies most of the specification; 6. demonstrated some forward planning; 7. tested and evaluated some aspects of their work; 8. used some appropriate communication, graphical and ICT skills to convey design ideas; 9. provided limited evidence of having considered industrial practices and systems and control.	1. corrected working errors where necessary; 2. used materials, components, equipment and processes correctly and safely (including CAM if appropriate); 3. produced a largely complete and largely effective outcome; 4. demonstrated a fair degree of accuracy and finish in the overall product; 5. applied QA and QC broadly but superficially.
D	1. used several appropriate sources to gather relevant research information; 2. made a simple analysis of the task and all research material; 3. produced a specification which reflects most of the analysis; 4. produced several proposals which satisfy the specification; 5. used their proposals and relevant knowledge to develop a solution which satisfies the specification; 6. planned sequence of making activities; 7. tested and evaluated most aspects of their work and made some appropriate modifications; 8. used appropriate communication, graphical and ICT skills to convey design ideas; 9. provided limited evidence of having considered relevant industrial practices and systems and control.	1. appropriately corrected working errors; 2. used appropriate materials, components, equipment and processes correctly and safely (including CAM); 3. produced an effective and largely complete outcome; 4. demonstrated a reasonable level of accuracy and finish in the product.; 5. applied QA and QC broadly.

Candidates will have:

Grade	Designing	Making
C	1. used a variety of appropriate sources to gather and order relevant research information; 2. analysed the task and the research material; 3. produced a specification which reflects the analysis; 4. produced a range of proposals which satisfy the specification; 5. used their proposals and relevant knowledge to develop a detailed design solution which satisfies the specification; 6. planned a largely correct, and workable, sequence of main making activities; 7. tested, evaluated and modified their work throughout the process as appropriate; 8. used a range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others; 9. provided evidence of having considered relevant issues, industrial practices and systems and control.	1. recognised the need for and justified any changes or adaptations; 2. used appropriate materials, components, tools, equipment and processes (including CAM) correctly and safely; 3. produced a complete, effective and well-assembled outcome; 4. demonstrated a level of accuracy and finish in the product which satisfies most of the demands of the design solution; 5. clearly used QA and QC to control quality in most activities.
B	1. produced a well ordered and relevant range of appropriate research information; 2. thoroughly analysed the task and research material; 3. produced a detailed specification closely reflecting the analysis; 4. produced a wide range of proposals which satisfy the specification; 5. used their proposals and relevant knowledge of techniques, manufacturing and working characteristics of materials to develop a detailed design solution; 6. planned the correct sequence of making activities; 7. tested, evaluated and modified their work throughout the process as appropriate; 8. used an appropriate range of communication, graphical and ICT skills sufficient to convey ideas to themselves and others effectively; 9. provided evidence of having considered relevant issues, industrial practices and systems and control.	1. recorded and justified the need for any changes or adaptations; 2. used appropriate materials, components, tools, equipment and processes (including CAM) skilfully, correctly and safely; 3. made a complete, effective and skilfully-produced outcome; 4. demonstrated a level of accuracy and finish in the product which satisfies the demands of the design solution; 5. provided evidence of QA & QC throughout manufacture.
A	1. used a wide variety of appropriate sources to gather relevant research information; 2. analysed the task and the research material logically, thoroughly and effectively; 3. produced a detailed specification which focuses closely on the analysis; 4. produced a wide range of distinct proposals which satisfy the specification; 5. used one or more of their proposals and relevant knowledge of techniques, manufacturing and working characteristics to develop a detailed and coherent design solution; 6. produced a correct sequence of activities which shows where, why and how practical production decisions were made; 7. tested, objectively evaluated and effectively modified their work throughout the process as appropriate; 8. selected and skilfully used a wide range of communication, graphical and ICT skills which have helped to clarify their thinking and are sufficient to convey ideas to themselves and others effectively and precisely; 9. provided evidence that they have considered and taken account of relevant issues, industrial practices and systems and control.	1. recorded and justified the need for any changes or adaptations; 2. used appropriate materials, components, equipment and processes (including CAM) consistently correctly, skilfully and safely; 3. made a complete product of high quality; 4. demonstrated an ability to satisfy accurately and completely all the demands of the design solution; 5. thoroughly considered QA & QC and applied them consistently and successfully.

16.4 Quality of Written Communication

An assessment for the quality of written communication shown in the completed design folder is to be made separately from the designing grade. Use the criteria given below and record the mark on the Candidate Record Form.

Marks	
4–5	Information is clearly and logically presented using an appropriate form. The text is legible. Candidates spell, punctuate and use the rules of grammar accurately, enabling the meaning to be clearly understood.
2–3	Information is presented in an appropriate form. The text is legible. Candidates generally spell, punctuate and use the rules of grammar accurately, although there may be some errors. The meaning is clear.
1	Some of the information presented is in an appropriate form. Generally the text is legible. Although there are errors in spelling, punctuation and grammar, candidates' meaning can be understood.
0	Candidates have failed to reach the standard required for the award of a mark.

16.5 Evidence to Support the Award of Marks

Teachers should keep records of their assessments during the course, in a form which facilitates the complete and accurate submission of the final assessments at the end of the course.

When the assessments are complete, the grades and/or marks awarded under each of the assessment criteria must be entered on the Candidate Record Form, with supporting information given in the spaces provided. A specimen Candidate Record Form appears in Appendix B; the exact design may be modified before the operational version is issued and the correct year's Candidate Record Forms should always be used.

17 Supervision and Authentication

17.1 Supervision of Candidates' Work

Candidates' work for assessment must be undertaken under conditions which allow the teacher to supervise the work and enable the work to be authenticated. If it is necessary for some assessed work to be done outside the centre, sufficient work must take place under direct supervision to allow the teacher to authenticate each candidate's whole work with confidence.

17.2 Guidance by the Teacher

The work assessed must be solely that of the candidate concerned.

The Coursework Project is, however, as much a vehicle for teaching as for assessment. It is therefore expected that the teacher will need to give advice and assistance to individual candidates as part of normal teaching. This should be provided, but normally in such a way that candidates have alternative possibilities to explore, and their own decisions to make about accepting or using the information or advice provided by the teacher. There may, of course, be occasions when direct teacher intervention is necessary to ensure safety, to prevent costly waste of materials or to provide a less able candidate with positive assistance.

In any case where assistance given to an individual candidate goes beyond normal teaching, details must be recorded on the Candidate Record Form and taken into account in the assessment of coursework.

17.3 Unfair Practice

At the start of the course, the supervising teacher is responsible for informing candidates of the AQA Regulations concerning malpractice. Candidates must not take part in any unfair practice in the preparation of coursework to be submitted for assessment, and must understand that to present material copied directly from books or other sources without acknowledgement will be regarded as deliberate deception. Centres must report suspected malpractice to AQA. The penalties for malpractice are set out in the AQA Regulations.

17.4 Authentication of Candidates' Work

Both the candidate and the teacher are required to sign declarations confirming that the work submitted for assessment is the candidate's own. The teacher declares that the work was conducted under the specified conditions, and records details of any additional assistance.

18 Standardisation

18.1 Standardising Meetings

Annual standardising meetings will usually be held in the autumn term. Centres entering candidates for the first time must send a representative to the meetings. Attendance is also mandatory in the following cases:

- where there has been a serious misinterpretation of the specification requirements;
- where the nature of coursework tasks set by a centre has been inappropriate;
- where a significant adjustment has been made to a centre's marks in the previous year's examination.

After the first year, attendance is at the discretion of centres. At these meetings support will be provided for centres in the development of appropriate coursework tasks and assessment procedures.

18.2 Internal Standardisation of Marking

The centre is required to standardise the assessments across different teachers and teaching groups to ensure that all candidates at the centre have been judged against the same standards. If two or more teachers are involved in marking a component, one teacher must be designated as responsible for internal standardisation. Common pieces of work must be marked on a trial basis and differences between assessments discussed at a training session in which all teachers involved must participate. The teacher responsible for standardising the marking must ensure that the training includes the use of reference and archive materials such as work from a previous year or examples provided by AQA. The centre is required to send to the moderator the Centre Declaration Sheet, duly signed, to confirm that the marking of centre-assessed work at the centre has been standardised. If only one teacher has undertaken the marking, that person must sign this form.

A specimen Centre Declaration Sheet appears in Appendix B.

19 Administrative Procedures

19.1 Recording Assessments

The candidates' work must be marked according to the assessment criteria set out in sections 16.3 and 16.4. The marks and supporting information must be recorded in accordance with the instructions in Section 16.5. The completed Candidate Record Form for each candidate must be attached to the work and made available to AQA on request.

At the beginning of the course, centres are required to inform the AQA of the approximate number of candidates to be entered for the examination so that the appropriate number of Candidate Record Forms may be sent.

19.2 Submitting Marks and Sample Work for Moderation

The total component mark for each candidate must be submitted to AQA on the mark sheets provided or by Electronic Data Interchange (EDI) by the specified date. Centres will be informed which candidates' work is required in the samples to be submitted to the moderator.

19.3 Factors Affecting Individual Candidates

Teachers should be able to accommodate the occasional absence of candidates by ensuring that the opportunity is given for them to make up missed assessments.

Special consideration should be requested for candidates whose work has been affected by illness or other exceptional circumstances. Information about the procedure is issued separately.

If work is lost, AQA should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. AQA will advise on the procedures to be followed in such cases.

Where special help which goes beyond normal learning support is given, AQA must be informed so that such help can be taken into account when assessment and moderation take place.

Candidates who move from one centre to another during the course sometimes present a problem for a scheme of internal assessment. Possible courses of action depend on the stage at which the move takes place. If the move occurs early in the course the new centre should take responsibility for assessment. If it occurs late in the course it may be possible to accept the assessments made at the previous centre. Centres should contact AQA at the earliest possible stage for advice about appropriate arrangements in individual cases.

19.4 Retaining Evidence and Re–Using Marks

The centre must retain the work of all candidates, with Candidate Record Form attached, under secure conditions, from the time it is assessed, to allow for the possibility of an enquiry upon results. The work may be returned to candidates after the issue of results provided that no enquiry upon result is to be made which will include re-moderation of the coursework component. If an enquiry upon result is to be made, the work must remain under secure conditions until requested by AQA.

Candidates repeating the examination may carry forward their moderated mark for the coursework component once only and within a twelve month period.

20 Moderation

20.1 Moderation Procedures

Moderation of the coursework is by inspection of a sample of candidates' work. This will initially involve design folders for the sample being sent by post from the centre to the moderator appointed by AQA. Moderators will visit new centres to assess the practical outcomes. They will also visit other centres as needs dictate. The centre marks must be submitted to AQA and the sample of design folders must reach the moderator by the specified date in the year in which the qualification is awarded.

Following the re-marking of the sample work, the moderator's marks are compared with the centre marks to determine whether any adjustment is needed in order to bring the centre's assessments into line with standards generally. In some cases it may be necessary for the moderator to call for the work of other candidates. In order to meet this possible request, centres must have available the coursework and Candidate Record Form of every candidate entered for the examination and be prepared to submit it on demand. Mark adjustments will normally preserve the centre's order of merit, but where major discrepancies are found, AQA reserves the right to alter the order of merit.

20.2 Post-Moderation Procedures

On publication of the GCSE results, the centre is supplied with details of the final marks for the coursework component.

The candidates' work is returned to the centre after the examination with a report form from the moderator giving feedback to the centre on the appropriateness of the tasks set, the accuracy of the assessments made, and the reasons for any adjustments to the marks.

Some candidates' work may be retained by AQA for archive purposes.

Awarding and Reporting

21 Grading, Shelf-Life and Re-Sits

21.1 Qualification Titles

The qualifications based on this specification have the following titles:

AQA General Certificate of Secondary Education in Design and Technology (Resistant Materials Technology).

AQA General Certificate of Secondary Education in Design and Technology (Resistant Materials Technology) Short Course.

21.2 Grading System

The qualification will be graded on an 8 point grade Scale A*, A, B, C, D, E, F, G. Candidates who fail to reach the minimum standard for grade G will be recorded as U (unclassified) and will not receive a qualification certificate.

Candidates must be entered for either the Foundation Tier or Higher Tier. For candidates entered for the Foundation Tier, grades C–G are available. For candidates entered for the Higher Tier A*-D are available. There is a safety net for candidates entered for the Higher Tier, where an allowed Grade E will be awarded where candidates just fail to achieve Grade D. Candidates who fail to achieve a Grade E on the Higher Tier or Grade G on the Foundation Tier will be reported as unclassified.

21.3 Re-Sits

Individual components may not be retaken, but candidates may retake the whole qualification more than once.

21.4 Minimum Requirements

Candidates will be graded on the basis of work submitted for assessment.

21.5 Carrying Forward of Centre-Assessed Marks

Candidates re-taking the examination may carry forward their moderated coursework marks. These marks have a shelf-life which is limited only by the shelf-life of the specification, and they may be carried forward an unlimited number of times within this shelf-life.

21.6 Awarding and Reporting

The regulatory authorities, in consultation with GCSE awarding bodies, developed a revised Code of Practice for GCSE qualifications which were introduced in September 2000. This specification complies with the grading, awarding and certification requirements of the current GCSE, GCE and AEA Code of Practice April 2008 and will be revised in the light of any subsequent changes for future years.

Appendices

A Grade Descriptions

The following grade descriptors indicate the level of attainment characteristic of the given grade at GCSE. They give a general indication of the required learning outcomes at each specific grade. The descriptors should be interpreted in relation to the content outlined in the specification; they are not designed to define that content.

The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives (as in section 6) overall. Shortcomings in some aspects of the examination may be balanced by better performances in others.

Grade F When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates draw on and use various sources of information. They clarify their ideas through discussion, drawing and modelling; use their understanding of the characteristics of familiar products when developing and communicating their own ideas and work from their own plans, modifying them where appropriate.

Candidates work with a range of tools, materials, equipment, components and processes with some precision; check their work as it develops and modify their approach in the light of progress; test and evaluate their products, showing that they understand the situations in which their designs will have to function and are aware of resources as a constraint and evaluate their use of basic information sources.

Grade C When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates use a wide range of appropriate sources of information and strategies to develop ideas, responding to information they have identified. They investigate form, function and production processes and communicate ideas, using appropriate media.

Candidates recognise the needs of users and develop realistic designs. They produce plans that make use of time and resources to carry out the main stages of making products. They work with a range of tools, materials, equipment, components and processes, taking account of their characteristics, and organise their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials and components with precision.

Candidates adapt their methods of manufacture to changing circumstances, providing a sound explanation for any change from the initial specification. They select appropriate techniques to test and evaluate how their products would perform when used and modify their products in the light of ongoing evaluation to improve their performance. They evaluate their use of information sources.

Grade A

When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates seek out and use information to help their detailed design thinking, and recognise the needs of a variety of client groups. They are discriminating in their selection and use of information sources to support their work and they use a wide range of strategies to develop appropriate ideas, responding to information they have identified.

Candidates investigate form, function and production processes and communicate ideas using a variety of appropriate media. They recognise the different needs of a range of users when developing fully realistic designs. When planning, they make sound decisions on materials and techniques based on their understanding of the physical properties and working characteristics of materials. They work from formal plans that make the best use of time and resources; work with a range of tools, equipment, materials and components to a high degree of precision and make products that are reliable and robust and that fully meet the quality requirements given in the design proposal.

Candidates identify conflicting demands on their design, explain how their ideas address these demands and use this analysis to produce proposals. They identify a broad range of criteria for evaluating and testing their products, clearly relating their findings to the purpose for which the products were designed and the appropriate use of resources, and fully evaluate their use of information sources.

B Record Forms

Candidate Record Forms and Centre Declaration Sheets are available on the AQA website in the Administration area. They can be accessed via the following link http://www.aqa.org.uk/ admin/p_course.php

C

Overlaps with other Qualifications

Some overlaps exist between this and other Design and Technology specifications. The overlap is primarily in the design process and the scheme of assessment. As all specifications conform to the GCSE Design and Technology Subject Criteria, there are also overlaps of broad content, e.g. ICT, health and safety, systems and control, industrial and commercial practice.

DESIGN & TECHNOLOGY PROJECT ASSESSMENT MATRIX

MAKING SKILLS		DESIGNING SKILLS																							
		A			B			C			D			E			F			G			U		
		H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
A	H	90	89	88	86	85	84	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60
	M	88	87	86	84	83	82	80	79	78	76	75	74	72	71	70	68	67	66	64	63	62	60	59	58
	L	86	85	84	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56
B	H	82	81	80	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52
	M	80	79	78	76	75	74	72	71	70	68	67	66	64	63	62	60	59	58	56	55	54	52	51	50
	L	78	77	76	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48
C	H	74	73	72	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44
	M	72	71	70	68	67	66	64	63	62	60	59	58	56	55	54	52	51	50	48	47	46	44	43	42
	L	70	69	68	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40
D	H	66	65	64	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36
	M	64	63	62	60	59	58	56	55	54	52	51	50	48	47	46	44	43	42	40	39	38	36	35	34
	L	62	61	60	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32
E	H	58	57	56	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28
	M	56	55	54	52	51	50	48	47	46	44	43	42	40	39	38	36	35	34	32	31	30	28	27	26
	L	54	53	52	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24
F	H	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20
	M	48	47	46	44	43	42	40	39	38	36	35	34	32	31	30	28	27	26	24	23	22	20	19	18
	L	46	45	44	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16
G	H	42	41	40	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12
	M	40	39	38	36	35	34	32	31	30	28	27	26	24	23	22	20	19	18	16	15	14	12	11	10
	L	38	37	36	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8
U	H	34	33	32	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4
	M	32	31	30	28	27	26	24	23	22	20	19	18	16	15	14	12	11	10	8	7	6	4	3	2
	L	30	29	28	26	25	24	22	21	20	18	17	16	14	13	12	10	9	8	6	5	4	2	1	0