



## **National Course Assessment**

### **Automotive Engineering Intermediate 2 C01S 11**

#### ***Practical Assignment***

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These Arrangements for C01S 11(Automotive Engineering Intermediate 2) are valid for diet 2009 and 2010 **only**. This Course will be removed from the NQ Catalogue after diet 2010. The Units making up this Course will be retained in the catalogue.

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# Contents

1. Practical Assignment overview
2. Recommended entry
3. Practical Assignment brief
4. Outcome coverage
5. Subject/occupationally-related knowledge and skills
6. Candidate evidence requirements and allocation of marks
7. Marking and grading for Practical Assignments with visiting assessment
8. Ensuring evidence is authentic
9. Investigating tools
10. Materials and resources
11. Core Skills



# 1. Practical Assignment overview

This national project specification provides details of the assessment tasks and the evidence which candidates are expected to produce. It contains a degree of choice in terms of the way the Practical Assignment is taken forward by centres so that it fits available resources and candidates' interests and personal strengths.

The Practical Assignment is not concerned exclusively with practical activity, but is designed to emphasise skills relating to the application of practical skills, and related knowledge and understanding to a situation that involves task management.

Candidates are provided with a brief and are expected to demonstrate attainment relating to:

- interpreting the brief
- gathering information to clarify the brief
- deciding on a product, or activity/event, or performance to develop
- selecting and managing materials/resources
- producing the product, or organising the activity/event or delivering the performance
- evaluating the product or activity/event or performance (through feedback)

Evidence requirements are as follows:

- a plan of action
- evidence of a product or an organised activity/event or a performance
- evidence which documents the processes underpinning the practical hands-on activity
- evidence showing an evaluation of the Practical Assignment

Copies of Units are available from the Scottish Qualifications Authority Sales Section, telephone 0141-242 2168; fax 0141-242 2244; e-mail [sales@sqa.org.uk](mailto:sales@sqa.org.uk)

The Scottish Qualifications Authority Helpdesk is available on 0141-242 2214.

## **Note:**

Please note that individual project specifications should be read in conjunction with the relevant *Arrangements for Project-based National Courses*. The *Arrangements* document provides an overview of the project-based National Courses for the given SQA. The guidance document, *Project-based National Courses: procedural guide for centres*, which gives full details of operational procedures, should also be used.

This specification forms part of Section F of the *Arrangements* document. It can be used until such a time that SQA advises centres that a new or revised version is available and should be used in its place.

## 2. Recommended entry

We strongly advise that candidates should have completed the Units in the National Course prior to embarking on the Practical Assignment. However, there may well be candidates who, for whatever reason, choose to undertake the Practical Assignment on a stand-alone basis. Any such candidates who have not completed or embarked upon the Units of the National Course *prior* to undertaking the external assessment should have demonstrated attainment in and/or be working towards the following qualification:

- PDA in Motor Vehicle Systems (National Unit based) post August 1998

Centres should ensure that every candidate has the necessary level of knowledge, experience and skills (both in motor vehicle repair and in planning and evaluating) to complete the Practical Assignment. It is stressed that undertaking the Units is the best preparation for the Practical Assignment.

Candidates who achieve the National Course assessment will not be certificated for the Course until they have successfully completed the component Units.

### 3. Practical Assignment briefs

Candidates should choose one of the following briefs. Both briefs have a number of common activities and tasks and a number specific to the brief chosen.

#### **Briefs 1 and 2 – common activities and tasks**

The candidate should select either brief 1 or brief 2. Whichever brief is chosen, the candidate must:

- plan the order of activities/tasks, based on realistic timescales and within the overall timescale
- keep a log book (using an appropriate format)
- identify and list resources
- identify correct procedures from manufacturer's data and operational procedures (eg CD-ROMs, instruction manuals)
- follow identified procedures
- evaluate how the project was carried out

A number of tasks are to be carried out on a motor vehicle. In addition to the specific tasks in the selected brief (see below), the candidate must, whichever brief is chosen :

- complete a job card/worksheet for each of the practical tasks
- from manufacturer's data, calculate engine capacity and compression ratio
- describe, using diagrams if appropriate, where wear and/or failure might occur on 5 main engine mechanical components and identify the form this wear/failure might take – this should be done in relation to the engine(s) on which the candidate is working

#### **Brief 1 – specific tasks**

- Demonstrate the procedure for the removal and refitting of a cooling system water pump then pressure test the system for leaks.
- Demonstrate the procedure for the removal and refitting of an oil pressure switch and while it is removed test and compare the oil pressure with manufacturer's data.
- Demonstrate the procedure for the removal and refitting of one of the following main engine components: camshaft, rockershaft or a valve timing drive mechanism.
- Draw a line diagram showing the layout of the main components from engine through to the driven wheels and identify 6 components on the diagram.

#### **Brief 2 – specific tasks**

- Demonstrate the procedure for the removal and refitting of a cooling system water pump then pressure test the system for leaks.
- Demonstrate the procedure for the removal and refitting of one of the following main engine components: camshaft, rockershaft or a valve timing drive mechanism.
- Test one of the following ignition components: trigger, coil or module and compare the test results with recommended specifications and report on the component condition.

## 4. Outcome coverage

Course Structure		
Unit title	Credit value	Unit number
Automotive: Cooling System	1.0	EG3G 11 (2210208)
Automotive: Engine Mechanical	1.0	EG3H 11 (2210218)

and either Option 1

Automotive: Introduction to Vehicle Layout	0.5	EG3M 11 (2210258)
Automotive: Lubrication Systems	0.5	EG31N 11 (2210268)

or Option 2

Automotive: Ignition Systems	1	EG3K 11 (2210238)
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All Practical Assignments for project-based National Courses cover a minimum of two thirds of the Outcomes from the component Units. For this project these are:

### Unit: Cooling System

1. identify engine cooling system components
3. demonstrate the procedure for testing, removal and fitting of main engine cooling system components

### Unit: Engine Mechanical

1. identify main engine components
4. explain and calculate from given data engine capacity and compression ratio
5. demonstrate the procedure for removing and fitting a main engine component

### Option Units

Coverage of Outcomes in the optional Units will depend on which brief and therefore on which tasks are chosen.

#### Option 1 (brief 1)

### Unit: Introduction to Vehicle Layout

1. identify the layout of the main body/chassis components of a vehicle
2. identify the layout of the main mechanical and electrical components of a vehicle
3. outline the purpose of the main mechanical and electrical components of a vehicle

### Unit: Lubrication Systems

1. identify engine lubrication and crankcase ventilation system components
2. explain the operation of the engine lubrication and crankcase ventilation system components
3. identify main engine lubrication and crankcase ventilation system components that are subject to wear and/or failure
4. demonstrate the procedure for testing, removal and fitting of an engine lubrication

## **Option 2 (brief 2)**

### **Unit: Ignition Systems**

1. identify the main components of an electronic ignition system
2. explain the operation of selected components of electronic ignition systems
3. indicate electronic ignition system components that are subject to problems and/or failure
4. demonstrate the procedure for testing, removal and fitting of electronic ignition system components

It is strongly advised that candidates should have completed the assessments for the individual component Units before undertaking this National Course assessment.

## 5. Subject/occupationally-related knowledge and skills

The Practical Assignment allows candidates to develop and apply skills in:

- performing calculations on engine data
- identifying components within vehicle systems
- removing and replacing components
- identifying wear and/or failure within vehicle systems

It also allows candidates to further develop and apply knowledge of:

- the inter-relationship between vehicle systems
- how to access relevant manufacturer's data and information on procedures
- the application and use of IT to access CD-ROMs
- computer software

Each of the above points is in relation to the vehicle system that the candidate chooses.

## 6. Candidate evidence requirements and allocation of marks

### General information

The three stages of the Practical Assignment for all project-based National Courses at Intermediate 2 are:

- planning
- developing
- evaluating

Here we describe evidence requirements which apply to each of the three stages of the Practical Assignment for all project-based National Courses at Intermediate 2. Where there are any specific evidence requirements relating to this Course, these are given later in this section.

### Planning

Candidates must produce a 500 word (or equivalent) plan of action. The plan should include an introduction and a main body. Centres should ensure that candidates either already have, or are taught, the necessary skills to devise their own plan before they start the project.

For the introduction of the plan, candidates should:

- provide a rationale for selecting a particular brief
- interpret the brief
- gather information to clarify the brief
- define the aims and objectives of the Practical Assignment

For the main body of the plan candidates should:

- identify information sources
- identify materials and resources
- establish timescales for completion of stages of the Practical Assignment

The plan of action should be produced in a supervised environment although candidates may carry out the preparation beforehand. Candidates may communicate with each other when producing their plans of action but each plan must be tailored to the candidate's own project and the action points should relate to the work to be carried out by the individual candidate.

The work produced should always be the candidate's own. However, teachers/lecturers are expected to provide candidates with advice, guidance and constructive criticism as necessary when they are devising their plans. It is important to note that, as the plan underpins the rest of the project, centres should ensure that no candidate proceeds to the development stage until the candidate has devised a plan that is potentially workable. The level of support that candidates need to devise a viable plan of action will of course vary from candidate to candidate. Centres should indicate the level of support given to each candidate on the flyleaf for the project provided by the SQA. This should not inhibit centres from providing constructive comment nor the candidate from acting on their own initiative and taking on board the advice. In some cases however, if the level of support and intervention given is more than that which would normally be seen as reasonable, the authenticity of the candidate's work may be called into question. If the level of input needed from the teacher/lecturer is above normal (for example, the poor

quality of the plan would mean that the project would be unworkable if the plan was not revised) then candidates cannot score more than 20 of the 40 marks allowed for the planning stage.

## **Developing**

Candidates must provide evidence that:

- testifies to the quality of the hands-on practical activity
- documents the processes underpinning the activity

Specific evidence requirements for this Course are given later in this section.

All of the evidence should be produced in a supervised environment. Candidates may communicate with each other but should produce work which can be clearly attributed to the candidate as being his or her own.

## **Evaluating**

Candidates must produce an extended evaluation report which should:

- provide a brief summary of what the assignment was about
- review and update the action plan in the light of experience
- assess the effectiveness of the action plan
- summarise any unforeseen events and how they were handled
- identify knowledge and skills which have been gained and/or developed
- assess the strengths, weaknesses and quality of any hands-on activity
- assess the effectiveness of the research methods used
- determine to what extent the assignment met the original brief

The evaluation report should be 500 words (or equivalent) at Intermediate 2. Candidates may carry out the preparation for the report beforehand.

Candidates at Intermediate 2 should be allowed up to one hour 30 minutes to complete an evaluation (including the summary).

Candidates should be allowed to take one side of an A4 page of notes (maximum 200 words or equivalent) which they have prepared, into the room with them. They should not be allowed to take a draft of the evaluation report into the room with them. The centre has the responsibility for ensuring that the notes brought in are the candidate's own work.

For this activity the accommodation should be arranged to reflect centre-invigilated conditions and candidates should not be allowed to communicate with each other in any way.

## Specific evidence requirements and assessment arrangements for the Practical Assignment for Automotive Engineering at Intermediate 2

This Practical Assignment is subject to type 2 visiting assessment.

<b>Planning</b>	
Evidence:	Plan of action 500 words <i>or</i> equivalent (40 marks)
Conditions of National Course assessment:	Supervised
Who assesses it?	Centre and SQA – plan for sample of candidates to be sent to SQA for marking*

<b>Developing</b>	
Evidence:	For hands-on activity: Record of observation/checklist  For processes underpinning the activity: Portfolio  (120 marks in total for this stage)
Conditions of National Course assessment:	Supervised
	Portfolio Hands-on activity  Subject to type 2 visiting assessment*

<b>Evaluating</b>	
Evidence	Evaluation report – including summary 500 words <i>or</i> equivalent (40 marks)
Conditions of National Course assessment:	Centre-invigilated
Who assesses it?	Centre and SQA — reports for sample of candidates to be sent to SQA for marking*

It is important that candidates know that they will be penalised for submitting evidence that significantly exceeds the stated word count.

\* Centres should refer to *Project-based National Courses: procedural guide for centres* for full procedural details of type 2 visiting assessment.

## Specific additional information and requirements

### Automotive Engineering: planning stage

Each candidate should be given a schedule of work to be carried out on one or, preferably, more vehicles (if more than one vehicle were involved, this would allow more flexibility in planning). Ideally this should include some investigative work, eg testing components/systems to identify faults. The work should be chosen to ensure good coverage of the systems/components in the Units. Where appropriate, candidates may present part of their plan using diagrams.

The candidate should undertake a preliminary investigation to clarify the brief and establish exactly what is required, and should then list all the separate jobs to be done. They would then set out a work plan, showing each separate task, the resources required, and the order in which the tasks should be carried out.

Candidates might find it an advantage to co-operate with other candidates for the planning stage but each candidate must ensure that they provide all the evidence needed for this stage on an individual basis.

Each candidate must produce a plan of action which contains:

- an introduction (as detailed earlier in this section) 10 marks
  
- a main body which:
  - indicates the sources of information they intend to use
  - shows how the activities planned fit into the overall timescale for the project
  - details the resources and tools required for completing the tasks and shows where/how these fit into the project plan

30 marks

**Total: 40 marks**

### Automotive Engineering: developing stage

The recommended sequence of events would be as follows:

1. Appropriate sources of information would be consulted, eg manufacturer's parts lists, manuals, CD-ROMs, software packages. The candidate should gather information which would enable him/her to calculate the total engine capacity. The candidate should prepare written/diagrammatic answers to the questions asked in the brief. When obtaining the total engine capacity, the candidate should show all data, formulae and the stages followed.
2. Actual work on the vehicles/components would be undertaken.
3. Each candidate must keep a log (in any appropriate format) of all that they do and must monitor and review day-to-day and overall progress against their plan of action.

Evidence should be collated and presented in a portfolio. This should contain:

**Practical activities**

- record of observation/checklist

60 marks

**Log book (in appropriate format)**

and

- copy of written answers to questions

40 marks

**Supporting documentation**

- calculations undertaken
- job cards
- details of time allocation
- details of procedures, including technical data used to carry out the task
- details of information sources used

20 marks

**Total: 120 marks**

**Automotive Engineering: evaluating stage**

Candidates should make use of the log to draw up the notes they will use to write the evaluation report.

They should make reference to:

- how well or otherwise the work has gone
- whether the work has been carried out on schedule or not
- any unexpected problems which occurred and how were these dealt with
- whether any co-ordination of group work has been successful or otherwise
- any changes made to the original work plan
- ways in which the planning could have been improved
- how own work could have been done better
- the comparison between time actually taken to do practical tasks on the engine and manufacturer's time or time given by teacher/lecturer

**Total: 40 marks**

## 7. Marking and grading for Practical Assignments with visiting assessment

The assessment evidence for this Practical Assignment is subject to visiting assessment by SQA. Centres are strongly advised to read *Project-based National Courses: procedural guide for centres* for further information about the processes and procedures for visiting assessment.

Visiting assessors will be trained by SQA to apply national standards. As candidate evidence becomes available exemplars will be issued to centres as guidance.

Centres must mark all three stages of the Practical Assignment for each individual candidate and decide on the mark, band and grade they think should be given to that candidate. SQA will provide detailed marking instructions for centres. The SQA visiting assessor will mark all three stages for a sample of candidates

As the Practical Assignment will be marked by centres, centres do not need to provide estimates for Practical Assignments with visiting assessment. Nor should there normally be any need for appeals as the SQA visiting assessor and the centre should have negotiated and resolved any differences of opinion during the visiting assessment process.

The internal assessor uses the same processes for deciding on marks, grades and bands as any SQA visiting assessor. The final assessment decision must be based on accurate assessment of all the available candidate evidence. No candidate will be certificated for these Practical Assignments until the assessment decision is in line with national standards.

The total mark for the Practical Assignment is 200 (this makes it easier to discriminate effectively between performances of candidates across the three stages of the assessment). These marks will be allocated as follows in *Table A*.

*Table A*

<b>Practical Assignment Stage</b>	<b>Assessment Evidence</b>	<b>Mark Allocation</b>
Planning	Plan of action	40
Developing	Evidence arising from the hands-on practical activity and from documenting the underpinning processes involved	120
Evaluating	Extended evaluation report	40

SQA will provide detailed marking instructions in addition to the information given earlier in this specification. SQA will also provide a form (Attendance Register, Form Ex 6) for submission of marks.

The internal assessors must:

- Mark each stage of the project using the marking instructions provided by the SQA.
- Maintain a detailed record of the marks given for each of the three stages (for internal moderation purposes and for SQA visiting assessor).
- Add the marks for each stage for the candidate to give a total mark out of 200.
- Divide that total mark by 2 to give a percentage.
- Convert the overall % mark for each candidate into a grade and band using *Table B*.

Table B

<b>% Mark range</b>	<b>Grade</b>	<b>Band</b>
85–100	A (upper)	1
70–84	A (lower)	2
65–69	B (upper)	3
60–64	B (lower)	4
55–59	C (upper)	5
50–54	C (lower)	6
45–49	Fail (near miss)	7
40–44	Fail	8
Less than 40	Fail	9

- Check the grade given to candidate against the grade descriptions given in *Table C*, using the grade descriptions as a touchstone. The final grade should reflect the grade descriptions.
- Provide marks, bands and grades for each candidate

Although it is possible for a candidate to be given a band 7, 8 or 9 which would be classified as 'fail', this would not appear on the certificate. If a band 7 is given the centre should ensure that it gives feedback to the candidate for remediation purposes.

## Grade Descriptions for a Practical Assignment at Intermediate 2

*Table C*

A	B	C
<b>Content and scope appropriate for Higher</b>		
<b>And looking at the evidence as a whole:</b>	<b>And looking at the evidence as a whole:</b>	<b>And looking at the evidence as a whole:</b>
<p><b>A Practical Assignment at Grade A:</b></p> <ul style="list-style-type: none"> <li>• produces high quality, clearly inter-related documented and process or product-related evidence for the three essential phases of planning, developing and evaluating</li> <li>• is an exercise to which candidates have brought an accurate and enthusiastic interpretation of the practical assignment brief</li> <li>• is tightly structured, relevant to the content of the units and displays a high level of subject/occupational expertise</li> <li>• applies integrated and consolidated knowledge, understanding and skills effectively and consistently from the Course Units to situations and/or design specifications with varying degrees of complexity</li> </ul>	<p><b>A Practical Assignment at Grade B:</b></p> <ul style="list-style-type: none"> <li>• produces good quality, inter-related documented and process or product-related evidence for the three essential phases of planning, developing and evaluating</li> <li>• is an exercise to which candidates have brought an accurate and fairly innovative and enthusiastic interpretation of the practical assignment brief</li> <li>• is well structured, relevant to the content of the Units and displays a good level of subject/occupational expertise</li> <li>• applies integrated and consolidated knowledge, understanding and skills fairly effectively and consistently from the Course Units to situations and/or design specifications with varying degrees of complexity</li> </ul>	<p><b>A Practical Assignment at Grade C:</b></p> <ul style="list-style-type: none"> <li>• produces adequate, fairly well inter-related documented and process or product-related evidence, for the three essential phases of planning, developing and evaluating</li> <li>• an exercise to which candidates have brought an acceptable interpretation of the practical assignment brief</li> <li>• is reasonably well structured, relevant to the content of the Units and displays an adequate level of subject/occupational expertise</li> <li>• applies integrated and consolidated knowledge, understanding and skills from the Course Units with some lack of continuity and consistency</li> </ul>

## Internal moderation

The internal moderator should:

- Oversee the internal moderation process to ensure consistency of judgement or *reliability of assessment*. This process will vary according to the nature of the evidence and the number of assessors and sites. It is likely to involve agreement trials and/or Marker standardisation. The internal moderator should normally be a specialist in the subject. (It may be helpful in the first few years of these project-based National Courses to do a cross-subject moderation of samples of like parts such as the plans of action and evaluation reports. Such additional cross-subject internal moderation is however not mandatory.)
- Ensure that all candidates have been fairly treated. For example, some candidates may have produced more fully integrated projects than others but have similar overall marks/bands; this may lead to a reconsideration of marking of the individual components for some candidates.
- Oversee the finalisation of marks, bands and grades and submission of candidate evidence for sample candidates.

(See *Guide to Assessment and Quality Assurance for Colleges of Further Education* or *Guide to Assessment and Quality Assurance for Secondary Schools*, SQA June 1999 for further information relating to internal moderation. A guide to good practice for internal moderation is also under development.)

## Submitting candidate evidence to SQA

Specific information on this part of the process is available to centres in *Project-based National Courses: procedural guide for centres*. Where materials have to be sent to SQA for marking you will be provided with any necessary packaging materials.

The following must be sent to SQA for this Practical Assignment for a sample of candidates:

- plan of action
- evaluation report

**Note:** In addition, centres will be expected to submit all notes used by the sample of candidates during write-up sessions.

## 8. Ensuring evidence is authentic

The following methods should be used to ensure that the evidence produced by a given candidate is all their own work. These methods are for use outwith any situation where the candidate's work will be produced under supervised or invigilated conditions already stipulated by the SQA (eg the plan of action and the evaluation).

- **Logbook/diary (in appropriate format)**  
A log book/diary should be used to ensure that work produced by the candidate, when working unsupervised or not under invigilated conditions, is genuine and all their own work. Project tutors should regularly discuss and review the log book/diary content with the candidate; on completion of each discussion and review session they should authenticate the candidate's work by signing and dating a progress report

## 9. Investigating tools

Candidates are expected to make use, as appropriate, of the following information sources during the Practical Assignment:

### **Information sources**

- workshop manuals
- technical/professional/trade journals
- data sheets
- Internet
- CD-ROMs
- software
- videos
- demonstrations
- motor shows
- teaching and lecturing staff

### **Accessing information**

Most of this information could be available through, for example:

- section/college/university library or inter-library

## References supplied by candidates

Please note that it is legitimate for candidates to quote from information sources such as articles (in print or stored electronically) or books. Such quotations must be placed within quotation marks followed by the reference, including the chapter and or section and page number. Texts referred to should be included in the bibliography.

The following format for references should be used:

### Books

Author's surname, followed by forename or initials, title of book (in italics or underlined), place of publication, name of publisher, year of publication.

For example:

Barton, T, *Fieldwork for Geographers*, London: Edward Arnold, 1985

### Articles

Author's surname, followed by forename or initials, title of the article (in inverted commas), title of the periodical (underlined or in italics), volume number, part number, year of publication, page number(s).

For example:

Sugden, DE, 'Perspectives on the Glaciation of Scotland', *SAGT Journal No. 17*, 1988, pp 4-10.

### Maps and Diagrams

Sources should be given on each map and diagram and should be stated in the same format as for books and articles, as appropriate.

For example:

Microsoft Encarta 1997

### Internet

If a website has been used then the address (URL) must be disclosed.

For example:

[www.sqa.org.uk](http://www.sqa.org.uk)

**It is important to note that unacknowledged copying will be penalised, usually by cancellation of the candidate entry.**

## 10. Materials and resources

Candidates are expected to select from the following materials and resources as appropriate:

- the normal requirements for delivering Units in automotive engineering eg:
  - workshop equipment
  - specialist tools
  - hand tools
  - personal protection equipment

In addition, the following are also essential:

- recommended removal/reassembly procedures
- recommended standard time schedules
- technical data
- test procedures
- CD-ROMs

## 11. Core Skills

It is possible that successful attainment of this course would lead to the automatic certification of particular Core Skills or Core Skill components. A final statement will be provided at a later date by the Scottish Qualifications Authority once full validation procedures are complete.

It should be noted that this project, in common with other project-based Courses, follows the planning/developing/evaluating cycle. As a result of this it is likely that successful completion of the project will lead to automatic certification of the Problem Solving Core Skill at Intermediate 2. The final Core Skills statement, as above, will confirm this.