

**Scottish Group Award Specifications**

|         |                                |       |                |
|---------|--------------------------------|-------|----------------|
| SGA in: | <b>Engineering: Electrical</b> |       |                |
| Level:  | <b>Higher</b>                  | Code: | <b>G5AD 12</b> |





# Rules for credit contribution

## Important Note\* Achievement above the minimum requirements

The specification shows the **minimum** requirements for this SGA. Where possible, centres may wish to encourage candidates to exceed this minimum. Candidates achieving above the minimum specification will have this achievement recorded on their Scottish Qualifications Certificate. For example the following can be achieved above the minimum requirement:

- Core Skills at levels above those specified
- more National Courses and Units at Higher instead of the credits at Intermediate 2
- National Course grades, eg grade A or B instead of grade C
- more than the required three National Courses, in which case each additional course completed counts as four credits

## Hierarchies

- courses and units can be substituted by those with the same title at a higher level, eg Mathematics 1 (Int 2) can be substituted by Mathematics 1 (H) (See Section C)

## Double counting

- courses and units with the same title at different levels cannot both contribute credits to the SGA, eg **either** Mathematics 1 (Int 2) **or** Mathematics 1 (H)
- courses at the same level in the same subject cannot both contribute credits to the SGA, eg **either** the National Course in Technological Studies at Higher or SCE Higher Grade Technological Studies (See Sections D and E)
- same course achieved with different grades cannot both contribute credits to the SGA, eg **either** Higher Electrical Engineering at grade A **or** Higher Electrical Engineering at grade C

## National Course awards at Grade D

National Course awards at Grade D can contribute to the SGA in the following ways:

- in place of the specified mandatory or optional Higher Courses, a grade D at Advanced Higher (or above) in a Course of the same title can contribute 4 credits to the SGA
- in place of the specified optional Intermediate 2 Courses, a grade D at Higher (or above) in a Course of the same title can contribute 4 credits to the SGA.

Note - The former compensatory course awards (fallbacks) can also contribute to the SGA:

- in place of the specified mandatory or optional Higher Courses, a compensatory award for a Course of the same title taken at Advanced Higher (ie awarded at Higher) can contribute 4 credits to the SGA

in place of the specified optional Intermediate 2 Courses, a compensatory award for a Course of the same title taken at Higher (ie awarded at Intermediate 2) can contribute 4 credits to the SGA.

## Specific section

# A

This section specifies: mandatory courses, mandatory units, mandatory combinations of courses and/or units, mandatory core skill requirements and optional courses and units.

\*Mandatory unit of a course. †Optional unit of a course. All other units are free-standing National Units.  
[ ]Bracketed numbers indicate the former coding for these unrevised National Units

| Course/unit no   | Course/unit title                                | Credits                             |
|--|--|-------------------------------------|
| <b>One mandatory National Course:</b>                          |  |                                     |
| C026 12  | Electrical Engineering (H)                       | 4                                   |
| <b>plus two National Courses:</b>                              |  |                                     |
| C027 12  | Electronics (H)                                  | 4                                   |
| C036 12  | Technological Studies (H)                        | 4                                   |
| <b>or one National Course from the above and one from:</b>     |  |                                     |
| C100 12  | Mathematics: Maths 1, 2 and 3 (H)                | 4                                   |
| C102 12  | Mathematics: Maths 1, 2 and Stats (H)            | 4                                   |
| <b>plus one mandatory National Unit:</b>                       |  |                                     |
| D06H 12  | Engineering Quality Assurance (H)                | 0.5                                 |
| <b>plus one or two National Units to gain one credit from:</b> |  |                                     |
| D11V 11  | Core Mathematics 4 (Int 2) [7180331]             | 1                                   |
| D0N0 11  | Mathematics: Craft Technology 1 (Int 2) [91045]  | 0.5                                 |
| D0N1 11  | Mathematics: Craft Technology 2 (Int 2) [91046]  | 0.5                                 |
| <b>plus one National Unit from:</b>                            |  |                                     |
| D988 12  | Engineering Draughting (H)                       | 1                                   |
| D993 12  | Graphical Engineering Communication (H)          | 1                                   |
| D173 11  | *Computer Graphics (Int 2)                       | 1                                   |
| D172 11  | *Technical Graphics 2 (Int 2)                    | 1                                   |
| D997 11  | Graphical Communication: An Introduction (Int 2) | 1                                   |
|  |  | <b>Total credits required: 14.5</b> |

**plus any combination of courses, component units and free-standing units to gain 5.5 credits**  
(at minimum Int 2) from the above (not already chosen) and/or from:

### Electrical Engineering

Course:

|         |  |   |
|---------|--|---|
| C025 11 | Electronic and Electrical Fundamentals (Int 2) | 4 |
|---------|--|---|

Component units of course:

|         |  |   |
|---------|--|---|
| D134 11 | *Combinational Logic (Int 2)                         | 1 |
| D132 11 | *Electrical Fundamentals (Int 2)                     | 1 |
| D133 11 | *Semiconductor Applications: An Introduction (Int 2) | 1 |

Component unit of Engineering Craft Skills course:

|         |                                |   |
|---------|--------------------------------|---|
| D181 11 | †Practical Electronics (Int 2) | 1 |
|---------|--------------------------------|---|

Free-standing National Units:

|         |                                      |     |
|---------|--------------------------------------|-----|
| E9RR 12 | Circuit Elements (H) [2160020]       | 0.5 |
| D975 12 | Computer Software (H) <b>or</b>      | 1   |
| E8FD 12 | Computer System Software (H) [71119] | 1   |

| Course/unit no                          | Course/unit title   | Credits |
|---|---|---------|
| Free-standing National Units continued: |   |         |
| E9RS 12                                 | DC and AC Circuit Responses (H) [2160090]                     | 0.5     |
| E969 12                                 | Electrical Machine Principles (H) [84167]                     | 0.5     |
| E96A 12                                 | Electrical Motor Applications (H) [84168]                     | 0.5     |
| E96C 12                                 | Electrical Plant Maintenance (H) [84170]                      | 1       |
| E7S3 12                                 | Electrical Systems Control Circuits (H) [64166]               | 1       |
| E9RV 12                                 | Electromagnetics (H) [2160050]                                | 1       |
| E9RW 12                                 | Electrostatics (H) [2160060]                                  | 0.5     |
| D11R 12                                 | Health and Safety in the Work Place (H) [7161324]             | 1       |
| D987 12                                 | Electrical Motor Starting and Speed Control (H)               | 1       |
| E9RX 12                                 | Network Analysis (H) [2160080]                                | 0.5     |
| E7S2 12                                 | Power Electronics (H) [64165]                                 | 1       |
| E9RY 12                                 | Power Factor Improvement and Three-Phase Theory (H) [2160070] | 0.5     |
| ED6H 12                                 | Programmable Logic Controllers (H) [3150644]                  | 1       |
| E9S0 12                                 | Single Phase AC (H) [2160030]                                 | 1       |
| E7S0 12                                 | Switchgear and Protection (H) [64163]                         | 1       |
| E9S1 12                                 | Transformation and Rectification (H) [2160040]                | 0.5     |
| E96B 11                                 | Basic Electrical Plant Safety and Maintenance (Int 2) [84169] | 1       |
| E9MD 11                                 | Materials and Jointing Methods (Electrical) (Int 2) [4110060] | 0.5     |
| ED8C 11                                 | Soldering Techniques on Electronic Circuits (Int 2) [2150034] | 1       |
| ED8B 11                                 | Wiring and Assembly Techniques (Int 2) [2150024]              | 0.5     |

#### Mathematics

maximum of three credits from this option

Component units of Mathematics course:<sup>1</sup>

|         |                                     |   |
|---------|-------------------------------------|---|
| D321 11 | Mathematics 1 (Int 2)               | 1 |
| D322 11 | Mathematics 2 (Int 2)               | 1 |
| D323 11 | Mathematics 3 (Int 2)               | 1 |
| D324 11 | Applications of Mathematics (Int 2) | 1 |

<sup>1</sup>See Rules for credit contribution

Free-standing National Units:

|         |   |     |
|---------|---|-----|
| ED51 12 | Mathematics: Analysis/Algebra 2 (H) [7180414]     | 1   |
| D11W 11 | Mathematics: Analysis/Algebra 1 (Int 2) [7180401] | 1   |
| ED50 12 | Mathematics: Calculus 1 (H) [7181144] <b>or</b>   | 1   |
| EE3X 12 | Mathematics: Calculus A (H) [7181155]             | 0.5 |

#### Technological Studies

Course:

|         |  |   |
|---------|--|---|
| C036 11 | Technological Studies (Int 2) <sup>1</sup> | 4 |
|---------|--|---|

Component units of course:

|         |                              |     |
|---------|------------------------------|-----|
| D186 11 | *Applied Electronics (Int 2) | 1   |
| D185 11 | *Energy (Int 2)              | 0.5 |
| D188 11 | *Mechanical Systems (Int 2)  | 0.5 |
| D187 11 | *Systems and Control (Int 2) | 1   |

<sup>1</sup>See Rules for credit contribution

| Course/unit no | Course/unit title | Credits |
|----------------|-------------------|---------|
|----------------|-------------------|---------|

**Working with Others**

Free-standing National Unit:

|         |                         |   |
|---------|-------------------------|---|
| D36H 11 | Work Experience (Int 2) | 1 |
|---------|-------------------------|---|

**Core Skills**

Free-standing National Units:

|         |                                |   |
|---------|--------------------------------|---|
| D01B 11 | Communication (Int 2)          | 1 |
| D01C 11 | Numeracy (Int 2)               | 1 |
| D01D 11 | Information Technology (Int 2) | 1 |
| D01E 12 | Problem Solving (H)            | 1 |
| D01F 11 | Working with Others (Int 2)    | 1 |

SVQs can contribute credits to this SGA. (See Section F)

**Total credits required: 5.5**

*20 credits*

**\*\* Core skills requirement**

- Communication at Intermediate 2
- Numeracy at Intermediate 2
- Information Technology at Intermediate 2
- Problem Solving at Higher
- Working with Others at Intermediate 2

\*\* See Section B for core skills details.

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## Core skills

B

To achieve this SGA, all candidates **must achieve** the following core skills:

| Core skill             | Level          |
|------------------------|----------------|
| Communication          | Intermediate 2 |
| Numeracy               | Intermediate 2 |
| Information Technology | Intermediate 2 |
| Problem Solving        | Higher         |
| Working with Others    | Intermediate 2 |

One or more core skills units in this SGA may be automatically certificated through mandatory courses and units. Where this is the case, the corresponding core skill unit in this section cannot be counted towards the SGA.

Candidates can achieve core skills:

- through Standard Grades or other units which give automatic certification of core skills, eg a candidate who has completed Standard Grade English at Credit Level is given automatic certification of Communication at Intermediate 2
- by selecting from the group award units and courses which give automatic certification of core skills, eg the Higher Technological Studies course gives automatic certification of Problem Solving and Numeracy at Higher and Information Technology at Intermediate 2
- by doing dedicated core skills units – these units can contribute credits to the SGA and should be achieved through integration with appropriate subject specialist units. However, if the candidate wishes, the unit credits need not contribute to the SGA.

Candidates' current level of achievement in core skills is shown on the Scottish Qualifications Certificate in the form of a profile. This shows achievement against each of the core skills *components*. Where a core skill has more than one component, the candidate needs to achieve each component at the level specified for the SGA. For example, if an SGA requires Problem Solving at Higher, a candidate whose profile shows Critical Thinking and Planning and Organising at Higher and Reviewing and Evaluating at Intermediate 2 would not meet the requirement and would have to improve in Reviewing and Evaluating.

Details of all courses which give automatic certification of core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001/2002).



The SQA numbering system for qualifications consists of a 4 + 2 reference code.

The qualifications in a hierarchical sequence have the same title and are available at more than one level. They are identified by their reference code having the same first four digits, eg D186 in the example below. The last two digits are unique to each level of qualification, eg 12 equates to Higher, 11 equates to Intermediate 2.

## Units

The following is an example of a hierarchical sequence of units:

|         |                             |
|---------|-----------------------------|
| D186 11 | Applied Electronics (Int 2) |
| D186 12 | Applied Electronics (H)     |
| D186 13 | Applied Electronics (AH)    |

Where units which are part of hierarchical sequences are specified, candidates who achieve a unit at a higher level than the one specified can use the upper level unit to count as credit towards the group award. For example, Applied Electronics (H) can be counted instead of Applied Electronics (Int 2).

Candidates can only use one of these units to count as credit towards the group award.

In the case of unrevised National Certificate Modules, ie units which retain their original number, there are hierarchies where the title is the same and the number is different. Details of these exceptions will be published in a separate document. The pattern for these hierarchies is the same as that previously established for GSVQs.

There are also some hierarchies where the titles and numbers of the units at different levels are different. In this specification, if there are two units at different levels with heavily overlapping content, only one of these units should be used to count as credit towards the group award. Details of these exceptions will be published in a separate document.

## Courses

The following is an example of a hierarchical sequence of courses:

|         |                               |
|---------|-------------------------------|
| C036 11 | Technological Studies (Int 2) |
| C036 12 | Technological Studies (H)     |
| C036 13 | Technological Studies (AH)    |

In the SGA specification, where courses which belong to hierarchical sequences are specified, candidates who achieve a course at a higher level than the one specified can use the upper level course to count as credit towards the group award. For example, Technological Studies (AH) can be counted instead of Technological Studies (H).

Candidates can only use one of these courses to count as credit towards the group award - a maximum of 4 credits.



## Standard Grades

D

Designated Standard Grades at Credit Level can each contribute 4 credits to the SGA in place of corresponding National Courses.

The designated Standard Grade and the corresponding National Courses, either of which can contribute to this SGA, is as follows:

**Standard Grade\***

**National Course**

Technological Studies at Credit Level

Technological Studies (Int 2)

\*If achieved prior to 1994 please contact SQA Helpdesk ☎ 0141 242 2214.



## SCE Highers

E

Designated SCE Highers can each contribute 4 credits to the SGA in place of corresponding National Courses.

The designated SCE Highers and their corresponding National Courses, either of which can contribute to this SGA, are as follows:

### **SCE Higher Grade\***

Technological Studies  
Mathematics

### **National Course**

Technological Studies (H)  
Mathematics (H)

\*If achieved prior to 1994 please contact SQA Helpdesk ☎ 0141 242 2214.

SCE Highers do not give automatic certification of core skills. Further information will be published about this in due course.





## SVQs

F

Relevant Scottish Vocational Qualifications (SVQs) can each contribute up to eight credits to an SGA.

SVQs at Level 3 contribute credits at Higher.

SVQs at Level 2 contribute credits at Intermediate 2.

In this particular SGA any SVQs from occupational area 004 (Engineering) can each contribute 7 credits. Specific SVQs from the following areas can each contribute 7 credits:

001 (Tending Animals, Plants and Land)

002 (Extracting and Providing Natural Resources)

005 (Manufacturing)

006 (Transporting)

| Code no   | Relevant SVQs  | Level |
|---|--|-------|
| <b>001 Tending Animals, Plants and Land</b>           |  |       |
| G3P0 23   | Fishing Vessel Engineering   | 3     |
| G311 22   | Fishing Vessel Engineering   | 2     |
| <b>002 Extracting and Providing Natural Resources</b> |  |       |
| G3PY 23   | Electricity Distribution and Transmission Engineering  | 3     |
| G325 22   | Electricity Distribution and Transmission Engineering  | 2     |
| G324 22   | Nuclear Decommissioning  | 2     |
| G615 22   | Operating Hydro Generation Systems   | 2     |
| G31R 22   | Operating Single Electricity Generation Systems  | 2     |
| G3PS 23   | Maintaining Electricity Generation Systems (Control and Instrumentation)                       | 3     |
| G3PH 23   | Maintaining Electricity Generation Systems (Electrical)  | 3     |
| G3PW 23   | Maintaining Electricity Generation Systems (Electrical /Control and Instrumentation)           | 3     |
| G3PR 23   | Maintaining Electricity Generation Systems (Mechanical)  | 3     |
| G3PV 23   | Maintaining Electricity Generation Systems (Mechanical /Control and Instrumentation)           | 3     |
| G3PT 23   | Maintaining Electricity Generation Systems (Mechanical/Electrical)                             | 3     |
| G3PX 23   | Maintaining Electricity Generation Systems (Mechanical/Electrical Control and Instrumentation) | 3     |
| G31W 22   | Maintaining Electricity Generation Systems (Control and Instrumentation)                       | 2     |
| G31S 22   | Maintaining Electricity Generation Systems (Electrical)  | 2     |
| G320 22   | Maintaining Electricity Generation Systems (Electrical /Control and Instrumentation)           | 2     |

| Code no   | Relevant SVQs   | Level |
|---|---|-------|
| <b>002 Extracting and Providing Natural Resources</b> |   |       |
| G31V 22   | Maintaining Electricity Generation Systems (Mechanical)   | 2     |
| G31Y 22   | Maintaining Electricity Generation Systems (Mechanical /Control and Instrumentation)                  | 2     |
| G31X 22   | Maintaining Electricity Generation Systems (Mechanical/Electrical)                                    | 2     |
| G321 22   | Maintaining Electricity Generation Systems (Mechanical/Electrical/Control and Instrumentation)        | 2     |
| G3PK 23   | Operating Multiple Electricity Generation Systems (Combined Heat and Power Systems (inc Gas Turbines) | 3     |
| G3PJ 23   | Operating Multiple Electricity Generation Systems (Diesel Systems)                                    | 3     |
| G3PG 23   | Operating Multiple Electricity Generation Systems (Fossil-fired Systems)                              | 3     |
| G3PL 23   | Operating Multiple Electricity Generation Systems (Hydro/pumped Storage Systems)                      | 3     |
| G3PM 23   | Operating Multiple Electricity Generation Systems (Nuclear (Magnox) Systems)                          | 3     |
| G3PP 23   | Operating Multiple Electricity Generation Systems (Nuclear (Pressurised Water Reactor) Systems)       | 3     |
| G3PN 23   | Operating Multiple Electricity Generation Systems (Nuclear (Advanced Gas Reactor) Systems)            | 3     |
| <b>004 Engineering</b>                                |   |       |
| G38G 22   | Engineering Manufacture: Foundation   | 2     |
| G5KY 22   | Performing Engineering Operations   | 2     |
| <b>005 Manufacture</b>                                |   |       |
| G38J 22   | Performing Manufacturing Operations   | 2     |
| <b>006 Transporting</b>                               |   |       |
| G5C3 23   | Rail Transport Engineering: Maintenance (Communication Systems)                                       | 3     |
| G5C5 23   | Rail Transport Engineering: Maintenance (Electrification)   | 3     |
| G5C4 23   | Rail Transport Engineering: Maintenance (Permanent Way)   | 3     |
| G5C7 23   | Rail Transport Engineering: Maintenance (Plant)   | 3     |
| G5C2 23   | Rail Transport Engineering: Maintenance: (Signal Engineering)   | 3     |
| G5C6 23   | Rail Transport Engineering: Maintenance: (Traction and Rolling Stock)                                 | 3     |
| G5C3 22   | Rail Transport Engineering: Maintenance (Communication Systems)                                       | 2     |
| G5C5 22   | Rail Transport Engineering: Maintenance (Electrification)   | 2     |
| G5C4 22   | Rail Transport Engineering: Maintenance (Permanent Way)   | 2     |

| Code no                      | Relevant SVQs  | Level |
|------------------------------|--|-------|
| 006 Transporting (continued) |  |       |
| G5C7 22                      | Rail Transport Engineering: Maintenance (Plant)                      | 2     |
| G5C2 22                      | Rail Transport Engineering: Maintenance (Signal Engineering)         | 2     |
| G5C6 22                      | Rail Transport Engineering: Maintenance (Traction and Rolling Stock) | 2     |
| G5CB 22                      | Rail Transport Operations (Control Room Operations)                  | 2     |
| G5C8 22                      | Rail Transport Operations (Driving)                                  | 2     |
| G5CC 22                      | Rail Transport Operations (Passenger Services)                       | 2     |
| G5C9 22                      | Rail Transport Operations (Shunting)                                 | 2     |
| G5CA 22                      | Rail Transport Operations (Signal Operations)                        | 2     |

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