SQA Advanced Unit Specification

General information

Unit title: Construction Materials and Specification

Unit code: J53G 47

Superclass: TE

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Unit purpose

This unit provides the learner with knowledge and understanding of the properties and the manufacturing process of common construction materials. It also seeks to provide them with skills in the drafting of specifications for construction materials and workmanship.

The unit is aimed at learners taking the SQA Advanced Certificate or Diploma in Architectural Technology. However, because of its relatively broad nature, it may be suitable for learners taking any of the SQA Advanced Certificate/Diploma awards in the built environment disciplines, including civil engineering.

The skills and knowledge acquired in this unit will be useful for learners who progress into the construction industry in the fields of architecture and design, quantity surveying, construction management and the various engineering disciplines.

Outcomes

On successful completion of the unit, the learner will be able to:

1. describe the manufacture and the properties of construction materials
2. describe common laboratory tests employed on construction materials
3. prepare sample specifications for construction materials and workmanship in line with industry standards

Credit points and level

1 SQA unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7).

Recommended entry to the unit

Entry is at the discretion of the centre. However, it would be beneficial if learners had a knowledge and understanding of construction materials and components and where and how they are used in construction projects. This might have been acquired through study of the built environment at National Certificate (NC) level.

Nevertheless, the unit itself contributes to an understanding of construction materials from basic principles including the sources of raw materials and the process of manufacturing what will become site-ready materials. Therefore, prior knowledge of this subject area is not essential.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes section for this unit specification.

There is no automatic certification of Core Skills or Core Skill components in this unit.

Context for delivery

If this unit is delivered as part of a group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods, or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

Statement of standards

Unit title: Construction Materials and Specification

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the manufacture and the properties of construction materials.

Knowledge and/or skills

- Sources of raw materials
- Manufacturing processes for materials
- Quality control procedures in the manufacture of materials
- Properties of finished materials

Outcome 2

Describe common laboratory tests employed on construction materials.

Knowledge and/or skills

- Published industry standard tests
- Materials tested
- Equipment used in testing
- Procedures followed in testing
- Results and data obtained in tests
- Analysis of data and results — including calculations
- Basis for concluding success in tests

Outcome 3

Prepare sample specifications for construction materials and workmanship in line with industry standards.

Knowledge and/or skills

- Specification of materials or components
- Specification of workmanship
- Concrete or masonry materials or components

- Carpentry and joinery materials or components
- Floor, wall and ceiling finishes
- Building services materials or components
- Civil and structural engineering materials or components

Evidence requirements for this unit

All assessments in this unit should be carried out in controlled, supervised conditions. All assessments should be open-book with learners permitted to refer to the following:

- For Outcome 1 learners should be permitted access to personal class notes including notes from tutorial tasks only
- For Outcome 2 learners should be permitted access to personal class notes, handouts, textbooks and the internet
- For Outcome 3 learners should be permitted access to personal class notes, handouts, textbooks and the internet (including specification writing applications)

It is recommended that assessment is carried out for each outcome separately after the learning for each outcome — and in numerical order. However, the order in which the outcomes are delivered and assessed is not vital.

Where evidence for outcomes is gathered on a sample basis the whole of the knowledge/ skills lists must be taught and available for assessment. Learners should not know in advance which of the items in the lists will be sampled in any one assessment event.

Evidence can be written and/or oral. If written it can be produced online, via an electronic portfolio or it can be hard copy. The use of industry standard templates or software (including online applications) for Outcome 3 (specification writing) is permitted.

It is possible that assessment components for this unit might be integrated into other appropriate units. This might involve the learners' applying the learning outcomes and subsequent evidence requirements within the unit, by responding to each outcome on within an integrated/combined project-based scenario. Therefore, use of online assessment, electronic portfolios of evidence and presentations would be most appropriate — although hard copy evidence is equally valid.

Also this allows the possible integration of the assessment evidence into a single portfolio of candidate work thus providing an integrated approach to assessment which closely mirrors workplace practice. If an integrated approach is used to gather evidence, mapping matrixes and checklists should be used to record learner progress as a formative record of achievement prior to the substantive submission of all completed solutions for the corresponding outcomes.

Learners will need to provide evidence to demonstrate their knowledge and/or skills across all outcomes by showing that they can:

For Outcome 1: Describe the manufacture and the properties of construction materials.

For any one assessment event the tasks must cover both of the listed knowledge/skills bullets:

- Sources of raw materials
- Manufacturing processes for materials

plus, one of the other two:

- Quality control procedures in the manufacture of materials
- Properties of finished materials

Learners must describe the manufacture, etc of two out of a given list of at least four materials. Any one list must not include materials that have practically identical sources of materials and manufacturing processes, eg in-situ concrete and concrete blocks.

Learners' descriptions of manufacturing processes should be given in chronological order. They should be in concise detail but with specialist terms and processes more fully explained.

This list must not include materials that have no manufacturing process — materials that are used raw and unrefined. The list should include materials commonly used in at least four different trades, eg builder work (concrete and masonry, etc), carpentry and joinery, structural frames and building services trades. Other trades' materials can be added to the given list to suit local contexts or learning and teaching.

When describing tests or other quality control processes the learner should make reference to a minimum of two such tests/quality control processes for each of the two materials selected from the list. Such reference may be relatively concise here as more detail on the testing of materials is the subject of Outcome 2. BS EN standard tests should be cited in responses if such standards exist.

When describing the properties of the finished materials the learner must cover each of the following areas as applicable:

- Physical properties
- Mechanical properties
- Appearance

The description of properties should include — where appropriate — typical units of measurement for the property described. Given lists must include materials that have at least two physical and two mechanical properties.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 1 should take no longer than 60 minutes but need not be timed.

For Outcome 2: Describe common laboratory tests employed on construction materials.

For any one assessment event the tasks must cover all of the listed knowledge/skills bullets:

- Published industry standard tests
- Materials tested
- Equipment used in testing
- Procedures followed in testing
- Results and data obtained in tests
- Analysis of data and results — including calculations
- Basis for concluding success in tests

Learners must describe common laboratory tests for two out of a given list of at least four materials. The list should include materials tests from the main trades, eg builder work (including masonry components and concrete), carpentry and joinery (including timber and manufactured boards), structural materials such as steel and civil engineering materials including aggregates.

Learners are permitted — after consultation and approval — to add to the list themselves materials tests with which they are familiar.

The list must not include tests that have practically identical processes, eg compressive strength testing of clay bricks and concrete blocks.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 2 should take no longer than 60 minutes but need not be timed.

For Outcome 3: Prepare sample specifications for construction materials and workmanship in line with industry standards.

For any one assessment learners must produce two draft specifications from a given list of materials, components or finishes. The assessment tasks must cover both of the listed knowledge/skills bullets:

- Specification of materials or components
- Specification of workmanship

The assessment tasks must relate trade-wise to two of the following listed knowledge/skills bullets:

- Concrete or masonry materials or components

- Carpentry and joinery materials or components
- Floor, wall and ceiling finishes
- Building services materials or components
- Civil and structural engineering materials or components

The given list of materials or components must include a context for each of the materials, components or finishes, eg engineering brickwork must be given in the context of a manhole or a retaining wall in an exposed environment. Or for joinery a door can be either internal or external.

The learners' response must cover both materials/components/finishes and workmanship. This can be evidenced by two single specifications that cover both materials/components and workmanship. Either of the single specifications can, alternatively, be covered by two 'half' specifications (one half covering materials/components only and the other covering workmanship only).

The specifications which learners draft must not include items with virtually identical workmanship, eg clay brickwork and concrete brickwork or blockwork. The given list should try to preclude this possibility in the first instance.

Learners are encouraged to produce their specifications using industry standard software, online applications or given industry standard templates should any of these be available. They can produce their specifications as part of a BIM. Alternatively, they can draft their specifications longhand and from scratch.

Learners are not permitted to plagiarise wholesale (be it copy and paste or otherwise) pre-published specifications from manufacturers' websites, textbooks or the internet generally.

The use of online specification writing templates that require data and description to be inserted or that require significant editing down to only relevant items is permitted.

Learners are to be encouraged to keep their specifications comprehensive yet clear and concise. Appropriate reference to standard products/components/finishes or workmanship standards reduces word count and makes specifications more readable.

Learner's materials specifications are comprehensive when the materials/components/ finishes have been completely identified, unambiguously, with no manufacturers' options remaining.

Learner's workmanship specifications are comprehensive when they cover compliance with all manufacturers' and designers' requirements. This may include or indeed comprise reference to a code of practice or standards, or by approval of samples or by testing.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 3 should take no longer than 90 minutes but need not be timed.

Support notes

Unit title: Construction Materials and Specification

Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

This unit forms part of several SQA Advanced Certificates and SQA Advanced Diplomas in construction technician disciplines. It allows learners to develop understanding of a range of construction materials. It helps learners' understanding of materials testing processes. It allows them to develop skills in specification writing.

Knowledge of construction materials is of use to everyone in the construction industry. The unit is therefore of broad, general benefit to every learner. It will hold them in good stead in future careers as either technicians or industry professionals.

Specification writing is a more particular skill — but not necessarily a specialist undertaking. In industry it should be carried out by designers as part of their design process.

Everyone in the construction industry will benefit from an understanding of specifications because they define what is expected of the finished building in terms of materials, components, finishes and workmanship. Indeed, drawings and BIMs without specifications are mere 'pictures'. Both drawings/BIM and specifications are required for the complete picture of what is to be built. This confirms that the unit is of broad, general benefit.

Testing materials is a particular skill and often carried out by specialist technicians and professionals (for example resident engineers and clerks of works). The testing is often carried out on site during the works. Learners may find themselves in the future involved in on-site testing of materials. Furthermore, specific tests are often part of specifications.

Outcome 1 concerns the manufacture and the properties of construction materials. In this context 'materials' also includes simple components such as bricks, blocks and steel beams. It does not, in the context of Outcome 1, include complex components such as doors and windows.

Description of the manufacture of materials should start with the sources of raw materials. For aggregates (a material) this would be, for example, quarries and, for fine aggregates, might also include riverbanks. For the manufacture of simple components such as bricks and blocks the description should also start with the mining of the basic raw materials such as clay. For the manufacture of a compound 'material' with several raw materials — concrete is a good example — the description of the source of materials may start with the cement, sand and aggregate ready to be mixed. The assessment may require learners to describe quality control procedures in the manufacture of materials. Most quality control procedures involve testing — which may be destructive or non-destructive. These tests are often to the finished materials.

Other quality control processes involve control of ingredients and temperatures during the manufacturing process. This is true of the manufacture of cement, for example.

To keep their answers concise and to the point here, learners need not do more than mention the name or type of test and make reference to any recognised industry standard test by means of its BS EN number, for example.

When it comes to describing the properties of finished materials learners should include, where applicable:

- Physical properties — at least two for each material, eg density and conductivity
- Mechanical properties — at least two for each material, eg compressive strength and modulus of elasticity
- Appearance — at least one for each material, eg freedom from surface blemishes

These descriptions of properties should include — where appropriate — typical units of measurement for the property described, eg density in kg/m^3. Given lists must therefore include materials that have at least two physical and two mechanical properties — and ideally an aspect of appearance that can be 'tested' or otherwise measured, no matter how simply.

Outcome 2 concerns the describing of common laboratory tests employed on construction materials. Learners must describe the standard tests normally carried out on two out of a given list of at least four materials.

The list must not include tests that have practically — if not precisely — identical processes, eg compressive strength testing of clay bricks and concrete blocks. They should ideally include tests that learners have either carried out themselves or had demonstrated to them. If practicalities preclude such practical work or demonstrations then the list of tests should hopefully include several that learners have viewed being demonstrated in videos on the internet.

Learners are asked in the assessment to cover all of the knowledge/skills bullets when it comes to materials tests. These are, in order (with additional information or exemplification):

- Published industry standard tests, — (eg BS EN 771-1 brick dimension test)
- Materials tested — (eg Engineering bricks class 'B')
- Equipment used in testing — (list of tools or equipment)
- Procedures followed in testing — (in chronological order)
- Results and data obtained in tests — (the format, unit of measurement and possibly typical examples)
- Analysis of data and results — including calculations — (an explanation of the calculations performed on the resulting raw data and what these calculations prove or confirm)
- Basis for concluding success in tests — (a description of what would constitute a satisfactory test, eg the confirmation that the dimensions of the given engineering bricks

conform with what the manufacturers' published literature claims for them in terms of tolerance)

Most of these bullets form what might be the headings for the sections of a lab test report proper. It would be fair to say that the assessment almost requires the drafting of an actual lab report — without having actual data to record or analyse. This is a positive state of affairs as this frees up some time for the other two outcomes — particularly Outcome 3 which is more specialised than Outcome 1.

Outcome 3 concerns the drafting of specifications for construction materials and workmanship. This has to be done in line with industry standards. The most obvious way to accomplish this is to use industry-recognised templates, software or online applications — most of which are very well-known and readily available.

Some of the most popular specification drafting software packages are available as part of BIM packages or can be purchased as bolt-on software.

If software packages are unavailable or unaffordable at any one centre then the use of hard copy templates is advised.

If neither software nor hard copy templates are available it will still be possible to look at current examples of industry-standard specifications online or on donated construction contract documents.

The correct use of industry-standard templates should ensure that specifications drafted are comprehensive. If these or other templates are not available to learners then specifications can be drafted long-hand and by scouring through to manufacturers' literature and workmanship standards (eg the BS 8000 series) from source. In fact, most industry-standard software package templates require that learners research external sources of information in any event in order to fill in the 'blanks' and complete the specification.

Draft specifications are complete as regards materials when they have identified completely and unambiguously the materials to be used for an element of the building. Metal gutters, for example come in different shapes, sizes and surface finishes. If there is an option missing or unclear from the specification of materials then the plumbers' merchant will not know precisely what you want to order — and they will probably ask for clarification or more detail. Learners must adopt the same approach to their assessments — and be prepared to be marked down if they omit part of the specification of materials.

Draft specifications are complete as regards workmanship when they have identified fully and unambiguously the way in which materials and components to be assembled/fixed/used in an element of the building. Metal gutters, for example need to be fixed using specific brackets at specific minimum centres and with specific screws. The gutters need to be to a minimum fall or gradient. There will be a maximum distance between outlets. And the performance of the completed installation will need to be tested to a specific standard test.

Again, if there is a part missing or unclear from the specification of workmanship then learners must be prepared to lose marks in assessment.

It should be clear that correct specification writing is — to a large extent — dependent on a detailed knowledge of construction technology. This — combined with careful reading of manufacturers' literature and product guidance.

For any one assessment event the tasks must cover both of the listed knowledge/skills bullets immediately below:

- Specification of materials or components
- Specification of workmanship

To include just materials is limiting — indeed it could be argued that mere bricks and blocks are components as opposed to just materials. Just to be clear — it is appropriate for assessment to cover the drafting of specifications for manufactured items such as doors and windows as well as simple materials such as sand and coarse aggregates. In context the term 'materials or components' also includes construction finishes like plaster or plasterboard.

Most aspects of workmanship will likely be covered by reference to one of the BS8000 series of workmanship standards. However, learners should examine relevant product installation guides, etc to ensure that their specifications for workmanship are comprehensive.

To place a reasonable boundary on the scope and volume of assessment, for any one assessment event, learners must draft specifications for materials/components and workmanship that relate to only two of the following listed 'trades':

- Builder work materials or components, eg clay brickwork, precast concrete cills or an in-situ concrete foundation
- Carpentry and joinery materials or components, eg floor joists, plywood shelving or external doors
- Floor, wall and ceiling finishes, eg ceramic floor tiling, plaster boarding or suspended ceiling tiles
- Building services materials or components, eg roof leadwork, waste pipework or a kitchen sink
- Civil and structural engineering materials or components, eg underground drainage, a road base or a manhole cover and frame

Learners must produce two draft specifications for materials and workmanship for different materials or components from a given list. This might comprise a specification for materials and workmanship for engineering brickwork in a manhole — plus a specification for a kitchen sink and its installation in a worktop.

It is important that the given list includes the context for the building work because, for example, you should specify a very different type of mortar pointing in a foul sewer manhole to a decorative internal wall — even if you want to use the same bricks in both situations.

The evidence for assessment can be provided via two single specifications covering both materials/components and workmanship. Either of the single specifications can,

alternatively, be covered by two ‘half’ specifications (one half covering materials/components only and the other covering workmanship only).

As an example of the ‘half’ specification evidence: given the specification for engineering bricks in a manhole, for example, learners must draft the workmanship specification. Or given the workmanship specification for metal gutter installations, the learner must draft the materials/components specifications.

Learners are to be positively encouraged to produce their specifications using industry standard software and online applications. In addition, learners can produce their specifications as part of a BIM as long as the specification writing aspects can be discretely evidenced. The use of ‘fill-the-blanks’ hard copy templates is also acceptable — be it with given online industry-standard templates or other similar. Alternatively, learners can draft their specifications longhand and from scratch.

No doubt if learners taking the unit do not have — at that time — the chance to hone their skills with online specification writing applications it would be something they would be advised to follow through on at a later date. This would be especially important if they want to become proficient with BIM.

Learners are not permitted to plagiarise wholesale pre-published specifications from any source. Of course, the technical nature of specification writing lends itself to copying and pasting of technical information from suppliers’ literature and installation guides. Manufacturers positively want you to use their unedited specification clauses from their websites. But the assessment is about writing specifications — it’s not about IT skills and mere ‘cut-and-paste’. This may dictate the nature and scope of the software or online applications that learners are allowed to use in assessment tasks.

Mere dragging and dropping of manufacturers’ literature and installation guides into BIMs is also totally unacceptable as evidence in this unit — for the same reason mentioned in the previous paragraph. This again may dictate the nature and scope of the software or online applications that learners are allowed to use in assessment tasks.

Learners are to be encouraged to keep their specifications comprehensive yet clear and concise. Appropriate reference to named manufacturers’ standard products/components or BS workmanship standards reduces word count and makes specifications more readable. This is correct and positively professional.

For example: if Ibstock’s Chesterton Wirecut facing bricks came only in a smooth texture and only in multi red colour then all you would have to specify is ‘Ibstock Chesterton Wirecut facing bricks’. That would be it — in five words. The fact that there are in reality more options for Ibstock’s Chesterton facing bricks means that, sadly, this materials specification is less than complete! See https://ibstockbrick.co.uk/brick-selector/ — accessed on 4 January 2020.

Guidance on approaches to the delivery of this unit

The unit is academic in nature. Nevertheless, much of the learning and teaching can be practical or at least visual in nature. Delivery can be by means of practical demonstrations and tasks, lab work, site visits, presentations, tutorials, discussions and quizzes. Much of the learning can be learner-centred.

It might be advisable for learners in this unit to start with Outcome 1 and the manufacture and the properties of construction materials. The initial focus should probably be on the manufacturing aspect, saving the examination of properties until later.

There are lots of videos on the internet showing the manufacturing processes for all of the main construction materials and more. Most of these are relatively short and informative. They invariably go through the manufacturing process in chronological order.

For those learners who prefer reading there are a host of textbooks on construction materials. The range of textbooks includes basic introductions through to very technical, specialist books on specific materials. There is also, obviously, a vast quantity of written and pictorial material on the internet about each and every construction material imaginable. Learners should be encouraged to take notes about each material as they read and view because they will not be permitted access to the textbooks or the internet during the assessment of this outcome.

Site visits are very visual and memorable for learners. Perhaps a visit to a construction site or better still a builders' merchant will allow learners to examine up close the materials in reality — along with the logistics of storage. Hopefully, the memories of seeing specific materials will reinforce and complement video watching and reading tasks.

Learners can be asked to research the manufacturing process of one or more specific materials and give personal or group presentations about their findings to the rest of the class. This will both structure their thinking and bolster their store of notes that can be used at the assessment event. In fact, with care and planning of the supervision, there is no reason why the assessment evidence cannot take the form of an individual presentation — as long as it is the learner's own work and satisfies the evidence requirements.

In addition to academic or class-based learning the study of construction materials can be bolstered and made more interesting by practical work. This might include the mixing and testing of concrete. It might include tensile testing of metals. All of this will help learners to be better prepared for assessment.

Research and presentations can cover testing of materials as well as the manufacturing processes. Both destructive and non-destructive testing can be demonstrated if the centre has the resources for it. Failing that there are undoubtedly videos on the internet of practically all of the materials tests you might want to look at.

Description of the properties of construction materials also forms part of the assessment for this outcome. This is largely an academic subject and manufacturers' literature is a very important source of information here. However, the subject can be delivered, in part, through physical demonstrations, comparisons and practical tests.

Throughout this process learners should be reminded of the fact that they are only permitted to bring personal notes into the assessment. Consequently, they should be taking notes throughout any learning activity for future use. Especially should learners take note of standard units of measurement for the relevant properties and maybe even typical empirical examples for the main materials.

The delivery of every aspect of this outcome can be bolstered by tutorial discussions and formative assessment — maybe in the form of mock tests or quizzes.

For Outcome 2, learners must be able to describe common laboratory tests employed on construction materials. The best way to learn how to do this is to perform the tests and write the reports on them. If time permits and facilities are available then this is how it should be done. The learner will then be in a good place to describe the tests — from memory or using their lab reports as a prompt.

If time does not permit actual testing or facilities are unavailable then there are lots of videos on the internet that must surely cover every one of the main materials tests you would want to view. Many of these videos are produced by manufacturers but most seem to be by academics and materials technicians. As such they are usually very learner-friendly.

In addition to the videos manufacturers and trades associations have published guides to all of the main materials tests. These are readily available in pdf form on the internet. There are, of course, textbooks about construction materials — and most of these carry associated sections or paragraphs on testing of specific materials.

Learners may also find access to BS EN and other published standards on tests. These may be less readable than some of the textbooks and less visual than the videos — but they are there, nevertheless.

One of the most effective tutorial tasks might be where learners are required to carry out calculations and analyse data from given results from a nominal or actual lab test. This will help them better grasp what is probably in practice the least well-done aspect of materials lab reports.

Tutorials, discussions, presentations and quizzes will all reinforce the learner's understanding of materials testing and prepare them for assessment.

Outcome 3 requires learners to prepare sample specifications for construction materials and workmanship — and to do so in line with industry standards. The last bit sounds daunting but there is a lot of guidance available — and the assessment is open-book.

The best place to start with learning and teaching might be to look at a completed specification document — or at least a section from one. It would be ideal if this was one prepared using online industry-standard templates. If learners could grasp from the start that their ultimate task may be a blank-fill exercise (with guidance available) it might not seem so daunting.

Another good place to start might be on the internet looking at manufacturers' published specifications — again many of these unashamedly of well-known industry-standard software origin. Alumasc, for example have a very user-friendly specification-builder section on their website at: https://www.alumascwms.co.uk/support/nbs-specifications/ — (accessed on 4 January 2020). This allows you to build a specification using options from a scroll-down menu and ultimately copy your specification to clipboard for future use in contract documents.

Other manufacturers' websites contain drop-down facilities to trawl through the options and isolate the specific product that suits your needs. For example, learners might find it beneficial to look at the *Ibstock* brick selector function at: https://ibstockbrick.co.uk/brick-selector/ (accessed on 3 January 2020).

Centres that do not subscribe to well-known specification packages need not fear — there are other ways of going about the learning and assessment processes. Manufacturers and suppliers' websites are available to all — admittedly sometimes with a sign-up requirement for logging on. The functions highlighted above in the Alumasc and Ibstock websites are feely available to all regardless. And manufacturers' literature abounds both hard copy and electronically on the internet.

Don't forget guidance from the Scottish Government website regarding small building works and conservatories. Some of these resources are specific about the specifications that would, in effect, be deemed to satisfy the requirements of building regulations for such small projects.

Learners might need guidance through manufacturers' literature and websites. Tutors may have more experience in doing so and also have more awareness of what options are available for different construction materials and components. Learners must be helped to make their specifications *specific*.

Learners may be comforted by the fact that most materials specifications are satisfactorily given with as few words as possible: if you asked a shop assistant for a tin of *Heinz Beans,* they would know exactly what you wanted. You would not need to go further and spell out the type of bean or the constituent ingredients and proportions in the mix of the accompanying sauce. In fact, this or similar analogy might be helpful in aiding learners to be clear, concise and specific in their specifications.

Specifying workmanship is also part of the assessment and an aspect of specification that must be learned. The best way to learn how to specify workmanship is to pay attention at construction technology lessons — and to be constantly asking questions: How is this material cut? How is it fixed? How many fixings does it need? How do I define *straight*? How do I define *plumb*? And so on…

For learners who are less inclined to ask their own questions the best industry-standard online and hard copy templates prompt you as to what clauses you want to use for any one operation or element of the building. In fact, some online industry-standard specification templates may come complete and it's a matter of editing out what you don't want to use!

For centres that do not subscribe to online industry-standard specification packages then workmanship requirements can be researched via manufacturers' literature and installation guides in particular. In addition, the BS800 series of construction workmanship standards can be explored either hard copy or online. Learners can peruse the BSI shop online at: https://shop.bsigroup.com/ (accessed on 4 January 2020) and can select from the search facility the current standards for both materials and workmanship.

BS EN standards for workmanship may include options and learners must be taught to read these with care to select the correct options for any one construction situation. Looking again

at published completed specifications and discussing these in groups or in tutor-led tutorials will be helpful to the inexperienced.

Learners are to be encouraged to keep their specifications comprehensive yet clear and concise. Appropriate reference to standard products/components or workmanship standards reduces word count and makes specifications more readable. Why not get them to read the small print on a tin of beans? The 'complex' materials specification is summed up in two words… and the workmanship is merely the cooking instructions. Not too difficult when you get learners to think about it in those terms.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

This unit lends itself to written evidence for specification writing and written and/or oral evidence for the other outcomes. The unit lends itself readily to the use of electronic portfolios of evidence — although hard copy evidence is equally valid.

All assessments in this unit should be carried out in controlled, supervised conditions. All assessments should be open-book with learners permitted to refer to the following:

- For Outcome 1 learners should be permitted access to personal class notes or tutorial tasks notes only
- For Outcome 2 learners should be permitted access to personal class notes, handouts, textbooks and the internet
- For Outcome 3 learners should be permitted access to personal class notes, handouts, textbooks and the internet

It is recommended that assessment is carried out for each outcome separately after the learning for each outcome — and in numerical order. However, the order in which the outcomes are delivered and assessed is not vital.

For Outcome 1: Describe the manufacture and the properties of construction materials.

Given a list of at least four different construction materials learners must select two of them. They must describe the manufacturing process for each, starting with the winning of the raw materials. The assessment paper must then require the learner to describe **either** the quality control procedures (tests, etc) relevant to the two materials **or** describe several of the properties of the two finished materials.

Alternatively, the learner may — individually and under supervision — produce a presentation covering all of the above aspects from his or her notes. This presentation may be delivered in actuality or otherwise. But regardless it must satisfy the evidence requirements of the outcome. Mere hyperlinks to a manufacturers' website and a video of the manufacture of plywood does not constitute a learner's own description of a manufacturing process for that material, for example.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 1 should take no longer than 60 minutes but need not be timed.

For Outcome 2: Describe common laboratory tests employed on construction materials.

Given a list of at least four different materials with which the learners are familiar they have to describe common laboratory tests for two of them. For any one assessment event the response must cover all of the listed knowledge/skills bullets:

- Published industry standard tests
- Materials tested
- Equipment used in testing
- Procedures followed in testing
- Results and data obtained in tests
- Analysis of data and results — including calculations
- Basis for concluding success in tests

The assessment paper or guidelines can freely include the bullet list as a prompt for learners. In fact, it should contain the breakdown of marks available for each part.

The list must not include tests that have practically identical processes, eg compressive strength testing of clay bricks and concrete blocks. However, it can happily include both wet concrete and hardened concrete, for example, as the tests on each are so different from one another.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 2 should take no longer than 60 minutes but need not be timed.

For Outcome 3: Prepare sample specifications for construction materials and workmanship in line with industry standards.

For any one assessment event learners must draft two specifications for materials and workmanship. Learners will choose these specifications from a given list of at least five — one from each of the following listed knowledge/skills bullets:

- Builder work materials or components
- Carpentry and joinery materials or components
- Floor, wall and ceiling finishes
- Building services materials or components
- Civil and structural engineering materials or components

The given list of materials or components must include a context for each of the materials or components in order to require learners to consider appropriate specification options in each scenario.

Learners are encouraged to produce their specifications using industry standard software (or online applications) or hard copy industry standard templates should any of these be available. They can produce their specifications as part of a BIM. Alternatively, they can draft their specifications longhand — hard copy or typed and from scratch.

The assessment paper should include marks for each task and sub-task and should carry a cut-off score of 60% for the assessment overall.

The assessment for Outcome 3 should take no longer than 90 minutes but need not be timed.

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. In designing the assessment instrument(s), opportunities should be taken to generate appropriate evidence to contribute to the assessment of Core Skills units. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

All assessments in this unit should be open-book in nature, under controlled, and supervised condition within an appropriate assessment environment, carried out outcome by outcome, with learners permitted to refer to class notes, handouts, textbooks and the internet. It is recommended that assessment is carried out for each outcome separately after the learning for each outcome — and in numerical order. However, the order in which the outcomes are delivered and assessed is not vital. Assessment in this unit should therefore be carried out by means of separate tasks: each task will cover each of the individual outcomes in order.

This unit requires written evidence and /or oral evidence. It is recommended that evidence for learning outcomes is achieved through well-planned course work, assignments and projects. While assessments, must be focused on the individual achievement of each learner, group work and role-play activities may contribute to the assessment.

The volume of evidence required for each assessment should take into account the overall number of assessments being contemplated within this unit and the design of the overall SQA Advanced teaching programme. Therefore, it is possible that assessment components for this unit might be integrated into other appropriate units. This might involve the learners' applying the learning outcomes within the unit, by responding to each outcome on within an integrated/combined project-based scenario. Therefore, use of online assessment, electronic portfolios of evidence and presentations would be most appropriate — although hard copy evidence is equally valid.

Also this allows the possible integration of the assessment evidence into a single portfolio of candidate work thus providing an integrated approach to assessment which closely mirrors

workplace practice. Where available, relevant evidence from the workplace can also be incorporated to enhance the learning outcomes, provided that this evidence is appropriate and authenticated as the learner's own work. If an integrated approach is used to gather evidence, mapping matrixes and checklists should be used to record learner progress as a formative record of achievement prior to the substantive submission of all completed solutions for the corresponding outcomes.

Open-book Controlled Supervised Assessments

For any SQA Advanced unit assessment within the Construction Technician Suite of Qualifications stipulate 'open-book assessment', SQA is comfortable that these can now be assessed under the following conditions:

1 **Integrated combined assessment model, within the context of 'project-based' learning and assessment**, ie carried out holistically with the learning and assessment of other relevant SQA Advanced units based on a centre-devised project.

Documented evidence of these processes needs to be retained for verification purposes If an integrated approach is used to gather evidence, mapping matrixes and checklists should be used to record learner progress as a formative record of achievement prior to the substantive submission of all completed solutions for the corresponding outcomes.

2 **Assessed individually: As an online timed assessment, require to adhere to the following criteria:**

- Long answer questions/responses
- Plagiarism detection engine/tool
- Large question bank to allow randomised question generation to individual candidates, in order to create unique exams for each learner.

Documented evidence of these processes needs to be retained for verification purposes. If assessed individually: as an online timed assessment to gather evidence, mapping matrixes and checklists should be used to record learner progress as a formative record of achievement prior to the substantive submission of all completed solutions for the corresponding outcomes.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment, we mean assessment which is supported by Information and Communication Technology, such as e-testing or the use of e-portfolios or social software. Centres wishing to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment — as specified in the evidence requirements — are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at: www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

Learners have opportunity in this unit to develop skills in research as they explore the sources and manufacturing processes of a range of building materials. They will also

develop listening skills and note-taking skills as they prepare for assessment that allows only the use of personal notes.

Much of the research will require careful study of technical literature — including BS EN and other industry standards. Learners that can read and interpret technical literature and standards have gained a skill that will be useful in any number of industries — not just construction.

Above all this unit offers the opportunity to gain skills in technical specification writing. Such specifications must be clear, unambiguous and preferably concise. The ability to write technically in clear, concise terms is a valuable transferable skill. This is valued universally by businesses and customers from all industries. It will be especially useful to enterprising learners who wish to start their own business.

This 40-hour unit will not change the world — but with environmental issues and sustainability high on the national and international agenda learners have the opportunity to focus some of the specification writing tasks on specifying sustainable materials. This may mean considering locally manufactured or sourced materials — but it need not be. Learners will have to consider the overall carbon footprint before selecting any one product. Regardless it will open their eyes to a complex but very important consideration in specification writing.

History of changes to unit

Version	Description of change	Date

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

Further information

Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for learners

Unit title: Construction Materials and Specification

This section will help you to decide whether this is the unit for you by explaining: what the unit is about; what you should know or be able to do before you start; what you will need to do during the unit; and opportunities for further learning and employment.

This unit is about construction materials. It allows you to learn how they are made or manufactured. It gives you the opportunity to think about which materials you would use in different situations and to formalise these choices by means of a specification. In fact, you will be introduced to a skill vital in the industry — that of specification writing.

You will learn a lot about materials from videos and manufacturers' websites. You might find time for materials tests — but you won't be assessed in that practical part of your learning.

You will be assessed by answering questions and writing responses to given tasks. You might be asked to use software or online applications for your specification writing — but that depends on the resources available at your centre.

Everyone in the construction industry needs to know about materials — it's what we build with!