



## Higher National Unit specification

### General information

**Unit title:** Sound Production Theory 1 (SCQF level 7)

**Unit code:** H1M1 34

**Superclass:** XL

**Publication date:** August 2014

**Source:** Scottish Qualifications Authority

**Version:** 02

### Unit purpose

This Unit is designed to give candidates clear knowledge and understanding of the basics of sound production theory. It will prepare them for using sound production technology and techniques by providing a foundation of commonly used equipment and techniques. This Unit is intended for candidates who are interested in pursuing a career in sound production where the use of sound production technology is a key component of the job for example, recording, sound reinforcement, television, radio, audio-visual and multimedia.

### Outcomes

On completion of the Unit the learner will be able to:

- 1 Demonstrate an understanding of common components found in the audio recording and reproduction process.
- 2 Demonstrate an understanding of microphones and microphone techniques.
- 3 Describe the principles of stereo audio imaging.
- 4 Demonstrate an understanding of audio signal processing.

### Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

## Higher National Unit Specification: General information (cont)

### Recommended entry to the Unit

Access to this Unit will be at the discretion of the centre. However, it would be beneficial if candidates had some experience (practical or theoretical) of sound recording. This may be evidenced by having studied the relevant NQ Units F58H 12 *Sound Engineering and Production*, F58G 12 *Sound: Understanding the Signal Path* or by having prior experience.

### Core Skills

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

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

### Context for delivery

This is a mandatory Unit in the framework for HNC/HND Sound Production and is an optional Unit in the HNC/HND Music framework. 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](http://www.sqa.org.uk/assessmentarrangements).

## **Higher National Unit specification: Statement of standards**

### **Unit title:** Sound Production Theory 1 (SCQF level 7)

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. Candidates 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**

Demonstrate an understanding of common components found in the audio recording and reproduction process.

#### **Knowledge and/or Skills**

- ◆ Types of audio inputs
- ◆ Types of audio outputs
- ◆ Audio interconnections (cables and connectors)
- ◆ Monitoring
- ◆ Metering

### **Outcome 2**

Demonstrate an understanding of microphones and microphone techniques.

#### **Knowledge and/or Skills**

- ◆ Common types of microphone construction
- ◆ Microphone polar patterns
- ◆ Mono microphone techniques and microphone placement
- ◆ Stereo microphone techniques and microphone placement

### **Outcome 3**

Describe the principles of stereo audio imaging.

#### **Knowledge and/or Skills**

- ◆ How the stereo image is recorded and reproduced
- ◆ How the recorded and reproduced stereo image relates to human hearing
- ◆ Differentiate between mono and stereo recordings
- ◆ Differentiate pan-potted mono and spatial reproduction

## Higher National Unit specification: Statement of standards (cont)

**Unit title:** Sound Production Theory 1 (SCQF level 7)

### Outcome 4

Demonstrate an understanding of audio signal processing.

#### Knowledge and/or Skills

- ◆ Gain structure
- ◆ Equalisation
- ◆ Compression/limiting
- ◆ Gating/expansion
- ◆ Time domain effects

#### Evidence Requirements for this Unit

##### Outcome 1

Candidates will need written and/or oral evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ identify and describe different types of audio inputs and outputs commonly found in the recording and reproduction process.
- ◆ identify and describe different commonly used types of interconnection.
- ◆ describe typical characteristics of recording studio monitoring.
- ◆ describe the characteristics and use of RMS/Average, Peak, PPM and VU metering in sound production.

Evidence should be generated through an assessment undertaken in open-book controlled conditions. Candidates may prepare and only refer to two sides of A4 notes during the assessment of this Outcome.

##### Outcome 2

Candidates will need written and/or oral evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ identify, from circuit diagrams and/or technical specifications, the common types of microphone construction and state the advantages/disadvantages of each type.
- ◆ identify and describe the polar patterns of common types of microphone.
- ◆ describe typical mono microphone techniques for given scenarios.
- ◆ identify and describe typical stereo microphone techniques for given scenarios.

Diagrams may be used to support this evidence. Any oral response should be recorded on a high quality format and kept as evidence for external verification.

Evidence should be generated through an assessment undertaken in open-book controlled conditions. Candidates may prepare and only refer to two sides of A4 notes during the assessment of this Outcome.

## Higher National Unit specification: Statement of standards (cont)

**Unit title:** Sound Production Theory 1 (SCQF level 7)

### Outcome 3

Candidates will need written and/or oral evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ describe how the audio image is captured by microphones in mono and stereo recordings.
- ◆ describe how mono and stereo recordings are reproduced through stereo speakers and headphones.
- ◆ compare the difference in audio images provided by pan-potted mono and spatial reproduction techniques for stereo reproduction systems.

Evidence should be generated through an assessment undertaken in open-book controlled conditions. Candidates may prepare and only refer to two sides of A4 notes during the assessment of this Outcome.

### Outcome 4

Candidates will need to provide written and/or oral evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain gain structure in the recording and reproduction process.
- ◆ describe two common examples of the application of equalisation.
- ◆ describe two common examples of the application of compression/limiting.
- ◆ describe two common examples of the application of gating/expanding.
- ◆ describe two common examples of the application of reverb.
- ◆ describe two common examples of the application of delay.

For any two processes listed in the Knowledge and/or Skills, candidates must select and justify appropriate parameter settings for a given scenario.

Evidence should be generated through an assessment undertaken in open-book controlled conditions. Candidates may prepare and only refer to two sides of A4 notes during the assessment of this Outcome.



## Higher National Unit Support Notes

**Unit title:** Sound Production Theory 1 (SCQF level 7)

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

The Unit is primarily intended to give candidates underpinning knowledge of sound production theory for use within, but not exclusively, the HN Sound Production framework.

It may be beneficial for candidates if delivery of this Unit could be integrated with more practical based Units, such as *Sound Production Practice 1* and *Digital Audio Workstations 1* in order to reinforce knowledge and understanding.

### Guidance on approaches to delivery of this Unit

**Outcome 1** — covers gain structure, inputs and outputs, interconnections, monitoring and metering. The nominal operating conditions for the equipment should also be emphasised with respect to gain structure and headroom and its impact on signal integrity throughout the signal path. The use of balanced and unbalanced signals and the associated inputs/outputs and cables/connectors should be fully explored. Reference should be made to technical standards for metering and signal levels, though not assessed.

#### Key topics

- ◆ Gain structure — microphone/line level, pre-amplifiers, gain, gain reduction/make-up
- ◆ Inputs and outputs — balanced/unbalanced mic, line, insert, AUX send/return, etc
- ◆ Connectors — balanced/unbalanced XLR, TRS/TS-Jack, phono, insert leads, etc
- ◆ Monitoring — near-field/main studio monitoring, small and large speaker performance, performers monitoring, headphones, etc
- ◆ Metering — metering characteristics, typical professional uses and standards

## Higher National Unit Support Notes (cont)

**Unit title:** Sound Production Theory 1 (SCQF level 7)

**Outcome 2** — covers microphone selection and techniques. This covers three key areas of knowledge — microphone polar patterns; the correct microphone technique; and the placement of microphones in relation to the technique being used. The *Sound Production Practice 1* Unit would be ideal for augmenting the delivery of this Outcome.

### Key topics

- ◆ Microphone types — dynamic, condenser, ribbon, etc
- ◆ Polar patterns — omni, bi-polar, cardioid, hyper-cardioid, etc
- ◆ Mono microphone techniques — close/near/far placement, instrument/vocal studio and live microphone use, etc
- ◆ Stereo microphone techniques — coincident/XY/M-S, near-coincident ORTF/NOS, spaced/A/B, etc

**Outcome 3** — covers the principles of audio imaging theory through four key areas of knowledge — audio images produced due to intensity difference, time arrival difference, the Haas Effect and the difference between mono and stereo recording and reproduction. It is suggested that the principles of human hearing are established first before relating to the characteristic responses of microphone pairs for stereo recording and stereo reproduction.

For candidates undertaking the Sound Production HND, concepts concerning aural perception will be studied as part of the Unit *Acoustics 1*, which would ideally be delivered before or concurrently with this Unit.

### Key topics

- ◆ Monophonic/stereophonic — what these terms mean, the consequences for listening, the practicalities of recording and reproduction
- ◆ Human hearing — ITD, IID, Haas Effect, listening with loudspeakers/headphones, etc
- ◆ Reproduction in stereo — pan-potted mono, stereo recording/reproduction, pseudo-stereo from time domain effects, phase, correlated/non-correlated audio/reflections, etc

**Outcome 4** — covers audio signal processing and understanding the application of audio signal processors. The main types of signal processing would be pre-amplification, equalisation, dynamic and time domain processing. The Outcome would benefit from practical demonstration of audio signal processing in a studio environment.

### Key topics

- ◆ Signal levels — microphone/line
- ◆ Equalisation — filter types, filter quality, spectral range and common vocabulary, eg bass, mid, presence, treble, etc
- ◆ Compression/limiting — threshold, ratio, attack, release, gain, side-chain
- ◆ Gating/expansion — threshold, range, ratio, attack, hold, release, key, filtering, etc
- ◆ Delay/phaser/flanger — delay time, feedback, phase, modulation
- ◆ Reverberation — reverb time, early reflection, balance, width, etc

## Higher National Unit Support Notes (cont)

**Unit title:** Sound Production Theory 1 (SCQF level 7)

### Guidance on approaches to assessment of this Unit

It is recommended that the four Outcomes are assessed individually and in sequence. Summative assessment should only be undertaken after a significant amount of hands-on experience with the equipment and familiarity with equipment manuals, etc.

All assessments should be carried out in open-book controlled conditions.

If Outcomes are assessed individually, candidates may prepare and only refer to a maximum of two sides of A4 notes during the assessment of each Outcome.

If Outcomes are assessed cumulatively, candidates may prepare and only refer to a maximum of eight sides of A4 notes during the assessment of the Unit.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

### Assessment Guidelines

The assessment of this Unit is designed to test candidates' retained knowledge of sound production theory. If supplying oral responses, these should be recorded on a high quality format and kept as evidence for external verification.

All assessments should allow the candidate to demonstrate knowledge of the appropriate terms and terminology embedded in common use of the items in the Knowledge and/or Skills.

#### Outcome 1

Candidates are required to correctly identify the components typically used in a professional sound recording studio. The assessment could be broken into two parts as follows:

- ◆ A practical identification of cables, connectors, inputs and outputs from diagrams/pictures or physical devices
- ◆ A description of monitoring and metering highlighting the key features and typical usage

#### Outcome 2

Formative assessment opportunities will allow candidates to become familiar with the essential microphone types and their characteristics and how they are commonly used. If the candidate is also studying Sound Production Practice Units then it will be beneficial to integrate the Knowledge and/or Skills development prior to assessment of this Outcome.

Appropriate Instruments of Assessment may include a mix of picture-based questions with multiple choice and restricted-response answers in addition to extended response, where the candidate has to provide a description.



## Higher National Unit Support Notes (cont)

### Unit title: Sound Production Theory 1 (SCQF level 7)

Candidates should be able to:

- ◆ correctly identify at least three different common types of microphone construction and state at least one advantage and disadvantage of each type.
- ◆ describe at least two typical mono microphone techniques stating microphone polar pattern used and its position relative to the sound source.
- ◆ identify and describe at least two typical stereo microphone techniques stating microphone polar pattern used and their position relative to the sound source.

#### Outcome 3

As with Outcome 2 practical experience and studio demonstrations should occur before this assessment takes place. The Knowledge and/or Skills from *Acoustics 1* Outcome 2 could be beneficial to the candidate for this Outcome.

Any Instrument of Assessment covering the Knowledge and/or Skills should allow candidates to provide a description and comparison, where required.

#### Outcome 4

Candidates could be asked to describe how each of the Knowledge and/or Skills are commonly used with regard to case studies/scenarios, eg a diagram could be shown of a filter response that elicits a description of how and why that particular example of equalisation is being used. Alternatively questions could be specific in asking the candidate to describe how a particular process would be applied, eg describe how EQ, dynamics and time domain effects would be applied when recording a 'voice-over' for a film trailer, explain the typical settings of each process and reasons for choosing those settings.

Candidates should provide an answer that includes:

- ◆ How the audio signal is being processed
- ◆ Why the audio signal is being processed
- ◆ Key terms associated with each device

### 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 (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish 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](http://www.sqa.org.uk/e-assessment).

## **Higher National Unit Support Notes (cont)**

**Unit title:** Sound Production Theory 1 (SCQF level 7)

### **Opportunities for developing Core Skills**

Opportunities for developing Core Skills will be dependent on the learning and teaching approaches for this Unit. Candidates undertaking research and practical activities associated with developing the knowledge and skills, particularly through well structured practical formative exercises, could allow elements of *Problem Solving*, *Working with Others*, *Communication* and *Information and Communication Technology (ICT)* to be developed.

## History of changes to Unit

Version	Description of change	Date
02	The assessment conditions have been revised for each Outcome. Evidence should now be generated through controlled open-book conditions. Learners may prepare and only refer to two sides of A4 notes during the assessment of each Outcome.	25/08/14

© Scottish Qualifications Authority 2012, 2014

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Business Development and Customer Support team, telephone 0303 333 0330.

## General information for learners

### Unit title: Sound Production Theory 1 (SCQF level 7)

This Unit is designed to give you clear knowledge and understanding of the basics of sound production theory. It will prepare you for using sound production technology and techniques by providing a foundation of commonly used equipment and techniques.

There are four Outcomes. They cover the audio signal path from input to processing to output.

Most of the content of this Unit is found in the key texts, Practical Recording Techniques and Modern Recording Techniques. This theory Unit will assess your retained knowledge and therefore you will not be able to use any text or graphic resources during the assessments.

#### Outcome 1 — Key topics

- ◆ Gain structure — microphone/line level, pre-amplifiers, gain, gain reduction/make-up
- ◆ Inputs and outputs — balanced/unbalanced mic, line, insert, AUX send/return, etc
- ◆ Connectors — balanced/unbalanced XLR, TRS/TS-Jack, phono, insert leads, etc
- ◆ Monitoring — near-field/main studio monitoring, small and large speaker performance, performers monitoring, headphones, etc
- ◆ Metering — metering characteristics, typical professional uses and standards

#### Outcome 2 — Key topics

- ◆ Microphone types — dynamic, condenser, ribbon, etc
- ◆ Polar patterns — omni, bi-polar, cardioid, hyper-cardioid, etc
- ◆ Mono microphone techniques — close/near/far placement, instrument/vocal studio and live microphone use, etc
- ◆ Stereo microphone techniques — coincident/XY/M-S, near-coincident ORTF/NOS, spaced/A/B, etc

#### Outcome 3 — Key topics

- ◆ Monophonic/stereophonic — what these terms mean, the consequences for listening, the practicalities of recording and reproduction
- ◆ Human hearing — ITD, IID, Haas Effect, listening with loudspeakers/headphones, etc
- ◆ Reproduction in stereo — pan-potted mono, stereo recording/reproduction, pseudo-stereo from time domain effects, phase, correlated/non-correlated audio/reflections, etc

#### Outcome 4 — Key topics

- ◆ Signal levels — microphone/line
- ◆ Equalisation — filter types, filter quality, spectral range and common vocabulary, eg bass, mid, presence, treble, etc
- ◆ Compression/limiting — threshold, ratio, attack, release, gain, side-chain
- ◆ Gating/expansion — threshold, range, ratio, attack, hold, release, key, filtering, etc
- ◆ Delay/phaser/flanger — delay time, feedback, phase, modulation
- ◆ Reverberation — reverb time, early reflection, balance, width, etc

This theory Unit is designed to develop your knowledge and skills of the underpinning theory behind the use and application of technology.