Unit 62: Stage Technical Maintenance

Unit code: A/600/0169
QCF Level 3: BTEC National
Credit value: 10
Guided learning hours: 60

Aim and purpose

The aim of this unit is to develop learners' knowledge in the maintenance requirements of theatre lighting, sound and stage equipment. Learners will have the opportunity to research and learn how to maintain common types of equipment and carry out pre-event checks.

Unit introduction

Technical maintenance is one of the most vital roles within the technical team. When equipment is at height and it fails for whatever reason the costs and time associated with replacement and repair can be prohibitive. Therefore maintenance of sound, lighting, stage and rigging equipment is vital, not only to ensure it is safe and fit for purpose but also to save many hours in the production process. As part of this unit learners will install and maintain a range of different types of equipment to the recognised standards, ensuring the equipment is fit for purpose.

Learners will carry out all three parts of the maintenance process, from pre-show safety, maintenance and function checks, to ongoing checks and maintenance during the event process where the equipment fails during the event. It is a legal requirement to hold the required maintenance records, and to ensure the safety of electrical equipment. This is carried out through portable appliance (PAT) testing. Other health and safety checks and requirements need to be carried out and logged. In this unit learners will develop the skills they need to carry out maintenance tasks typical of those found within the entertainment and presentation industry.

The unit covers technical support work spread across three disciplines: lighting, sound and stage rigging. It represents a broad skills base and will appeal to learners wishing to work in the industry in a more general setting as the skills are transferable to both the general maintenance and electrical industries.

Learning outcomes

On completion of this unit a learner should:

1 Know the operation and maintenance requirements of theatre equipment

2 Be able to demonstrate skills in general technical maintenance and related health and safety processes

3 Be able to carry out the installation of equipment

4 Be able to set up a record keeping system for testing and repair.

Unit content

1 Know the operation and maintenance requirements of theatre equipment

Techniques: fibre rope work; wire rope systems and termination; stage flying systems

Health and safety: legislation; codes of practice; hazard analysis

Equipment: eg luminaries, audio recording/playback equipment, smoke machines, pulley/counterweight systems, fibre and wire rope, bubble machines, mirror balls

Safety: fire proofing; fire safety; electrical safety; pyrotechnic storage; personal protective equipment (PPE)

Fault finding: guide; lighting chain; sound chain

Access equipment: extension ladders; a frame; tallescope; scaffold tower; aerial work platform

2 Be able to demonstrate skills in general technical maintenance and related health and safety processes

Cleaning: eg luminaries, audio recording/playback equipment, smoke machines

Adjustment: eg luminaries, pulley/counterweight systems, fibre and wire rope

Safety: fire proofing; fire safety; electrical safety; pyrotechnic storage

3 Be able to carry out the installation of equipment

Rigging: clamps; suspension systems; bars; internally wired bars (IWB); cloths; cabling

Connection: power; control; data; distribution systems

4 Be able to set up a record-keeping system for testing and repair

Stock: inventory; manuals; identification

Maintenance: servicing; portable appliance testing records; schedules; usage

Systems: eg paper based, computer based, hybrids

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 collate appropriate information into a reference manual [IE]	**M1** present a range of information clearly with some sense of order in terms of relevance and importance	**D1** present a detailed and comprehensive reference manual that is clearly indexed and in which there is evidence of careful selection of material
P2 carry out maintenance adequately and safely with considerable guidance and supervision [IE]	**M2** carry out maintenance competently and safely with limited guidance	**D2** carry out maintenance successfully and safely with autonomy
P3 install, connect and test the specified range of equipment with considerable support and guidance [EP]	**M3** install, connect and test the specified range of equipment with little support and guidance	**D3** install, connect and test the specified range of equipment independently showing initiative
P4 develop a record system that is effective when in use. [SM]	**M4** develop a detailed record system that communicates information effectively.	**D4** keep comprehensive record systems and inventories that are clear to understand and that indicate forward planning.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Learners will need time to experiment with stage technology and to practise the techniques and skills required by the unit. A flexible approach to timetabling may be required for this unit to integrate successfully with the needs of other units in the programme. This unit could be delivered by shorter, intensive periods of work based around the needs of the qualification as a whole. Learners working on sound, lighting and crewing units need fully working equipment to use on their projects. This equipment should be provided for this unit.

Learners should be familiar with all of the content listed. Learners should carry out and be assessed on a maintenance programme that covers each of the following as a minimum:

- cleaning luminaires and audio equipment
- adjusting luminaires and an item of stage equipment
- rigging a suspension bar, hanging a cloth, rigging an item of flying scenery, rigging at least six luminaires and cabling a sound system
- connecting an item of equipment that has an input and output and preparing it for operation
- servicing at least two items of equipment.

PAT testing is not a requirement of this unit though its purpose should be explained, to check the safety of each appliance and cable annually, and following any service. If these facilities are available with suitably qualified supervisors then this could be carried out as part of the service.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to equipment maintenance: Tutor • health and safety • electrical safety.
Assignment 1: Research Equipment, and Produce Reference Manual – P1, M1, D1 Learners: • research user manuals, maintenance requirements for equipment found within the venue • generate indexed portfolio of evidence identifying ◊ maintenance requirements ◊ adjustments ◊ servicing potential ◊ checklist for each type of equipment.
Introduction to PAT testing: Tutor. Learner: PAT testing checklist exercises.
Introduction to maintenance techniques: Tutor • cleaning • checks • health and safety • working at height • cable suspension/fixing • wire rope/fibre rope/rigging • cloths • soldering.
Assignment 2: Carry out Maintenance of Equipment within Portfolio of Evidence – P2, M2, D2, P4, M4, D4 Use • checklists • PAT testing (if available) • visual check • cleaning.

Topic and suggested assignments/activities and/assessment
Assignment 3: Reinstall Test and Operate Equipment Following Maintenance Checks – P3, M3, D3 Learners: reinstall equipment following maintenance. Use • checklist • flash out items • safe system of work • any repairs/installation signed off by tutor.

Assessment

Evidence for this unit can be generated through real maintenance of the specialist equipment available in centres. It should be possible to integrate assignment work to cover a number of evidence requirements. For example, a project that produces an inventory of centre equipment stock may generate information concerning required maintenance. This maintenance can be carried out generating additional assessment opportunities. It is expected that assessment will be a combination of practical tasks and associated documentation typical of the type of work carried out in the industry. Attention should be paid to the minimum requirements specified in the content section.

A portfolio of research material will be collected and this builds into the evidence required for the study components of the unit. A permanent record of learners' achievements can best be made with photographic or video evidence of the effects or processes achieved in practical work. Written evidence from learners would also be valid but it would be difficult to detail adequately the actual processes they used and, whilst acceptable as evidence, the production of this written evidence would be very time consuming.

Observation assessment systems may be useful to assess the practical elements of this unit, but must be thorough and carried out over an extended period. Assessors should be aware that evidence collection during the production phase is vital. Post-production evidence is unlikely to allow access to the higher grades.

There are four elements in the evidence for assessment for this unit:

- producing an indexed reference portfolio of lighting, sound and audio visual equipment technical and maintenance requirements
- demonstration of skills in technical maintenance and health and safety
- demonstration of installation of equipment
- set up of a record keeping system for testing and repair.

Each element can be documented in a number of ways to produce sufficient and reliable evidence for assessment purposes. Evidence of background research material should include manufacturer and product range research undertaken along with a presented report either written, spoken or using ICT.

Learners should maintain a working log/diary for the practical elements of this unit and should also have supporting evidence in the form of photographic, video and observation records. A permanent record of learners' achievements can be made with photographic or video evidence of the effects or processes achieved in practical work. Written evidence is also valid but it would be difficult to adequately detail the actual processes they used and, whilst acceptable as evidence, the production of this written evidence would be very time consuming.

Witness evidence from suitably qualified individuals in a professional environment would also be acceptable subject to internal and external verification processes.

Learning outcome 1 requires learners to develop a portfolio of reference material, showing types of lighting, sound and AV equipment and their maintenance requirements.

Differentiation between pass, merit and distinction will be apparent through the depth of research and the factors taken into account when presenting their ideas

At pass level, learners will identify types of equipment and how each can be maintained. There should be some knowledge about which ones learners can maintain and what is beyond the legal or practical requirements and requires secondary maintenance. Research evidence will be presented showing examples of each type. This could be in the form of a report, either written, spoken, or using ICT and should contain a portfolio of research

At merit level, learners will be describe the equipment types and look at a maintenance checklist for each type of equipment.

At distinction level, learners will describe in detail a range of types of equipment and produce a comprehensive checklist of maintenance tasks for each type of equipment

Learning outcome 2 requires learners to demonstrate the role of a maintenance technician. Learners will use the checklists produced in learning outcome 1 and carry out maintenance on a range of equipment, including lanterns, cables, and audio source equipment

At pass level, learners will be able to produce some completed checklists and evidence that they have maintained the range of lanterns, this will be done under supervision and with guidance provided.

At merit level, learners will be able to provide a full range of working documentation to support the maintenance. This will include diary logs, photos, videos and witness testimonies and involve only minimal guidance.

At distinction level, learners should independently carry out the maintenance but request safety checks of equipment as required. The equipment will function, look clean, tidy and repairs will be logged.

Learning outcome 3 requires learners to reinstall and connect the maintained equipment, this will include lighting ad audio equipment.

At pass level, learners will be able to install a range of equipment with support and guidance. It should work as designed and follow conventions, so lanterns should be pointing in the correct direction, with barndoors and shutters open, cabling installed neatly, audio sources patched neatly and re-racked if applicable.

At merit level, learners will be able to install a range of equipment with minimal support and guidance.

At distinction level, learners will be able to install and connect the equipment independently carrying out tests and fault-finding tasks, showing initiative.

Learning outcome 4 requires learners to institute and utilise a record-keeping system.

This should be evidenced through the finished log, an evaluation should indicate how well the actual notes meet the Centres requirements and legal requirements.

At pass level, learners will be able to develop and use a record system logging all maintenance and repairs

At merit level, learners will be able to develop a detailed system, logged and indexed so that it identifies the key data required, such as retest dates, detailed description of maintenance or repair undertaken

At distinction level, learners should be able to produce a comprehensive record system and inventory, with a unique identifier for each lantern, retest and next inspection dates. This could be carried out using an ICT database, with a search facility

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	1: Research Equipment, and Produce Reference Manual	Learners research maintenance requirements/ user manuals of equipment found within the venue generating a checklist for each types of equipment.	Indexed portfolio of reference material. Checklists. Adjustment and servicing requirements.
P2, M2, D2, P4, M4, D4	2. Carry out Maintenance of Equipment within Portfolio of Evidence	Learners use checklists and research to carry out servicing, safety checks and maintenance of equipment creating inventory, and logging future work requirements.	Observation. Completed checklists. Evaluation. Diary. Inventory log. Documented tests/servicing.
P3, M3, D3	3: Reinstall Test and Operate Equipment Following Maintenance Checks	Learners put equipment back into service following maintenance, including reconnecting equipment.	Observation. Documentation of equipment chain and interconnects. Diary. Photo/video evidence.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Performing and Production Arts sector suite. This unit has particular links with the following unit titles in the BTEC Performing and Production Arts suite:

Level 1	Level 2	Level 3
Exploring Technical Support for Stage Performance	Lighting Operations for Stage Performance	Production Arts Workshop
	Sound Operations for Stage Performance	Stage Lighting Operations
	Crewing For Stage Performance	Technical Stage Operations
		Temporary Theatre Electrical Installations
		Automated Stage Lighting
		Stage Sound Operations

This unit also has links with the following National Occupational Standards:

Technical Theatre

- CPD1 – Improving your skills
- CPD2a –TP Keeping up to date with technical and production developments in the live arts
- CPD4a – Contributing to technical production work for performance
- HS1 – Working safely
- TP8.2a – Setting up, focussing lighting and checking control systems and accessories
- TP8.4 – Setting up and checking sound equipment
- TP16a – Preparing and assembling rigging and de-rigging
- MTP1 – Using tools and equipment for construction or maintenance.

Essential resources

This unit requires learners to have access to a range of stage technical systems. Although there is scope within the unit for simulations and paper-based work, learners need access at certain stages in the unit to equipment commonly only available in professional working theatres; this may often be arranged by learners providing voluntary support to these theatres.

Employer engagement and vocational contexts

It is unlikely that this type of servicing work can be carried out in a professional theatre because of health and safety legislations. There will therefore be limited vocational content outside the centre.

Indicative reading for learners

Textbooks

Fitt B – *A-Z of Lighting Terms* (Focal Press, 1999) ISBN 9780240515304

Fitt B and Thornley J – *Lighting Technology: A Guide for the Entertainment Industry Paperback* (Focal Press, 2001) ISBN 9780240516516

Fitt B and Thornley J – *The Control of Light* (Focal Press, 1992) ISBN 9780240513461

Huntington J – *Control Systems for Live Entertainment* (Focal Press, 2007) ISBN 9780240809373

Kaye D and Lebrecht J – *Sound and Music for the Theatre: The Art and Technique of Design* (Focal Press, 2009) ISBN 9780240810119

Palmer S – *Essential Guide to Stage Management: Lighting and Sound* (Essential Guides to the Performing Arts) (Hodder Arnold, 2000) ISBN 9780340721131

Reid F – *The Stage Lighting Handbook* (Theatre Arts, 2002) ISBN 9780878301478

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	collating maintenance information carrying out maintenance of equipment
Team workers	carrying out maintenance
Self-managers	creating a record/inventory system
Effective participators	reinstalling equipment following maintenance.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	carrying out detailed repairs.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	creating an inventory system
Manage information storage to enable efficient retrieval	creating an inventory system
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	creating an inventory system
Bring together information to suit content and purpose	creating an inventory system
Present information in ways that are fit for purpose and audience	creating an inventory system
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	creating an inventory system
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	creating an inventory system
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	creating an inventory system
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	creating an inventory system.