

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

**Hanover House
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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- 4281010 -Session-1990-91
-Superclass- TH

-Title- GAS DISTRIBUTION: TRENCH SUPPORT SYSTEMS
(x 1/2)

-DESCRIPTION-

Purpose This module is designed to develop the knowledge and skills required to construct trench support systems and use de-watering equipment in order to carry out set tasks safely in below ground conditions.

It is aimed at those following a career in the distribution sector of the gas industry and receiving complementary industrial experience.

Preferred Entry Level No formal entry requirements.

Outcomes The student should:

1. outline the legal requirements governing the use of trench support systems during excavation activities;
2. construct an open board trench support system for use in moderately firm ground conditions;
3. construct a close board timbering trench support system for use in unstable ground conditions;
4. use de-watering equipment to maintain minimum water table.

Assessment Procedures Acceptable performance in the module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

Unless otherwise indicated, the student may be assisted by one or more students in carrying out the practical exercises. However, each student in turn must be assessed as being responsible for the completion of the tasks specified.

The following abbreviations are used below:

PC Performance Criteria
IA Instrument of Assessment

Note: The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

OUTCOME 1 OUTLINE THE LEGAL REQUIREMENTS GOVERNING THE USE OF TRENCH SUPPORT SYSTEMS DURING EXCAVATION ACTIVITIES

- PCs
- (a) The reasons given for the use of trench support systems are correct in terms of safe working practices.
 - (b) The selected trench support system is suitable for ground conditions, depth of excavation and/or soil type for:
 - (i) open boarding;
 - (ii) close boarding;
 - (iii) sheet piling.

IA Restricted Response

The student will be presented with an exercise consisting of restricted response questions to test comprehension of the legal requirements governing the use of trench support systems during excavation activities.

The exercise will consist of 5 questions allocated as follows:

- | | | |
|-------|--------------------------|-----|
| (i) | sources of information | - 1 |
| (ii) | trench support selection | - 2 |
| (iii) | legal requirements | - 1 |
| (iv) | trench support selection | - 1 |

Satisfactory achievement of the Outcome will be based on Performance Criteria being met. This will be demonstrated by the student producing one correct response to each of (i), (ii) and (iv) and two correct responses to (iii).

OUTCOME 2 CONSTRUCT AN OPEN BOARD TRENCH SUPPORT SYSTEM FOR USE IN MODERATELY FIRM GROUND CONDITIONS

- PCs
- (a) The construction of open boarding is in accordance with recommended statutory procedures.
 - (b) The procedures adopted to inspect open boarding are correct in terms of trench support and safety.
 - (c) The dismantling of the shoring equipment is in accordance with recommended procedures.
 - (d) Working practices followed are safe.
 - (e) Tools and equipment used are appropriate to the task.

IA Practical Exercise

The student will be set an exercise consisting of a series of practical tasks to test the application of knowledge and skills required to construct and remove open board trench support.

The student may be assisted by another student for this practical exercise but an individual student will be responsible for the construction and removal of a section of open board trench support.

The exercise will consist of 3 tasks allocated as follows:

- (i) construction of a section of open board trench support;
- (ii) removal of a section of open board trench support;
- (iii) inspection of a section of open board trench support.

For tasks (i) and (ii) the student will be presented with a section of open trench of 6m length 1.2m depth and 0.8m wide, a selection of timber and a range of tools appropriate for the completion of the given tasks.

For task (iii) each student will be presented with a section of trench supported by an open board system containing known faults.

Satisfactory achievement of the Outcome will be based on all the Performance Criteria being met. This will be demonstrated by the student achieving all the items on the following checklist:

CHECKLIST(i) and (ii)

- (i) safe working practices relevant to each task are followed
- (ii) measuring and cutting of poling boards and struts
- (iii) correct sequential construction order
- (iv) correct sequential dismantling order
- (v) organisation of construction activities on site
- (vi) rejection of unsuitable materials

CHECKLIST (iii)

- (i) trench entry and exit provision
- (ii) vertical board alignment
- (iii) horizontal board alignment
- (iv) strut, off set positioning
- (v) water table
- (vi) clear way round trench side.

OUTCOME 3**CONSTRUCT A CLOSE BOARD TIMBERING TRENCH SUPPORT SYSTEM FOR USE IN UNSTABLE GROUND CONDITIONS**

PCs

- (a) The construction of close boarding is in accordance with recommended statutory procedures.
- (b) The procedures adopted to inspect close boarding are correct in terms of trench support and safety.
- (c) The dismantling of close board shoring is in accordance with recommended statutory procedures.
- (d) Working practices followed are safe.
- (e) Tools and equipment are appropriate to the task.

IA Practical Exercise

The student will be set an exercise consisting of a series of practical tasks to test the application of knowledge and skills required to construct and remove close board trench support.

The exercise will consist of 3 tasks allocated as follows:

- (i) construction of a section of close board trench support;
- (ii) removal of a section of close board trench support;
- (iii) inspection of a section of close board trench support.

For tasks (i) and (ii) the student will be presented with a section of concrete sides open trench of 4m length, 2m

depth and 1m wide, a selection of timber and a range of tools appropriate for the completion of the given tasks.

For task (iii) each student will be presented with a section of trench, supported by close board system containing known faults.

Satisfactory achievement of the Outcome will be based on all the Performance Criteria being met. This will be demonstrated by the student achieving all the items on the following checklist:

CHECKLIST (i) and (ii)

- (i) safe working practices relevant to each task are followed
- (ii) rejection of unsuitable materials
- (iii) measuring and cutting of a range of vertical and horizontal placed timbers
- (iv) correct sequential construction order
- (v) correct placement of wedges and lacings
- (vi) correct sequential dismantling order
- (vii) organisation of construction activities on site

CHECKLIST (iii)

- (i) trench entry and exit provision
- (ii) vertical board alignment
- (iii) horizontal board alignment
- (iv) strut, off set positioning
- (v) water table
- (vi) ground condition
- (vii) clear way round trench side

OUTCOME 4 USE DE-WATERING EQUIPMENT TO MAINTAIN MINIMUM WATER TABLE

- PCs
- (a) The selection of water pump is correct in terms of maintaining low water table conditions.
 - (b) The inspection and pre-assembly checks of water pump components ensure operational service ability.
 - (c) The use of de-watering equipment is correct in terms of achieving low water table conditions.
 - (d) Working practices followed are safe.

IA Practical Exercise

The student will be set an exercise consisting of a series of practical tasks to test the application of knowledge and skills required to use de-watering equipment to control the level of water in trenches.

The exercise will consist of two tasks allocated as follows:

- (i) selection and assembly of a de-watering system;
- (ii) correct discharging of water from a trench.

For task (i) the student will be presented with a range of pumps, hoses and tools.

For task (ii) the student will be presented with a 45 gallon water-filled chamber of 1.5m suction lift, with 10m length discharge point.

Satisfactory achievement of the Outcome will be based on all the Performance Criteria being met. This will be demonstrated by the student achieving all the items on the following checklist:

CHECKLIST:

- (i) safe working practices relevant to each task are followed
- (ii) pump and hose check and assembly
- (iii) placement of equipment to trench sides
- (iv) use of de-watering apparatus
- (v) correct discharge of water

**The following sections of the descriptor are offered as guidance.
They are not mandatory.**

CONTENT/CONTEXT

Safety regulations and safe working practices and procedures should be adhered to at all times.

Corresponding to Outcomes 1-4:

1. Differentiation between lawful requirements and good working practices.

Legislation which may affect the excavation of trenches on a public road and footpath includes:

- The Health and Safety at Work Act 1974
- The Public Utilities Streets Works Act 1950
- London Traffic Act 1924
- Road Transport Lighting Act 1927
- Construction (General Provision) Regulations 1961.

Measures to be taken to ensure the safety of workmen, trenches and adjoining works are governed by the:

- Building (Safety, Health and Welfare) Regulations 1948
- Health and Safety at Work Act 1974

Within the vicinity of ancient monuments and historical buildings, private Acts of Parliament may be in force.

- Planning Authority should be consulted.

Model consultative procedure (MCP) for pipelines construction involve deep excavation, between Water Authorities Association and British Gas Corporation.

Factors relating to the selection of a trench support system in terms of ground condition:

- soil classification, clay, silt, sand, gravel and boulders.
- soil drainage properties.
- volume variance of cohesive soils in relation to moisture.
- sedimentary rock bedding planes.
- trench side wall failure planes.

- 2&3. The selection and use of a range of timbers and trench jacks to construct an open and close board trench support system.

Factors relating to the selection of construction materials:

- condition of timber, moisture content, cracking, warp and previously sustained construction damage.
- poling board minimum dimension 200mm width face and 37mm thick.

- waling board minimum dimension 225mm width face and 75mm thick.
- struts comparable dimension with waling boards.
- jacks, square plate ended with timber pad.

Factors relating to construction:

- safe entry and exit.
- poling board extended length dimension to include 300mm toe in, plumb vertical placement and support by ground props and puncheon.
- waling board horizontal placement and support by ground props and puncheon.
- strut dimension to include potential for compression, horizontal placement at zero degree off set to opposing side forces.
- jack dimensions to include potential compression and trench width dimension changes.

Use of daily trench support check to include:

- water table
- ground condition
- weather changes
- clearway around trench sides
- jack and edge adjustments
- vertical placed board movement
- horizontal placed board movement

4. Procedures for the use of water pumps to reduce the level of static and running water in a trench should be safety related in terms of:

- the exhaust fumes from powered pump units should not contaminate confined spaces;
- the placement of pumping apparatus in relation to trench sides and suction lift;
- discharged water should be disposed of safely;
- suction power should be moderated and sump hole lined to reduce the displacement of solid matter.

SUGGESTED LEARNING AND TEACHING APPROACHES

Outcomes 1-4 could be introduced through formal input sessions, demonstration and student practice.

Adequate time could be allocated to theory sessions with every consideration given to the subject being taught in proper subject progression. The use of visual and audio-visual aids and materials samples would assist the student's understanding of the wide range of topics associated with basic soil mechanics and timber trench support system.

It is recommended that great care and sufficient time is given to the practical exercises and the quality of practical demonstrations and supervision throughout

all practical sessions. Outcomes 1 to 4 could be best achieved by the careful management of both practical and theoretical sessions.

It is recommended that a reference manual is available and issued to the student.

It is recommended that case studies and accident statistics are used to highlight the importance of supporting trenches during pipelaying activities.

The individual's contribution to group activities should be stressed throughout.

Safety, safe working practices and care in use of equipment should be an integral part of the module's activities.

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10/02/98