The Further Education and Training Awards Council (FETAC) was set up as a statutory body on 11 June 2001 by the Minister for Education and Science. Under the Qualifications (Education & Training) Act, 1999, FETAC now has responsibility for making awards previously made by NCVA.

Module Descriptor

Solar Domestic Hot Water Systems

Level 6 C30264

March 2007
# Level 6 Module Descriptor

## Summary of Contents

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Describes how the module functions as part of the national vocational certificate framework.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Title</td>
<td>Indicates the module content. This title appears on the learner’s certificate. It can be used to download the module from the website <a href="http://www.ncva.ie">www.ncva.ie</a>.</td>
</tr>
<tr>
<td>Module Code</td>
<td>An individual code is assigned to each module; a letter at the beginning denotes a vocational or general studies area under which the module is grouped and the first digit denotes its level within the national vocational certificate framework.</td>
</tr>
<tr>
<td>Level</td>
<td>Indicates where the module is placed in the national vocational certificate framework, from Foundation to Level 3.</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Denotes the amount of credit that a learner accumulates on achievement of the module.</td>
</tr>
<tr>
<td>Purpose</td>
<td>Describes in summary what the learner will achieve on successfully completing the module and in what learning and vocational contexts the module has been developed. Where relevant, it lists what certification will be awarded by other certification agencies.</td>
</tr>
<tr>
<td>Preferred Entry Level</td>
<td>Recommends the level of previous achievement or experience of the learner.</td>
</tr>
<tr>
<td>Special Requirements</td>
<td>Usually ‘none’ but in some cases detail is provided here of specific learner or course provider requirements. There may also be reference to the minimum safety or skill requirements that learners must achieve prior to assessment.</td>
</tr>
<tr>
<td>General Aims</td>
<td>Describe in 3-5 statements the broad skills and knowledge learners will have achieved on successful completion of the module.</td>
</tr>
<tr>
<td>Units</td>
<td>Structure the learning outcomes; there may be no units.</td>
</tr>
<tr>
<td>Specific Learning Outcomes</td>
<td>Describe in specific terms the knowledge and skills that learners will have achieved on successful completion of the module.</td>
</tr>
<tr>
<td>Portfolio of Assessment</td>
<td>Provides details on how the learning outcomes are to be assessed.</td>
</tr>
<tr>
<td>Grading</td>
<td>Provides details of the grading system used.</td>
</tr>
<tr>
<td>Individual Candidate Marking Sheets</td>
<td>List the assessment criteria for each assessment technique and the marking system.</td>
</tr>
<tr>
<td>Module Results Summary Sheet</td>
<td>Records the marks for each candidate in each assessment technique and in total. It is an important record for centres of their candidate’s achievements.</td>
</tr>
<tr>
<td>Appendices</td>
<td>Can include approval forms for national governing bodies.</td>
</tr>
<tr>
<td>Glossary of Assessment Techniques</td>
<td>Explains the types of assessment techniques used to assess standards.</td>
</tr>
<tr>
<td>Assessment Principles</td>
<td>Describes the assessment principles that underpin the NCVA approach to assessment.</td>
</tr>
</tbody>
</table>
Introduction

A module is a statement of the standards to be achieved to gain a FETAC award. Candidates are assessed to establish whether they have achieved the required standards. Credit is awarded for each module successfully completed.

The standards in a module are expressed principally in terms of specific learning outcomes, i.e. what the learner will be able to do on successful completion of the module. The other elements of the module - the purpose, general aims, assessment details and assessment criteria - combine with the learning outcomes to state the standards in a holistic way.

While the NCVA is responsible for setting the standards for certification in partnership with course providers and industry, it is the course providers who are responsible for the design of the learning programmes. The duration, content and delivery of learning programmes should be appropriate to the learners’ needs and interests, and should enable the learners to reach the standard as described in the modules. Modules may be delivered alone or integrated with other modules.

The development of learners’ core skills is a key objective of vocational education and training. The opportunity to develop these skills may arise through a single module or a range of modules. The core skills include:

- taking initiative
- taking responsibility for one’s own learning and progress
- problem solving
- applying theoretical knowledge in practical contexts
- being numerate and literate
- having information and communication technology skills
- sourcing and organising information effectively
- listening effectively
- communicating orally and in writing
- working effectively in group situations
- understanding health and safety issues
- reflecting on and evaluating quality of own learning and achievement.

Course providers are encouraged to design programmes, which enable learners to develop core skills.
1 Module Title  
Solar Domestic Hot Water Systems

2 Module Code  
C30264

3 Level  
6

4 Credit Value  
1 credit

5 Purpose  
This module is a statement of the standards to be achieved to gain a FETAC credit in Solar Domestic Hot Water Systems at Level 6.

This module is designed to provide a basis in solar hot water technology and installation. It provides the knowledge and skills required for those intending to specify and install solar hot water systems.

6 Preferred Entry Level  
Level 6 Advanced Certificate in Craft - Plumbing or equivalent. Practitioners with a background in related fields of technology and a number of year’s experience may also be considered.

7 Special Requirements  
Providers must provide solar hot water installation models, from which measurements and control readings may be taken, in order to provide for demonstration during training.

8 General Aims

Learners who successfully complete this module will:

8.1 develop an understanding and appreciation of solar hot water technology

8.2 be able to advise customers on the advantages and economic issues relating to solar hot water technologies

8.3 be able to specify an efficient solar hot water installation with regard to site orientation assessment, aesthetics, pipe loop installation and control strategy

8.4 be able to install and commission a solar hot water system
be able to take overall responsibility for the co-ordination of all aspects of the solar hot water installation.

9 Units

The specific learning outcomes are grouped into 5 units.

Unit 1  Introduction to Solar Hot Water Technology
Unit 2  Solar Hot Water Systems
Unit 3  Installation of Solar Hot Water Systems and Controls
Unit 4  Site and System Suitability
Unit 5  Commissioning and Safe Working Practices

10 Specific Learning Outcomes

Unit 1  Introduction to Solar Hot Water Technology

Learners should be able to:

10.1.1 outline applications of solar hot water heating
10.1.2 justify the environmental argument for the installation and use of solar hot water systems
10.1.3 recognise the market potential for solar hot water
10.1.4 explain the different types of solar radiation
10.1.5 define the correct orientation and inclination of solar panels.

Unit 2  Solar Hot Water Systems

Learners should be able to:

10.2.1 compare the advantages and disadvantages of direct and indirect systems
10.2.2 identify the principal system components and their function
10.2.3 recognise the safety equipment needed for each system
10.2.4 evaluate the benefits of a range of solar hot water systems e.g. the direct system, the indirect system, the pressurised system, open vented system, drain back system
10.2.5 select the most advantageous type of solar hot water system
10.2.6 describe the different types of collectors e.g. flat plate glazed/unglazed, evacuated tubes, heat pipes.

Unit 3 Installation of Solar Hot Water Systems and Controls

Learners should be able to:

10.3.1 identify the correct fixing and siting position of the solar collector
10.3.2 explain the installation of in-roof collectors
10.3.3 describe how to handle and care for evacuated tube collectors
10.3.4 explain the procedure for installing heat pipe collectors
10.3.5 distinguish between systems set up in parallel and series
10.3.6 explain the reason for adding antifreeze
10.3.7 describe the method of filling the system
10.3.8 calculate the storage vessel capacity for a given dwelling based on the number of occupants
10.3.9 recommend the type of storage cylinder required
10.3.10 illustrate the difference between twin coil cylinders and single coil cylinders used as pre-heat cylinders
10.3.11 explain the importance of safety controls (e.g.) working thermostats, high limit thermostats, temperature relief valves, thermostats, mixing valves/anti scald valves
10.3.12 explain the importance of storing water at 60°C to eliminate the risk of legionella
10.3.13 demonstrate the set up and workings of the differential temperature controllers
10.3.14 select the correct positioning of thermostats and sensors throughout the system.
Unit 4    Site and System Suitability

*Learners should be able to:*

10.4.1 compile a risk assessment sheet to eliminate any hazards
10.4.2 interpret any relevant statutory requirements in regard to planning and building regulations
10.4.3 calculate the size of the collector array
10.4.4 advise customers on the collector positioning with regards to Inclination and orientation
10.4.5 calculate the pipe sizes required for different systems (e.g.) indirect systems, drain back system etc.
10.4.6 compile a site survey sheet
10.4.7 identify plumbing materials suitable for use with solar hot water systems
10.4.8 state the type of connections used in the solar hot water systems
10.4.9 recognise the importance of pipe support and linear expansion
10.4.10 specify pipe weathering and insulation requirements.

Unit 5    Commissioning and Safe Working Practices

*Learners should be able to:*

10.5.1 interpret the relevant standards in relation to the commissioning of hot water systems
10.5.2 describe the filling and flushing of systems
10.5.3 explain the use of a refractometer
10.5.4 produce an inspection report sheet and an installation checklist.
11 Portfolio of Assessment

Please refer to the glossary of assessment techniques and the note on assessment principles at the end of this descriptor.

All assessment is carried out in accordance with FETAC regulations.

Assessment is devised by the internal assessor, with external moderation by FETAC.

Summary

Examination 100%

11.1 Examination

The internal assessor will devise a theory examination that assesses candidates’ ability to recall and apply theory and understanding, requiring response to a range of short answer and structured questions.

The examination will be based on a range of specific learning outcomes covering all units.

The examination will be 2 hours in duration

The format of the examination will be as follows:
Theory based with two sections

Section A
12 short answer questions
Candidates are required to answer 10 (5 marks each)

Section B
3 structured questions
Candidates are required to answer 2 (25 marks each)

12 Grading

Pass 50-64%
Merit 65-79%
Distinction 80-100%
<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Maximum Mark</th>
<th>Candidate Mark</th>
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<tbody>
<tr>
<td><strong>Section A: short answer questions</strong></td>
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<tr>
<td>12 short answer questions, answer any 10 (5 marks each)</td>
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<tr>
<td>Question No: ___</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<tr>
<td><strong>Section B: structured questions</strong></td>
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<tr>
<td>3 structured questions, answer any 2 (25 marks each)</td>
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<tr>
<td>Question No: 1 ___</td>
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<tr>
<td>Question No: 2 ___</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>50</td>
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<tr>
<td><strong>TOTAL MARKS</strong></td>
<td>100</td>
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*This mark should be transferred to the Module Results Summary Sheet*

Internal Assessor’s Signature: __________________________ Date: ______________

External Examiner’s Signature: __________________________ Date: ______________
# NCVA Module Results Summary Sheet

**Module Title:** Solar Domestic Hot Water Systems C30264  
**Module Code:**

<table>
<thead>
<tr>
<th>Candidate Surname</th>
<th>Candidate Forename</th>
<th>Total 100%</th>
<th>Grade*</th>
</tr>
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<tbody>
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</table>

Signed:  
**Internal Assessor:** ___________________________  **Date:** ______________

This sheet is for internal assessors to record the overall marks of individual candidates. It should be retained in the centre. The marks awarded should be transferred to the official NCVA Module Results Sheet issued to centres before the visit of the external examiner.

Grade*  
D: 80 - 100%  
M: 65 - 79%  
P: 50 - 64%  
U: 0 - 49%  
W: candidates entered who did not present for assessment
Glossary of Assessment Techniques

Assignment  
*An exercise carried out in response to a brief with specific guidelines and usually of short duration.*

Each assignment is based on a brief provided by the internal assessor. The brief includes specific guidelines for candidates. The assignment is carried out over a period of time specified by the internal assessor.

Assignments may be specified as an oral presentation, case study, observations, or have a detailed title such as audition piece, health fitness plan or vocational area profile.

Collection of Work  
*A collection and/or selection of pieces of work produced by candidates over a period of time that demonstrates the mastery of skills.*

Using guidelines provided by the internal assessor, candidates compile a collection of their own work. The collection of work demonstrates evidence of a range of specific learning outcomes or skills. The evidence may be produced in a range of conditions, such as in the learning environment, in a role play exercise, or in real-life/work situations.

This body of work may be self-generated rather than carried out in response to a specific assignment eg art work, engineering work etc.

Examination  
*A means of assessing a candidate’s ability to recall and apply skills, knowledge and understanding within a set period of time (time constrained) and under clearly specified conditions.*

Examinations may be:
- practical, assessing the mastery of specified practical skills demonstrated in a set period of time under restricted conditions
- oral, testing ability to speak effectively in the vernacular or other languages
- interview-style, assessing learning through verbal questioning, on one-to-one/group basis
- aural, testing listening and interpretation skills
- theory-based, assessing the candidate’s ability to recall and apply theory, requiring responses to a range of question types, such as objective, short answer, structured, essay. These questions may be answered in different media such as in writing, orally etc.

Learner Record  
*A self-reported record by an individual, in which he/she describes specific learning experiences, activities, responses, skills acquired.*

Candidates compile a personal logbook/journal/diary/daily diary/record/laboratory notebook/sketch book.
The logbook/journal/diary/daily diary/record/laboratory notebook/sketch book should cover specified aspects of the learner’s experience.
**Project**

*A substantial individual or group response to a brief with guidelines, usually carried out over a period of time.*

Projects may involve:

- research – requiring individual/group investigation of a topic
- process – eg design, performance, production of an artefact/event

Projects will be based on a brief provided by the internal assessor or negotiated by the candidate with the internal assessor. The brief will include broad guidelines for the candidate. The work will be carried out over a specified period of time.

Projects may be undertaken as a group or collaborative project, however the individual contribution of each candidate must be clearly identified.

The project will enable the candidate to demonstrate: *(some of these – about 2-4)*

- understanding and application of concepts in (specify area)
- use/selection of relevant research/survey techniques, sources of information, referencing, bibliography
- ability to analyse, evaluate, draw conclusions, make recommendations
- understanding of process/planning implementation and review skills/planning and time management skills
- ability to implement/produce/make/construct/perform
- mastery of tools and techniques
- design/creativity/problem-solving/evaluation skills
- presentation/display skills
- team working/co-operation/participation skills.

**Skills Demonstration**

*Assessment of mastery of specified practical, organisational and/or interpersonal skills.*

These skills are assessed at any time throughout the learning process by the internal assessor/another qualified person in the centre for whom the candidate undertakes relevant tasks.

The skills may be demonstrated in a range of conditions, such as in the learning environment, in a role-play exercise, or in a real-life/work situations.

The candidate may submit a written report/supporting documentation as part of the assessment.

Examples of skills: laboratory skills, computer skills, coaching skills, interpersonal skills.
NCVA Assessment Principles

1. Assessment is regarded as an integral part of the learning process.

2. All NCVA assessment is criterion referenced. Each assessment technique has **assessment criteria** which detail the range of marks to be awarded for specific standards of knowledge, skills and competence demonstrated by candidates.

3. The mode of assessment is generally local i.e. the assessment techniques are devised and implemented by internal assessors in centres.

4. Assessment techniques in NCVA modules are valid in that they test a range of appropriate learning outcomes.

5. The reliability of assessment techniques is facilitated by providing support for assessors.

6. Arising from an extensive consultation process, each NCVA module describes what is considered to be an optimum approach to assessment. When the necessary procedures are in place, it will be possible for assessors to use other forms of assessment, provided they are demonstrated to be valid and reliable.

7. To enable all learners to demonstrate that they have reached the required standard, candidate evidence may be submitted in written, oral, visual, multimedia or other format as appropriate to the learning outcomes.

8. Assessment of a number of modules may be integrated, provided the separate criteria for each module are met.

9. Group or team work may form part of the assessment of a module, provided each candidate’s achievement is separately assessed.