

Ofqual Ref

Level

603/1716/4

Diploma at Level 3

# Waste Water Treatment

Issue 3 – March 2020



## ABOUT THE QUALIFICATION SPECIFICATION

This specification for CABWI Awarding Body's **CABWI Level 3 Diploma in Waste Water Treatment (Ofqual Ref: 603/1716/4)** is designed to provide assessment centres with information on the qualification's content, structure and delivery.

This document provides both general assessment guidance and more detailed information, including general requirements for the qualification and specific requirements for each unit, where applicable. It also includes sections relating to personnel and facilities approval. If you or your centre has any queries relating to the qualification or its delivery, please contact either your allocated external quality assurer (EQA) or the CABWI office (Tel: 020 7469 2641; E-mail: [enquiries@cabwi.co.uk](mailto:enquiries@cabwi.co.uk)).

This guidance (and updated versions issued during the qualification's lifetime) will be produced electronically and can be accessed via the CABWI website ([www.cabwi.co.uk](http://www.cabwi.co.uk)) or by contacting the CABWI office ([enquiries@cabwi.co.uk](mailto:enquiries@cabwi.co.uk)). Additional materials available for this qualification include questions and answers which can be used to support assessment.

Further information relating to the delivery of CABWI qualifications, including copies of CABWI's current forms and centre administration manual, may be obtained direct from the CABWI office by contacting:

The Systems & Process Co-ordinator  
CABWI Awarding Body  
Holland House  
1-4 Bury Street  
London  
EC3A 5AW

Tel: 020 7469 2641

E-mail: [enquiries@cabwi.co.uk](mailto:enquiries@cabwi.co.uk)

Website: <http://www.cabwi.co.uk>

### Copyright information

This centre guidance and related assessment material is protected by copyright and any unauthorised production, whether in whole or in part, is prohibited. Please contact [enquiries@cabwi.co.uk](mailto:enquiries@cabwi.co.uk) if you wish to use any CABWI copyright material in any type of hard copy or electronic publication.

CABWI approved centres offering this qualification may copy the guidance and related assessment material for the use of its assessment and quality assurance teams and learners in delivering this qualification. Centres may make this material available in .pdf format only on their company intranet sites, but the intranet must be accessible only to its centre staff and learners. Copies of this document that are made available on centres' intranet sites must be the current and up-to-date edition.

Copies of the document may not be sold, altered or misused. CABWI reserves the right to withdraw permission to copy in the event that this condition is not met.

# CONTENTS

	<b>Page</b>
<b>1. Qualification Overview</b>	<b>3</b>
1.1 Qualification objective	3
1.2 Qualification content and structure	3
1.3 Total Qualification Time, Guided Learning Hours and Credit	4
1.4 Relationship to Apprenticeships	4
1.5 Grading	4
<b>2. Qualification approval requirements</b>	<b>5</b>
2.1 Centre facilities	5
2.2 Personnel resources for qualification delivery	6
2.3 Independent assessment	11
<b>3. Qualification delivery</b>	<b>13</b>
3.1 Pre-registration learner requirements	13
3.2 Assessment methodology	13
3.3 Recording assessment	13
3.4 Internal quality assurance	13
3.5 External quality assurance and post-approval monitoring	14
3.6 Reasonable adjustments and special considerations	16
<b>4. CABWI Level 3 Diploma in Waste Water Treatment: Unit information</b>	<b>17</b>
3401 Waste Water - Regulation and Compliance	18
3402 Waste Water - Science and Applied Mathematics	21
3403 Waste Water - Preliminary Treatment	25
3404 Waste Water - Primary Treatment	29
3405 Waste Water - Fixed Film Biological Treatment	33
3406 Waste Water - Activated Sludge Processes	37
3407 Waste Water - Tertiary Treatment	42
3408 Waste Water - Small works and package plants	46
3409 Waste Water - Nutrient Removal	49
3410 Waste Water - Sludge Treatment and Recycling	52
3411 Waste Water - Sludge Digestion	56
3412 Waste Water - Nuisance Control	60
3413 Waste Water - Pumping Stations	63
3414 Waste Water - Asset Management	66
3415 Waste Water - Understanding Sludge Digestion	70

# 1. QUALIFICATION OVERVIEW

## 1.1 Qualification objective

The CABWI Level 3 Diploma in Waste Water Treatment is designed to demonstrate the occupational competence of learners. This qualification can be used both for the upskilling of existing staff and for the on-programme learning element of related apprenticeships.

The content, structure and assessment requirements of the qualification were developed by CABWI Awarding Body, in consultation with representatives of the water industry and its training and assessment providers.

This Occupational Qualification sits in the Regulated Qualifications Framework (RQF) and is regulated by Ofqual and CCEA Regulation.

If the assessment team identifies any queries or issues with the content of the qualification units or the structure, the centre should contact its external quality assurer or the CABWI office in the first instance. The awarding body can then provide advice on the most suitable course of action and consult further with qualification users, employers and/or training providers as necessary.

## 1.2 Qualification structure

To achieve a full CABWI Level 3 Diploma in Waste Water Treatment, a learner must complete the 12 mandatory units and 1 Optional unit. Where required the additional unit may be taken in addition. This is not required for achievement of the qualification but may further support on-programme learning for apprentices.

### Mandatory Units – *all learners must complete the following thirteen mandatory units*

3401	Waste Water – Regulation and Compliance (H/615/7470)
3402	Waste Water – Science and Applied Mathematics (J/615/7512)
3403	Waste Water – Preliminary Treatment (Y/615/7563)
3404	Waste Water – Primary Treatment (F/615/7573)
3405	Waste Water – Fixed Film Biological Treatment (H/615/7582)
3406	Waste Water – Activated Sludge Processes (J/615/7591)
3407	Waste Water – Tertiary Treatment (D/615/7595)
3408	Waste Water – Small works and package plants (T/615/7599)
3409	Waste Water – Nutrient Removal (D/615/7600)
3410	Waste Water – Sludge Treatment and Recycling (H/615/7601)
3412	Waste Water – Nuisance Control (M/615/7603)
3413	Waste Water – Pumping Stations (F/615/7606)

### Optional Units – *learners must complete one of the following units*

3411	Waste Water – Sludge Digestion (K/615/7602)
3415	Waste Water – Understanding Sludge Digestion (M/615/9105)

**Additional Unit – learners may take the following unit in addition to the qualification if required**

3414	Waste Water – Asset Management (Y/615/7613)
------	---

### 1.3 Total Qualification Time, Guided Learning Hours and Credit

To meet regulatory requirements, all RQF qualifications must be assigned a number of Guided Learning Hours (GLH) and a number of hours for Total Qualification Time (TQT). These figures are assigned to the qualification during the development process, through consultation with industry specialists and training and assessment providers.

**Guided Learning Hours** is an estimate of the number of hours a learner would be expected to spend working towards a qualification, under the immediate guidance or supervision of a provider of education or training (e.g. a tutor, lecturer, supervisor, etc.).

**Total Qualification Time** is an estimate of the total amount of time (in hours) that a learner could reasonably be expected to achieve the level of attainment required for the award of a qualification. The TQT for any qualification is calculated by adding the number of hours assigned for Guided Learning to the estimated number of hours that a learner could reasonably be expected to spend in preparation, study or any other education or training activity, including assessment, that may be directed by, but not under the immediate supervision of a tutor, lecturer, supervisor, etc.

Please note: The GLH and TQT figures assigned by CABWI to its qualifications are notional, and it is not mandatory for centres to provide a specific number of GLH in delivery a qualification. Learners and their employers should be aware that different individuals may take different amounts of time to complete their assessment successfully.

The Qualification GLH is: 301

The Total Qualification time is: 487

The Credit Value of the qualification is: 49

### 1.4 Relationship to apprenticeships

This qualification can be used to support the on-programme learning for the Water Process Technician Apprenticeship Standard.

### 1.5 Grading

The CABWI Level 3 Diploma in Waste Water Treatment is graded PASS\FAIL.

## 2. QUALIFICATION APPROVAL REQUIREMENTS

All centres seeking to deliver CABWI regulated qualifications must complete the application process using CABWI's current centre and personnel application forms, providing information about how the centre will meet CABWI's centre recognition criteria. Information relating to CABWI's centre recognition process can be found in CABWI's *Centre Administration Manual*, a copy of which is available on the CABWI website.

Any centre recognition application requires details of:

- the title of the qualification(s) for which approval is required, or a list of the unit(s) if seeking unit approval only;
- the assessment and quality assurance team members, and named centre co-ordinator (it is helpful to provide a chart or diagram showing the team structure);
- proposed facilities, locations for assessment and storage of records (including satellite sites). This includes any proposed arrangements for the use of simulated activities in a realistic working environment;
- how the centre will meet the CABWI centre recognition criteria and any additional requirements relating to the specific qualification(s) they wish to deliver;
- how assessment and quality assurance will be conducted *for the specific qualification(s) required*.

If the organisation is already a recognised assessment centre with CABWI or any other awarding body, qualifications delivery and quality assurance systems and processes will already be in place. CABWI recommends that centres align the delivery of this qualification with their current systems, providing this allows them to meet the specific scheme requirements and centre recognition criteria.

A centre seeking to deliver the CABWI Level 3 Diploma in Waste Water Treatment must also ensure that it has the resources, including facilities and personnel, to meet the qualification-specific requirements described in this section.

### 2.1 Centre facilities

#### Facilities and equipment requirements

As this is an occupational qualification practical activities are expected to be naturally occurring in the work environment. Where this is not possible use of a simulated or realistic working environment may be acceptable. Unit information defines where this is likely to be acceptable.

#### Use of realistic working environment and simulated activities

The unit information in section 4 identifies where the use of a Realistic Working Environment (RWE) or Simulation is acceptable. The RWE or simulated activities must be approved by the centre's EQA before assessments commence.

## **Records storage**

All qualification records must be stored securely, and centres must maintain records of:

- learners
- assessments and assessment decisions
- internal quality assurance.

The records must be:

- sufficient to provide an audit trail
- retained for at least three years, to allow for monitoring (by the awarding body or the regulatory authorities) to take place.

Some records will include learners' personal information (subject to the Data Protection Act) and others may include details of written or oral underpinning knowledge questions asked during assessment, which must not be freely available to learners. It is vital that these records are held securely by the centre. Secure storage facilities will be verified by the external quality assurer during centre approval and at subsequent monitoring visits.

## **2.2 Personnel resources for qualification delivery**

A centre must have at least one fully-qualified and occupationally competent assessor, and one fully-qualified and occupationally competent internal quality assurer (IQA) in order to be recognised to deliver the CABWI Level 3 Diploma in Waste Water Treatment. Centres should also have a tutor/trainer as part of their personnel where they have less than two fully qualified and occupationally competent assessors in order to comply with the independent assessment requirements set out in section 2.3.

Each assessor, IQA, assessor-candidate or IQA-candidate must submit the appropriate personnel application, together with relevant supporting evidence of qualifications and occupational competence. The qualifications and occupational expertise requirements for assessors and IQAs delivering the CABWI Level 3 Diploma in Waste Water Treatment are set out below.

### **Centre co-ordinator / centre manager**

The centre must have a named central point of contact for the administration of CABWI qualifications. They are responsible for ensuring that the correct application forms are submitted to the awarding body and for providing (either in person or via other designated personnel) details of learners who require registration and certification for particular qualifications.

### **Assessors**

#### **Assessor qualifications**

In order to assess learners for the CABWI Level 3 Diploma in Waste Water Treatment, an assessor must have relevant occupational expertise, and must hold one of the following qualifications:

- Level 3 Award in Assessing Competence in the Work Environment, or
- Level 3 Certificate in Assessing Vocational Achievement, or
- Assessing Candidates Using a Range of Methods (A1), or
- D32 – Assess Candidate Performance and D33 – Assess Candidate Performance Using Diverse Evidence.

CABWI does not require assessors who hold earlier versions of assessor qualifications to complete the current versions. However, assessors must ensure that they are aware of current assessment practice, and must ensure that they review their skills, knowledge and understanding of assessment processes and practice regularly, and undertake relevant CPD. This activity may be undertaken in conjunction with the assessment centre(s) where the assessor works.

### Assessor-candidates

Assessor-candidates are individuals who meet the occupational expertise requirements to assess the qualification, but who do not yet hold an assessor qualification.

They may apply to CABWI for an assessor-candidate licence, for a maximum period of 18 months, while they undertake their assessor qualification. All assessment decisions taken by assessor-candidates must be countersigned by a fully-qualified assessor who is also approved to assess the same unit(s).

Assessor-candidates working on the CABWI Level 3 Diploma in Waste Water Treatment must be undertaking one of the following assessor qualifications:

- Level 3 Award in Assessing Competence in the Work Environment, or
- Level 3 Certificate in Assessing Vocational Achievement.

These are the two current assessor qualifications, developed as part of the Training, Assessment and Quality Assurance (TAQA) suite of qualifications, which cover the assessment of workplace competence.<sup>1</sup>

When seeking approval from CABWI, assessor-candidates may be required to provide confirmation of the assessment centre where they are registered to take their assessor qualification, and when they expect to complete the qualification.

### Occupational expertise and assessor requirements

Any assessor or assessor-candidate who wishes to assess the CABWI Level 3 Diploma in Waste Water Treatment must also show that they can meet the criteria listed in the table below (the column on the right provides examples of evidence against the requirements: please note that these are suggestions, and the lists are not exhaustive).

Assessor criteria	Potential sources of evidence
<ul style="list-style-type: none"> <li>• In-depth technical and practical knowledge of the areas they are</li> </ul>	<ul style="list-style-type: none"> <li>• CV confirming occupational experience relating to those unit(s)/qualification(s) for</li> </ul>

<sup>1</sup> The required qualifications for assessors may be updated during the lifetime of this qualification. CABWI can provide confirmation of the current requirements on request.



Assessor criteria	Potential sources of evidence
<p>assessing.</p> <ul style="list-style-type: none"> <li>Up-to-date knowledge and relevant technical/industrial experience in the areas they are assessing. (The experience must be not more than 5 years old, and at a level relevant to their assessor role and the level of the award.) Specific occupational experience that is at least at the same level as the qualification and/or unit(s) that they are assessing.</li> </ul>	<p>which approval is required - through an industry operational role and/or delivering operational training and/or assessment in activities covered by the unit(s) required.</p> <ul style="list-style-type: none"> <li>Occupational information must confirm experience of Water treatment activities according to the units required.</li> <li>Details of any vocational qualifications etc. relevant to the activities covered.</li> <li>Other supporting information: witness testimonies or other testimonials.</li> </ul>
<ul style="list-style-type: none"> <li>Experience &amp; working knowledge of the assessment and quality assurance processes.</li> </ul>	<ul style="list-style-type: none"> <li>Copy assessor qualification certificates.</li> <li>For assessor-candidates, details of the induction they have received for their assessor award.</li> <li>For experienced assessors, confirmation of assessor experience on previous related qualifications or units.</li> </ul>
<ul style="list-style-type: none"> <li>Thorough understanding of the content of the CABWI Level 3 Diploma in Waste Water Treatment, and the ability to interpret it and offer advice on assessment-related matters.</li> </ul>	<ul style="list-style-type: none"> <li>Confirmation of familiarity with the qualification content.</li> <li>For experienced assessors, confirmation of assessor experience on previous related qualifications or units.</li> <li>Confirmation of involvement in standardisation process, assessment team meetings etc within centre.</li> <li>If applicable, details of involvement with the qualification development process for the CABWI Level 3 Diploma in Waste Water Treatment.</li> </ul>
<ul style="list-style-type: none"> <li>High level of interpersonal and communication skills.</li> </ul>	<ul style="list-style-type: none"> <li>CV details confirming use of interpersonal skills etc.</li> <li>For experienced trainers or assessors, confirmation of previous training or assessment activity.</li> <li>Details of any qualifications covering communications skills (e.g. Key Skills or Functional Skills qualifications; qualifications or units covering soft skills – e.g. units from Management or Customer Service qualifications etc.).</li> </ul>
<ul style="list-style-type: none"> <li>Commitment to CPD for the assessor role and to maintain currency of knowledge and experience in Waste Water Treatment activities.</li> </ul>	<ul style="list-style-type: none"> <li>Assessor licence application – details of how currency will be maintained.</li> <li>Details (as part of CV or application information) of participation in industry groups, consultations, etc., relating to Waste</li> </ul>

Assessor criteria	Potential sources of evidence
	Water Treatment. <ul style="list-style-type: none"> <li>• Details of involvement in centre staff development programmes, as per centre application.</li> </ul>

## Internal quality assurers (IQAs)

### Internal quality assurer qualifications

In order to quality assure the CABWI Level 3 Diploma in Waste Water Treatment, an IQA must have relevant occupational expertise, and must hold one of the following qualifications:

- Level 4 Award in the Internal Quality Assurance of Assessment Process and Practice, or
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice, or
- Conducting Internal Quality Assurance of the Assessment Process (V1), or
- D34 – Co-ordinate the Assessment Process.

CABWI does not require internal quality assurers who hold earlier versions of the IQA qualifications to undertake the current versions, based on later national occupational standards. However, IQAs must ensure that they are aware of current assessment and quality assurance practice, and must ensure that they review their skills, knowledge and understanding of assessment and quality assurance processes and practice regularly, and undertake relevant CPD. This activity may be undertaken in conjunction with the assessment centre(s) where the IQA works.

### IQA-candidates

IQA-candidates are individuals who meet the occupational expertise requirements to internally quality assure the qualification, but who do not yet hold an IQA qualification.

They may apply to CABWI for an IQA-candidate licence, for a maximum period of 18 months, while they undertake their internal quality assurer/IQA qualification. All quality assurance decisions taken by IQA-candidates must be countersigned by a fully qualified IQA who is also approved to quality assure the same unit(s).

IQA-candidates working on the CABWI Level 3 Diploma in Waste Water Treatment must be working towards one of the following IQA qualifications:

- Level 4 Award in the Internal Quality Assurance of Assessment Process and Practice, or
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice.

These are the two current quality assurance qualifications, developed as part of the Training, Assessment and Quality Assurance (TAQA) suite of qualifications.<sup>2</sup>

When seeking approval from CABWI, IQA-candidates may be required to provide confirmation of the assessment centre where they are registered to take their IQA qualification, and when they expect to complete the qualification.

### Occupational expertise and IQA requirements

Any IQA or IQA-candidate who wishes to quality assure the CABWI Level 3 Diploma in Waste Water Treatment must also show that they can meet the criteria listed in the table below (the column on the right provides examples of evidence against the requirements: please note that these are suggestions, and the lists are not exhaustive).

Internal quality assurer criteria	Potential sources of evidence
<ul style="list-style-type: none"> <li>• Comprehensive understanding of the areas they are internally quality assuring.</li> <li>• Up-to-date knowledge and relevant technical/industrial experience in the areas they are quality assuring. (The experience must be not more than 5 years old, and at a level relevant to their IQA role and the level of the award.)</li> <li>• Qualification-specific occupational knowledge and experience that is at least at the same level as the qualification and/or unit(s) that they are quality assuring.</li> </ul>	<ul style="list-style-type: none"> <li>• CV confirming occupational experience relating to those unit(s)/qualification(s) for which approval is required - through an industry operational role and/or delivering operational training, assessment or quality assurance in activities covered by the unit(s) required.</li> <li>• Details of any vocational qualifications etc relevant to the activities covered.</li> <li>• Other supporting information: witness testimonies or other testimonials.</li> </ul>
<ul style="list-style-type: none"> <li>• Experience &amp; working knowledge of the assessment and quality assurance processes. <i>(Please note: it is desirable, though not mandatory, for IQAs working on this qualification to hold an assessor qualification.)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Copy IQA qualification certificates.</li> <li>• Copy assessor certificates, if qualified assessors.</li> <li>• For IQA-candidates, details of the induction they have received for their IQA award.</li> <li>• For experienced IQAs, confirmation of internal quality assurance experience on previous related qualifications or units.</li> </ul>

<sup>2</sup> The required qualifications for internal quality assurers may be updated during the lifetime of this qualification. CABWI can provide confirmation of the current requirements on request.

Internal quality assurer criteria	Potential sources of evidence
<ul style="list-style-type: none"> <li>• Thorough understanding of the content of the CABWI Level 3 Diploma in Waste Water Treatment, and the ability to interpret it and offer advice on assessment-related matters.</li> </ul>	<ul style="list-style-type: none"> <li>• For experienced IQAs, confirmation of experience on previous related qualifications or units.</li> <li>• Confirmation of involvement in standardisation process, assessment team meetings etc within centre.</li> <li>• If applicable, details of involvement with the qualification development process for the CABWI Level 3 Diploma in Waste Water Treatment.</li> </ul>
<ul style="list-style-type: none"> <li>• High level of interpersonal and communication skills.</li> </ul>	<ul style="list-style-type: none"> <li>• CV details confirming use of interpersonal skills etc.</li> <li>• For experienced trainers, assessors or IQAs, confirmation of previous training, assessment or IQA activity.</li> <li>• Details of any qualifications covering communications skills (e.g. Key Skills or Functional Skills qualifications; qualifications or units covering soft skills – e.g. units from Management or Customer Service qualifications etc.).</li> </ul>
<ul style="list-style-type: none"> <li>• Commitment to CPD for the IQA role and to maintain currency of knowledge and experience in Waste Water Treatment activities.</li> </ul>	<ul style="list-style-type: none"> <li>• IQA licence application – details of how currency will be maintained.</li> <li>• Details of involvement in centre staff development programmes, as per centre application.</li> </ul>
<ul style="list-style-type: none"> <li>• Sufficient authority to carry out the IQA role at any centre where they are working – irrespective of whether they are a direct or contracted employee of the assessment centre.</li> </ul>	<ul style="list-style-type: none"> <li>• Endorsement of the CABWI IQA application by a manager at the assessment centre where they are working.</li> <li>• Organisation and/or team charts showing roles, responsibilities and authority of assessment and quality assurance team members.</li> <li>• For experienced IQAs, evidence of managing assessors within the team, dissemination and completion of agreed actions, etc.</li> <li>• Evidence of involvement in and contribution to centre standardisation activity and meetings.</li> </ul>

### 2.3 Independent assessment

Independent assessment is a quality control measure that is used to minimise any potential vested interest that an assessor could have in the outcome of a learner's assessments.

Centres seeking approval to deliver the CABWI Level 3 Diploma in Waste Water Treatment must ensure that:

- assessors do not assess any learner for whom they have line management responsibility, and
- assessors do not assess any learner for any unit on which they have been involved in training that learner.

In cases where the centre's assessment team cannot meet the above criteria, an alternative method of independent assessment will be agreed with the centre.

CABWI's assessor application form includes two questions that ask if they will be training learners and if they will be assessing people who report directly to them. If the assessor answers 'YES' to the training-related question, CABWI reserves the right to contact the centre co-ordinator to obtain further information, as follows:

If training learners:

- *To what extent will the assessor be training learners?*
- *Are they the only assessor, or does the centre have other assessors?*
- *Which units will the assessor be assessing?*
- *When did the applicant train the learners and when will they be assessing them?*

On receipt of this information, CABWI will agree an alternative quality assurance procedure with the centre and their EQA, details of which will be kept on file. Each case is judged on an individual basis, according to: the detail provided; whether there are other significant risk factors at the centre that could affect the integrity of delivery; and whether there is any scope for the centre to work towards meeting the independent assessment requirements in the future.

Other independent assessment measures, as discussed and agreed with the external quality assurer, could include (but are not limited to):

- additional IQA sampling
- requiring additional EQA visits to monitor the situation
- requiring the centre to arrange for the separation of training and assessment wherever possible (e.g. through having dedicated assessors and trainers, resources permitting.)

CABWI's EQAs will monitor the implementation of independent assessment during quality assurance visits, and will highlight any areas for improvement through the action planning section of their EQA Visit Report by agreement with the centre.

*Please note: It is vital that the centre informs CABWI if it cannot meet the independent assessment requirement for the CABWI Level 3 Diploma in Waste Water Treatment, or if it becomes unable to meet these requirements after approval. If the requirements are found not to have been met during EQA monitoring, and the centre has not agreed an alternative quality assurance procedure with CABWI, this can impact upon learner certification, leading to a requirement for re-assessment of the learners affected or other remedial action.*

## 3. QUALIFICATION DELIVERY

### 3.1 Pre-registration learner requirements

There are no entry requirements for this qualification. However, as there is a requirement for learners to provide evidence from workplace activities, the learner must have access to the work environment and tasks that allow them to complete the qualification.

### 3.2 Assessment methodology

Assessment for the CABWI Level 3 Diploma in Waste Water Treatment will be conducted using a portfolio of evidence. CABWI has produced documentation to support the recording of evidence and questions and answers which can be used to support assessment. Knowledge can be assessed using an open book approach but assessors are expected to ensure that the learner understands their answers fully by exploring their depth of understanding using additional questions which can be devised by the assessor. This additional questioning should be recorded by the assessor and mapped to the assessment criteria covered.

### 3.3 Recording assessments

Assessment for this qualification is via a portfolio of evidence. As there is a large amount of knowledge which need to be evidenced CABWI will provide questions and a mark scheme which indicates the expected coverage of the answers.

### 3.4 Internal quality assurance

The CABWI Level 3 Diploma in Waste Water Treatment must be internally quality assured in line with CABWI's centre recognition criteria and the specific qualification requirements. If the centre has experience of delivering similar or related qualifications, through CABWI or another awarding body, it is likely that the current internal quality assurance systems can also be used for the CABWI Level 3 Diploma in Waste Water Treatment, although the external quality assurer will need to review the systems as part of the centre recognition process.

Internal quality assurers are expected to:

- manage the operation of assessment within their centres
- support assessors
- quality assure assessors' work (including observing assessments taking place), according to the centre's IQA sampling strategy and specific plans for the quality assurance of this qualification
- ensure that the qualification requirements are applied consistently by the assessment team and across all learners at the centre, including participation in standardisation activities
- manage the qualification delivery process.

The types of records that EQAs review to verify internal quality assurance activities include (but are not limited to):

- IQA sampling strategy (the document that the IQA uses to determine what s/he will sample over time: this must take a risk-based approach)
- more detailed IQA sampling plans (they will be informed by the IQA sampling strategy, but may be modified over time, and in line with identified risks, familiarity with the qualification, learner numbers etc.)
- evidence of interim and summative sampling of assessments (to cover the full delivery process across all units that the assessment team delivers)
- IQA reports on work sampled, which **must** include a proportion of IQA observation reports, confirming that they have watched assessments (observations and/or meetings) taking place over time. The IQA records must also include, over time, sampling of the work of all assessors working on the qualification and all units covered at the centre.
- evidence of team meetings and standardisation exercises (while not relating to the IQA role alone, it is usual for the IQA to lead meetings and standardisation exercises, etc.).

It is likely that one of the internal quality assurers at the centre will act as the main point of contact with the EQA and the awarding body for policy issues relating to delivery of this qualification, disseminate the detail of EQA reports, and ensure that actions are implemented.

### 3.5 External quality assurance and post-approval monitoring

Once the centre has been approved, the external quality assurer will start to plan and discuss quality assurance and monitoring activity with the team. Typically, a centre will receive at least two external quality assurance visits per year, but CABWI reserves the right to recommend additional visits, depending upon the centre's circumstances. The most common reasons for additional visits include, but are not limited to:

- high learner numbers and activity levels (including where a centre offers a wide variety of CABWI qualifications)
- to monitor completion of action points that must be resolved within specific timescales
- if there is a risk to the centre's qualification delivery or quality assurance systems (e.g. insufficient assessors, a high proportion of newly-qualified assessors or IQAs, etc.)
- to approve the centre to deliver new qualifications.

The centre may also request additional visits or EQA activity such as remote sampling of assessment materials, either for a review of learners' evidence and assessment records (usually prior to self-certification – 'direct claims' – status being granted), to add further units or awards to the existing centre licence, to review completion of agreed actions, or to discuss any aspect of scheme delivery.

The EQA monitors all aspects of assessment and quality assurance activity. This will include observation of assessments taking place, on site or at the centre. Over time, the EQA will seek to monitor the work of all assessors and IQAs at the centre, review the systems against current qualifications requirements and CABWI's centre recognition criteria, and provide feedback on the centre's activities.

An EQA report is produced after each quality assurance visit or activity, and sent to CABWI. Over time, CABWI will monitor the centre's progress and completion of actions agreed with the awarding body, to ensure that robust qualification delivery and quality assurance systems are in place.

In order for CABWI to ensure that quality assurance activity is conducted effectively and within appropriate timescales, it is important that centres provide the external quality assurer with as much information as possible about planned activity, and the location of cohorts of learners. This allows the EQA to schedule quality assurance with the centre so that relevant monitoring activity can be undertaken at a rate and within timescales that meet, as far as possible, the centre's activity levels and commitments to learners, clients and regulatory or funding bodies. If a centre does not advise the EQA of their forthcoming activity, and quality assurance activities cannot be planned in advance, there is a risk that EQA activities may be delayed, which can impact upon the timescales for issuing certificates.

External quality assurance activity may take place between visits to centres, either through remote sampling of learners' portfolios or other assessment records, and/or correspondence with centre personnel (e.g. to confirm completion of action points, circulate records of team meetings or standardisation activity, etc.). This type of activity will usually be agreed between the EQA and the centre, and/or the CABWI office.

Details of the fees that CABWI charges in relation to external quality assurance and qualifications activity are available via the CABWI office and on the CABWI website.

### **Certification**

The centre may apply for learner certification either on a unit-by-unit basis or when the learner has completed sufficient units for a full qualification. (Please ensure that certificates are claimed within 12 months of the final date of assessment for any unit, to confirm the learners' currency.)

### **Direct claims status**

Direct claims status (DCS) may be recommended by the EQA, when s/he is satisfied that the systems and processes for delivering the qualification are robust and are operating in accordance with the scheme requirements. Self-certification status can be recommended for full qualifications or individual units, according to the centre's circumstances, and it will be granted only when the EQA has had chance to review the centre's systems and qualification delivery in operation.

**Please be aware that, if a centre without direct claims status submits claims before the EQA has authorised them, the request will be referred to the EQA, which could delay certificate issue.**

Direct claims status is kept under review by the awarding body, and can be suspended or withdrawn for a particular qualification, or suite of qualifications, in the event that issues are identified that cause a risk to the centre's qualifications delivery.



### **3.6 Reasonable adjustments and special considerations**

CABWI is committed to complying with all current and relevant equalities legislation and the requirements of the Regulator(s), to ensure that all learners have an equal opportunity to demonstrate their knowledge, skills and understanding, to the level of attainment required for each of CABWI's qualifications.

The CABWI Policy for Reasonable adjustments and special considerations is available on the CABWI website [www.cabwi.co.uk](http://www.cabwi.co.uk).

## 4. CABWI LEVEL 3 DIPLOMA IN WASTE WATER TREATMENT: UNIT REQUIREMENTS

This section outlines the requirements for each unit in the CABWI Level 3 Diploma in Waste Water Treatment. The assessment guidance and requirements covered in Section 3 above apply across the full qualification, and most of this information is not repeated in the unit-specific notes that follow. Assessors should be aware of the general requirements covered in Section 3, and also of any specific requirements relating to the delivery of individual units.

Each unit includes learning outcomes and assessment criteria. The 'Terms and definitions' sections provide detail of the scope of terms used in the assessment criteria, and additional notes may be provided, where applicable, on the assessment and/or evidence requirements for each unit.

*Where the qualification is completed in a jurisdiction other than England or Wales differing legislation, organisations, regulators and Government departments may be substituted for any identified within the assessment criteria or terms and definitions.*

Evidence produced by learners in the workplace may cover more than one Assessment Criterion or unit and it is therefore desirable for centres to use a holistic approach to assessment. Evidence should be mapped within the portfolio to the criteria and units to which it applies.

## Waste Water – Regulation and Compliance (H/615/7470)

Level	3	CABWI Unit Ref	3401
Credit Value	2	Guided learning hours	14

### Unit purpose and aim

This unit is designed to allow learners to develop and demonstrate their knowledge and understanding of the activities of the Water regulatory bodies. The learner will be able to identify and describe the core functions and duties laid down by regulatory frameworks. This unit is designed to allow the learner to develop awareness and understanding on how the key regulatory bodies discharge their duties and administer the water industry. This unit is designed to allow the learner to develop a basic awareness and understanding of the direct and indirect impact of the regulation on water companies, customers and other stakeholders.

*Where the qualification is completed in a jurisdiction other than England or Wales differing legislation, organisations, regulators and Government departments may be substituted for any identified within the assessment criteria or terms and definitions.*

### Learning Outcome 1: Understand the UK water supply regulatory framework

#### Assessment criteria – the learner can:

- 1.1 explain why a regulatory environment is important in relation to the performance of the water industry
- 1.2 explain the functions of the key **water industry regulators**
- 1.3 explain the functions of the **key stakeholders with influence**
- 1.4 explain the purpose of the **main legislation** and the regulations which support legislation in relation to wastewater treatment
- 1.5 describe the main areas of operational activity which could directly impact on public health and the **protection of the environment**

### Learning Outcome 2: Understand regulatory performance measures

#### Assessment criteria – the learner can:

- 2.1 outline the main provisions of the **regulatory framework** and reporting mechanisms
- 2.2 explain the purpose of the current performance monitoring mechanism (e.g. service incentive mechanism)
- 2.3 explain why the current performance monitoring mechanism is important to regulation
- 2.4 describe the importance of customer contact in regulation

### Learning Outcome 3: Understand how regulation impacts the operational activities within a water company

#### Assessment criteria – *the learner can:*

- 3.1 explain the main provisions of the environmental permit regulations relating to wastewater and their influence on operational activities
- 3.2 explain the main provisions of the Urban Waste Water Treatment Directive and their influence on operational activities
- 3.3 explain the importance of compliance with **regulatory measures** and the consequences of non-compliance for water companies

### Learning Outcome 4: Understand the health and safety regulations

#### Assessment criteria – *the learner can:*

- 4.1 outline the main provisions of the Health & Safety at Work Act
- 4.2 explain the purpose of **Health & Safety Regulations** and guidance that form part of the Health & Safety at Work Act

### Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows ALL of the following MUST be assessed unless otherwise stated:

1. **Water Industry Regulators** in 1.2 above includes all of the following:
  - (a) OFWAT –The Water Services Regulation Authority - Economic regulator of the Water Sector in England and Wales
  - (b) Environmental protection agencies such as EA – Environment Agency and Natural Resources Wales
2. **Key Stakeholders with influence** in 1.3 includes all of the following
  - (a) DEFRA – Department for Environment, Food and Rural Affairs
  - (b) CCW – Consumer Council for Water (sits under OFWAT)
  - (c) HSE – Health and Safety Executive
  - (d) Local Authority (Planning, Environmental Health)
3. **Main legislation** in 1.4 above includes both:
  - (a) Environmental Permit Regulations (EPR)
  - (b) Urban Waste Water Treatment Directive (UWWTD)
4. Areas which impact on the **protection of the environment** in 1.5 above include all of the following:
  - (a) Prevention of pollution
  - (b) Control and movement of waste
  - (c) Environmental Permits

## Terms and Definitions

5. **Regulatory framework** in 2.1 above includes all of the following:
  - (a) Financial/Economic
  - (b) Customer Experience
  - (c) Environmental
  - (d) Water Quality
  - (e) Health & Safety
  
6. **Regulatory measures** in 3.3 above includes all of the following:
  - (a) Key Performance Indicators
  - (b) Compliance standards
  - (c) Regulatory reporting
  
7. **Health & Safety Regulations and guidance** in 4.2 above includes at least 10 of the following:
  - (a) Management of Health and Safety at Work Regulations (MHSWR)
  - (b) DSEAR Regs
  - (c) Construction (Design and Management) Regs
  - (d) Confined Spaces Regs
  - (e) Work at Height Regs
  - (f) Control of Asbestos Regs
  - (g) COSHH Regs
  - (h) Chemicals - Transport of Chemicals (CDG) Regs, Information and Packaging, Classification and Labelling
  - (i) Electricity Regulations
  - (j) Fire Safety
  - (k) Noise at Work Regs
  - (l) Manual Handling Operations Regs
  - (m) Risk Assessment (Management of Health and Safety at Work Regulations (MHSWR))
  - (n) Regulations supporting the New Roads and Street Works Act (NRSWA)

## Assessment Requirements

This unit is knowledge only - all assessment tools used by centres must be approved by the EQA.

## Waste Water – Science and Applied Mathematics (J/615/7512)

Level	3	CABWI Unit Ref	3402
Credit Value	5	Guided learning hours	28

### Unit purpose and aim

This unit is designed to allow learners to develop and demonstrate their understanding and application of the maths used in the design and operation of waste water industry assets. This will include the application of: approximation methods, arithmetic, algebra, geometry, and trigonometry and the analysis and presentation of data with graphs and statistics. This unit is designed to allow learners to develop an understanding of chemical and biological characteristics of waste water.

Learners will gain an understanding of how these characteristics affect operational processes and will develop an understanding of the parameters required to measure and evaluate the performance of waste water assets.

### Learning Outcome 1: Understand mathematical techniques commonly used in Waste Water Treatment

#### Assessment criteria – the learner can:

- 1.1 explain how **common measurements** are used within the water industry
- 1.2 undertake a range of typical **water industry calculations** using appropriate methods
- 1.3 undertake a range of **methods** to interpret, analyse and present water industry data

### Learning Outcome 2: Understand the chemical and physical characteristics of waste water

#### Assessment criteria – the learner can:

- 2.1 describe the basic **chemical characteristics** of sewage
- 2.2 describe the basic **physical characteristics** of water
- 2.3 explain the measurement of the **variables** used to monitor the quality of waste water
- 2.4 explain **hydraulic principles** used in the water industry

### Learning Outcome 3: Understand the microbiological characteristics of waste water

#### Assessment criteria – the learner can:

- 3.1 describe the types of **micro-organisms** found in the water environment
- 3.2 explain the health risks associated with common **waterborne pathogens**

## Learning Outcome 4: Understand the environmental impact of the waste water industry

**Assessment criteria** – *the learner can:*

- 4.1 describe the **sources of water contamination**
- 4.2 explain the implications of water contamination on the environment and to public health
- 4.3 explain how information from indicators is used to monitor environmental impact and provide protection in relation to water industry activity
- 4.4 explain the river quality classification system

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Common measurements** in 1.1 above includes all of the following:
  - (a) areas -  $m^2$
  - (b) volumes -  $m^3$
  - (c) flow rates - litres/second,  $m^3$ /hour, megalitres/day
  - (d) concentrations - mg/litre,  $\mu g$ /litre
  - (e) dosing rates - mg/litre
  - (f) retention times - seconds, minutes, hours
2. **Water industry calculations** in 1.2 above includes all of the following:
  - (a) areas
  - (b) volumes
  - (c) flow rates
  - (d) concentrations
  - (e) chemical addition calculations (dosing rates)
  - (f) retention times
  - (g) loading rates
3. **Methods** in 1.3 and 1.4 above includes all of the following:
  - (a) statistics
    - i. range
    - ii. median
    - iii. mode
    - iv. mean
  - (b) standard deviation
  - (c) graphs
  - (d) charts
  - (e) spreadsheets
4. **Chemical characteristics** of sewage in 2.1 above includes all of the following:
  - (a) elements
  - (b) atoms
  - (c) molecules
  - (d) chemical bonding

## Terms and Definitions

5. **Physical characteristics** of water in 2.2 above includes all of the following:
  - (a) solids, liquids, gasses
  - (b) boiling point
  - (c) freezing point
  - (d) effect of temperature on density
  - (e) solutions
  - (f) temperature and dissolved oxygen concentration
6. **Variables** in 2.3 above includes all of the following:
  - (a) Dissolved Oxygen (DO)
  - (b) pH
  - (c) temperature
  - (d) ammonia (Amm.-N)
  - (e) nitrogen, phosphorus and potassium (NPK)
  - (f) trade effluents
7. **Hydraulic principles** in 2.5 above includes all of the following:
  - (a) pressure/head
  - (b) flow in pipes
  - (c) flow in open channels
  - (d) frictional losses
8. Types of **micro-organisms** in treatment in 3.1 above includes all of the following:
  - (a) indicator bacteria e.g. coliforms
  - (b) pathogens
  - (c) filamentous
  - (d) carbonaceous
  - (e) nitrifying
9. **Waterborne pathogens** in 3.2 above includes all of the following:
  - (a) e. coli (Escherichia coli)
  - (b) leptospira
  - (c) infectious diseases
10. **Sources** of water contamination in 4.1 above includes all of the following:
  - (a) receiving water course
  - (b) treated water (flushing, discharges to the environment)
  - (c) sewage
  - (d) agricultural activity
  - (e) industrial activity
11. **Indicators** used to measure and monitor environmental impact and protection in 4.3 above includes all of the following:
  - (a) pH
  - (b) BOD
  - (c) COD
  - (d) Ammonia (Amm.-N)
  - (e) phosphates
  - (f) metals
  - (g) turbidity
  - (h) odour
  - (i) suspended solids
  - (j) wildlife and habitats
  - (k) flora and fauna



## Assessment Requirements

This unit is knowledge only – all assessment tools used by centres must be approved by the EQA.

## Waste Water – Preliminary Treatment (Y/615/7563)

Level	3	CABWI Unit Ref	3403
Credit Value	6	Guided learning hours	35

### Unit purpose and aim

The aim of this unit is to enable learners to develop an understanding of the principles of preliminary waste water treatment. The unit is intended to increase the learner's confidence in operational treatment processes. This unit also covers fault-finding, decision making, optimisation and cost-effective identification and correction of faults.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

*Where the qualification is completed in a jurisdiction other than England or Wales differing legislation, organisations, regulators and Government departments may be substituted for any identified within the assessment criteria or terms and definitions.*

### Learning Outcome 1: Understand the preliminary treatment process of waste water

#### Assessment criteria – the learner can:

- 1.1 explain the reasons for the preliminary treatment of waste water including regulatory requirements
- 1.2 describe the **nature** of crude sewage
- 1.3 explain the different **stages** of preliminary treatment of waste water
- 1.4 explain how the **performance** of preliminary treatment effects the downstream processes

### Learning Outcome 2: Understand the purpose and operation of plant and equipment used in preliminary treatment of waste water

#### Assessment criteria – the learner can:

- 2.1 explain the purpose and operation of preliminary treatment **plant and equipment**
- 2.2 describe how the preliminary treatment process is monitored and controlled

### Learning Outcome 3: Understand how to investigate faults and take corrective action for preliminary treatment of waste water

#### Assessment criteria – *the learner can:*

- 3.1 describe the typical faults & problems that can occur in the preliminary processes
- 3.2 explain how to identify typical faults & problems in the preliminary processes
- 3.3 explain the corrective actions that should be taken to resolve typical faults & problems with the preliminary processes

### Learning Outcome 4: Understand the optimisation of preliminary waste water treatment

#### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation of preliminary treatment processes
- 4.2 explain how data analysis can provide information to facilitate optimisation
- 4.3 describe **sources** of additional optimisation information and advice
- 4.4 explain the **techniques** used to optimise preliminary waste water treatment processes

### Learning Outcome 5: Undertake Preliminary Treatment processes

#### Assessment criteria – *the learner can:*

- 5.1 monitor the condition of the preliminary treatment process
- 5.2 verify the readings on an on-line instrument or monitor related to preliminary treatment
- 5.3 carry out observations, measurements, recording and reporting of key performance measures relating to preliminary treatment
- 5.4 interpret results from an **analysis** of crude sewage samples from a waste water treatment site

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Nature** in 1.2 above includes all of the following:
  - (a) Gross solids
  - (b) Organic material
  - (c) Inorganic material
  - (d) Polluting qualities
  - (e) Volume
  - (f) flow rate
2. **Stages** in 1.3 above includes all of the following:
  - (a) flow monitoring and control
  - (b) flow separation
  - (c) screening
  - (d) Fat Oil and Grease (FOG) removal

## Terms and Definitions

- (e) grit removal
  - (f) nuisance control
3. **Performance** in 1.4 above includes all of the following:
- (a) Quality
  - (b) Quantity
  - (c) Flow rate
4. **Plant and Equipment** in 2.1 above includes all of the following:
- (a) Inlet Sewers
    - i. rising mains
    - ii. gravity sewers
    - iii. works returns
    - iv. pumping stations
  - (b) weir overflows
  - (c) bypass channels
  - (d) storm tanks
  - (e) flow measurement equipment
  - (f) level sensors
  - (g) valves
    - i. manual
    - ii. actuated valves
    - iii. modulating
  - (h) pumps
  - (i) Screens
    - i. Washers
    - ii. Compactors
    - iii. Comminutors/macerators
  - (j) Grit removal
    - i. Grit pumps
    - ii. Classifiers
  - (k) FOG removal
  - (l) by-product collection, storage and removal
  - (m) nuisance control
5. **Typical faults and problems** in 3.1 above includes all of the following:
- (a) flow control
  - (b) flow monitoring
  - (c) flow separation
  - (d) quality
  - (e) quantity
  - (f) FOG
  - (g) screens
  - (h) grit removal
6. **Sources** in 4.3 above includes all of the following:
- (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) subject matter experts
  - (g) relevant external and internal standards
  - (h) cost/benefit analysis

## Terms and Definitions

7. **Techniques** for optimisation in 4.4 above includes all of the following:
  - (a) data/information analysis
  - (b) interpretation of results
  - (c) risk assessment
  - (d) application of relevant external and internal standards
  - (e) cost/benefit analysis
  - (f) implementation and monitoring results
  
8. **Analysis** in 5.4 above should include reference to all of the following:
  - (a) sewage “strength”
  - (b) ammonia present
  - (c) suspended solids
  - (d) possible industrial waste water content

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Primary Treatment (F/615/7573)

Level	3	CABWI Unit Ref	3404
Credit Value	6	Guided learning hours	21

### Unit purpose and aim

The aim of this unit is to enable learners to develop an understanding of the principles of primary waste water treatment. The unit is intended to increase the learner's confidence in operational treatment processes. This unit also introduces the learner to fault-finding, decision making, optimisation and cost-effective identification and correction of faults.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation

### Learning Outcome 1: Understand the principles of primary treatment of waste water

#### Assessment criteria – the learner can:

- 1.1 explain the **principles** of primary treatment of waste water
- 1.2 explain the process of primary treatment of waste water
- 1.3 describe the **factors** affecting sedimentation
- 1.4 explain how the **performance** of primary treatment effects the downstream process

### Learning Outcome 2: Understand the purpose and operation of plant and equipment used in primary treatment of waste water

#### Assessment criteria – the learner can:

- 2.1 describe the principles and properties of different **types of** settlement **tank** design
- 2.2 describe the **operational activities** associated with the management of settlement tanks
- 2.3 explain the impact of removing tanks from service
- 2.4 describe the **indicators** of a correctly operating settlement tank

### Learning Outcome 3: Understand how to investigate faults and take corrective action for primary treatment of waste water

#### Assessment criteria – the learner can:

- 3.1 describe the **operational problems** that can occur in the primary treatment process
- 3.2 explain how to identify operational problems in the primary treatment process
- 3.3 describe the **tests** used to determine the performance of sedimentation tanks
- 3.4 explain the purpose of **laboratory tests** on waste water samples
- 3.5 explain the corrective actions that should be taken to resolve operational problems in the primary treatment process

## Learning Outcome 4: Understand the optimisation of primary waste water treatment

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in primary treatment processes
- 4.2 explain how data analysis can provide information to facilitate optimisation
- 4.3 describe the **sources** of additional optimisation information and advice
- 4.4 explain the techniques used to optimise preliminary waste water treatment processes

## Learning Outcome 5: Undertake Primary Treatment processes

### Assessment criteria – *the learner can:*

- 5.1 carry out routine operational checks and adjustments of the primary treatment processes
- 5.2 identify and carry out corrective actions for two different types of primary treatment **operational problem**
- 5.3 carry out observations, measurements, recording and reporting of key performance measures relating to primary treatment
- 5.4 verify the readings of an on-line instrument used to monitor related primary treatment

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Solids Settlement
  - (b) Biochemical Oxygen Demand (BOD) reduction
  - (c) Sludge collection/storage
2. **Factors** affecting sedimentation in 1.3 above includes all of the following:
  - (a) nature of sewage
  - (b) preliminary treatment
  - (c) secondary sludges
  - (d) imported sludges/liquors
  - (e) internal return liquors
  - (f) industrial waste waters
  - (g) desludging
  - (h) equipment failure
  - (i) flows/retention time
  - (j) chemical dosing
  - (k) seasonal variations
3. **Performance** in 1.4 above includes all of the following:
  - (a) quality
  - (b) quantity
  - (c) flow rate

## Terms and Definitions

4. **Types of tank** in 2.1 above includes all of the following:
  - (a) Horizontal flow
  - (b) Upward flow
  - (c) Radial flow
5. **Operational** activities in 2.2 above includes all of the following:
  - (a) desludging
  - (b) managing equipment performance
  - (c) monitoring
6. **Indicators** in 2.4 above includes all of the following:
  - (a) Odour
  - (b) Appearance
  - (c) Thickness
  - (d) Levels
  - (e) Flows
7. **Operational problems** in 3.1 and 5.2 above includes all of the following:
  - (a) Auto desludge system failure
  - (b) Scraper failure
  - (c) Septicity
  - (d) Poor quality sludge
  - (e) Inappropriate sludge depth
8. **Tests** used to determine performance in 3.3 above includes all of the following:
  - (a) Suspended solids
  - (b) Sludge level detectors
  - (c) BOD
9. **Laboratory test** analysis in 3.4 above includes all of the following:
  - (a) crude sewage
  - (b) settled sewage
  - (c) imports
  - (d) return liquors
10. **Sources** in 4.3 above includes all of the following:
  - (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant internal and external standards
  - (h) Cost/benefit analysis



## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Fixed Film Biological Treatment (H/615/7582)

Level	3	CABWI Unit Ref	3405
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow learners to develop a technical understanding of principles of biological filtration waste water treatment and to improve decision making with regard to the operation and maintenance. The unit is designed to develop an understanding of how to monitor and maintain treatment processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation

### Learning Outcome 1: Understand the principles of fixed film biological treatment

#### Assessment criteria – *the learner can:*

- 1.1 explain the **principles** of fixed film biological treatment
- 1.2 explain the process of fixed film biological treatment
- 1.3 describe the **factors** affecting fixed film biological treatment
- 1.4 explain how the **performance** of fixed film biological treatment effects the downstream process

### Learning Outcome 2: Understand the purpose and operation of plant and equipment used in fixed biological filtration

#### Assessment criteria – *the learner can:*

- 2.1 describe the different **types** of fixed film biological treatment processes and their operation
- 2.2 explain the **operating methods** of biological filtration treatment processes
- 2.3 describe the main types of biological filter **media**
- 2.4 explain the operation of humus tanks in secondary treatment

### Learning Outcome 3: Understand how to investigate faults and take corrective action for fixed film biological filtration

#### Assessment criteria – *the learner can:*

- 3.1 describe the **operational problems** that can occur in fixed film biological treatment
- 3.2 explain how to identify **operational problems** in fixed film biological treatment
- 3.3 explain how **incorrect loading** can affect the performance of biological filtration treatment
- 3.4 describe the **tests** used to monitor the performance of fixed film biological treatment
- 3.5 explain the corrective actions which should be taken to resolve operational problems with fixed film biological treatment

### Learning Outcome 4: Understand the optimisation of fixed film biological filtration processes

#### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in fixed film biological filtration processes
- 4.2 explain how analysis of monitoring data for operational **variables** can provide information to facilitate optimisation
- 4.3 describe the **sources** of additional optimisation information and advice
- 4.4 explain the techniques used to optimise fixed film biological treatment processes

### Learning Outcome 5: Undertake Fixed Film Biological Treatment Processes

#### Assessment criteria – *the learner can:*

- 5.1 monitor the condition of the fixed film biological treatment process
- 5.2 carry out observations, measurements, recording and reporting of key performance measures relating to fixed film biological treatment.
- 5.3 verify the readings on an on-line instrument or monitor related to fixed film biological treatment

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Biology of the process
  - (b) Construction and design
  - (c) Growth and distribution of micro-organisms
  - (d) Heterotrophic & Autotrophic bacteria
  - (e) Humus settlement

## Terms and Definitions

2. **Factors** in 1.3 above includes all of the following:

- (a) Nature of Sewage
  - i. Biochemical Oxygen Demand (BOD)
  - ii. Chemical Oxygen demand (COD)
  - iii. Treatability/inhibition
- (b) Temperature
- (c) Ammonia (Amm.-N)
- (d) Type of media
- (e) Ventilation
- (f) Configuration
  - i. Circular/Rectangular
  - ii. Depth
  - iii. Volume
- (g) Flow control
- (h) Distribution method
- (i) Frequency of dosing

3. **Performance** in 1.4 above includes all of the following:

- (a) Quality
- (b) Quantity
- (c) Flow rate

4. **Types** in 2.1 above includes all of the following:

- (a) Conventional Bio-filters
- (b) Rotating Biological Contactor (RBC) or Biodisc
- (c) Submerged aerated filter (SAF)
- (d) Biological Aerated Flooded Filter (BAFF)
- (e) Nitrifying filters
- (f) Distributor types and drives

(NB: For clarity “Bio-Filter”, “Filter Bed”, “Percolating Filter”, “Trickling Filter” should be treated here as the same thing.)

5. **Operating methods** in 2.2 above includes all of the following:

- (a) Single stage
- (b) Recirculation
- (c) Two stage filtration
- (d) Two stage alternating filtration
- (e) Nitrifying filters

6. **Media** in 2.3 above includes all of the following:

- (a) Stone
- (b) Slag
- (c) Plastic
- (d) Surface area

## Terms and Definitions

7. **Operational** problems in 3.1 and 3.2 above includes all of the following:
  - (a) Sloughing
  - (b) Ponding
  - (c) Moss/ weeds
  - (d) Fly nuisance
  - (e) Temperature
  - (f) Overloading
  - (g) Under-loading
  - (h) Ice and snow
  - (i) Syphon and dosing problems
  - (j) Treatability/inhibition
8. **Incorrect Loading** in 3.3 above includes all of the following:
  - (a) Hydraulic
  - (b) Organic
9. **Tests used to determine performance in 3.4 above includes all of the following;**
  - (a) Suspended solids
  - (b) BOD
  - (c) COD
  - (d) Ammonia (Amm.-N)
  - (e) Nitrate
  - (f) Turbidity
  - (g) Temperature
  - (h) Consent compliance
10. **Operational variables** in 4.2 above includes all of the following;
  - (a) Hydraulic loading
  - (b) Organic loading
  - (c) Ventilation
  - (d) Distribution
  - (e) Frequency of dosing
11. **Sources** in 4.3 above includes all of the following:
  - (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant internal and external standards
  - (h) Cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Activated Sludge Processes (J/615/7591)

Level	3	CABWI Unit Ref	3406
Credit Value	5	Guided learning hours	42

### Unit purpose and aim

This unit is designed to allow learners to develop a technical understanding of principles of Activated Sludge treatment and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain treatment processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the principles of activated sludge

#### Assessment criteria – *the learner can:*

- 1.1 explain the **principles** of waste water treatment with activated sludge
- 1.2 describe the **factors** affecting the operation of activated sludge reactors and final settlement tanks
- 1.3 explain the F:M ratio, Stirred Specific Volume Index (SSVI) and Sludge Volume Index (SVI)
- 1.4 explain how the **performance** of activated sludge treatment effects the downstream process

### Learning Outcome 2: Understand the purpose and operation of the main components including plant and equipment used in activated sludge treatment

#### Assessment criteria – *the learner can:*

- 2.1 explain the function of **Activated Sludge treatment processes**
- 2.2 explain the operational activities associated with the **different types of plant** and equipment used in activated sludge processes

### Learning Outcome 3: Understand how to investigate faults and take corrective action for activated sludge

#### Assessment criteria – *the learner can:*

- 3.1 describe **operational problems** that can occur in the activated sludge process
- 3.2 explain how to identify **operational problems** in the activated sludge process
- 3.3 describe the **process variables** which can affect the performance of the activated sludge process
- 3.4 describe the **tests** used to monitor the performance of the activated sludge process
- 3.5 describe the corrective actions that should be taken to resolve **operational problems**

### Learning Outcome 4: Understand the optimisation of activated sludge processes

#### Assessment criteria – *the learner can:*

- 4.1 explain the benefits of optimisation in activated sludge processes
- 4.2 explain how data analysis of process variables can provide information to facilitate optimisation
- 4.3 describe **sources** of additional optimisation information and advice
- 4.4 explain the techniques used to optimise activated sludge treatment processes

### Learning Outcome 5: Undertake Activated Sludge processes

#### Assessment criteria – *the learner can:*

- 5.1 carry out routine operational checks and adjustments of activated sludge processes
- 5.2 identify and carry out corrective actions for different types of activated sludge process operational problems
- 5.3 carry out observations, measurements, recording and reporting of key performance measures relating to activated sludge
- 5.4 produce data and calculations relating to organic loadings on an activated sludge plant
- 5.5 carry out organic and hydraulic checks to improve the overall efficiency of an activated sludge plant
- 5.6 make adjustments based on the results of organic and hydraulic checks
- 5.7 analyse data and make process adjustments to improve the overall efficiency of an activated sludge plant
- 5.8 obtain operational support to improve the activated sludge process

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Biology of the process
    - i. Microscopic examination
    - ii. Indicator species
    - iii. Nitrification
    - iv. Development of flocs & Settleability
  - (b) Oxygen transfer
  - (c) Construction and design
  - (d) Growth and distribution of micro-organisms
  - (e) Heterotrophic & Autotrophic bacteria
  - (f) Final settlement
  
2. **Factors** in 1.2 above includes all of the following:

Reactors

  - (a) Loading – a range from High to Low
  - (b) Aeration Method
  - (c) Configuration (mixing regime)
    - i. Plug Flow
    - ii. Completely mixed
    - iii. Anoxic zone

Final Settlement tanks

  - (d) Design Parameters
  - (e) Capacity/retention
  - (f) Return Activated sludge
  - (g) Surplus Activated sludge
  - (h) Shape & arrangement
  
3. **Performance** in 1.4 above includes all of the following:
  - (a) Quality
  - (b) Quantity
  - (c) Flow rate
  
4. **Activated Sludge treatment processes** in 2.1 above includes all of the following:
  - (a) Aeration Tank
  - (b) Aerators
  - (c) Final Tank
  - (d) Return Activated Sludge
  - (e) Surplus Activated Sludge
  - (f) Process Monitoring and Control
  - (g) Anoxic zone



## Terms and Definitions

5. **Types of Plant** in 2.2 above includes at least 4 of the following:
  - (a) Conventional
  - (b) High Rate
  - (c) Extended aeration
  - (d) Sequence Batch Reactors (SBR) including Cyclic Activated Sludge System (CASS)
  - (e) Membrane Biological Reactor (MBR)
  - (f) Biological Nutrient Removal (BNR)
  - (g) Oxygen plants
  - (h) Deep shaft
  - (i) Hybrid Aeration
  - (j) Nitrifying/Non-nitrifying
  - (k) Contact stabilisation
  
6. **Operational problems** in 3.1 and 3.2 above includes all of the following:
  - (a) Bulking
  - (b) Hydraulic Overloading
  - (c) Organic overloading
  - (d) Foaming
  - (e) Denitrification
  - (f) Treatability/inhibition
  - (g) Filamentous
  - (h) Pin flocs
  
7. **Process Variables** in 3.3 above includes all of the following:
  - (a) Nature of Sewage (quantity and quality)
  - (b) Biochemical Oxygen Demand (BOD) & Chemical Oxygen Demand (COD) of Sewage feed
  - (c) Mixed Liquor Suspended Solids (MLSS) Concentration
  - (d) Surplus Activated sludge (SAS) / Returned Activated Sludge (RAS)
  - (e) Sludge Volume index
  - (f) Dissolved Oxygen concentration
  - (g) Sludge loading (F:M)
  - (h) Floc loading
  - (i) Stirred Specific Volume Index (SSVI)
  - (j) Ammonia concentration (Amm.-N)
  - (k) Consent/Permit requirements
  
8. **Tests in 3.4 above includes all of the following:**
  - (a) MLSS
  - (b) Sludge Volume Index / SSVI
  - (c) BOD
  - (d) COD
  - (e) Blanket level
  - (f) Ammonia concentration & removal (Amm.-N)
  - (g) Nitrates concentration & removal
  - (h) Final Settlement Tank (FST) solids loading - maximum permissible MLSS
  - (i) Dissolved Oxygen (DO)

## Terms and Definitions

9. **Sources** in 4.3 above includes all of the following:
- (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant internal and external standards
  - (h) Cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion. Assessment Criteria 5.6 only requires one piece of evidence. Simulation **may** be acceptable subject to prior approval.

## Waste Water – Tertiary Treatment (D/615/7595)

Level	3	CABWI Unit Ref	3407
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles of Tertiary Treatment and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain treatment processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the principles of tertiary treatment

#### Assessment criteria – *the learner can:*

- 1.1 explain the **principles** of wastewater tertiary treatment
- 1.2 describe the **methods** of tertiary treatment
- 1.3 describe **factors** affecting the performance of Tertiary treatment
- 1.4 explain how the **performance** of tertiary treatment effects the downstream process

### Learning Outcome 2: Understand the purpose and operation plant and equipment used in Tertiary Treatment

#### Assessment criteria – *the learner can:*

- 2.1 explain the operation of **Tertiary Treatment methods**
- 2.2 explain how tertiary treatment processes are monitored and controlled
- 2.3 explain the variables that influence the performance of tertiary treatment processes

### Learning Outcome 3: Understand how to investigate faults and take corrective action for tertiary treatment

#### Assessment criteria – *the learner can:*

- 3.1 describe the **operational problems** that can occur in Tertiary Treatment processes
- 3.2 explain how to identify **operational problems** in Tertiary Treatment processes
- 3.3 explain how incorrect loading can affect the performance of Tertiary Treatment processes
- 3.4 describe the **tests** used to monitor the performance of Tertiary Treatment processes
- 3.5 explain the corrective actions that should be taken to resolve **operational problems** in tertiary treatment processes

## Learning Outcome 4: Understand the optimisation of tertiary treatment processes

### Assessment criteria – *the learner can:*

- 4.1 explain the benefits of optimisation in tertiary treatment processes
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise tertiary treatment processes

## Learning Outcome 5: Undertake Tertiary Treatment processes

### Assessment criteria – *the learner can:*

- 5.1 carry out routine operational checks and adjustments of tertiary treatment processes
- 5.2 monitor the condition of tertiary treatment processes
- 5.3 carry out observations, measurements, recording and reporting of key performance measures relating to tertiary treatment.
- 5.4 carry out different types of process adjustments to improve the overall efficiency of tertiary treatment.

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Effluent polishing / Permit compliance
  - (b) Biochemical Oxygen Demand (BOD) removal
  - (c) Suspended solids removal
  - (d) Nutrient removal
  - (e) Ammonia removal
2. **Tertiary Treatment Methods** in 1.2 and 2.1 above includes at least 3 from the following:
  - (a) Prolonged Settlement – Lagoons
  - (b) Grass plots
  - (c) Constructed Wetlands (Reed beds)
  - (d) Micro-strainers
  - (e) Filtration
    - i. Slow sand
    - ii. Rapid Gravity
    - iii. Moving bed
    - iv. Upward Flow
  - (f) Nutrient Removal
    - i. Phosphorus
    - ii. Nitrogen
  - (g) Disinfection – UV radiation
  - (h) pH correction

## Terms and Definitions

3. **Factors** in 1.3 above includes all of the following:
  - (a) Nature of Sewage
  - (b) BOD & Chemical Oxygen Demand (COD)
  - (c) Nutrient concentration
  - (d) Consent/Permit requirements
  - (e) Treatability/inhibition
4. **Performance** in 1.4 above includes all of the following:
  - (a) Quality
  - (b) Quantity
  - (c) Flow rate
5. **Operational problems** in 3.1 and 3.2 above includes all items from at least two methods from the list below:
  - (a) Lagoons / constructed wetlands
    - i. Sludge removal
    - ii. Algae turbidity
    - iii. Overloading
    - iv. Short circuiting
  - (b) Strainers
    - i. Blinding
    - ii. Organic growth
  - (c) Filtration
    - i. Sludge removal
    - ii. Backwashing
    - iii. Liquor treatment
    - iv. Media loss
  - (d) Nutrient removal
    - i. pH
    - ii. Alkalinity
    - iii. Bacterial growth rate
    - iv. Permit conditions
  - (e) Disinfection
    - i. Turbidity
    - ii. Dosage rate
    - iii. Lamp cleaning / replacement
    - iv. Power failure
6. **Tests** in 3.4 above includes all of the following:
  - (a) BOD
  - (b) COD
  - (c) Suspended Solids
  - (d) Turbidity
  - (e) Ammonia (Amm.-N)
  - (f) Nitrate
  - (g) Phosphate
  - (h) pH
  - (i) Alkalinity

## Terms and Definitions

7. **Sources** in 4.2 above includes all of the following:
- (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant external and internal standards
  - (h) Cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion. Simulation **may** be acceptable subject to prior approval.

## Waste Water – Small works and package plants (T/615/7599)

Level	3	CABWI Unit Ref	3408
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow learners to develop a technical understanding of principles related to Small Works and Package Plants and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

### Learning Outcome 1: Understand the principles of Sewage treatment with Small Works and Package plants

#### Assessment criteria – *the learner can:*

- 1.1 explain the purpose of different **types** of small works and package plants available for sewage treatment
- 1.2 explain the **principles** of sewage treatment for small works and package plants
- 1.3 describe the **factors** affecting the performance of small works and package plants

### Learning Outcome 2: Understand the operation of Small Works and Package Plants

#### Assessment criteria – *the learner can:*

- 2.1 explain the operation of **types** of small works and package plants
- 2.2 explain how small works and package plants are monitored and controlled
- 2.3 explain the variables that influence the performance of small works and package plants

### Learning Outcome 3: Understand how to investigate faults and take corrective action for Small Works and Package Plants

#### Assessment criteria – *the learner can:*

- 3.1 describe the **operational problems** that can occur in small works and package plants
- 3.2 explain how to identify **operational problems** in small works and package plants
- 3.3 explain the corrective actions which should be taken to resolve operational problems for small works and package plants

## Learning Outcome 4: Understand the optimisation methods used for Small Works and Package Plants

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in small works and package plants
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise small works processes

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. Types in 1.1 and 2.1 above should include at least 3 of the following:
  - (a) Conventional Biofilters
  - (b) Conventional Activated Sludge
  - (c) Septic tanks
  - (d) Rotating Biological Contactors
  - (e) Oxidation Ditches (extended aeration plants)
  - (f) Submerged Aerated filters
  - (g) Biological Aerated Flooded Filters
  - (h) Reed beds
  - (i) Grass plots
2. **Principles** in 1.2 above should include all of the following:
  - (a) Conventional Sewage Treatment
  - (b) Biological treatment – Oxidation of organic material
  - (c) Fixed Film
  - (d) Activated Sludge
  - (e) Settlement
  - (f) Sludge removal
  - (g) Monitoring
3. **Factors** in 1.3 above includes all of the following:
  - (a) Unit size
  - (b) Susceptibility to shock load
  - (c) Resources / investment
  - (d) Sludge disposal
  - (e) Plant Failures (Electrical & Mechanical)
  - (f) Frequency of visits
  - (g) Security
  - (h) Monitoring through Telemetry
4. **Operational problems** in 3.1 and 3.2 include all of the following:
  - (a) Blockages
  - (b) Variable flow
  - (c) Variable load
  - (d) Plant failures – mechanical, electrical and instrumentation
  - (e) Monitoring and control
  - (f) Process failures



## Terms and Definitions

5. **Sources** in 4.2 above includes all of the following:
- (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant external and internal standards
  - (h) Cost/benefit analysis

## Assessment Requirements

This unit is knowledge only - all assessment tools used by centres must be approved by the EQA

## Waste Water – Nutrient Removal (D/615/7600)

WasteLevel	3	CABWI Unit Ref	3409
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles related to Nutrient Removal and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain installations for optimum performance whilst maintaining a safe working environment.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the principles of Nutrient Removal

#### Assessment criteria – *the learner can:*

- 1.1 explain the **nutrients** found in waste water
- 1.2 explain the reasons for nutrient removal.
- 1.3 explain the principles of **Nutrient Removal Processes**
- 1.4 explain the risks associated with insufficient nutrient removal

### Learning Outcome 2: Understand the processes and operations involved in Nutrient Removal

#### Assessment criteria – *the learner can:*

- 2.1 explain the operation of **Nutrient Removal Processes**
- 2.2 describe the **factors** that can affect the operation of Nutrient Removal

### Learning Outcome 3: Understand how to investigate faults and take corrective action for Nutrient Removal Processes

#### Assessment criteria – *the learner can:*

- 3.1 describe the **operational problems** that can occur in Nutrient Removal processes
- 3.2 explain how to identify **operational problems** in nutrient removal processes
- 3.3 explain the corrective actions that should be taken to resolve **operational problems** in nutrient removal

## Learning Outcome 4: Understand the optimisation methods used for Nutrient Removal

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in nutrient removal processes
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise nutrient removal processes

## Learning Outcome 5: Undertake Nutrient Removal from Waste Water processes

### Assessment criteria – *the learner can:*

- 5.1 carry out routine operational checks on nutrient removal processes
- 5.2 carry out adjustments on nutrient removal processes
- 5.3 identify different faults on nutrient removal processes
- 5.4 carry out corrective actions for different faults on nutrient removal processes
- 5.5 identify opportunities for optimisation
- 5.6 carry out different types of process adjustments to improve the efficiency of nutrient removal processes

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Nutrients** in 1.1 above includes all of the following:
  - (a) Phosphorous
  - (b) Nitrogen
2. **Nutrient Removal Processes** in 1.3 and 2.1 above includes all of the following:
  - (a) Phosphorus
  - (b) Physico-chemical removal
  - (c) Biological removal
  - (d) Nitrogen
  - (e) Nitrification
  - (f) De-nitrification
3. **Factors** in 2.2 above includes all of the following:
  - (a) pH
  - (b) Chemical dosing
  - (c) Sludge production
  - (d) Alkalinity
  - (e) Phosphorous/biochemical oxygen demand (BOD) ratio
  - (f) Nitrate/BOD ratio
  - (g) Dissolved oxygen
  - (h) Plant and equipment
  - (i) Trade Effluent
  - (j) Flow rate

## Terms and Definitions

4. **Operational problems** in 3.1, 3.2 and 3.3 above includes all of the following:
  - (a) pH
  - (b) Chemical
  - (c) Sludge Production
  - (d) Alkalinity
  - (e) Dissolved Oxygen level
  - (f) Trade Effluent
  
5. **Sources** in 4.2 above includes all of the following:
  - (a) On site testing
  - (b) Laboratory testing
  - (c) Data analysis/trending
  - (d) SCADA
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant external and internal standards
  - (h) Cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion. Simulation **may** be acceptable subject to prior approval.

## Waste Water – Sludge Treatment and Recycling (H/615/7601)

Level	3	CABWI Unit Ref	3410
Credit Value	5	Guided learning hours	42

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles of sludge treatment and recycling and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the principles of sludge treatment and recycling

#### Assessment criteria – the learner can:

- 1.1 explain the **principles** of Sewage Sludge Treatment and recycling
- 1.2 describe the **factors** affecting the types of sludge
- 1.3 describe the **factors** affecting the sludge strategy
- 1.4 describe the **factors** affecting the nature of the sludge
- 1.5 describe the **factors** affecting the treatment of sludge liquors

### Learning Outcome 2: Understand the processes and operations involved in the main sludge disposal/recycling routes used in the UK

#### Assessment criteria – the learner can:

- 2.1 describe the main **disposal/recycling routes** used in the UK
- 2.2 explain the **operational systems and processes** used in sludge treatment and recycling
- 2.3 explain the importance of following regulatory obligations, company policy and procedures for process monitoring and control of sludge disposal

### Learning Outcome 3: Understand how to investigate faults and take corrective action for sludge treatment and recycling

#### Assessment criteria – the learner can:

- 3.1 describe the **operational problems** that can occur in sludge treatment and recycling
- 3.2 explain how to identify **operational problems** in sludge treatment and recycling
- 3.3 explain the corrective actions that should be taken to resolve operational problems

## Learning Outcome 4: Understand the optimisation of sludge treatment and recycling

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in sludge treatment and recycling
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise activated sludge processes

## Learning Outcome 5: Undertake Waste Water Sludge Treatment processes

### Assessment criteria – *the learner can:*

- 5.1 carry out routine operational checks of a sludge treatment and recycling process
- 5.2 carry out routine operational adjustments of a sludge treatment and recycling process
- 5.3 identify where corrective actions are required for at least two different types of operational problems
- 5.4 carry out corrective actions for at least two different types of operational problems
- 5.5 carry out observations, measurements, recording and reporting of key performance measures relating to sludge treatment and recycling
- 5.6 identify opportunities for optimisation
- 5.7 carry out different types of process adjustments to improve the efficiency of sludge treatment or recycling

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Source of Sludge
  - (b) Nature of sludge
  - (c) Volumes of sludge produced
  - (d) Consolidation/Thickening and Dewatering
  - (e) Nature of sludge liquors from consolidation and dewatering

## Terms and Definitions

2. **Factors in 1.2, 1.3, 1.4 and 1.5 above** includes all of the following:
- Types and nature of Sludges
    - (a) Primary
    - (b) Secondary
      - i. Humus
      - ii. Surplus Activated
    - (c) Tertiary
    - (d) Digested
    - (e) Production of gasses
    - (f) Composted
    - (g) Lime treated
  - Sludge Strategy
    - (h) Legislation/Codes of practice
    - (i) Safe Sludge Matrix
    - (j) Risks to Strategy
  - Nature of Product
    - (k) Odour
    - (l) Pathogen kill
    - (m) Safe Agricultural use
  - Treatment of sludge liquors
3. **Disposal/recycling routes in 2.1 above** includes all of the following:
- (a) Recycling to land
    - i. Agricultural use
    - ii. Land reclamation
    - iii. Composting
  - (b) Thermal destruction
    - i. Power production
  - (c) Land fill
4. **Operational Systems/processes in 2.2 above** includes –a-e plus at least one of f-h and one of i-l:
- All of:**
- (a) Consolidation
  - (b) Thickening
  - (c) Dewatering
  - (d) Sludge pumping
  - (e) Sludge Conditioning
- At least 1 of the following:**
- (f) Thermal Hydrolysis
  - (g) Incineration
  - (h) CHP (Combined Heat and Power)
- At least 1 of the following:**
- (i) Centrifuges
  - (j) Gravity Belt Thickeners
  - (k) Belt Presses
  - (l) Plate Presses

## Terms and Definitions

5. **Operational problems** in 3.1 above includes at least 4 of the following:
  - (a) Gas production
  - (b) Quantity and quality
  - (c) Chemical dosing
  - (d) Sludge process equipment
  - (e) Return liquor quality
  - (f) Sludge pumping
  - (g) Rag content
  - (h) Grit content
  - (i) Odour
  - (j) Sludge Conditioning
  - (k) Seasonal loss of disposal route
  - (l) Transport
  - (m) Sludge storage
  - (n) Works permit/consent (compliance) risks
  
6. **Sources** in 4.2 above includes all of the following:
  - (a) On-line monitors
  - (b) Field tests
  - (c) SCADA
  - (d) Laboratory analysis
  - (e) Colleagues
  - (f) Subject matter experts
  - (g) Relevant external and internal standards
  - (h) Cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion. Simulation **may** be acceptable subject to prior approval.



## Waste Water – Sludge Digestion (K/615/7602)

Level	3	CABWI Unit Ref	3411
Credit Value	5	Guided learning hours	42

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles of Anaerobic Sludge Digestion and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain processes whilst maintaining a safe working environment, also to monitor and maintain processing for optimum performance.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the principles of Anaerobic Sludge Digestion

#### Assessment criteria – the learner can:

- 1.1 explain the **principles** of Sewage Sludge Treatment through Anaerobic Digestion
- 1.2 describe the **factors** affecting Sludge Digestion
- 1.3 explain the **safety considerations** that must be taken into account when operating sludge digestion processes
- 1.4 explain how the **performance** of sludge digestion affects the downstream processes

### Learning Outcome 2: Understand the function and operation of the main systems and processes involved in Sludge Digestion

#### Assessment criteria – the learner can:

- 2.1 explain the function of the **systems and processes** involved in Sludge Digestion
- 2.2 explain the importance of retention time calculations
- 2.3 describe **non-routine operations**

### Learning Outcome 3: Understand how to investigate faults and take corrective action for sludge digestion

#### Assessment criteria – the learner can:

- 3.1 describe the **operational problems** that can occur in sludge digestion processes
- 3.2 explain how to identify **operational problems** in Sludge Digestion processes
- 3.3 explain how to identify the possible causes of **operational problems** in Sludge Digestion processes
- 3.4 explain the corrective actions that should be taken to resolve **operational problems**

## Learning Outcome 4: Understand the optimisation methods used in sludge digestion

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in sludge digestion
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise sludge digestion processes

## Learning Outcome 5: Undertake Sludge Digestion processes

### Assessment criteria – *the learner can:*

- 5.1 carry out process monitoring checks and record the required data
- 5.2 calculate retention time
- 5.3 identify different operational problems and carry out corrective actions which resolve the problem
- 5.4 prevent possible operational problems by early intervention
- 5.5 carry out different types of process adjustment to improve the overall efficiency of a Sludge Digester
- 5.6 explain the reasons for selecting the process adjustments made to improve the overall efficiency of a sludge digester.

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Natural Anaerobic process
  - (b) Breakdown of Organic Matter
  - (c) Multi Stage Biology
    - i. Hydrolysis
    - ii. Acid formation
    - iii. Gas production
  - (d) Nature of Product
    - i. Odour
    - ii. Pathogen kill
    - iii. Agricultural use
  - (e) Nature of Digester Gas
  - (f) Energy production
  - (g) Other By-products
  - (h) Temperature

## Terms and Definitions

2. **Factors** in 1.2 above includes all of the following:
  - (a) Source and Nature of Feed Sludge
  - (b) Feeding Rate and sludge withdrawal
  - (c) Retention Time (Mean Residence Time)
  - (d) Mixing
  - (e) Heating
  
3. **Safety Considerations** in 1.3 above includes all of the following:
  - (a) Risk Assessment
  - (b) DSEAR (Dangerous Substances and Explosive Atmospheres Regulations)
  - (c) Safe Working Procedures
  - (d) Permits to work
  - (e) Training/Competence
  - (f) Zoning
  - (g) Personal gas monitors
  - (h) Gas handling systems
  
4. **Performance** in 1.4 above includes all of the following:
  - (a) Quality
  - (b) Quantity
  - (c) Flow rate
  
5. **Systems and processes** in 2.1 above includes all of the following:
  - (a) Heating Systems
  - (b) Mixing Systems
  - (c) Feeding systems
  - (d) Hazard Analysis and critical control points (HACCP)
  - (e) Gas System
    - i. Collection
    - ii. Storage
    - iii. Pressure relief
    - iv. Gas Compressors
    - v. Boosters
  - (f) CHP (Combined Heat and Power)
  
6. **Non-Routine operations** in 2.3 above includes all of the following:
  - (a) Commissioning
  - (b) Start-up
  - (c) Shut-down
  
7. **Operational problems** in 3.1,3.2, 3.3 and 3.4 above includes all of the following:
  - (a) Temperature
  - (b) Loading
  - (c) Gas issues
  - (d) process issues
  - (e) electrical failure
  - (f) mechanical failure

## Terms and Definitions

8. **Sources** in 4.2 above includes all of the following:
- (a) On-line monitors
  - (b) Field tests
  - (c) SCADA
  - (d) Laboratory analysis
  - (e) Colleagues
  - (f) subject matter experts
  - (g) relevant external and internal standards
  - (h) cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Nuisance Control (M/615/7603)

Level	3	CABWI Unit Ref	3412
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow learners to develop a technical understanding of principles related to Nuisance and nuisance control processes and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain installations for optimum performance whilst maintaining a safe working environment.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation

### Learning Outcome 1: Understand the principles of nuisance control processes

#### Assessment criteria – *the learner can:*

- 1.1 explain the causes of nuisance associated with waste water treatment
- 1.2 describe the **principles** of controlling nuisance types associated with waste water treatment
- 1.3 describe the **nuisance control processes** used in waste water treatment

### Learning Outcome 2: Understand the operation of nuisance control processes

#### Assessment criteria – *the learner can:*

- 2.1 explain the application and operation of **nuisance control processes** for flies
- 2.2 explain the application and operation of **nuisance control processes** for odour

### Learning Outcome 3: Understand how to investigate faults and take corrective action for nuisance control processes

#### Assessment criteria – *the learner can:*

- 3.1 describe the **operational problems** that can occur in nuisance control processes
- 3.2 identify the corrective actions that should be taken to resolve **operational problems**

## Learning Outcome 4: Understand the optimisation methods used for nuisance and nuisance control processes

**Assessment criteria** – *the learner can:*

- 4.1 describe the benefits of optimisation of nuisance control processes
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise nuisance control processes

## Learning Outcome 5: Undertake Waste Water Nuisance processes

**Assessment criteria** – *the learner can:*

- 5.1 carry out routine operational checks of a nuisance control process
- 5.2 carry out routine operational adjustments of a nuisance control process
- 5.3 identify where corrective actions are required for at least two different types of **operational problems**
- 5.4 carry out corrective actions for at least two different types of **operational problems**
- 5.5 carry out monitoring, measurements, recording and reporting of key performance measures relating to nuisance control processes
- 5.6 identify opportunities for optimisation
- 5.7 carry out different types of process adjustments to improve the efficiency of nuisance control processes.

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.2 above should include 7 items from Odour and 3 items from Other:
  - (a) Odour; to include all of the following:
    - i. Sources of Odour
    - ii. Chemicals causing odour
    - iii. Assessment - Mapping
  - (b) Insects (to include both)
    - i. Life cycle
    - ii. Species
  - (c) Vermin
  - (d) Dust
  - (e) Transport
  - (f) Noise
  - (g) Light
  - (h) Visual/aesthetic

## Terms and Definitions

2. **Nuisance control processes** in 1.3, 2.1, 2.2 and 3.1 above includes all of the following:
  - Flies
    - (a) Chemical
    - (b) Netting
    - (c) Biological
  - Odour
    - (d) Prevention
    - (e) Dilution Dispersion
    - (f) Chemical masking and counteractants
    - (g) Covering and treating off gasses
    - (h) Wet scrubbing
    - (i) Adsorption
    - (j) Biological
3. **Operational problems** in 3.1, 5.3 and 5.4 above includes all of the following:
  - Flies
    - (a) Available chemicals
    - (b) Legislation
    - (c) Dosing at appropriate time in life cycle
    - (d) Netting causing ponding
    - (e) Torn or degraded netting
  - Odour
    - (f) Confined spaces
    - (g) Intermittent and diffuse sources
    - (h) Noxious chemicals used
    - (i) Sludge handling/movement
4. **Sources** in 4.2 above includes all of the following:
  - (a) On-line monitors
  - (b) Field tests
  - (c) SCADA
  - (d) Laboratory analysis
  - (e) Colleagues
  - (f) subject matter experts
  - (g) relevant external and internal standards
  - (h) cost/benefit analysis

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes 5 should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Pumping Stations (F/615/7606)

Level	3	CABWI Unit Ref	3413
Credit Value	3	Guided learning hours	21

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles related to waste water pumping stations and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain installations for optimum performance whilst maintaining a safe working environment.

All practical activities should be carried out in line with safe working practices, fully compliant with company policy and relevant Health & Safety legislation.

### Learning Outcome 1: Understand the purpose and operation of waste water pumping and flow

#### Assessment criteria – *the learner can:*

- 1.1 explain the purpose of waste water pumping stations
- 1.2 describe the **factors** affecting the operation of waste water pumping stations

### Learning Outcome 2: Understand how to investigate faults and take corrective action for pumping stations

#### Assessment criteria – *the learner can:*

- 2.1 describe the **operational problems** that can occur with waste water pumping stations
- 2.2 explain how to identify **operational problems** in waste water pumping operations
- 2.3 explain how to identify the possible causes of equipment or control failures in waste water pumping operations
- 2.4 explain the corrective actions that should be taken to resolve operational problems in waste water pumping operations

### Learning Outcome 3: Understand the efficiency and reliability factors of waste water pumping operations

#### Assessment criteria – *the learner can:*

- 3.1 describe the **efficiency and reliability** factors that can affect the performance of Pumping Stations
- 3.2 explain how operational monitoring checks can support improvements in efficiency and reliability



## Learning Outcome 4: Undertake waste water pumping station operations

### Assessment criteria – *the learner can:*

- 4.1 carry out routine operational checks and adjustments on pumping stations
- 4.2 identify different operational problems and carry out corrective actions to resolve the problem
- 4.3 prevent possible operational problems by early intervention
- 4.4 carry out observations, measurements, recording and reporting of key performance measures relating to Pumping Stations reliability and efficiency

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Factors** in 1.2 above includes all of the following:
  - (a) Type of Pumping Station (wet well/dry well, submersible pumps)
  - (b) Types of pump
  - (c) Number of pumps
  - (d) Duty/assist and standby rotation
  - (e) Control systems
  - (f) Consents/Permits
  - (g) Material to be transferred
  - (h) Maintenance
  - (i) Pump Performance
2. **Operational problems** in 2.1 and 2.2 above includes all of the following:
  - (a) Blockages
  - (b) Bursts
  - (c) Contamination
  - (d) Flooding
  - (e) Fat, oil and grease accumulations
  - (f) Rag and grit accumulation
  - (g) Deposits in the wet well
  - (h) Pump failure
  - (i) Control equipment failure
3. **Efficiency and reliability** factors in 3.1 above to include at least 4 from the list below:
  - (a) Planned routine maintenance
  - (b) Inspection and monitoring checks
  - (c) Energy costs and load management
  - (d) Telemetry
  - (e) Pump rotation
  - (f) Pump duty and level control
  - (g) Surge protection
  - (h) Fixed and mobile power emergency generators

## Assessment Requirements

For the knowledge elements of this unit all assessment tools used by centres must be approved by the EQA.

Evidence for Learning outcomes should be naturally occurring in the workplace and unless otherwise stated 3 pieces of evidence should be provided for each assessment criterion.

## Waste Water – Asset Management (Y/615/7613)

Level	3	CABWI Unit Ref	3414
Credit Value	4	Guided learning hours	21

### Unit purpose and aim

The water industry relies on a high proportion of physical infrastructure and non-infrastructure assets. This is a complex mix of assets of varying materials and asset lifespans. The key objective is maintaining service to customers. Assets are often remote or out-of-sight, underground, difficult to inspect, maintain or assess condition. Asset Management is the management of physical assets - their selection, operation, maintenance, inspection and renewal. Asset Management is key in determining the operational performance and profitability of industries that operate assets as part of their core business.

This unit will provide an opportunity for learners to develop their understanding and awareness of the skills required for waste water treatment asset management relating to water industry operations.

### Learning Outcome 1: Understand the principles of Asset Lifecycles and Asset Management Systems

#### Assessment criteria – the learner can:

- 1.1 describe the term “Asset Management” from a water industry focus
- 1.2 outline how asset management determines the operational performance and profitability of the water industry
- 1.3 explain the **lifecycle** of asset management projects
- 1.4 outline the tangibles and intangibles that relate to **asset management decisions**
- 1.5 describe the key **asset management systems** used in the water industry

### Learning Outcome 2: Understand how water industry assets are financed

#### Assessment criteria – the learner can:

- 2.1 explain the components which make up **Operating Expenditure** (Opex)
- 2.2 describe how Opex is used to finance operations and maintenance activities
- 2.3 explain the components which make up **Capital Expenditure** (Capex)
- 2.4 describe how Capex is used to finance renewal and improvement activities
- 2.5 outline how the principle of Total Expenditure (**TOTEX**) impacts asset management planning decisions
- 2.6 explain how infrastructure and non-infrastructure assets are **depreciated** in the water industry

## Learning Outcome 3: Understand how waste water treatment asset performance is maintained

### Assessment criteria – *the learner can:*

- 3.1 explain the importance of maintaining compliance and capacity of waste water assets
- 3.2 describe the **conditions** that can influence the performance of waste water assets
- 3.3 explain how the **performance of assets** are categorised for rehabilitation or replacement options
- 3.4 describe the processes for determining the structural integrity of assets

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Lifecycle** of Asset Management Projects in 1.3 above includes all of the following:
  - (a) strategy & planning
  - (b) financing & procurement
  - (c) design & build
  - (d) commission & handover
  - (e) operate & maintain
  - (f) replace & decommission
2. **Asset management decisions** in 1.4 above includes ALL of (a) to (h) plus at least one other of the following:
  - (a) asset performance
  - (b) asset condition
  - (c) asset serviceability
  - (d) asset life
  - (e) asset operating costs
  - (f) asset replacement/improvement costs
  - (g) asset criticality
  - (h) regulatory targets
  - (i) asset disposal
  - (j) investment strategy/long term asset management plan
  - (k) whole life costs
  - (l) return on investment
  - (m) legislation and regulation
  - (n) company reputation
  - (o) customer satisfaction
  - (p) Capex versus Opex expenditure and Totex considerations
3. **Asset management systems** in 1.5 above includes all of the following:
  - (a) Publicly Available Specification (PAS) 55:2008
  - (b) ISO 55000:2014
  - (c) Failure Modes Effects and Criticality Analysis (FMECA)

## Terms and Definitions

4. **Operating Expenditure** in 2.1 above includes at least 5 of the following:
  - (a) employment
  - (b) power/energy
  - (c) chemicals
  - (d) materials
  - (e) operating/maintenance contracts
  - (f) consumables
  - (g) rents/leases
  - (h) waste disposal
  - (i) licencing
  - (j) transport
5. **Capital Expenditure** in 2.2 above includes at least 2 of the following:
  - (a) asset construction/maintenance/improvement
  - (b) asset commissioning
  - (c) asset disposal
  - (d) acquisition
6. **TOTEX** in 2.5 above includes at least 4 of the following:
  - (a) whole life/lifetime cost
  - (b) Capex/Opex options for achievement of outputs
  - (c) Totex targets
  - (d) innovation
  - (e) productivity
  - (f) cost
  - (g) risk
  - (h) performance
  - (i) efficiency
7. **Depreciated** in 2.6 includes all of the following:
  - (a) standard depreciation method
  - (b) Infrastructure Renewals Charge (IRC)
  - (c) Infrastructure Renewals Expenditure (IRE)
8. **Conditions** that can influence asset performance in 3.2 above includes at least 5 of the following:
  - (a) hydraulic capacity
  - (b) asset condition
  - (c) compliance with internal/external standards
  - (d) safety
  - (e) bursts and leakage
  - (f) discoloured water
  - (g) water quality
  - (h) structural integrity
  - (i) ingress
  - (j) maintenance
9. **Performance of assets** are categorised in 3.3 above includes at least 3 of the following:
  - (a) water quality
  - (b) security of supply
  - (c) asset failure rates
  - (d) hydraulic capacity
  - (e) reliability

## Assessment Requirements

This is a knowledge based unit all assessment tools used by centres must be approved by the EQA.

## Waste Water – Understanding Sludge Digestion (M/616/9105)

Level	3	CABWI Unit Ref	3415
Credit Value	2	Guided learning hours	7

### Unit purpose and aim

This unit is designed to allow the learner to develop a technical understanding of principles of Anaerobic Sludge Digestion and to improve decision making with regard to the operation and maintenance. The unit is also designed to develop an understanding of how to monitor and maintain processes whilst maintaining a safe working environment.

### Learning Outcome 1: Understand the principles of Anaerobic Sludge Digestion

#### Assessment criteria – the learner can:

- 1.1 explain the **principles** of Sewage Sludge Treatment through Anaerobic Digestion
- 1.2 describe the **factors** affecting Sludge Digestion
- 1.3 explain the **safety considerations** that must be taken into account when operating sludge digestion processes
- 1.4 explain how the **performance** of sludge digestion affects the downstream processes

### Learning Outcome 2: Understand the function and operation of the main systems and processes involved in Sludge Digestion

#### Assessment criteria – the learner can:

- 2.1 explain the function of the **systems and processes** involved in Sludge Digestion
- 2.2 explain the importance of retention time calculations
- 2.3 describe **non-routine operations**

### Learning Outcome 3: Understand how to investigate faults and take corrective action for sludge digestion

#### Assessment criteria – the learner can:

- 3.1 describe the **operational problems** that can occur in sludge digestion processes
- 3.2 explain how to identify **operational problems** in Sludge Digestion processes
- 3.3 explain how to identify the possible causes of **operational problems** in Sludge Digestion processes
- 3.4 explain the corrective actions that should be taken to resolve **operational problems**

## Learning Outcome 4: Understand the optimisation methods used in sludge digestion

### Assessment criteria – *the learner can:*

- 4.1 describe the benefits of optimisation in sludge digestion
- 4.2 describe the **sources** of optimisation information and advice
- 4.3 explain the techniques used to optimise sludge digestion processes

## Terms and Definitions

Some terms, used in the assessment criteria, cover a range of situations, as follows:

1. **Principles** in 1.1 above includes all of the following:
  - (a) Natural Anaerobic process
  - (b) Breakdown of Organic Matter
  - (c) Multi Stage Biology
    - i. Hydrolysis
    - ii. Acid formation
    - iii. Gas production
  - (d) Nature of Product
    - i. Odour
    - ii. Pathogen kill
    - iii. Agricultural use
  - (e) Nature of Digester Gas
  - (f) Energy production
  - (g) Other By-products
  - (h) Temperature
2. **Factors** in 1.2 above includes all of the following:
  - (a) Source and Nature of Feed Sludge
  - (b) Feeding Rate and sludge withdrawal
  - (c) Retention Time (Mean Residence Time)
  - (d) Mixing
  - (e) Heating
3. **Safety Considerations** in 1.3 above includes all of the following:
  - (a) Risk Assessment
  - (b) DSEAR (Dangerous Substances and Explosive Atmospheres Regulations)
  - (c) Safe Working Procedures
  - (d) Permits to work
  - (e) Training/Competence
  - (f) Zoning
  - (g) Personal gas monitors
  - (h) Gas handling systems
4. **Performance** in 1.4 above includes all of the following:
  - (a) **Quality**
  - (b) **Quantity**
  - (c) **Flow rate**



## Terms and Definitions

5. **Systems and processes** in 2.1 above includes all of the following:
  - (a) Heating Systems
  - (b) Mixing Systems
  - (c) Feeding systems
  - (d) Hazard Analysis and critical control points (HACCP)
  - (e) Gas System
    - i. Collection
    - ii. Storage
    - iii. Pressure relief
    - iv. Gas Compressors
    - v. Boosters
  - (f) CHP (Combined Heat and Power)
6. **Non-Routine operations** in 2.3 above includes all of the following:
  - (a) Commissioning
  - (b) Start-up
  - (c) Shut-down
7. **Operational problems** in 3.1,3.2, 3.3 and 3.4 above includes all of the following:
  - (a) Temperature
  - (b) Loading
  - (c) Gas issues
  - (d) process issues
  - (e) electrical failure
  - (f) mechanical failure
8. **Sources** in 4.2 above includes all of the following:
  - (a) On-line monitors
  - (b) Field tests
  - (c) SCADA
  - (d) Laboratory analysis
  - (e) Colleagues
  - (f) subject matter experts
  - (g) relevant external and internal standards
  - (h) cost/benefit analysis

## Assessment Requirements

This is a knowledge only unit - all assessment tools used by centres must be approved by the EQA.