GLOBAL WIND ORGANISATION

Control of Hazardous Energy (CoHE) Training Standard

V3

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CONTENTS

1. LIST OF ABBREVIATIONS

CoHE	Control of Hazardous Energy
GFCI	Ground Fault Circuit Interrupter
GWO	Global Wind Organisation
PE	Protective Earth
PPE	Personal Protective Equipment
RCD	Residual Current Device
WTG	Wind Turbine Generator

2. TERMS AND DEFINITIONS

Term	Definition
Approach boundaries	Limited Approach Boundary This is the closest distance that an Ordinary Electrical Person can approach exposed energised conductors without escort. An Ordinary Electrical Person may be escorted within the Limited Approach Boundary by a Qualified Electrical Person but may never enter the Restricted Approach Boundary. All persons in the Limited Approach Boundary must wear the minimum PPE for electrical work. All tools that enter the Limited Approach Boundary must be insulated for the equipment's voltage. Restricted Approach Boundary The Restricted Approach Boundary may only be entered by a Qualified Electrical Person. All parts of the Qualified Electrical Person that enter the Restricted Approach Boundary must be insulated from the equipment's voltage. An Energised Electrical Work Permit is required to enter the Restricted Approach Boundary, unless performing switching or taking measurements.
Approved work instruction	Work instruction approved by the company responsible for the work described, according to its internal processes. Normally done with its corresponding risk assessment that will include the control measures for all risks identified.
Deranged equipment	Equipment that is suspected to be damaged and must be treated with more caution than equipment in its normal condition.

Electrical work (definition and examples)	Any task performed on an electrical installation that requires specific electrical knowledge to be performed safely and correctly. Examples: install components, alter a circuit, take electrical measurements, replace a component, create an electrically safe work condition etc.
Establishing an electrically safe work condition (when and how to establish.)	When? Whenever someone is required to enter the Limited Approach Boundary to do tasks other than 'visual inspection' and whenever someone needs to enter the Restricted Approach Boundary for tasks other than "switching" or "measuring" How? 1) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags. 2) After properly interrupting the load current, open the disconnecting device(s) for each source. 3) Whenever possible, visually verify that all contact points of the disconnected devices are fully open, or that draw-out type circuit breakers are withdrawn to the disconnected position 4) To mitigate for activation spring failure in circuit breakers equipped with spring activation, the spring must be released prior to opening the breaker or prior to using the breaker as the isolation point. 5) Where the possibility of stored electrical energy exists, this must be isolated or insulated. Where this is not possible the energy must be dissipated by using an approved tool rated and designed for the purpose. 6) Verify absence of voltage to verify that the circuit parts are de-energised. 7) For low voltage circuits with the possibility of induced voltage, apply short-circuiting earth connections rated for the fault current. 8) Apply lockout/tagout devices in accordance with the local legislation and specific company procedure and rules. Depending on the configuration of the circuit it may be necessary to perform this step prior to steps five - seven.
Exposed electrical parts	Electrical components or parts capable of being inadvertently touched or approached nearer than a safe distance by a person that is by not being enclosed or insulated (e.g. IP0X, IP1X)
Hazardous energy	Any energy (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational force etc.) that could cause injuries to personnel.
Isolation point	An isolation device shall ensure a reliable disconnection or separation from an energy source.
Live known source	Energy source where you know the level of energy (e.g., as part of a circuit, socket, or a hydraulic check/test point)

Minimum arc flash PPE	Minimum: • safety glasses • non-melting clothing (including underwear) with long sleeves and long trousers (small parts of melting materials are acceptable but should be reduced to the minimum possible, ideally eliminated, for example elasticated waistbands) • Safety shoes with non-melting materials (acceptable exceptions are the sole and shoelaces)
Pressure fluids	Compressible (e.g., nitrogen) and non-compressible (e.g., hydraulics) fluids under pressure.
Pre-task or job briefing (toolbox talk)	Before starting each job, the employee in charge of the job must conduct a job briefing with the employees involved. The briefing must cover such subjects as: • hazards related to the job • work procedures involved • special precautions • energy source controls • personal protective equipment requirements
Safe handling of batteries and capacitors	a. always visually inspect the batteries and capacitors before starting work; look for signs of distress and leakage. b. take precautions to guard battery terminals against short circuiting by covering the terminals with insulating tape or insulating mats. c. ensure all batteries and capacitors are correctly and securely mounted. d. ensure the batteries and capacitors are wired with the correct polarity as per the wiring diagrams and that all terminals are tight. e. defective batteries and capacitors must be disposed of in accordance with local legislation. f. insulated tools approved for the rated voltage must be used when working around live, exposed conductors.
Test point	Point used to measure energy.
The qualification requirements for working on high voltage systems	Qualified Electrical Person with specific training in the job and experience in high voltage.

The requirements for tools to be used for testing for the absence of voltage	Have limited functionality and be with fixed test leads. Or; Be multi-meters with an audible alert function to warn the user in the event the meter function selector and test leads positions are not compatible. Test probes must be selected to match the physical requirements of the test point and be in accordance with local electrical regulatory requirements. Non-contact voltage detectors are for use only with non-contact voltage portals or for double checking that the lockout boundary is in electrically safe work condition. Non-contact voltage detectors are not allowed for 'test-before-touch' verification.
When to use insulated (voltage-rated), approved tools?	Mandatory when performing energised work (in extraordinary circumstances under an approved special permit) that requires using the tools inside the Limited Approach Boundary or Restricted Approach boundary.
Worked example	A worked example is a step-by-step demonstration of how to best perform a task or solve a problem. These include a starting point, a desired goal state, and a chosen solution to reach the goal state. They manage cognitive load by focusing on critical aspects of the solution steps and the solution. It is important to use a less is more approach and include only what participants need to understand the solution. Adding extra and 'nice to know' information or content makes it more difficult for participants to understand. For more information, please visit: https://3starlearningexperiences.wordpress.com/2018/11/13/why-and-how-to-use-worked-examples-in-the-workplace/

3. CHANGE LOG

Amendment date	Version	Approved by & date	Description of changes
4 December 2023	3	GWO TC 2023	

CoHE Standard

Section 4. CoHE roles and responsibilities

Sub-section 4.1 CoHE Basic Safety Module

- Text changed to: Examples of responsibilities: performing isolations and testing, creating a safe work condition for others to work under, lead job briefing, lead and supervise work parties.

CoHE Basic Safety Module

Lesson 5 – Electrical Safety

Element 5.1 – Why Electrical safety?

- Added new element, now 5.1.5: Explain the approach boundaries (please refer to Section 2 – Terms and Definitions) related to energised exposed electrical conductors and arc flash, highlight that a CoHE ordinary person cannot enter these boundaries unless under the direct supervision of a CoHE Qualified person.
- Added text to 5.1.6 (former 5.1.5): including the hazards of melting clothing and conductive jewellery
- Added text to 5.1.8 (former 5.1.7): including damaged or deranged equipment

Element 5.5 – Electrical Safety signs

- Added text to 5.5.2: including arc flash signs

4. COHE ROLES AND RESPONSIBILITIES

4.1 CoHE Basic Safety Module

Note *The following roles are for general reference and are not fully aligned with any standard or safe system of work.*

These definitions were made for the sake of creating this global training standard based on the common ground of different recognised standards.

Roles	**Responsibilities** (limitations to what can and cannot be)
Qualified Person	A person who has demonstrated skills and knowledge related to the construction and operation of equipment and installations specific to their work and has received safety training to identify the hazards and reduce the associated risk. Examples of responsibilities: performing isolations and testing, creating a safe work condition for others to work under, lead job briefing, lead and supervise work parties.
Ordinary Person / Unqualified Person	A person who is not a Qualified Person and does not have any responsibilities, given that this person generally needs control, instruction, and supervision to carry out assigned working activities. Additionally, a person who can be instructed to apply his personal lockout equipment in accordance with a company specific Lockout-Tagout program, procedures, and rules.
(Safe isolation) Authorised Person (role and responsibilities)	A person designated to be in charge of a particular lockout. Examples of responsibilities: • for Lockout-Tagout at the place of work. • to ensure everyone working under the lockout applied follows the particular rules. • for the use of group locks, personal locks and other Lockout-Tagout equipment. This role has been trained in establishing a safe work condition through the application of Lockout-Tagout practices including: • isolating the equipment or system. • attach all locking devices and tags.

4.2 Electrical Safety Module

Roles	**Responsibilities** (limitations to what can and cannot be)
Qualified Electrical Person	Perform electrical work. Needs to have been trained or instructed on the task and the equipment. Examples of responsibilities: • switch off, switch on, test absence of voltage, replace a component, establish an electrical lockout etc. • lead and supervise electrical tasks e.g.: - performing a pre-task briefing prior to work on electrical systems. - acting as a supervisor for Ordinary Persons working on, or in the vicinity of, electrical systems.

4.3 Pressure Fluid Safety Module

Roles	**Responsibilities** (limitations to what can and cannot be)
Qualified Pressure Fluids Person	Perform pressure fluids tasks. Needs to have been trained or instructed on the task and the equipment. Examples of the responsibilities of a Qualified Pressure Fluids Person are: • performing isolations and testing for the absence of pressure in accordance with existing documentation to be able to safely carry out specific tasks like component replacement. • creating a safe work condition that enable other workers to work safely on pressure fluid systems. • lead and supervise pressure fluids tasks e.g.: - performing a pre-task briefing prior to work on pressure fluid systems - acting as a supervisor for Ordinary Persons working on, or in the vicinity of, pressure fluid systems.

5. REFERENCE LIST

This reference list contains the references of relevant standards and norms that were used to create the GWO CoHE Training Standard:

- EN 50110 "Operation of Electrical Installations"
- NFPA 70E "Standard for Electrical Safety in the Workplace"
- WTSR "Wind Turbine Safety Rules"

Note *Please use the terms and definitions from the GWO CoHE Training Standard rather than terms and definitions used in the referenced standards and norms above. The terms and definitions in the GWO CoHE Training Standard were made for the sake of creating this global training standard based on the common ground of different recognised standards.*

Participants could end up working under any variety of safe system of work, so the language and terminology have been chosen to be as applicable as possible across the most common systems of work.

6. SCOPE

Global Wind Organisation is a non-profit body founded by the wind turbine manufacturers and owners. Our members strive for an injury free work environment in the wind turbine industry, setting common international standards for safety training and emergency procedures.

Hazardous energies pose a high risk of injury to all workers working within the wind industry. One of the reasons for this is that hazardous energies are found in various forms within the wind turbine environment and within the environment of a wind farm.

This CoHE training standard describes training that complements company, turbine, regional and equipment specific CoHE trainings by providing a common basis for CoHE trainings that are recommended by the members of GWO but does not automatically qualify the participants. These nominations can only be granted according to company specific trainings, rules, and procedures along with national and regional legislation.

Lastly, the members of GWO also strongly emphasise that company specific rules and procedures along with national and regional legislation shall always be looked up and followed when working in the wind industry. This is because CoHE rules, procedures and requirements can vary depending on: national and regional legislation; company approach and WTG model.

The standard comprises of three modules:

1. CoHE Basic Safety Module
2. CoHE Electrical Safety Module

3. CoHE Pressure Fluid Safety Module

Training is verified through GWO's WINDA database.

This standard has been developed in response to the demand for recognisable Control of Hazardous Energies (CoHE) training in the industry and has been prepared in co-operation between the members of GWO based on risk assessments, in-depth descriptions of job roles and tasks relevant to CoHE in the wind industry as well as factual incident and accident statistics from G+ and the wind industry.

General feedback on this document can be sent to info@globalwindsafety.org See globalwindsafety.org on how to raise a complaint about a training provider or report a safety incident occurring during training.

7. GENERAL REQUIREMENTS FOR THE GWO COHE MODULES

7.1 Overview

The GWO CoHE Training standard is divided into the following 3 modules:

Module 1: CoHE Basic Safety
Module 2: CoHE Electrical Safety
Module 3: CoHE Pressure Fluid Safety

7.2 Target Group

Target Group for the CoHE Basic Safety Module

This module is targeted at candidates working in the wind industry where they are exposed to the risk of injury related to hazardous energies.

Target Group for the CoHE Electrical Safety Module

This module is targeted at candidates whose scope of work will involve performing isolations and testing for the absence of voltage (in accordance with existing documentation) to be able to safely carry out specific tasks like component replacement, servicing and planned corrective maintenance on low voltage[1] electrical systems. Additionally, this person will also be responsible for establishing an electrically safe work condition, as e.g. a Qualified Electrical Person (NFPA 70E), Electrical Skilled Person (EN50110), Authorized Technician (WTSR), to enable others to work safely on low voltage electrical systems.

Note *The GWO CoHE Electrical Safety Module and Pressure Fluid Safety Module are aimed towards improving the candidates´ ability to "work safely" with electricity and fluids under pressure. This means that the two modules are not aimed at improving candidates´ technical knowledge, skills and abilities regarding electricity or pressure fluid systems. Candidates should already possess these technical knowledge, skills, and abilities before attending the modules. Similarly, it is not the intention of the GWO CoHE Standard (or these two modules) to promote the acquisition of advanced knowledge, such as troubleshooting.*

[1] Low voltage as defined and classified by the local legislation

Target Group for the CoHE Pressure Fluid Safety Module

This module is targeted at candidates whose scope of work will involve performing isolations and testing for the absence of pressure (in accordance with existing documentation) to be able to safely carry out specific tasks like component replacement, servicing and planned corrective maintenance on pressure fluid systems. Additionally, this person will also be responsible for establishing a safe work condition to enable others to work safely on pressure fluid systems.

Note *Candidates, who already possess the intended knowledge, skills, and abilities of the GWO CoHE Standard can apply for merit using the GWO merit process.*

7.3 Aims and Objectives

The GWO CoHE Standard will enable participants to manage the risks related to hazardous energies in the wind industry and act safely when in the vicinity of hazardous energies or when working on systems and equipment containing hazardous energies.

7.4 Duration of the GWO CoHE Standard Modules

The total contact time for completing the stand-alone modules in the CoHE standard is 21 hours and 45 minutes. This is based on the times given in the module timetables and summarised in table 7-4 below.

The training provider must not exceed the times per day given in table 7-4.1, below.

Modules	Duration
CoHE Basic Safety Module	4 hours
CoHE Electrical Safety Module	10 hours 45 minutes
CoHE Pressure Fluid Safety Module	7 hours

Table 7.4.1 – Duration of CoHE Modules

	Maximum Duration Per Day
Contact time	8 hours
Total training day	10 hours

Table 7.4.2 – Maximum durations for training days

Note *Contact time includes delivery of course lesson content, practical exercises and activities directly related to these.*

The total training day includes contact time, meals and breaks and travel between training sites (where applicable).

If a participant fails to meet the demands of a Control of Hazardous Energy training, they shall attend a new Control of Hazardous Energy training.

7.5 Validity Period

The CoHE training modules are valid for the period stated in the table below. Certificates and training records shall be renewed before the end of a given validity period. A certificate or training record can be renewed up to two months prior to expiry and maintain the original certification date by uploading the previous certificate's valid until date in WINDA.

If a certificate or training record is renewed outside of two months of expiry, it must carry the new date of certification.

The validity period is automatically calculated in WINDA by entering the course completion date.

Course/module	Certificate Validity (Months)
CoHE Basic Safety Module	24
CoHE Electrical Safety Module	24
CoHE Pressure Fluid Safety Module	24

Table 7.5.1 – GWO CoHE validity periods

7.6 Course Codes

Module	Course Code
CoHE Basic Safety	BaSC
CoHE Electrical Safety	ES
CoHE Pressure Fluid Safety	PFS

Table 7.6.1 – GWO CoHE Module course codes

7.7 Participant Prerequisites for the GWO CoHE Training Standard

Training and experience prerequisites

There are prerequisites to attend the Electrical Safety and Pressure Fluid Safety modules.

The participants must have completed the CoHE Basic Safety and the BTT Electrical module before attending the Electrical Safety Module. It is strongly recommended that before attending the Electrical Safety Module participants have some applicable working experience with electricity supervised by a Qualified Person. This means that the participants should have experience working in a team lead by a Qualified Person, who performed pre-task briefings, isolations, and testing, created a safe work condition for others to work under, lead and supervised work parties.

Similarly, the participants must have completed the CoHE Basic Safety Module and the BTT Hydraulic module before attending the Pressure Fluid Safety Module. It is strongly recommended that before attending the Pressure Fluid Safety Module participants have some applicable working experience with pressure fluids supervised by a Qualified Person. This means that the participants should have experience working in a team lead by a Qualified Person, who performed pre-task briefings, isolations, and testing, created a safe work condition for others to work under, lead and supervise work parties.

There are no training prerequisites for the CoHE Basic Safety module.

7.8 Physical Demands

All personnel participating must meet the participant prerequisites described in the GWO Requirements for Training.

7.9 Instructor Qualification Prerequisites

A competent GWO CoHE instructor must adhere to the instructor requirements for GWO Training.

8. GENERAL RESOURCES REQUIRED TO DELIVER COHE MODULES

The training provider shall ensure that staff, facilities, and equipment are in place to support the training of participants.

8.1 Instructor/Participant Ratio

The table below shows the maximum number of participants permitted (per instructor) in an instructor-led training for each of the three modules:

Modules	Instructor-Participant ratio
CoHE Basic Safety	1:12
CoHE Electrical Safety	1:8
CoHE Pressure Fluid Safety	1:8

Table 8.1.1 – GWO CoHE Instructor to participant ratio

8.2 Training Facilities

All training facilities shall fulfil all the requirements listed in Section 8- Equipment and Physical Resources in GWO's Requirements for Training.

8.3 Training Staff

The training staff shall fulfil all the requirements listed in Section – 7.9 Instructor Qualifications in GWO's Requirements for Training.

8.4 Equipment

The equipment required for the GWO CoHE Training Standard is shown in Annex 1.

9. USING THIS STANDARD TO DEVELOP TRAINING

The training in this standard is designed around the GWO taxonomy described in the GWO Requirements for Training. Theoretical and practical activities must be delivered according to the defined taxonomic level in order to reach the described learning objectives.

When teaching about equipment, a generic approach to shall be applied aiming to avoid additional potential product specific formal training after completion of this training. However, national or regional legislation, company gap analysis and location specific risk assessments may require additional product specific familiarisation which is the responsibility of the duty holder.

In addition to this, all training based on this standard including all related resources shall, as a minimum, meet the requirements described in the GWO Requirements for Training.

GLOBAL WIND ORGANISATION

CoHE Basic Safety Module

(BaSC)

10. MODULE 1 – COHE BASIC SAFETY MODULE

10.1 Aims and Objectives for the CoHE Basic Safety Module

The aim of this module is to enable participants, through theoretical and practical training, to act safely while working in the vicinity of hazardous energies in the wind industry and be able to perform assigned tasks safely.

After having successfully complete this CoHE Basic Safety module, the participants will have the ability to:

1) **Solve** the challenge of how to act safely while working in the vicinity of hazardous energies in the wind industry and will on their own initiative seek guidance when needed (Ability, basic level)

10.2 Duration of the CoHE Basic Safety Module

The total contact time for completing this module is 4 hours and 0 minutes. This is based on the times given in the module timetable.

The training provider must not exceed the times per day given in table 10-2 below.

	Maximum Duration Per Day
Contact time	8 hours
Total training day	10 hours

Table 10.2.1 – Maximum durations for training day

Note *Contact time includes delivery of course lesson content, practical exercises and activities directly related to these.*

The total training day includes contact time, meals and breaks and travel between training sites (where applicable).

10.3 CoHE Basic Safety Module Participant Ratio

The ratio shown for theory sessions indicates the maximum number of participants per instructor attending the course.

Practical ratios indicate the maximum number of participants to be supervised by an instructor during each activity.

Modules	Instructor-Participant ratio
CoHE Basic Safety Module	1:12

Table 10.3.1 – GWO CoHE Basic Safety Module instructor to participant ratio

10.4 CoHE Basic Safety Module Timetable

The delivery of this module must comply with the requirements described in the GWO Requirements for Training.

Lesson	Element		Duration
1. Introduction to the training	1.1	Safety instructions and emergency procedures	
	1.2	Facilities	
	1.3	Introduction	
	1.4	Aim and objectives	
	1.5	Ongoing assessments	
	1.6	Motivation	
		TOTAL	15 min.
2. Control of hazardous energies basic safety	2.1	CoHE in the wind industry	
	2.2	CoHE roles in the wind industry	
	2.3	Basic PPE	
	2.4	Protections	
	2.5	Emergency stop buttons in a WTG	
		TOTAL	30 min.
3. Lockout-Tagout for an Ordinary Person	3.1	Lockout-Tagout in the wind industry	
	3.2	Lockout-Tagout roles in the wind industry	
	3.3	Lockout-Tagout process	
		TOTAL	45 min.
4. Mechanical Safety	4.1	Why mechanical safety?	
	4.2	Mechanical safety signs	
	4.3	The importance of appropriate isolation	
		TOTAL	30 min.
5. Electrical safety	5.1	Why electrical safety?	
	5.2	Low/high voltage	
	5.3	PE and GFCI/RCD	
	5.4	Static electricity	

		5.5	Electrical safety signs	
		5.6	The importance of appropriate isolation	
		5.7	Response to an electrical incident	
			TOTAL	60 min.
6.	Pressure Fluid Safety	6.1	Pressure fluid safety	
		6.2	Hydraulic oil injections	
		6.3	Safety signs	
		6.4	The importance of appropriate isolation	
			TOTAL	30 min.
7.	Hazardous energy scenario	7.1	Hazardous energy scenario	
			TOTAL	20 min.
8.	Training review	8.1	Training review	
		8.2	Feedback session	
			TOTAL	10 min.
			GRAND TOTAL	240 min.

10.5 Detailed Description of the CoHE Basic Safety Module

Note *The administrative part of the course registration should be carried out before the module commences.*

LESSON 1 - INTRODUCTION TO THE TRAINING

15 min.

The aim of this lesson is for the participants to be motivated and to engage in the GWO CoHE Basic Safety Module safely at a training facility, while recognising what is expected of them during the training.

After having successfully completed this lesson, the participants can:

1) **Recognise** the course content and the facilities involved to ensure a clear understanding of what is expected of them during the course (Knowledge, basic level)

2) **Name** and point out local emergency procedures and facilities (Knowledge, basic level)

3) **Describe** the relevant human factors, and implications of these (Knowledge, basic level)

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

Learning objective:

4) The participants **show interest** or curiosity in the safety and emergency procedures (Ability, basic level)

The instructor shall:

1.1.1 Explain and ask involving question concerning:

1.1.2 Safety instruction according to internal procedures

1.1.3 Emergency procedures and emergency exit in the areas where the participants can be expected to be located during the module

The participants shall:

1.1.4 Engage in answering the above questions

ELEMENT 1.2 - FACILITIES

Learning objective:

5) The participants can **recognise** the facilities at the training location (Knowledge, basic level)

The instructor shall:

1.2.1 Present or handout a general description of the facilities at the training location (administration, dining area, restrooms, toilets, etc)

1.2.2 Alternative activity: tour of the facilitates

The participants shall:

1.2.3 Note relevant facilitates and ask questions when in doubt about facilities

ELEMENT 1.3 - INTRODUCTION

Learning objective:

6) The participants **show interest** in fellow participants and the programme of the CoHE Basic Safety Module (Ability, basic level)

The instructor shall:

1.3.1 Explain and ask involving question about the programme of the CoHE Basic Safety Module, including breaks and mealtimes.

1.3.2 Give a short introduction to themselves, including their background as instructors.

1.3.3 Ask for participants' expectations of the training and their learning outcome.

The participants shall:

1.3.4 Give a short introduction to themselves, including their job function, and share their expectations of the training and learning outcome expectation for training.

ELEMENT 1.4 - AIM AND OBJECTIVES

Learning objective:

7) The participants can **recognise** the scope and main objectives of the CoHE Basic Safety Module (Knowledge, basic level)

The instructor shall:

1.4.1 Present the scope and main objectives of the CoHE Basic Safety Module through a challenge, a story, a scenario or "your goal with this module, should you choose to accept is…"-message

Note *A suggested learning activity could be to share stories, present scenarios or personal experiences that show the importance of being able to act safely when working in the vicinity of hazardous energies in the wind industry (shows what is in it for the participants)*

Note *Where possible avoid using "learning objectives – PowerPoint slide(s)". Instead use stories, examples or personal experiences that shows the importance of being able to act safely when*

working in the vicinity of hazardous energies in the wind industry and the importance of the CoHE Basic Safety Module.

Note *Please visit https://toolbox.energyinst.org/ for scenarios, incident lessons and safety information shared by global energy companies.*

1.4.2 Ask the participants involving questions about their individual experiences relevant to the CoHE Basic Safety Module.

The participants shall:

1.4.3 Engage in answering the questions and share experiences relevant to the CoHE Basic Safety Module.

ELEMENT 1.5 - ONGOING ASSESSMENTS

Learning objective:

8) The participants can **recognise** the assessment procedure and the aim of the ongoing assessment (Knowledge, basic level)

The instructor shall:

1.5.1 Explain the reasons for the ongoing assessment.

1.5.2 Explain the GWO participant performance assessment form and how it will be used.

1.5.3 Ask for the participants' thoughts on the assessment procedure presented.

The participants shall:

1.5.4 Engage in discussions on the assessment procedure and ask questions when in doubt in relation to the assessment procedure.

ELEMENT 1.6 - MOTIVATION

Learning objective:

9) The participants **show interest** and willingness to engage in the learning activities (Ability, basic level)

The instructor shall:

1.6.1 Explain and ask the participants involving questions about:

a. the importance of personal involvement in the module

b. the need for the CoHE Basic Safety Module when working in the wind industry

The participants shall:

1.6.2 Engage in answering questions about the importance of personal involvement in the course and the need for the CoHE Basic Safety Module when working in the wind industry.

1.6.3 Ask clarifying questions about any doubts or concerns about the course.

LESSON 2 - CONTROL OF HAZARDOUS ENERGIES BASIC SAFETY

30 min.

The aim of this lesson is to enable the participants to act safely when in the vicinity of hazardous energies in a WTG environment and enable participants to avoid these in different hazardous situations in a WTG environment. This lesson will also enable participants to determine when to seek help or guidance from a Qualified Person to avoid the dangers of hazardous energies.

After having successfully completed this lesson, the participants:

10) **Show interest** in the applicable requirements, roles, and responsibilities of CoHE in the wind industry and will on their own initiative search for help or seek guidance regarding CoHE legislation, rules, and procedures (Ability, basic level)

11) Can **solve** the challenge of how to act safely in relation to hazardous energies in a WTG environment (Ability, basic level)

12) Can on their own initiative **solve** the challenge of knowing when to seek help or guidance from a Qualified Person in relation to hazardous energies in a WTG environment (Ability, basic level)

ELEMENT 2.1 - COHE IN THE WIND INDUSTRY

Learning objectives:

13) The participants can **recognise** hazardous energies in a WTG environment (knowledge, basic level)

14) The participants can **describe** how hazardous energies and CoHE relate to their work (Knowledge, basic level)

15) The participants can **recognise** the requirement of CoHE in the wind industry (Knowledge, basic level)

16) The participants can **describe** examples of benefits and potential consequences of adhering and not adhering to applicable CoHE standards and company specific rules and procedures (Knowledge, basic level)

17) The participants **show interest** in adhering to applicable legislations, company specific rules and procedures and will on their initiative search for help or seek guidance regarding CoHE legislation, rules, and procedures (Ability, basic level)

The instructor shall:

2.1.1 Define what is a hazardous energy

2.1.2 Present that the focus of the GWO CoHE Standard is on the hazardous energies: mechanics, pressure fluids and electricity

2.1.3 Show examples of hazardous situations with mechanics, pressure fluids and electricity in a WTG environment and how to identify the hazardous energies in the examples given

2.1.4 Facilitate a learning activity such as asking the participants questions based on the examples about the hazardous energies in a WTG environment and how to identify the three hazardous energies

2.1.5 Provide to the participants additional, simple examples (e.g., situations, scenarios, pictures, videos etc.) of the hazardous energies in a WTG environment

2.1.6 Facilitate guided practice for the participants in identifying the hazardous energies (in the additional examples) from a WTG environment and give constructive feedback to the participants´ practice

2.1.7 Ask involving questions about how hazardous energies relates to the participants' work

2.1.8 Facilitate a learning activity for the participants, such as a realistic challenge, scenario-based questions, scenarios or sharing a story that show examples of:

a. how CoHE legislation, rules and procedures in the wind industry relates specifically to the participants´ work

b. when, where and why to search for help or seek guidance about CoHE legislation, rules and procedures (e.g. with a Qualified Person, site lead, company representative or in the standards and company specific rules and procedures)

c. the benefits of adhering to applicable CoHE country and regional applicable standards (e.g. Wind Turbine Safety Rules, EN50110 and NFPA-70e) and company specific rules and procedures

d. the potential consequences of not adhering to applicable country and regional applicable standards and company specific rules and procedures

2.1.9 Give constructive feedback to the participants throughout the activities

The participants shall:

2.1.10 Engage in the activity and share their understandings about hazardous energies in a WTG environment and how to identify the hazardous energies

2.1.11 Engage in the activity and practise identifying the hazardous energies in the examples of hazardous energies in a WTG environment

2.1.12 Engage in answering the questions and share their understandings about how hazardous energies relates to their work

2.1.13 Engage in the learning activities and share their relevant understandings and experiences about examples of:

a. how CoHE legislation, rules and procedures in the wind industry relates specifically to the participants´ work

b. when, where, and why to search for help or seek guidance about CoHE legislation, rules, and procedures

c. the benefits of adhering to applicable CoHE country and regional applicable standards (e.g. Wind Turbine Safety Rules, EN50110 and NFPA-70e) and company specific rules and procedures

d. the potential consequences of not adhering to applicable country and regional applicable standards and company specific rules and procedures

2.1.14 Think about received feedback and use the feedback to improve their performance

ELEMENT 2.2 - COHE ROLES IN THE WIND INDUSTRY

Learning objectives:

18) The participants can **recognise** CoHE roles and responsibilities (boundaries & limitations) (Knowledge, basic level)

19) The participants can **describe** examples of what they, as a CoHE Ordinary Person, can and cannot do in a given situation (Knowledge, basic level)

20) The participants can **recognise** the requirement to have BTT trainings (Mechanical, Electrical & Hydraulic) to perform specific tasks related to mechanics, electricity & hydraulics under supervision (Knowledge, basic level)

21) The participants can **recognise** the importance of different situations where an Ordinary Person needs to seek support from a Qualified Person (Knowledge, basic level)

22) The participants can on their own initiative **solve** the challenge of knowing when it is needed to seek a Qualified Person for help or guidance (Ability, basic level)

The instructor shall:

2.2.1 Briefly present the different types of CoHE roles in the wind industry to give an overview of:

a. training requirements

b. experience requirements

c. responsibilities (limitations to what they can and cannot do)

2.2.2 Briefly emphasise the requirement to have BTT trainings (Mechanical, Electrical & Hydraulic) to perform specific tasks related to mechanics, electricity & hydraulics (i.e. replacing a component, taking an electrical measurement, releasing hydraulic pressure etc.) under the supervision of an experienced technician

2.2.3 Briefly highlight that this module is part of the foundation that will be complemented by the specific technical and safety training for each company necessary to enable participants to be able to perform these tasks without supervision

Note *This module will NOT make the participant a trained person who is allowed to perform any work on systems and equipment containing hazardous energies or in the vicinity of hazardous energies without supervision*

2.2.4 Show examples of what the participants can, and cannot, do because of their CoHE Ordinary Person role (allowed work, role boundaries and limitations of an Ordinary Person role)

2.2.5 Facilitate a learning activity such as asking the participants questions about the examples e.g.:

a. what you can, and cannot, do and why: as a CoHE Ordinary Person in this situation?

b. how does this compare to what a CoHE Qualified Person can do in the situation?

c. what are the reasons for these different role boundaries?

2.2.6 Present six relevant examples of different situations or scenarios with hazardous energies in a WTG environment

2.2.7 Facilitate practice for the participants in the six examples of different situations or scenarios where the participants shall decide and share their reasoning behind whether they (as an Ordinary Person) need to seek support from a qualified person (or not)?

Note *Three examples where the Ordinary Person needs to seek support from a Qualified Person, and three examples where the Ordinary Person does not need to seek support from a Qualified Person. The examples should be of varying complexity and with fading support and guidance from the instructor*

2.2.8 Give constructive feedback to the participants' answers in the exercise. Explain the reasons why the answers were correct, or incorrect, and show the real-word consequences of a correct, or incorrect, answer to each situation

Note *Please emphasise that the participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answers to whether support is needed could change depending on regional/company/WTG model rules*

The participants shall:

2.2.9 Engage in answering the activity and share understandings about what they, as an Ordinary Person can, and cannot, do

2.2.10 Engage in the practice (previous point 2.2.7) and sharing their reasoning behind whether they need to seek the support from a Qualified Person (or not) in the six examples of different situations or scenarios

Note *It is key that the participants share why (or why not) they need to seek support from a Qualified Person i.e., sharing their reasons for seeking the support from a Qualified Person (or not)*

ELEMENT 2.3 - BASIC PPE

Learning objectives:

23) The participants can **describe** the basic PPE for working in wind turbines (Knowledge, basic level)

24) The participants can **recognise** the importance of basic PPE (Knowledge, basic level)

25) The participants **show interest** in seeking out the required basic PPE, if this has not provided to them, before initiating work (Ability, basic level)

The instructor shall:

2.3.1 Present and show examples of the basic PPE required for accessing and being in wind turbines (gloves, safety goggles, safety shoes or boots and working clothing)

2.3.2 Ask the participants involving questions about the need for the basic PPE for working in wind turbines (e.g. through scenario or situation-based questions)

2.3.3 Lead a brainstorm with the participants about what hazards and their associated risks in their work environment can be reduced by wearing the required basic PPE

2.3.4 Share key examples of what hazards and their associated risks in their work environment can be reduced by wearing the required basic PPE (to enable the participants' comparison of their own answers)

2.3.5 Facilitate a learning activity such as; a scenario, an exercise, asking involving questions or facilitate discussions with the participants that challenges the participants to try and share attitudes about:

a. what to do when the required basic PPE is not provided, and they are asked to begin working?

b. why the participants must always seek the required basic PPE, before initiating work?

2.3.6 Give constructive feedback to the participants performance throughout the activities of this element

The participants shall:

2.3.7 Engage in answering the questions and share understandings about the basic PPE for working in wind turbines

2.3.8 Engage in the brainstorm on what hazards and their associated risks in the participants´ work environment can be reduced by wearing the required basic PPE

2.3.9 Engage in the activity and share understandings and attitudes about what to do if the required basic PPE is not provided including why they must seek the required basic PPE before initiating work

ELEMENT 2.4 - PROTECTIONS

Learning objectives:

26) The participants can **recognise** missing protections for equipment containing hazardous energies in a WTG environment (Knowledge, basic level)

27) The participants can **solve** the challenge of how to identify and avoid the safety hazards and potential consequences of missing protections for equipment containing hazardous energies (Ability, basic level)

The instructor shall:

2.4.1 Show examples of missing protections (cabinets being open, missing cover for rotating and moving parts)

2.4.2 Lead a brainstorm with the participants about the safety hazards of missing protections for equipment containing hazardous energies

2.4.3 Present key examples of what safety hazards and their associated risks in the wind industry are reduced by protections (to enable the participants' comparison of their own answers)

2.4.4 Facilitate a learning activity where the participants have to practise:

a. identifying examples of missing protections and the related safety hazards in situation(s) from a WTG environment

b. answering key questions about how to act in situation(s) with these missing protections

The participants shall:

2.4.5 Engage in the brainstorm about the safety hazards of missing protections for equipment containing hazardous energies

2.4.6 Engage in the activity and practise identifying examples of missing protections and the related safety hazards

2.4.7 Engage in answering the questions and share understandings about how to act in situations where protections are missing

ELEMENT 2.5 - EMERGENCY STOP BUTTONS IN A WTG

Learning objectives:

28) The participants can **describe** the purpose and importance of emergency stop buttons in the wind turbine (Knowledge, basic level)

29) The participants can **describe** examples of where an emergency stop button is located in a WTG (Knowledge, basic level)

30) The participants can **describe** examples of how systems in a WTG will react when an emergency stop button is pressed (Knowledge, basic level)

The instructor shall:

2.5.1 Facilitate a learning activity for the participants such asking them questions or lead discussions on the purpose and importance of emergency stop buttons in the wind turbine

2.5.2 Show typical examples of:

a. Where an emergency button is located in a WTG,

b. How systems in a WTG will react when an emergency stop button is pressed

2.5.3 Facilitate a learning activity for the participants such asking them questions about the typical examples (previous point)

The participants shall:

2.5.4 Engage in the activities and share understandings about:

a. the purpose and importance of emergency stop buttons in the wind turbine

b. the typical emergency stop buttons examples

LESSON 3 - LOCKOUT-TAGOUT FOR AN ORDINARY PERSON

45 min.

The aim of this lesson is to enable the participants to act safely in relation to Lockout-Tagout in a WTG environment. Additionally, this lesson will also enable the participants to determine when to seek help or guidance from an (Safe Isolation) Authorised Person.

After having successfully completed this lesson, participants:

31) **Show interest** in the applicable requirements, roles, and responsibilities of Lockout-Tagout in the wind industry (Ability, basic level)

32) Can **solve** the challenge of how to carry out the simplified, generic Lockout-Tagout process (Ability, basic level)

33) Can **solve** the challenge of how to act safely in relation to Lockout-Tagout in a WTG environment and will on their own initiative seek help or guidance by an (Safe isolation) Authorised Person when needed (Ability, basic level)

ELEMENT 3.1 - LOCKOUT-TAGOUT IN THE WIND INDUSTRY

Learning objectives:

34) The participants can **describe** the meaning and purpose of Lockout-Tagout and how Lockout-Tagout relate to their own work (Knowledge, basic level)

35) The participants can **recognise** that there is different legislation, standards and company specific rules that apply for Lockout-Tagout and need to be followed (Knowledge, basic level)

36) The participants can **recognise** the importance of following the instructions when instructed to apply Lockout-Tagout (Knowledge, basic level)

37) The participants can **describe** the prohibition of manipulating or trying to operate a device, tool or equipment locked out by someone else (Knowledge, basic level)

38) The participants **show interest** in Lockout-Tagout and how it relates to the topic of CoHE in the wind industry and their own work (Ability, basic level)

The instructor shall:

3.1.1 Facilitate a learning activity such as asking the participants scenario-based questions about:

a. the meaning and purpose of Lockout-Tagout

b. how Lockout-Tagout relates to the participants' own work?

3.1.2 If needed, elaborate on the meaning and purpose of Lockout-Tagout in the wind industry based on the participants´ answers

3.1.3 Emphasise there are different legislation, standards and company specific rules that apply for Lockout-Tagout and need to be followed (covered in company specific trainings)

3.1.4 Present examples of situations from a WTG environment and guide the participants to identify what is prevented from happening by following the instructions (when instructed to apply Lockout-Tagout) In addition, present what could happen if these instructions are not followed in the examples

3.1.5 Facilitate a learning activity such as asking the participants questions about the prohibition of manipulating or trying to operate a device, tool or equipment locked out by someone else

3.1.6 Ask the participants involving questions or facilitate discussions about how Lockout-Tagout relate to the CoHE requirement in the wind industry

3.1.7 Give constructive feedback to the participants´ performance throughout the activities of this element

The participants shall:

3.1.8 Engage in the learning activity and share understandings about the meaning and purpose of Lockout-Tagout and how Lockout-Tagout relate to the CoHE requirement in the wind industry and their work

3.1.9 Engage in the practice of identifying what is prevented from happening by following the instructions (when instructed to apply Lockout-Tagout) and what could happen if these instructions are not followed in the examples

3.1.10 Engage in the learning activity and share understandings about the prohibition of manipulating or trying to operate a device, tool or equipment locked out by someone else

3.1.11 Engage in answering the questions and share understandings about how Lockout-Tagout relate to the CoHE requirement in the wind industry

ELEMENT 3.2 - LOCKOUT-TAGOUT ROLES IN THE WIND INDUSTRY

Learning objectives:

39) The participants can **recognise** the roles and responsibilities of an Ordinary Person and an (Safe Isolation) Authorised Person in regard to Lockout-Tagout (Overview, boundaries & limitations) (Knowledge, basic level)

40) The participants can **describe** examples of what they as an Ordinary Person can, and cannot, do in a given situation in regard to Lockout-Tagout (Knowledge, basic level)

41) The participants can on their own initiative **solve** the challenge of knowing when to seek out a (Safe Isolation) Authorised Person for help or guidance (Ability, basic level)

The instructor shall:

3.2.1 Present briefly the roles and responsibilities of an Ordinary Person and an (Safe Isolation) Authorised Person in regard to Lockout-Tagout:

a. training requirements

b. responsibilities (limitations to what they can, and cannot, do)

3.2.2 Show examples of what the participants can and cannot do because of their Ordinary Person role in regard to Lockout-Tagout (role boundaries and limitations of an Ordinary Person role)

3.2.3 Facilitate a learning activity such as, asking the participants questions about the examples e.g.

a. why and what you can (and can you not) do as an Ordinary Person in this situation?

b. how does this compare to what a (Safe Isolation) Authorised Person can do in the situation?

c. what are the reasons for these different role boundaries?

3.2.4 Show examples of different situations where an Ordinary Person needs to seek support from a (Safe Isolation) Authorised Person and explain the reasons why the Ordinary Person seeking the support from a (Safe Isolation) Authorised Person in the situations

3.2.5 Facilitate practice for the participants in a minimum of three examples of different situations where the participants shall decide, and share their reasoning behind, if they need to seek the support from a (Safe Isolation) Authorised Person, or not?

Examples of these situations are:

a. Situation 1: You are about to use an electrical power tool with no hazardous energies involved beside from the energy that the tool uses. Please describe in detail why (or why not) you need to seek the support from a (Safe Isolation) Authorised Person

Note *The answer to the question is no*

b. Situation 2: You are about to drill a hole inside of an electrical cabinet. Please describe in detail why (or why not) you need to seek the support from a (Safe Isolation) Authorised Person

Note *The answer to the question is yes*

c. Situation 3: You are working under a Lockout-Tagout on a hydraulic system and you are then required to work on the electrical side, which is currently outside of the work scope. Please describe in detail why (or why not) you need to seek the support from a (Safe Isolation) Authorised Person

Note *The answer to the question is yes*

3.2.6 Give constructive feedback and the results of the participants' answers and explain the reasons why the answers were correct or incorrect. In addition, show the real consequences of a correct (or

incorrect) answer to each situation to provide the participants with a sense of the real world consequences.

Note *Please emphasise that the participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answer to whether support is needed could change in some situations depending on regional/company/WTG module rules*

The participants shall:

3.2.7 Engage in answering the activity and share their understandings about their own Lockout-Tagout role and Lockout-Tagout roles and responsibilities in general

3.2.8 Engage in above practice and share their reasoning to if they need to seek the support from a (Safe Isolation) Authorised Person, or not, in the minimum of three examples of different situations

Note *It is key that the participants share their reasoning for seeking the support (or not) from an Authorised Person*

ELEMENT 3.3 - LOCKOUT-TAGOUT PROCESS

Learning objectives:

42) The participants can **explain** how to perform the simplified, generic Lockout-Tagout process independently of the type of energy involved (Knowledge, intermediate level)

43) The participants **show interest** in and willingness to ensure that Lockout-Tagout are always applied to hazardous energy isolations (Ability, basic level)

44) The participants can **solve** how to sign safety documentation of the lockout-tagout process such as a permit to work as an Ordinary Person (instead of being in charge of the documentation) (Ability, basic level)

The instructor shall:

3.3.1 Emphasise that this is an introduction to the Lockout-Tagout process, and each company has their own Lockout-Tagout procedure and related Lockout-Tagout training for their (Safe Isolation) Authorised Person

Note *This means that the participants will not be allowed to perform any Lockout-Tagout based on the CoHE Basic Safety Module qualification i.e. will need additional company specific trainings, experience, qualifications etc. to be able to perform Lockout-Tagout*

3.3.2 Explain and demonstrate examples of the simplified, generic Lockout-Tagout process being applied in a WTG environment independently of the type of energy involved i.e. the focus is on the Lockout-Tagout process, not the type of energy:

a. determine all supplies into the boundary

b. isolate from the system

c. dissipate any stored energy

d. apply Lockout-Tagout

e. test for absence of energy

Note *As part of this simplified, generic Lockout-Tagout process, the instructor must fill out documentation that the participants must sign as a receiver. This documentation could be a permit to work or similar documents that outline the lockout-tagout process*

3.3.3 Facilitate in involving learning activity such as questions about the examples of the simplified, generic Lockout-Tagout process demonstrated e.g.:

a. how are the actions of the Lockout-Tagout process demonstrated? Can participants restate or summarise each action in their own words?

b. why are these actions performed in the Lockout-Tagout process necessary to establish a Lockout-Tagout?

c. how does this Lockout-Tagout process relate to what the participants have already seen regarding Lockout-Tagout in the wind industry?

3.3.4 Present examples of common situations in a WTG environment where Lockout-Tagout is performed with the three different energies (mechanics, pressure fluids and electricity)

a. electricity: locking a circuit breaker or locking a plug on equipment

b. pressure fluids: closing and locking a valve

c. mechanical: use of locking pins

3.3.5 Facilitate in a learning activity such as having the participants analyse the above examples e.g.:

a. what are the similarities between the examples?

b. what are the differences between the examples?

3.3.6 Present situation(s) or scenarios from a WTG environment, where the participants can practice identifying where the generic, simplified Lockout-Tagout must be applied. As part of this practice, the participants must be prompted to explain in their own words how the generic, simplified Lockout-Tagout is to be applied

3.3.7 Lead a brainstorm with the participants about what safety hazards and the associated risks in the hazards found in work environment can be reduced, if Lockout-Tagout is always applied to hazardous energy isolations

3.3.8 Present key examples of what safety hazards and the associated risks in the hazards found in work environment can be reduced, if Lockout-Tagout is always applied to hazardous energy isolations (to enable the participants' comparison of their own answers)

Examples of hazards are:

a. entrapment between rotating and moving parts

b. electrical shock

c. indirect or direct contact with live parts

d. exposure to pressure fluids

e. stored energy

The participants shall:

3.3.9 Engage in analysis of, and share understandings about, the Lockout-Tagout process demonstrated e.g.:

a. what are the actions of the Lockout-Tagout process shown? Can you restate or summarise each action in your own words?

b. why are these actions in the Lockout-Tagout process necessary to establish a Lockout-Tagout?

c. how does this Lockout-Tagout process relate to what the participants have already seen regarding Lockout-Tagout in the wind industry?

3.3.10 Engage in answering questions and sharing understandings about the examples of common situations where Lockout-Tagout is performed with the three different energies

3.3.11 Engage in identifying where the generic, simplified Lockout-Tagout has to be applied. In addition, explain in their own words how the generic, simplified Lockout-Tagout must be applied in simple situation(s)

3.3.12 Engage in the brainstorm about what safety hazards and the associated risks in the hazards in their work environment can be reduced if Lockout-Tagout is always applied to hazardous energy isolations

LESSON 4 - MECHANICAL SAFETY

30 min.

The aim of this lesson is to enable the participants to avoid mechanical dangers by acting safely in relation to mechanical hazards in a wind turbine.

After having successfully completed this lesson, participants can:

45) **Solve** the challenge of how to act safely when encountering mechanical safety hazards in a WTG environment (Ability, basic level)

ELEMENT 4.1 - WHY MECHANICAL SAFETY?

Learning objectives:

46) The participants can **recognise** examples of mechanical systems and their relevance to CoHE (Knowledge, basic level)

47) The participants can **recognise** the safety hazards of mechanical systems, entanglement with a mechanical system and moving and rotating parts in a turbine (Knowledge, basic level)

48) The participants can **solve** the challenge of how to identify and avoid the safety hazards related to mechanical systems in WTGs mechanical systems (Ability, basic level)

49) The participants can **solve** the challenge of how to identify and avoid the safety hazards of entanglement with a mechanical system (Ability, basic level)

50) The participants can **solve** the challenge of how to identify and avoid the safety hazards of moving and rotating parts on a turbine that can pose a risk (Ability, basic level)

51) The participants can **describe** the importance of working according to approved working practices (Knowledge, basic safety)

52) The participants **show interest in** adhering to safe working practices regarding mechanics and act safely when working with or in the vicinity of mechanical systems or moving and rotating parts (Ability, basic level)

The instructor shall:

4.1.1 Show examples of mechanical systems in a WTG

4.1.2 Facilitate a learning activity such as asking the participants about the mechanical systems shown and how these mechanical systems are relevant to CoHE and their work

4.1.3 Remind the participants about the requirement to have the GWO BTT training(s) to perform specific tasks related to mechanics, electricity, and hydraulics under the supervision of an experienced technician

4.1.4 Show examples of safety hazards related to mechanical systems in WTGs and how to identify and avoid these hazards (e.g. bruises, squeezing, rotation, fluids under pressure, trapping, slipping, pinching)

4.1.5 Provide examples of situations with safety hazards related to the mechanical systems of WTGs to the participants

4.1.6 Facilitate guided practice for the participants in identifying the safety hazards of mechanical system in WTGs and ask the participants involving questions about how to avoid these hazards in the examples of situations (previous point)

4.1.7 Show the safety hazards of entanglement with a mechanical system and how to identify and avoid these hazards (e.g. long hair, loose clothing or jewellery becoming entangled)

4.1.8 Present examples of moving and rotating parts in a turbine that can pose a hazard

4.1.9 Provide additional examples to the participants of situations from a WTG environment of safety hazards in regard to entanglement with a mechanical system and moving and rotating parts

4.1.10 Facilitate guided practice for the participants in identifying the safety hazards and ask them involving questions about how to avoid these hazards in the additional examples given

4.1.11 Facilitate a learning activity such as; sharing a story, asking the participants involving questions or leading discussions with the participants about:

a. the importance of working according to approved working practices regarding mechanical hazards and risks

b. the importance of acting safely when working with or in the vicinity of mechanical systems or moving and rotating parts

4.1.12 Facilitate practice (with less guidance) for the participants in identifying all mechanical safety hazards that have been covered in the lesson and deciding which actions to take to avoid these hazards (through e.g. a text-based or branching scenario, pictures or video of a hazardous situation)

4.1.13 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

4.1.14 Engage in answering the questions and share understandings about the mechanical systems and their relevance to CoHE and their work

4.1.15 Engage in identifying the safety hazards and share their understandings about how to avoid the safety hazards in WTGs mechanical systems

4.1.16 Engage in identifying the safety hazards and share their understandings about how to avoid the safety hazards of entanglement with a mechanical system and moving and rotating parts

4.1.17 Engage in answering the learning activity and share their thoughts and attitude about the importance of working according to approved working practices regarding mechanical hazards and risks

4.1.18 Practise identifying all the covered mechanical safety hazards in a WTG environment and deciding which actions to take to avoid these hazards

ELEMENT 4.2 - MECHANICAL SAFETY SIGNS

Learning objectives:

53) The participants can **describe** different signs of mechanical danger (Knowledge, basic level)

54) The participants can **recognise** safety signs on different locations in the WTG (Knowledge, basic level)

55) The participants can **recognise** the importance of complying with mechanical safety signs in a WTG (Knowledge, basic level)

The instructor shall:

4.2.1 Present examples of different signs for mechanical danger (i.e. rotating parts, pinch point, helmet mandatory)

4.2.2 Show examples of safety signs on different locations in a WTG (i.e. rotating parts, pinch point, helmet mandatory)

4.2.3 Facilitate a short learning activity (e.g. a quiz, questionnaire, or exercise) where the participants can practise identifying different mechanical safety signs in a WTG, describing their meanings, and deciding potential actions to take to comply with the safety signs

4.2.4 Give constructive feedback to the participants above practice with an emphasis on the potential consequences that could happen if mechanical safety signs are not correctly identified or complied with in a WTG

The participants shall:

4.2.5 Engage in the activity and practise identifying different mechanical safety signs in a WTG and describing their meanings

ELEMENT 4.3 - THE IMPORTANCE OF APPROPRIATE ISOLATION

Learning objectives:

56) The participants can **describe** the importance of using appropriate isolation when working with mechanical systems (Knowledge, basic level)

57) The participants **show interest** in and willingness to always work with mechanical systems with the appropriate isolation (Ability, basic level)

The instructor shall:

4.3.1 Show the importance of using appropriate isolation when working with mechanical systems (e.g., using stories or asking the participants to analyse how and why appropriate isolations could have prevented an accident in a scenario from happening)

4.3.2 Refer to safety signs discussed in the previous element and explain what actions to take to control the risk identified by those signs and why these actions are required (rotating part and pinch point) to:

a. stop the movement

b. lock the equipment, so it cannot start movement again

c. apply isolations

4.3.3 Facilitate discussions or ask the participants involving questions about the importance of appropriate isolation and to never work with mechanical system without appropriate isolation

4.3.4 Give constructive feedback to the participants discussions or answers and reinforce the importance of isolation to ensure the hazard is under control

The participants shall:

4.3.5 Engage in the discussions or answering the questions and share their attitudes and understandings about the importance of appropriate isolation and to never work with mechanical systems without appropriate isolation

LESSON 5 - ELECTRICAL SAFETY

60 min

The aim of this lesson is to enable the participants to avoid the dangers of electricity by acting safely in relation to electrical hazards in a wind turbine.

After having successfully completed this lesson, participants can:

58) **Solve** the challenge of how to act safely when encountering the safety hazards of electricity in a WTG environment (Ability, basic level)

59) **Solve** the challenge of how to correctly respond to an electrical incident (Ability, basic level)

ELEMENT 5.1 - WHY ELECTRICAL SAFETY?

Learning objectives:

60) The participants can **recognise** examples of electrical systems in a WTG and their relevance to CoHE (Knowledge, basic level)

61) The participants can **describe** the hazards of electricity in a WTG environment (Knowledge, basic level)

62) The participants can **recognise** the effects (including later effects) of electricity on the human body (Knowledge, basic level)

63) The participants can **recognise** the importance of working according to approved working practices with electricity in a WTG environment (Knowledge, basic level)

64) The participants can **solve** the challenge of how to identify and avoid the hazards of electricity in a WTG environment (Ability, basic level)

The instructor shall:

5.1.1 Emphasise to the participants that the CoHE Basic Safety Module will NOT qualify or enable the participants to be able to perform any electrical work

5.1.2 Show examples of electrical systems in a WTG

5.1.3 Facilitate a learning activity such as asking the participants questions about the electrical systems shown and how these electrical systems are relevant to CoHE and the participants´ work

5.1.4 Show examples of situations with hazards of electricity present in a WTG environment and how to avoid these hazards:

a. difficult to detect (invisible)

b. potential to be deadly or life altering

5.1.5 Explain the approach boundaries (please refer to Section 2 – Terms and Definitions) related to energised exposed electrical conductors and arc flash, highlight that a CoHE ordinary person cannot enter these boundaries unless under the direct supervision of a CoHE Qualified Person

5.1.6 Present the effects (including later effects) of electricity on the human body, including the hazards of melting clothing and conductive jewellery

5.1.7 Facilitate a learning activity such as asking the participants questions about:

a. The examples of the hazards of electricity in a WTG environment and how to avoid these hazards

b. The distinctiveness of the danger that electricity poses in a WTG environment compared to safety hazards of mechanical systems covered previously in the module

5.1.8 Provide additional examples of situations of electricity safety hazards present in a WTG environment to the participants, including damaged or deranged equipment

5.1.9 Facilitate guided practice for the participants in identifying the safety hazards and deciding which actions to take to avoid these hazards in the above examples

5.1.10 Give constructive feedback to the participants' identification of the safety hazards of electricity and descriptions how to avoid these hazards with an emphasis on the importance of working according to approved working practices

The participants shall:

5.1.11 Engage in answering the questions and share understandings about the electrical systems and their relevance to CoHE and the participants´ work

5.1.12 Engage in answering above questions and share understandings about:

a. the examples of the hazards of electricity in a WTG environment and how to avoid these hazards

b. the distinctiveness of the danger that electricity poses compared to safety hazards of mechanical systems covered previously in the module

5.1.13 Practise identifying safety hazards of electricity present in a WTG environment and deciding which actions to take to avoid these hazards

ELEMENT 5.2 - LOW / HIGH VOLTAGE

Learning objectives:

65) The participants can **describe** the basic difference of hazards and risks between HV and LV in a WTG environment (Knowledge, basic level)

66) The participants can **describe** examples of HV safety signs and HV restricted areas and examples of what actions to take when encountering HV safety sign and HV restricted areas in a WTG environment (Knowledge, basic level)

The instructor shall:

5.2.1 Explain the basic difference of hazards and risks between HV and LV in a WTG environment

5.2.2 Facilitate a learning activity such as scenario-based questions about the hazards and risks of low and high voltage in a WTG environment

5.2.3 Show examples of HV safety signs and HV restricted areas (HV transformer, HV transformer room, switchgear, HV cable, substation etc.) and examples of what actions to take when encountering HV safety signs and HV restricted areas in a WTG environment e.g.:

a. do not enter HV restricted areas

b. do not remove covers unless you are a Qualified Person and follow the guidance of the GWO Qualified Electrical Person as described in the Electrical Safety module and company rules plus local legislation

5.2.4 Facilitate a short learning activity (e.g. a quiz, questionnaire, or exercise), where the participants can practise:

a. identifying HV safety signs and HV restricted areas in a WTG environment

b. describing the meanings of these HV safety signs and HV restricted areas

c. what actions to take when encountering HV safety sign and HV restricted areas

The participants shall:

5.2.5 Engage in the activity and share understandings about the hazards and risks of low and high voltage in a WTG environment

5.2.6 Engage in the activity and practise:

a. identifying HV safety signs and HV restricted areas in a WTG environment

b. describing the meaning of the HV safety signs and HV restricted areas

c. what actions to take when encountering HV safety sign and HV restricted areas

ELEMENT 5.3 - PE AND GFCI / RCD

Learning objectives:

67) The participants can **describe** the function and importance of GFCI/RCD and PE in a WTG environment (Knowledge, basic level)

68) The participants can **describe** how to identify double isolated tools including that they do not require grounding (Knowledge, basic level)

69) The participants can **recognise** the importance of grounding an external generator in accordance with manufacturer's user manual, local legislation, and company rules (Knowledge, basic level)

70) The participants can **recognise** examples of the symbol of the GFCI/RCD and PE (Knowledge, basic level)

71) The participants can **recognise** that not all circuits on a wind turbine are protected by GFCI/RCD's and examples of what to do when encountering one of these circuits (Knowledge, basic level)

72) The participants can **recognise** the relation between current and contact time (Knowledge, basic level)

73) The participants can **recognise** and compare the consequences of getting a shock on a circuit protected by a GFCI and on a circuit without GFCI (Knowledge, basic level)

74) The participants **show interest** in always using PE and GFCI/RCD when applicable (Ability, basic level)

The instructor shall:

5.3.1 Show different situations from a WTG environment where a tool is used without protective earth and GFCI/RCD and with the consequence of improper grounding on tools or equipment:

a. situation where there is no PE, no GFCI/RCD

b. situation where there is PE, no GFCI/RCD

c. situation where there is both PE and GFCI/RCD

5.3.2 Facilitate a learning activity such as asking the participants questions about the different situations where a tool is used without protective earth and GFCI/RCD and with the consequence of improper grounding on tools or equipment

5.3.3 Lead discussions with the participants about the function and importance of GFCI/RCD and protective earth in tools and equipment

5.3.4 Explain and demonstrate how to identify double isolated tools including that they do not require grounding

5.3.5 Facilitate a learning activity such as asking the participants questions about how to identify double isolated tools

5.3.6 Show the importance of grounding an external generator in accordance with the manufacturer's user manual, local legislation, and company rules

5.3.7 Show examples of the symbol of the GFCI/RCD and PE

5.3.8 Emphasise that not all circuits on a wind turbine are protected by GFCI/RCD's

5.3.9 Lead a discussion with the participants about examples of what to do when encountering circuits that are not protected by GFCI/RCD's

5.3.10 Explain the relation between current and contact time

5.3.11 Ask the participants involving questions about the relation between current and contact time

5.3.12 Show the consequences of getting a shock from a circuit protected by a GFCI and on a circuit without GFCI

5.3.13 Ask the participants involving questions about the consequences of getting a shock from a circuit protected by a GFCI and on a circuit without GFCI

5.3.14 Test the participants´ attitudes and understandings about PE AND GFCI/RCD (e.g. through a multiple choice test, exercises, scenario-based questions or a questionnaire about PE & GFCI/RCD)

5.3.15 Give constructive feedback to the participants' performance throughout the activities of this element with an emphasis on encouraging the participants to always use PE and GFCI/RCD when applicable

The participants shall:

5.3.16 Engage in the activity and share understandings about different situations where a tool is used without protective earth and GFCI/RCD including the consequences of improper grounding on tools or equipment

5.3.17 Engage in the discussion about the function and importance of GFCI/RCD and protective earth in tools and equipment

5.3.18 Engage in the activity and share understandings about how to identify double isolated tools

5.3.19 Engage in the discussion and share understandings about examples of what to do when encountering circuits that are not protected by GFCI/RCD's

5.3.20 Engage in answering the questions and share understandings about the relation between current and contact time

5.3.21 Engage in answering the questions and share understandings about the consequences of getting a shock from a circuit protected by a GFCI and on a circuit without GFCI

5.3.22 Engage in the test and share their attitudes and understandings about PE AND GFCI/RCD

ELEMENT 5.4 - STATIC ELECTRICITY

Learning objectives:

75) The participants can **recognise** the hazard of static electricity and how this hazard can be avoided (Knowledge, basic level)

76) The participants can **solve** the challenge of how to identify and avoid the hazard of static electricity in a WTG environment (Ability, basic level)

The instructor shall:

5.4.1 Show examples of the hazard of static electricity in a WTG environment and how to avoid this hazard (e.g. in connection with the blade)

5.4.2 Facilitate guided practice for the participants in identifying areas with danger of static electricity, describing the hazard, and deciding how the hazard of static electricity can be avoided

The participants shall:

5.4.3 Practise identifying areas with danger of static electricity, describing the hazard, and deciding how the hazard of static electricity can be avoided

ELEMENT 5.5 - ELECTRICAL SAFETY SIGNS

Learning objectives:

77) The participants can **describe** the sign for "Danger Electricity" and examples of what actions to take when encountering electrical safety signs (Knowledge, basic level)

78) The participants can **recognise** examples of electrical safety signs in different locations in the WTG (Knowledge, basic level)

79) The participants can **recognise** the consequences of not complying with electrical safety signs in the WTG (Knowledge, basic level)

The instructor shall:

5.5.1 Present how to identify the sign for "Danger Electricity" and show examples of what actions to take when encountering these electrical safety signs

5.5.2 Show examples of electrical safety signs on different locations in a WTG, including Arc flash signs

5.5.3 Facilitate a short learning activity (e.g., a quiz, questionnaire, or exercise), where the participants can practise:

a. identifying electrical safety signs in different locations in the WTG

b. describing the meaning of electrical safety signs

c. deciding examples of what actions to take when encountering electrical safety signs e.g. 'Do not open' and 'Do not enter'

5.5.4 Give constructive feedback to the participants practice (previous points) with an emphasis on the potential consequences that could happen if electrical safety signs are not correctly identified or complied with in a WTG

The participants shall:

5.5.5 Engage in the activity and practise identifying electrical safety signs in different locations in the WTG and describe the meaning of the electrical safety signs and examples of what actions to take when encountering the electrical safety signs

ELEMENT 5.6 - THE IMPORTANCE OF APPROPRIATE ISOLATION

Learning objectives:

80) The participants can **describe** the importance of using appropriate isolation when working in the vicinity of electricity (Knowledge, basic level)

81) The participants **show interest** in never working in the vicinity of electricity without appropriate isolation (Ability, basic level)

The instructor shall:

5.6.1 Show the importance of using appropriate isolation when working electricity. For example using stories or asking the participants to analyse how and why appropriate isolations could have prevented an accident in a scenario from happening?

5.6.2 Refer to safety signs discussed in the previous element and explain what actions to take to control the risk identified by those signs and why these actions are required:

a. 'Do not open' or 'Do not enter'

5.6.3 Facilitate discussions or ask the participants involving questions about the importance of appropriate isolation and to never work in the vicinity of electricity without appropriate isolation

5.6.4 Give constructive feedback to the participants' discussions or answers and reinforce the importance of isolation to ensure the hazard is under control

The participants shall:

5.6.5 Engage in the discussions or answering the questions and share their attitudes and understandings about the importance of appropriate isolation and to never work in the vicinity of electricity without appropriate isolation

ELEMENT 5.7 - RESPONSE TO AN ELECTRICAL INCIDENT

Learning objectives:

82) The participants can **recognise** the importance of responding to electrical shock immediately and reporting all electrical shocks (Knowledge, basic level)

83) The participants can **describe** how to respond to an electrical incident (Knowledge, basic level)

84) The participants can **solve** the challenge of how to correctly respond to an electrical incident (Ability, basic level)

The instructor shall:

5.7.1 Refer to the GWO BST First Aid Module and emphasise that the lifesaving techniques trained in GWO BST First Aid Module shall be followed

5.7.2 Emphasise that company specific procedure to an electrical incident should be checked and always followed

5.7.3 Explain and demonstrate to the participants how to respond to an electrical incident while highlighting the importance of responding to electrical shock immediately:

a. stopping the shock (don't touch the injured person)

b. seeking assistance

c. medical evaluation of the injured person (mandatory)

d. reporting

5.7.4 Highlight the need to report all electrical shocks

5.7.5 Ask the participants involving questions about the response to an electrical incident being demonstrated:

a. what happened?

b. how did the responder(s) to the electrical incident act?

c. of those actions, which were the most important?

d. why were these key actions performed?

5.7.6 Provide constructive feedback to participants´ descriptions that focus on how and what should be corrected in participants' understanding of the response to an electrical incident being demonstrated

5.7.7 Facilitate participants practice (through e.g. a challenge or a scenario) in deciding the actions and describing how to execute the actions needed to correctly respond to an electrical incident

5.7.8 Give constructive feedback to the participants throughout the activities of this element

The participants shall:

5.7.9 Engage in answering the questions and share understandings about the response to an electrical incident being applied:

a. what happened?

b. how did the responder(s) to the electrical incident act?

c. of these actions, which were the most important?

d. why were these key actions performed?

5.7.10 Engage in the practice of deciding on the actions and describing how to execute the actions needed to correctly respond to an electrical incident

LESSON 6 - PRESSURE FLUID SAFETY

30 min.

The aim of this lesson is to enable the participants to avoid the dangers of pressure fluids by acting safely in relation with the hazards of pressure fluids of a wind turbine.

After having successfully completed this lesson, participants can:

85) **Solve** the challenge of how to act safely when encountering the safety hazards of pressure fluids in a WTG environment (Ability, basic level)

ELEMENT 6.1 - PRESSURE FLUID SAFETY

Learning objectives:

86) The participants can **recognise** examples of pressure fluid systems and their relevance to CoHE (Knowledge, basic level)

87) The participants can **describe** the hazards of pressure fluids in a WTG environment (Knowledge, basic level)

88) The participants can **solve** the challenge of how to identify and avoid the hazards of pressure fluids in a WTG environment (Ability, basic level)

89) The participants can **describe** examples of safe working practices for pressure fluids in a WTG environment (Knowledge, basic level)

90) The participants can **describe** similarities of safe working practices for mechanics, electricity, and pressure fluids in a WTG environment (Knowledge, basic level)

The instructor shall:

6.1.1 Show examples of pressure fluid system in a WTG

6.1.2 Facilitate a learning activity such as asking the participants questions about the pressure fluid systems shown and how these pressure fluid systems are relevant to CoHE

6.1.3 Show examples of the hazards of pressure fluids in a WTG environment and how to avoid these hazards (e.g. cuts, injections, aerosolised chemicals, asphyxia, trapped pressure, or stored high pressure)

6.1.4 Ask the participants involving questions about the distinctiveness of the hazards of pressure fluids pose compared to the hazards of mechanical systems and electricity in a WTG environment

6.1.5 Provide examples of situations with the safety hazards of pressure fluids in a WTG environment to the participants

6.1.6 Facilitate guided practice for the participants in identifying the pressure fluid safety hazards in the above examples and deciding which actions to take to avoid these hazards

6.1.7 Give constructive feedback to the participants' identification of the pressure fluids safety hazards and how to avoid these hazards

6.1.8 Facilitate discussions or ask the participants involving questions about the safe working practices for pressure fluids and the similarities between the safe working practices for mechanical systems, electricity, and pressure fluids in a WTG environment

Note *Examples of relevant, similar safe work practices are:*

a. use of PPE

b. protections e.g., covers to protect against dangerous parts

c. Lockout-Tagout

d. working on systems that have been proved dead by a Qualified Person

The participants shall:

6.1.9 Engage in answering the questions and share understandings about the pressure fluid systems and their relevance to CoHE

6.1.10 Engage in answering the questions and share understandings to the distinctiveness of the hazards of pressure fluids pose compared to the hazards of mechanical systems and electricity in a WTG environment

6.1.11 Engage in identifying the pressure fluid safety hazards and deciding which actions to take to avoid these hazards in a WTG environment

6.1.12 Engage in answering the questions and share understandings to the safe working practices for pressure fluids and the similarities of safe working practices for mechanical systems, electricity and pressure fluids in a WTG environment

ELEMENT 6.2 - HYDRAULIC OIL INJECTIONS

Learning objectives:

91) The participants can **describe** the circumstances in which oil injection into the human body is possible and examples of actions and mitigation measures to prevent an oil injection from happening (Knowledge, basic level)

92) The participants can **describe** the importance of getting medical assistance ASAP in case of a hydraulic oil injection (Knowledge, basic level)

93) The participants can **recognise** the need to request specialised medical evaluation (Knowledge, basic level)

94) The participants **show interest** in and willingness to seeking out medical assistance ASAP in a case of hydraulic oil injection (Ability, basic level)

The instructor shall:

6.2.1 Show examples of circumstances in which hydraulic oil injection into the human body is possible in a WTG environment (e.g. hydraulic pitch system and when working with torque and tensioning tools)

6.2.2 Explain and demonstrate examples of relevant actions and/or mitigation measures to avoid a hydraulic oil injection from happening in above circumstances

6.2.3 Facilitate a learning activity such as scenario-based questions about the circumstances in which a hydraulic oil injection into the human body is possible in a WTG environment and the relevant actions and mitigation measures to avoid this occurring

6.2.4 Facilitate a learning activity for the participants such as leading discussions about:

a. consequences of suffering a hydraulic oil injection and not receiving prompt specialised medical attention

b. in the participants' opinion, why do individuals NOT seek prompt specialised medical attention after suffering a hydraulic oil injection?

c. In the participants' opinion, how could it be ensured that all individuals seek prompt specialised medical attention after suffering a hydraulic oil injection?

The participants shall:

6.2.5 Engage in the activity and share understandings about the circumstances in which a hydraulic oil injection into the human body is possible in a WTG environment and the relevant actions and mitigation measures to avoid this occurring

6.2.6 Engage in the activity and share their attitudes and understandings regarding hydraulic oil injections and receiving prompt, specialised medical attention

ELEMENT 6.3 - SAFETY SIGNS

Learning objectives:

95) The participants can **describe** the sign for "pressurised systems" and examples of what actions to take when encountering the pressure fluid safety signs (Knowledge, basic level)

96) The participants can **recognise** the safety signs for "pressurised systems" in a WTG environment (Knowledge, basic level)

97) The participants can **recognise** the consequences of not complying with safety signs for "pressurised systems" in the WTG (Knowledge, basic level)

The instructor shall:

6.3.1 Show examples of safety signs related to "pressurised systems" and examples of what actions to take when encountering pressure fluid safety signs e.g.

a. work safely around pressurised systems to avoid damaging the system to prevent leakage

6.3.2 Facilitate a short learning activity (e.g., a quiz, questionnaire, or exercise), where the participants can practise:

a. identifying pressurised systems safety signs in a WTG environment

b. describing the meaning of signs for "pressurised systems"

c. describing examples of what actions to take when encountering pressure fluid safety signs

6.3.3 Give constructive feedback to the participants' practice (previous point) with an emphasis on the potential consequences that could happen if the "pressurised fluid" safety signs are not correctly identified or follow in a WTG

The participants shall:

6.3.4 Practise identifying signs for "pressurised systems" in different locations in a WTG environment, as well as, describing the meaning of signs for "pressurised systems" including examples of actions to take when encountering pressure fluid safety signs

ELEMENT 6.4 - THE IMPORTANCE OF APPROPRIATE ISOLATION

Learning objectives:

98) The participants can **describe** the importance using appropriate isolation when working with pressure fluids in a WTG environment (Knowledge, basic level)

99) The participants **show interest** in never working with pressure fluids without appropriate isolation (Ability, basic level)

The instructor shall:

6.4.1 Show the importance of using appropriate isolation when working with pressure fluids (e.g. using stories or asking the participants to analyse how and why appropriate isolations could have prevented an accident, in a scenario, from happening)

6.4.2 Facilitate discussions or ask the participants involving questions about the importance of appropriate isolation and never working with pressure fluids without appropriate isolation

6.4.3 Give constructive feedback to the participants' discussions or answers and reinforce the importance of isolation to ensure the hazard is under control

The participants shall:

6.4.4 Engage in the discussions or answering the questions and share their attitudes and understandings about the importance of appropriate isolation and to never work with pressure fluids without appropriate isolation

LESSON 7 - HAZARDOUS ENERGY SCENARIO

20 min

The aim of the lesson is to enable the participants to act safely when in the vicinity of hazardous energies in the wind industry. This will be achieved by the participants being able, with a minimum of guidance, to identify the safety hazards of mechanics, electricity and pressure fluids present in scenario(s) from a WTG environment and determining how to avoid these hazards based on the learnings throughout the module.

After having successfully completed this lesson, participants can:

100) **Solve** the challenge of how to identify and avoid the safety hazards of mechanical systems, electricity and pressure fluids present in a WTG environment (Ability, basic level)

The instructor shall:

7.1.1 Present hazardous scenario(s) (e.g., text-based, or visual description) in a WTG environment

7.1.2 Facilitate practice for the participants in identifying and determining how to avoid the hazards of mechanics, electricity, and pressure fluids present in the scenario(s) based on the learnings throughout the module.

Note *Examples of safety hazards to be covered during this scenario-based training are:*

a. electricity (e.g. indirect, or direct contact with live parts)

b. contact or entanglement with rotating and moving parts

c. pressure fluids

d. stored energy

Note *In the above practice, the level of guidance and instructions given to the participants must be kept at a minimum to challenge the participants to take initiative and practise on their own*

7.1.3 Give constructive feedback to the participants' performance throughout the scenarios

The participants shall:

7.1.4 Practise and demonstrate how to identify the safety hazards and determine how to avoid all the different hazards present in the hazardous scenario(s) in a WTG environment

7.1.5 Think about received feedback and use the feedback to improve their performance

LESSON 8 - TRAINING REVIEW

10 min.

The aim of this lesson is to enable the participants to reflect on and process their learning outcome and key takeaways from the module, aiming to achieve a high learning transfer from the module to their way of working.

ELEMENT 8.1 - TRAINING REVIEW

The instructor shall:

8.1.1 Re-present the overall aims and learning objectives of the module to facilitate the participants' comparison of their learning outcome and the achievement with their previously stated expectations for the module

The participants shall:

8.1.2 Reflect on their learning outcome and key takeaways from the CoHE Basic Safety Module, aiming to achieve a high learning transfer from the module to their way of working by means of e.g.:

a. creating a mind-map of the participants´ learnings from the module and how these learnings connect to their way of working

b. group discussions or walk and talk

c. questions and answers in class, or where suitable

Note *The instructor may additionally conduct a local evaluation of the training*

ELEMENT 8.2 - FEEDBACK SESSION

The instructor shall:

8.2.1 Give overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training review session

8.2.2 Encourage the participants to examine and grow awareness of how specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualise and enhance learning transfer)

8.2.3 Encourage the participants to discuss (after the module completion) with colleagues about how the CoHE Basic Safety content, methods and techniques are similar or different to the local specific conditions identified

GLOBAL WIND ORGANISATION

Electrical Safety Module

(ES)

11. MODULE 2 -COHE ELECTRICAL SAFETY

11.1 Aims and Objectives of the CoHE Electrical Safety Module

The aim of GWO's CoHE Electrical Safety training module is to enable the participants to support and care for themselves and others while working with, and in the vicinity of, electricity in the wind industry and to perform assigned electrical work tasks safely and efficiently.

Upon successful completion of GWO's CoHE Electrical Safety Module, the participants will be able to perform electrical work safely within the wind industry using electrical PPE, precautionary techniques, and electrical safety safe working practices to reduce the associated risks to the electrical hazards.

Overall learning objectives for the CoHE Electrical Safety Module, the participants will have the ability to:

1) **Take responsibility** for their own and others safety while working with, and in the vicinity of, electricity in the wind industry (Ability, intermediate level)

2) **Take responsibility** for correctly completing a simple permit to work from beginning to end as the person responsible for establishing a safe work condition (Ability, intermediate level)

Note *The GWO COHE Electrical Safety Module is aimed towards improving the participants´ ability to "work safely" with electricity. This means that the CoHE Electrical Safety Module is not aimed at improving candidates´ technical knowledge, skills, and abilities regarding electricity. Participants should already possess the needed technical knowledge, skills, and abilities before attending the module. Similarly, it is not the intention of the GWO CoHE Standard to promote the acquisition of advanced knowledge, such as troubleshooting.*

11.2 Duration of the CoHE Electrical Safety Module

The total contact time for completing this module is 10 hours and 45 minutes. This is based on the times given in the module timetable.

The training provider must not exceed the times per day given in table 11-2.1, below.

	Maximum Duration Per Day
Contact time	8 hours
Total training day	10 hours

Table 11.2.1 – Maximum durations for training day

Note *Contact time includes delivery of course lesson contents, practical exercises and activities directly related to these.*

The total training day includes contact time, meals and breaks and travel between training sites (where applicable)

11.3 CoHE Electrical Safety Module - Instructor to Participant Ratio

The table below shows the maximum number of participants permitted (per instructor) in an instructor-led training for the Electrical Safety Module:

Modules	Instructor-Participant ratio
CoHE Electrical Safety	1:8

Table 11.3.1 – GWO CoHE Electrical Safety Module instructor to participant ratio

11.4 Equipment for CoHE Electrical Safety Module

The equipment required for training (as listed in Annex 1) must be available and must fulfil national, legal requirements of the country where the training is taking place

11.5 CoHE Electrical Safety Module Timetable

The order in which elements of this module are delivered may vary according to the didactical choices of the delivering training provider.

The delivery of this module must comply with the requirements described in the GWO Requirements for Training.

Lesson	Element		Duration
1. **Introduction to the training**	1.1	Safety instructions and emergency procedures	
	1.2	Facilities	
	1.3	Introduction	
	1.4	Aim and objectives	
	1.5	Ongoing assessments	
	1.6	Motivation	
	1.7	Human factors	
		TOTAL	30 min.
2. **Responsibilities and role of a Qualified Electrical Person**	2.1	Responsibilities and role of a Qualified Electrical Person	
		TOTAL	30 min.
3. **Electrical PPE**	3.1	Electrical PPE	

			TOTAL	30 min.
4.	Electrical safe working practices	4.1	How to perform electrical work tasks safely using electrical safe working practices	
		4.2	Exposed energised electrical conductors and circuit parts	
		4.3	Approach boundaries	
		4.4	Tools	
		4.5	Alerting techniques	
		4.6	Job briefing/ pre-task briefing	
		4.7	Deranged equipment	
		4.8	Guards and cover	
		4.9	Non-contact techniques (Infrared inspections)	
		4.10	Arc flash	
			TOTAL	120 min.
5.	Electrically safe working condition	5.1	Treating all electrical equipment as live etc.	
		5.2	When to establish an electrically safe work condition	
		5.3	How to establish an electrically safe work condition	
			TOTAL	80 min.
6.	Testing and isolation	6.1	Electrical measurement equipment	
		6.2	3-point test method to prove the absence of voltage	
		6.3	Isolation of electrical equipment	
			TOTAL	105 min.
7.	Stored Energy	7.1	Hazards related to batteries and capacitors	
		7.2	Task-based training for handling batteries and capacitors in a safe manner	
			TOTAL	20 min.
8.	Hazardous electrical safety scenario	8.1	Hazardous electrical safety scenario	
			TOTAL	180 min.
9.	Training review	9.1	Training review	
		9.2	Feedback session	

	TOTAL	10 min.
	GRAND TOTAL	645 min.

Table 11.5.1 – GWO Electrical Safety Module timetable

11.6 Detailed Description of the CoHE Electrical Safety Module

Note *The administrative part of the registration should be carried out before the module begins.*

LESSON 1 - INTRODUCTION TO THE TRAINING

30 min.

The aim of this lesson is for the participants to be motivated and to engage in the GWO CoHE Electrical Safety Module safely at a training facility, while recognising what is expected of them during the training.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

1) **Recognise** the course content and the facilities involved to ensure a clear understanding of what is expected during the course (Knowledge, basic level)

2) **Name** and point out local emergency procedures and facilities (Knowledge, basic level)

3) **Discuss** the relevant human factors, and explain the implications of these (Knowledge, intermediate level)

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

Learning objective:

4) The participants **show interest** in the safety and emergency procedures (Ability, basic level)

The instructor shall:

1.1.1 Explain and ask involving questions concerning:

a. safety instructions according to internal procedures

b. emergency procedures and emergency exit in the areas where the participants can be expected to be located during the course:

The participants shall:

1.1.2 Engage in answering the above questions

ELEMENT 1.2 - FACILITIES

Learning objective:

5) The participants can **recognise** the facilities at the training location (Knowledge, basic level)

The instructor shall:

1.2.1 Present a general description of the facilities at the location (administration, dining area, restrooms, and toilets etc)

1.2.2 Alternative activity: lead a tour and point out facilities

The participants shall:

1.2.3 Note relevant facilities and ask questions when in doubt about facilities

ELEMENT 1.3 - INTRODUCTION

Learning objective:

6) The participants **show interest** in fellow participants and the programme of Electrical Safety Module (Ability, basic level)

The instructor shall:

1.3.1 Explain and ask involving question about the programme of the CoHE Electrical Safety Module, including breaks and mealtimes

1.3.2 Give a short introduction about themselves, including their backgrounds as instructors

1.3.3 Ask for participants' expectations of the training and their learning training

The participants shall:

1.3.4 Give a short introduction of themselves, including their job function, and share their expectations of the training and learning outcome expectation for the training

ELEMENT 1.4 - AIM AND OBJECTIVES

Learning objective:

7) The participants can **recognise** the scope and main objectives of the CoHE Electrical Safety Module (Knowledge, basic level)

The instructor shall:

1.4.1 Present the scope and main objectives of the CoHE Electrical Safety Module through a challenge, a story, a scenario or "your goal with this module, should you choose to accept is…"-message

Note *A suggested learning activity could be to share stories, present scenarios or personal experiences that show the importance of being able to support and care for themselves and others while working with and in the vicinity of electricity in the wind industry and to perform assigned tasks safely and efficiently. (shows what is in it for the participants)*

Note *Where possible avoid using "learning objectives – PowerPoint slide(s)".. Instead use stories, examples or personal experiences that shows the importance of being able to support and care for oneself and others while: working with, and in the vicinity of, electricity in the wind industry; performing assigned tasks safely and efficiently; and the importance of the CoHE Electrical Safety Module*

Note *Please visit https://toolbox.energyinst.org/ for scenarios, incident lessons and safety information shared by global energy companies*

1.4.2 Involve participants through questions about the participants' understanding and individual experiences relevant to the CoHE Electrical Safety Module

The participants shall:

1.4.3 Engage in answering questions, and share experiences relevant to the CoHE Electrical Safety Module

ELEMENT 1.5 - ONGOING ASSESSMENT

Learning objective:

8) The participants can **recognise** the assessment procedure and the aim of ongoing assessment (Knowledge, basic level)

The instructor shall:

1.5.1 Explain the reasons for the on-going assessment

1.5.2 Explain the GWO participant assessment form and how it will be used

1.5.3 Ask for the participants' thoughts on the assessment procedure presented:

The participants shall:

1.5.4 Engage in discussions on the assessment procedure and ask questions when in doubt in relation to the assessment procedure

ELEMENT 1.6 - MOTIVATION

Learning objective:

9) The participants **show interest** in engaging in the learning activities (Ability, basic level)

The instructor shall:

1.6.1 Explain and facilitate discussion on:

a. The importance of personal involvement in the course

b. The need for the CoHE Electrical Safety Module when working in the wind industry:

The participants shall:

1.6.2 Engage themselves in discussion about the importance of personal involvement in the course and the need for the CoHE Electrical Safety Module when working in the wind industry

ELEMENT 1.7 - HUMAN FACTORS

The aim of the element is to draw the participants' attention to how human performance and taking responsibility influences a safe work environment, and to prepare for the continued focus on human factors during practical training and exercises.

Learning objectives:

10) The participants can **discuss** the relevant human factors, and **explain** the implications of these (Knowledge, intermediate level)

11) The participants **show interest** and willingness to focus on human factors during the following practical exercises (Ability, basic level)

The instructor shall:

1.7.1 Present how human factors have an influence on accidents in the wind industry (relevant statistics may be given)

1.7.2 Lead a discussion about the role of the individual in improving human performance, and how this improvement can benefit safety when working in the wind industry, by considering factors like:

a. attention and perception

b. group behaviour and peer pressure

c. weather conditions

d. weather delays

e. noise levels

f. site layout and housekeeping

g. fitness and health

h. domestic and work-related stress

i. workload (both overload and underload)

j. fatigue

k. time pressure and deadlines

l. alcohol, medication, and substance abuse

m. confusing labelling and equipment identification

n. procedure use

o. use of peer checks with independent and concurrent verification

p. pre-planning and staging of the workplace

The participants shall:

1.7.3 Engage in discussions and share experiences about how human factors influence accidents when working in the wind industry

1.7.4 Engage in and think on received feedback and take responsibility for their own performance and development during the training

LESSON 2 - REPONSIBILITIES AND ROLE OF A QUALIFIED ELECTRICAL PERSON

30 min.

The aim of this lesson is to enable the participants to ensure the safety of other workers by being able to comply with and fulfil the requirements and role of a Qualified Electrical Person in the wind industry.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

12) **Solve** the challenge of how to fulfil the responsibilities of a Qualified Electrical Person (Ability, basic level)

ELEMENT 2.1 - RESPONSIBILITIES AND ROLE OF A QUALIFIED ELECTRICAL PERSON

Learning objectives:

13) The participants can **explain** the role and responsibilities of a Qualified Electrical Person (boundaries & limitations) (Knowledge, intermediate level)

14) The participants can **recognise** the education requirements for a Qualified Electrical Person (knowledge, basic level)

15) The participants can **recognise** the requirements for working on high voltage systems which exceeds this module and the GWO CoHE Standard (Knowledge, basic level)

16) The participants can **decide** and **explain** what a Qualified Electrical Person should do in a given situation to fulfil the requirements and role of a Qualified Electrical Person (Knowledge, intermediate level)

The instructor shall:

2.1.1 Lead a brainstorm with the participants about the Qualified Electrical Person role and requirements in the wind industry to give an overview of

a. training requirements

b. experience requirements

c. responsibilities (limitations to what they can, and cannot, do)

d. high voltage requirements

2.1.2 Emphasise to the participants that the CoHE GWO Electrical Safety Module will NOT qualify or enable the participants to be able to perform any HV work. HV work is out of scope of the GWO CoHE standard including the GWO CoHE Electrical Safety Module and require additional company specific HV trainings, experience, and requirements

2.1.3 Show examples of what a Qualified Electrical Person can, and cannot, do

2.1.4 Facilitate an exercise with examples of different situations or branching scenarios in a WTG environment where the participants must practise deciding what an electrical Qualified Person should do:

a. for example, what can a Qualified Electrical Person do compared to an Ordinary Electrical Person in these situations? (e.g. giving guidance to an Ordinary Person or establishing an electrically safe working condition for others to work within) For more examples of the responsibilities of a Qualified Electrical Person, please refer to section 4.2 of this standard.

b. what are the reasons for these role boundaries?

2.1.5 Give constructive feedback to the participants decisions about what a Qualified Electrical Qualified Person should do in the situation or branching scenarios and explain the reasons why the actions/answers were correct, or incorrect, and show the realistic consequences of a correct, or incorrect, action/answer to each situation to provide the participants with a sense of the real world consequences

Note *Please emphasise that participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answers to what a*

Qualified Electrical Person should do in a given situation could change depending on regional/company/WTG model rules

The participants shall:

2.1.6 Engage in the brainstorm about Qualified Electrical Person role, requirements, and responsibilities

2.1.7 Engage in the exercise and practise deciding what an Electrical Qualified Person should do in the situations or branching scenarios from a WTG environment

LESSON 3 - ELECTRICAL PPE

30 min.

The aim of this lesson is to enable the participants to reduce the risk of injury for themselves and others by being able to pre-use check the correct and required PPE for performing electrical work.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

17) **Perform** a correct pre-use check of the required electrical PPE for a given task defined as electrical work in the wind industry (Skills, intermediate level)

ELEMENT 3.1 - ELECTRICAL PPE

Learning objectives:

18) Participants can **describe** the minimum electrical PPE for a given task defined as electrical work in the wind industry (Knowledge, basic level)

19) Participants can **recognise** that the requirements for arc flash PPE depends on each situation as well as the importance of finding the specific site (or turbine specific) requirements if arc flash PPE is required for a task (Knowledge, basic level)

20) Participants can **perform** pre-use checks of PPE for electrical work (Skills, intermediate level)

21) Participants can **explain** how to store and maintain the electrical PPE (Knowledge, intermediate level)

The instructor shall:

3.1.1 Lead a discussion with the participants about what is the minimum electrical PPE for common task(s) defined as electrical work in the wind industry and the importance of referring to the corresponding work instruction as a reference for the PPE to be used

a. minimum electrical PPE: non-melting clothing to include long trousers and long sleeves, safety glasses and safety footwear that fully covers the feet

Note *Electrical PPE will be revisited as part of the electrical safe working practices*

3.1.2 Present how the requirements for arc flash PPE are depending on each situation and highlight the importance of finding the specific site or turbine specific requirements if arc flash PPE is required

3.1.3 Facilitate exercise(s) where the participants must perform pre-use checks for electrical PPE with a special focus on pre-use checks of insulating gloves and give constructive feedback to the participants throughout the practice

3.1.4 Lead a brainstorm with the participants about how to store and maintain the electrical PPE Examples of actions required to store and maintain the electrical PPE:

a. comply with company specific procedures

b. store it in a clean and sanitary condition ready for use

c. store the electrical PPE away from any chemicals and maintain the electrical PPE without the use of chemicals (e.g., do not use chlorine bleach, hydrogen peroxide, fabric softeners when laundering the non-melting clothing)

d. maintain the electrical PPE in its natural shape

e. do not do your own markings on the electrical PPE

f. perform periodic inspections

g. respect instructions of washing PPE clothing

3.1.5 Ask the participants involving questions about the reasons for the required actions to store and maintain the electrical PPE (e.g. why do you need store electrical PPE in a clean and sanitary condition ready for use?)

The participants shall:

3.1.6 Engage in the discussion and share understandings about what is the minimum electrical PPE for common task(s) defined as electrical work in the wind industry

3.1.7 Engage in the exercise(s) and practise performing pre-use checks of electrical PPE with a special focus on pre-use checks of insulating gloves

3.1.8 Engage in the brainstorm about how to store and maintain the electrical PPE. Examples of actions required to store and maintain the electrical PPE

3.1.9 Engage in answering the questions and share understandings about the reasons for the required actions to store and maintain electrical PPE

LESSON 4 - ELECTRICAL SAFE WORKING PRACTISES

120 min.

The aim of the lesson is to enable the participants to be able to use electrical safe working practices to perform electrical work safely and reduce the risk of injury related to working around electricity in their daily work.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

22) **Act independently** in selecting and using electrical safe working practices to reduce the risk of injury related to working around electricity and performing electrical work in a WTG environment (Ability, intermediate level)

Note *As far as possible, this lesson must be facilitated by the instructor in an interactive and practical way with engagement of the participants. As far as possible, there must also be a minimum of lecturing and the amount of detail in the explanations must be kept to what is required and no more e.g., only cover the listed elements in the job briefing / pre-task briefing Lesson 4, element 4.6.*

ELEMENT 4.1 - HOW TO PERFORM ELECTRICAL WORK TASKS SAFELY USING ELECTRICAL SAFE WORKING PRACTICES

Learning objectives:

23) The participants can **solve** the challenge of selecting the right electrical safe working practices to reduce the risk of injury related to working around electricity and performing electrical work in a WTG environment (Ability, basic level)

24) The participants can **explain** the importance of always working in accordance with an approved work instruction (Knowledge, intermediate level)

25) The participants **show interest** and willingness to ensure electrical work is always performed in accordance with an approved work instruction (Ability, basic level)

26) The participants can **explain** the importance of using the correct revision of electrical diagrams (Knowledge, intermediate level)

27) The participants **show interest** in and will on their own initiative always seek the correct revision of electrical diagrams (Ability, basic level)

28) The participants can **explain** how and why minimum electrical PPE and removing prohibited articles reduces the risk of injury related to working around electricity (Knowledge, intermediate level)

29) The participants **show interest** in always removing all conductive articles from their person when working around electricity in a WTG environment (Ability, basic level)

30) Participants can **explain** the reasons for keeping electrical cabinets closed, how to mitigate that electrical cabinets are left open and what to do in situations with open electrical cabinets (Knowledge, intermediate level)

31) Participants **show interest** in and a willingness in keeping electrical cabinets closed (Ability, basic level)

32) The participants can **explain** how and why good housekeeping reduces the risk of injury related to working around electricity (Knowledge, intermediate level)

33) The participants can **explain** how good housekeeping can be ensured and examples of what actions to take in situations with poor housekeeping (Knowledge, intermediate level)

34) The participants can **explain** the consequences of tools and equipment being placed or left inside electrical cabinets (Knowledge, intermediate level)

35) The participants **show interest** in never placing tools and equipment inside electrical cabinets (Ability, basic level)

36) The participants can **explain** what to do when encountering a breaker that has suddenly and unexpectedly tripped (Knowledge, intermediate level)

The instructor shall:

4.1.1 Explain and demonstrate worked (step-by-step) examples of how to perform electrical work tasks safely using and combining electrical safe working practices in e.g. a WTG environment. Here, the instructor must focus more on the highlighted safe working practices below as the rest of the safe working practices will be covered more in-depth later in the lesson:

a. working in accordance with an approved work instruction

b. working in accordance with the correct revision of electrical diagrams

c. doing a job briefing / pre-task briefing prior to performing electrical work

d. using minimum electrical PPE and removing prohibited articles

e. identifying and reducing the risks of exposed energised electrical conductors and circuit parts

f. approach boundaries

g. using insulated and approved tool for the tasks

h. being alert

i. no blind reaching

j. illumination

k. alerting techniques

l. using correct body positioning

l.i for example, when switching on/off the person should stand to the side of the circuit breaker to minimise the exposure to an arc blast should it occur during the operation. Where a remote position is possible, this is preferred

m. cabinets enclosures

m.i explain that if a cabinet is in an abnormal state e.g. when temporary cables are going into the cabinet through a covering door or when covers are missing or faulty, the cabinet must be treated as opened (live working area)

m.ii show the importance of visual inspections to ensure the integrity of the cabinet enclosure, so no parts can accidentally enter into the cabinet

n. ensuring and maintaining good housekeeping

o. identifying deranged equipment

p. safe re-energising of breakers after a sudden, unexpected trip

p.i show importance of investigating the deranged circuit and making sure that it is safe to re-energise

p.ii what to do when encountering a breaker that has suddenly and unexpectedly tripped

q. ensuring that all applicable guards and covers are in place prior to re-energising the equipment inside

Note *For the worked examples, it would be beneficial if there is a difference in the contexts of the tasks and the used electrical safe working practices. This would give the instructor the possibility to encourage the participants to study the differences between examples and experience how electrical safe working practices can be applied in a range of contexts*

4.1.2 Facilitate a learning activity such as comparison assignments, asking involving questions or case studies of the worked examples shown by the instructor, where the participants must study the worked examples and share understandings about:

a. which electrical safe working practices were used?

b. how were these electrical safe working practices used?

c. why were these electrical safe working practices used?

4.1.3 Facilitate a learning activity such as group discussions about:

a. the importance of using the electrical safe working practices in the participants´ work

b. the participants responsibility in ensuring that work is always performed in accordance with the electrical working practices

c. examples of actions to take when there is a lack of electrical safe working practices in place for electrical work. For example:

c.i seeking out site lead or company representative if an approved work instruction has not been shared prior to starting the work

c.ii what to do when a breaker has suddenly and unexpectedly tripped

4.1.4 Facilitate guided practice opportunities such as simple scenarios or scenario-based questions for the participants in how to select electrical safe working practices to perform electrical work tasks safely

4.1.5 Give constructive feedback to the participants performance throughout the activities of this element

The participants shall:

4.1.6 Engage in the learning activity and share understandings about:

a. which electrical safe working practices were used?

b. how were these electrical safe working practices used?

c. why were these electrical safe working practices used?

4.1.7 Engage in the learning activity and share understandings about:

a. the importance of using the electrical safe working practices in their work

b. the participants' responsibility in ensuring that work is always performed in accordance with the electrical working practices

c. examples of actions to take when there is a lack of electrical safe working practices in place for electrical work

4.1.8 Engage in the practice opportunities and practise selecting electrical safe working practices to perform electrical work tasks safely

4.1.9 Think about the received feedback and use the feedback to improve their performance

ELEMENT 4.2 - EXPOSED ELECTRICAL CONDUCTORS AND CIRCUIT PARTS

Learning objective:

37) The participants can **distinguish** between exposed and unexposed energised electrical conductors and circuit parts in a WTG (Skills, intermediate level)

The instructor shall:

4.2.1 Briefly present the definition of exposed, energised, electrical conductors and circuit parts according to the definition in the terms and definitions CoHE standard (section 2 – Terms and Definitions)

4.2.2 Briefly present what IP (ingress protection) means and its various levels (only explain the first digit, protection against solids)

4.2.3 Lead a discussion or brainstorm with the participants about parts with exposed electricity in a WTG environment

4.2.4 Facilitate practice through examples from a WTG environment (pictures, scenarios, situations.) for the participants in:

a. determining what exposed and unexposed energised electrical conductors and circuit parts are in the examples

b. discussing what makes an energised electrical conductors and circuit parts exposed or unexposed in the examples

4.2.5 Give constructive feedback to the participants´ performance in determining what are exposed and not-exposed energised electrical conductors and circuit parts in the examples

Note *This is part of a Qualified Electrical Person responsibilities to care for and support their colleagues by identifying exposed conductors and circuit parts in the work area and informing colleagues of these*

The participants shall:

4.2.6 Engage in the discussions or a brainstorm about parts with exposed electricity in a WTG environment

4.2.7 Engage in activity and practise determining what are exposed and not-exposed energised electrical conductors and circuit parts in the examples

4.2.8 Engage in discussing what makes an energised electrical conductors and circuit parts exposed or not-exposed in the examples

ELEMENT 4.3 - APPROACH BOUNDARIES

Learning objectives:

38) The participants can **explain** the approach boundaries related to energised exposed electrical conductors and circuit parts (Knowledge, intermediate level)

39) The participants can **explain** which types of work can be performed within each boundary (Knowledge, intermediate level)

40) The participants can **explain** the approach boundaries related to exposed high voltage parts (Knowledge, intermediate level)

41) The participants can **describe** how approach boundaries connect to 'test before touch' and establishing an electrically safe work condition (Knowledge, basic level)

42) The participants can **distinguish** between when (and when not) to wear minimum electrical PPE and insulating gloves (Skills, intermediate level)

43) The participants can **act independently** and safely in hazardous situations with energised exposed electrical conductors and circuit parts in a WTG environment (Ability, intermediate level)

The instructor shall:

4.3.1 Present the approach boundaries (please refer to Section 2 – Terms and Definitions) related to energised exposed electrical conductors and circuit parts and highlight that there can be different values and names for the approach boundaries depending on local regulations:

a. Limited Approach Boundary

b. Restricted Approach Boundary

4.3.2 Present the relation between the boundaries and the voltage level

4.3.3 Ask the participants involving questions about the relation between the boundaries and the voltage level

4.3.4 Facilitate a learning activity such as case studies or discussions with the participants about types of work that can be performed within each boundary

4.3.5 Present examples of situations or scenarios from a WTG environment with energised exposed electrical conductors/parts to the participants

4.3.6 Guide the participants to analyse the (above) situations or scenarios and ask the participants involving questions about the approach boundaries

Note *Examples of these situations could be:*

***Situation 1**, an Ordinary Electrical Person approaches an energised exposed electrical conductor/part:*

a. what is the term for the closest distance that an Ordinary Electrical Person can approach exposed energised conductors without an escort? Correct answer is the Limited Approach Boundary

b. for this Ordinary Electrical Person to be able to cross the Limited Approach Boundary, what is then required? And why is this required? Correct answer to is an escort, informed of arc flash hazards, minimum PPE for electrical work and insulated tools. Equally important are the participants' reasoning behind their answers

c. what types of work can be performed in the Limited Approach Boundary?

***Situation 2**, a Qualified Electrical Person is about to perform a task within the Restricted Approach Boundary of an energised exposed electrical conductor/part*

a. for this Qualified Electrical Person to be able to enter the Restricted Approach Boundary, what is then required? And why is this required? Answer: All parts of the Qualified Electrical Person that enter the Restricted Approach Boundary must be insulated from the equipment voltage. An Energised Electrical Work Permit is required to enter the Restricted Approach Boundary, unless performing switching or taking measurements

d. What types of work can be performed in the Restricted Approach Boundary? Answer: Switching, Diagnosing and Testing

Please emphasise that participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answers to the examples could change depending on regional/company/WTG model rules

4.3.7 Present the approach boundaries related to exposed high voltage parts

4.3.8 Ask the participants involving questions about the approach boundaries related to exposed high voltage parts e.g.:

a. what are the key differences between the approach boundaries related to energised exposed electrical conductors/parts and the approach boundaries related to exposed high voltage parts?

4.3.9 Facilitate a learning activity with the participants about how approach boundaries are connected to 'test before touch' and establishing an electrically safe work condition

4.3.10 Mention that later in the module, the connection between approach boundaries will be revisited as part of the establishing an electrically safe working condition lesson

Note *Approach boundaries are connected to 'test before touch' and establishing an electrically safe work condition, because as part of establishing an electrically safe work condition, absence of voltage in all isolations must be tested first. After this, the absence of voltage in the working area must be tested according to the approach boundaries*

4.3.11 Provide the participants with a minimum of two examples of tasks defined as electrical work (the tasks should only be presented to the participants and not carried out or completed), where different PPE is required:

- Task 1) Visual inspection from within the limited approach boundary, but outside of the restricted approach boundary
    - Answer: minimum electrical PPE (that is, non-melting clothing to include long trousers and long sleeves, safety glasses and safety footwear that fully covers the feet)
- Task 2) Switching or testing including establishing an electrically safe work condition within the restricted approach boundary
    - Answer: Minimum electrical PPE + insulating gloves required

4.3.12 Guide the participants to discuss and determine what PPE is required in the examples of tasks (previous points) defined as electrical work and give constructive feedback throughout this activity

4.3.13 Lead discussions with participants about:

a. what are the differences in the required PPE for each of the tasks?

b. why are there differences in the required PPE for each of the tasks?

4.3.14 Facilitate practice for the participants in how to act safely in a WTG environment with energised exposed electrical conductors and circuit parts based on the learnings from this element

4.3.15 Give constructive feedback to the participants´ performance throughout the activities of this element

The participants shall:

4.3.16 Engage in answering the questions about the relation between the boundaries and the voltage level

4.3.17 Engage in the activity about types of work that can be performed within each boundary

4.3.18 Engage in analysis of the examples of situations or scenarios and answer questions about approach boundaries related to exposed energised electrical conductors and circuit parts

4.3.19 Engage in answering questions and share understanding about approach boundaries related to exposed high voltage

4.3.20 Engage in the activity and share understandings about how approach boundaries are connected to test-before-touch and establishing an electrically safe work condition

4.3.21 Engage in the activity and share understandings about what PPE is required in the examples of tasks defined as electrical work

4.3.22 Engage in discussions and share understandings about the differences in the required PPE for each of the tasks

4.3.23 Engage in the practice of acting safely in a WTG environment with energised exposed electrical conductors and circuit parts

ELEMENT 4.4 - TOOLS

Learning objectives:

44) The participants can **distinguish** between insulated (voltage-rated) tools and tools that are not insulated (Skills, intermediate level)

45) The participants can **distinguish** between when to use and when not to use insulated, approved tools for work around live electrical energy sources (Skills, intermediate level)

46) The participants can **select** the right approved tool for a given task (Skills, advanced level)

The instructor shall:

4.4.1 Explain and demonstrate how to differentiate between insulated (voltage-rated) tools and tools that are not insulated (voltage-rated)

4.4.2 Facilitate practice for the participants in distinguishing between insulated (voltage-rated) tools and tools that are not insulated (voltage-rated) and give constructive feedback to the participants throughout the practice

4.4.3 Facilitate guided practice for the participants in choosing when (and when not) to use insulated, approved tools for work around live electrical energy sources and give constructive feedback to the participants throughout the practice

Note *Insulated, approved tools are mandatory when performing energised work (in extraordinary circumstances under an approved special permit) that requires using the tools inside the Limited Approach Boundary or Restricted Approach Boundary*

4.4.4 Facilitate exercise(s) for the participants to practise selecting the right approved tool for a given task which is considered electrical work and give constructive feedback to the participants throughout the practice

The participants shall:

4.4.5 Engage in the exercise and practice of distinguishing between insulated (voltage-rated) tools and tools that are not insulated (voltage-rated)

4.4.6 Engage in the practice of choosing when (and when not) to use insulated, approved tools for work around live electrical energy sources

4.4.7 Engage in practice in selecting the right approved tool for a given task which is considered electrical work

ELEMENT 4.5 - ALERTING TECHNIQUES

Learning objectives:

47) The participants can **discuss** how and why alerting techniques reduces the risk of injury related to working around electricity (Knowledge, intermediate level)

48) The participants can **select** and apply the right alerting technique to reduce the risk of injury related to working around electricity in a WTG environment (Skills, intermediate level)

The instructor shall:

4.5.1 Present examples (situations, scenarios, pictures) from a WTG environment and guide all the participants to discuss how and why alerting techniques reduces the risk of injury related to working around electricity in the examples. Examples of alerting techniques:

a. signs or tags

b. barrier (anything to identify and restrict access to a hazardous work area)

c. standby person

4.5.2 Facilitate practice for the participants in selecting and applying the right alerting technique(s) to reduces the risk of injury related to working around electricity in examples of situations or scenarios from a WTG environment

4.5.3 Give constructive feedback to the participants´ selection and application of alerting technique(s)

The participants shall:

4.5.4 Practise selecting and applying the right alerting technique(s) to reduces the risk of injury related to working around electricity in e.g. examples of situations or scenarios from a WTG environment

ELEMENT 4.6 - JOB BRIEFING/PRE-TASK BRIEFING

Learning objectives:

49) The participants can **perform** a pre-task briefing for electrical work (Skills, intermediate level)

50) The participants can **discuss** the reasons for having a pre-task briefing prior to working on electrical systems (Knowledge, intermediate level)

51) The participants **show interest** in and a willingness to ensure that pre-task briefings (toolbox talks) are always performed prior to working on electrical systems (Ability, basic level)

The instructor shall:

4.6.1 Facilitate a learning activity such as a group discussion with the participants about the reasons and the importance of having a pre-task briefing (also known as job briefing or toolbox talk) prior to working on electrical system

4.6.2 Emphasise that the required elements in a pre-task briefing for electrical work can vary between companies and that participants must always follow and seek out company specific rules for a pre-task briefing prior to working on electrical systems

4.6.3 Facilitate an exercise where the participants e.g. in groups practise performing a pre-task briefing prior to performing electrical work tasks or working on electrical systems. The elements to cover with the pre-task briefing:

a. hazards involved

b. work procedures

c. work area (Identify the boundaries of the work area and prove that the work area is safe)

d. special precautions (specific non-standard precautions to be able to perform the task i.e. precautions that are not always required)

e. energy source controls (isolation points and how to isolate the energy source)

f. emergency response

g. PPE requirements

h. other works related

4.6.4 Ask the participants involving questions about the pre-task briefing practised e.g.:

a. what were the elements of the pre-task briefing?

b. can the participants restate or summarise the elements in their own words?

c. why were these elements performed in the pre-task briefing?

d. how does this pre-task briefing relate to what the participants have already seen?

e. what to do when something changes? (A pre-task briefing must be done anytime changes occur or the scope of the work changes)

4.6.5 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

4.6.6 Engage in a group discussion and share their understandings about the reasons and the importance of having a pre-task briefing (also known as job briefing or toolbox talk) prior to working on electrical systems

4.6.7 Engage in the exercise and practise performing a pre-task briefing for electrical work

4.6.8 Engage in answering the questions and share understandings about the pre-task briefing practised

ELEMENT 4.7 - DERANGED EQUIPMENT

Learning objectives:

52) The participants can **distinguish** deranged equipment from equipment that is not deranged (Skills, intermediate level)

53) The participants can **explain** how and why deranged equipment increase the risk of injury related to working around electricity (Knowledge, intermediate level)

54) The participants can **explain** examples of what to do when encountering deranged equipment (Knowledge, intermediate level)

The instructor shall:

4.7.1 Facilitate a learning activity with the participants such as a brainstorm about how to identify deranged equipment:

a. look

b. smell

c. temperature / heat

d. fire

e. sparks

f. sound (listening)

4.7.2 Lead a discussion about why deranged equipment (any electrical equipment that is suspected to be damaged) increase the risk of injury related to working around electricity

4.7.3 Present examples of deranged equipment and non-deranged equipment and facilitate exercise(s), where, based on the examples, the participants must practise:

a. how to distinguish deranged equipment from non-deranged equipment and

b. decide what to do when encountering deranged equipment e.g.

b.i seeking company specific procedures and equipment specific procedures. Extra safety precautions that the participants will need to take will depend on company specific procedures and rules

b.ii do not use → send for repair (signage)

b.iii report the deranged equipment

b.iv quarantine the deranged equipment

4.7.4 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

4.7.5 Engage in the activity about how to identify deranged equipment

4.7.6 Engage in the discussion and share understandings about why deranged equipment increase the risk of injury related to working around electricity

4.7.7 Engage in the exercise(s) and practise:

a. how to distinguish deranged equipment from non-deranged equipment

b. what to do when encountering deranged equipment

4.7.8 Think on the received feedback and use the feedback to improve their performance going forward

ELEMENT 4.8 - GUARDS AND COVERS

Learning objective:

55) The participants can **take responsibility** for ensuring that all applicable guards and covers are in place prior to re-energising the equipment in a WTG environment (Ability, intermediate level)

The instructor shall:

4.8.1 Facilitate and present a learning activity such as scenario that require the participants to ensure that all applicable guards and covers are in place prior to re-energising the equipment (e.g. a scenario with missing guards and covers where the participants have to determine which applicable guards and covers are missing)

4.8.2 Give constructive feedback to the participants´ practise in ensuring that all applicable guards and covers are in place prior to re-energising the equipment

The participants shall:

4.8.3 Engage in the learning activity and practise ensuring that all applicable guards and covers are in place prior to re-energising the equipment

ELEMENT 4.9 - NON-CONTACT TECHNIQUES (INFRARED INSPECTIONS)

Note *This element can be combined with other elements of this lesson, if deemed appropriate by the instructor*

Learning objectives:

56) The participants can **describe** the reasons why non-contact techniques, such as infrared inspections, can reduce the risks associated to the hazards of electricity (Knowledge, basic level)

57) The participants can **describe** how to perform an infrared inspection to reduce the risk of injury related to working around electricity (Knowledge, basic level)

The instructor shall:

4.9.1 Present the reasons why non-contact techniques such as infrared inspections can reduce the risks associated to the hazards of electricity

4.9.2 Present how to perform an infrared inspection in a safe manner

4.9.3 Facilitate a learning activity about why non-contact techniques, such as infrared inspections, can reduce the risks associated to the hazards of electricity and how to perform an infrared inspection in a safe manner

The participants shall:

4.9.4 Engage in the learning activity and share understandings about why non-contact techniques, such as infrared inspections, can reduce the risks associated to the hazards of electricity and how to perform an infrared inspection in a safe manner

ELEMENT 4.10 - ARC FLASH

Learning objectives:

58) The participants can **describe** the hazard of arc flash in a WTG environment (Knowledge, basic level)

59) The participants can **describe** typical injuries arising from electrical shocks and arc flash and how to reduce the risk of these typical injuries (Knowledge, basic level)

60) The participants **show interest** in reducing the risk of typical injuries arising from electrical shocks and arc flash (Ability, basic level)

The instructor shall:

4.10.1 Lead a discussion about the hazard of arc flash in a WTG environment

4.10.2 Facilitate in involving learning activity with the participants such as scenario-based questions about typical injuries arising from electrical shocks and arc flash and how to reduce the risk of typical injuries arising from electrical shocks and arc flash:

Note *Examples of how to reduce the risk of typical injuries arising from electrical shocks and arc flash are:*

a. *do not re-energise circuits that have tripped without making sure that it is safe*

b. *secure metallic parts, so they do not fall into a circuit*

c. *de-energise circuits below the working area (not only where you are going to be working)*

d. *making live tests with a faulty meter*

Note *An example of how to facilitate this learning activity on reducing the risk of typical injuries arising from electrical shocks and arc flash could look like this:*

a. *assign the participants into groups (maximum of 4 participants per group)*

b. *share a (text-based) scenario e.g., from Toolbox.org with the groups:*

b.i *a technician was replacing a 480 Volt electrical breaker*

b.ii *it had been isolated, removed, and replaced with a higher rated breaker*

b.iii *the new breaker had been energised and voltage checked with an adequate measuring equipment*

b.iv *while attempting to check phase sequence, an arc flash occurred*

b.v *the technician was holding the instrument test leads to the terminals of the breaker at the time of the incident*

b.vi *he suffered injuries and second-degree burns*

c. *Ask the participants to discuss in their group:*

c.i *why did this happen?*

c.ii *what could be learned from this?*

c.iii *what other actions could have been taken to prevent this?*

d. *Encourage the participants to ask themselves and their colleagues (when working)*

d.i how can something like this happen here?

d.ii how can we better plan the work so something like this doesn't happen?

d.iii what precautions have we put in place to:

4.10.2.d.iii.1. reduce the likelihood of arc flash or other events

4.10.2.d.iii.2. reduce the severity and consequences of arc flash or other events?

The participants shall:

4.10.3 Engage in discussions and share understandings about the hazard of arc flash

4.10.4 Engage in the learning activity and share understandings and attitudes about:

a. typical injuries arising from electrical shocks and arc flash

b. how to reduce the risk of typical injuries arising from electrical shocks and arc flash

LESSON 5 - ELECTRICALLY SAFE WORKING CONDITIONS

80 min.

The aim of this lesson is to enable the participants to determine when and how to establish an electrically safe work condition and enable others to perform work tasks as safely as possible while in the vicinity of electricity in the wind industry.

After successfully completing this lesson of the Electrical Safety Module, participants can:

61) **Act independently** in determining when and how to establish an electrically safe work condition (Ability, intermediate level)

ELEMENT 5.1 - TREATING ALL ELECTRICAL EQUIPMENT AS LIVE UNTIL AN ELECTRICALLY SAFE WORK CONDITION HAS BEEN ESTABLISHED

Learning objectives:

62) The participants can **explain** the importance of treating all electrical equipment as live until an electrically safe work condition has been established (Knowledge, intermediate level)

63) The participants **show interest** in always treating all electrical equipment as live until an electrically safe work condition has been established (Ability, basic level)

The instructor shall:

5.1.1 Lead a discussion with the participants about the importance of treating all electrical equipment as live until an electrically safe work condition has been established

The participants shall:

5.1.2 Engage in the discussion and share their experiences and understandings about the reasons for treating all electrical equipment as live until an electrically safe work condition has been established

ELEMENT 5.2 - WHEN TO ESTABLISH AN ELECTRICALLY SAFE WORKING CONDITION

Learning objectives:

64) The participants can **explain** the importance of establishing an electrically safe work condition (Knowledge, intermediate level)

65) The participants can **explain** when to establish an electrically safe work condition (Knowledge, intermediate level)

The instructor shall:

5.2.1 Facilitate a learning activity such as asking scenario-based questions or leading a discussion about the importance of establishing an electrically safe work condition:

a. brainstorming on what could go wrong if you open a breaker or an isolation and start working on the components supplied from it?

b. possibilities that could happened and could be covered in the learning activity:

b.i selection of the wrong breaker

b.ii the breaker is not really isolating

b.iii someone else closes the breaker

b.iv stored energy present

b.v backup system

b.vi faulty or deranged equipment

b.vii remote access

b.viii timers

5.2.2 Present when to establish an electrically safe work condition i.e. before entering or whenever someone has to enter the Limited Approach Boundary to do a task, an electrically safe work condition has to be established. Exceptions to this could be:

a. switching

b. diagnosing and testing

c. visual inspection (as far as we are not entering restricted approach boundary)

5.2.3 Present examples of hazardous situations or scenarios in a WTG environment and facilitate practice for the participants in analysing and answering when and why an electrically safe work condition has to be established

Note *Please emphasise that participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answers to the examples could change depending on regional/company/WTG model rules*

5.2.4 Give constructive feedback to the participants throughout the activities of this element

The participants shall:

5.2.5 Engage above group discussion about the importance of establishing an electrically safe work condition

5.2.6 Engage in the activities and practise:

a. analysing examples of hazardous situations or scenarios in a WTG environment

b. sharing answers about when and why an electrically safe work condition must be established

ELEMENT 5.3 - HOW TO ESTABLISH AN ELECTRICALLY SAFE WORKING CONDITION

Learning objective:

66) The participants can **explain** the main steps of establishing an electrically safe work condition (Knowledge, intermediate level)

The instructor shall:

5.3.1 Explain and demonstrate example(s) of how to establish an electrically safe work condition. The steps to establishing a safe work condition are:

a. determine all supplies into the boundary

b. interrupt the load current

c. disconnect the equipment

d. discharge stored energy (if required)

e. visually verify

f. apply Lockout-Tagout (needs to be performed by a (Safe Isolation) Authorised Person)

g. test for absence of voltage in all isolations

h. test for absence of voltage in the working area according to the approach boundaries

i. ground the conductors (if required)

5.3.2 Ask the participants involving questions about the steps to establishing a safe work condition e.g.:

a. what steps were performed?

b. how was each step performed? For example, ask the participants to re-state or summarise each step in their own words

c. why was each step performed? What is the justification for each step?

d. why were the steps sequenced in this way? "This sequence of steps is correct because…."

Note *Please emphasise that participants should always comply with company specific rules and procedures along with national and regional legislation. This means that how to establish an electrically safe work condition could change depending on regional/company/WTG model rules*

5.3.3 Give constructive feedback to the participants´ explanations about the steps to establishing a safe work condition

The participants shall:

5.3.4 Engage in answering the questions and share understandings about the steps to establishing a safe work condition

LESSON 6 - TESTING AND ISOLATION

105 min.

The aim of the lesson is to enable participants to perform isolations and absence of voltage testing to carry out specific electrical tasks so enabling other people to work safely on low voltage electrical systems.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

67) **Act independently** in safely performing isolations and absence of voltage testing (Ability, intermediate level)

ELEMENT 6.1 - ELECTRICAL MEASUREMENT EQUIPMENT

Learning objectives:

68) The participants can **describe** the reasons why electrical measurement equipment needs to be maintained, and approved (Knowledge, basic level)

69) The participants can **describe** why electrical measurement equipment need to be company approved (Knowledge, basic level)

70) The participants can **describe** that electrical measurement equipment needs to be approved for a given task (Knowledge, basic level)

71) The participants can **explain** the requirements for tools to be used for testing for the absence of voltage (Knowledge, intermediate level)

72) The participants **show interest** in only using electrical measurement equipment that is maintained, approved, and lives up to the applicable requirements (Ability, basic level)

73) The participants can **explain** the hazards of using a multimeter for absence of voltage testing and how to reduce the associated risks (Knowledge, intermediate level)

74) The participants can **solve** how to reduce the associated risk when using a multimeter for absence of voltage testing (Ability, basic level)

75) The participants can **discuss** the advantages of voltage testing with a two-pole tester (Knowledge, intermediate level)

76) The participants can **explain** the voltage rating and category (e.g., 600 V / Cat. IV) for electrical measurement equipment (Knowledge, intermediate level)

77) The participants can **select** a voltage detector/ electrical measurement equipment appropriate for measuring voltage in a given point of a circuit (Skills, advanced level)

78) The participants can **perform** pre-use check of the electrical measurement equipment (Skills, intermediate level)

79) The participants can **take responsibility** for selecting and checking the required electrical measurement equipment for a given task (Ability, intermediate level)

The instructor shall:

6.1.1 Lead discussions with the participants about:

a. the reasons why electrical measurement equipment needs to be maintained and approved

b. why electrical measurement equipment needs to be company approved

c. why electrical measurement equipment needs to be approved for a given task

6.1.2 Facilitate a learning activity such as a group discussion with the participants and give constructive feedback to the participants´ group discussions about the requirements for tools used for testing the absence of voltage:

a. have limited functionality and have fixed test leads

Or;

b. be multimeters with an audible alert function to warm the user if the meter function selector and test leads positions are not compatible

Note *Test probes must be selected to match the physical requirements of the test point and be in accordance with local electrical regulatory requirements*

Non-contact voltage detectors are for use only with non-contact voltage portals or for double checking that the lockout boundary is in an Electrically Safe Work Condition

Non-contact voltage detectors are not allowed for 'test before touch' verification

Note *The above requirements for tools to be used for testing for the absence of voltage is considered best practice, but please emphasise to the participants that these requirements could vary between companies based on specific company rules and local legislation*

6.1.3 Show examples of the hazards of using a multimeter for absence of voltage testing and demonstrate how to reduce the associated risks of these hazards

6.1.4 Facilitate a learning activity with the participants about the hazards of using a multimeter for absence of voltage testing and how to reduce the associated risks of these hazards

6.1.5 Facilitate a learning activity with the participants about the advantages of voltage testing with a two-pole tester

6.1.6 Present the voltage rating and category (e.g., 600 V / Cat. IV) for electrical measurement equipment

6.1.7 Ask the participants involving questions about the voltage rating and category (e.g., 600 V / Cat. IV) for electrical measurement equipment

6.1.8 Facilitate exercises for participants in how to select a voltage detector appropriate for measuring voltage at a given point in a circuit and give constructive feedback throughout this practice

6.1.9 Facilitate exercises for participants in performing pre-use check of the electrical measurement equipment and give constructive feedback to the participants throughout this practice

The participants shall:

6.1.10 Engage in discussions and share understandings about:

a. the reasons why electrical measurement equipment needs to be maintained and approved

b. why electrical measurement equipment needs to be company approved

c. why electrical measurement equipment needs to be approved for a given task

6.1.11 Engage in the group discussions and share understandings about the requirements for tools to be used for testing for the absence of voltage

6.1.12 Engage in the group discussions and share understandings about the hazards of using a multimeter for absence of voltage testing and how to reduce the associated risks of these hazards

6.1.13 Engage in the involving learning activity and share understandings about the advantages of voltage testing with a two-pole tester

6.1.14 Engage in answering questions and share understandings about the voltage rating and category (e.g. 600 V / Cat. IV) for electrical measurement equipment

6.1.15 Engage in the exercises and practise selecting a voltage detector appropriate for measuring voltage at a given point in a circuit

6.1.16 Engage in exercises and practise performing pre-use check of the electrical measurement equipment

ELEMENT 6.2 - 3-POINT TEST METHOD TO PROVE THE ABSENCE OF VOLTAGE

Learning objectives:

80) The participants can **explain** why the 3-point test method is used to prove absence of voltage (Knowledge, intermediate level)

81) The participants can **apply** the 3-point test method to prove the absence of voltage (Skills, intermediate level)

The instructor shall:

6.2.1 Facilitate a short activity which promotes the participants reflection (e.g. through knowledge sharing, discussions, and competitions) on why the 3-point test method is used to prove absence of voltage

6.2.2 Facilitate exercise(s) that enables the participants to practise proving the absence of voltage using the 3-point test method

6.2.3 Give constructive feedback to the participants´ application of the 3-point test method to prove the absence of voltage

The participants shall:

6.2.4 Engage in the activity and share understandings about why the 3-point test method is used to prove absence of voltage

6.2.5 Engage in the exercise(s) and practise applying the 3-point test method to prove the absence of voltage

ELEMENT 6.3 - ISOLATION OF ELECTRICAL EQUIPMENT

Learning objective:

82) The participants can **perform** isolation of electrical equipment using electrical diagrams in a correct and safe manner in accordance with the safety precautions in this training standard (Skills, intermediate level)

The instructor shall:

6.3.1 Facilitate exercise(s) that enables the participants to practise isolating electrical equipment using electrical diagrams in a correct and safe manner in accordance with the safety precautions in this training standard

6.3.2 Give constructive feedback to the participants´ isolation of electrical equipment using electrical diagrams in a correct and safe manner

The participants shall:

6.3.3 Practise isolating electrical equipment using electrical diagrams in a correct and safe manner

LESSON 7 - STORED ENERGY

60 min.

The aim of this lesson is to enable the participants to be able to act correctly and safely in relation to handling batteries and capacitors.

After successfully completing this lesson of the Electrical Safety Module, participants can:

83) **Act independently** in handling batteries and capacitors correctly and safely (Ability, intermediate level)

ELEMENT 7.1 - HAZARDS RELATED TO BATTERIES AND CAPACITORS

Learning objectives:

84) The participants can **explain** typical signs of distress and leakage found in batteries and capacitors and how to identify these signs (Knowledge, intermediate level)

85) The participants can **discuss** the hazards related to loose batteries and capacitors and ways to reduce the associated risks to these hazards (Knowledge, intermediate level)

86) The participants can **discuss** the hazards of improper battery disposal and ways to reduce the associated risks to these hazards (Knowledge, intermediate level)

87) The participants can **discuss** the importance of disposing of defective batteries and capacitors in accordance with local legislation (Knowledge, intermediate level)

88) The participants can **discuss** the hazards of short circuit in relation to batteries and capacitors and ways to reduce the associated risks to these hazards (Knowledge, intermediate level)

The instructor shall:

7.1.1 Present examples of situations or scenarios from a WTG environment about the hazards from batteries and capacitors (fatality or major injury, explosion, fires, electric shock, eye injuries):

7.1.2 Facilitate practice for the participants in identifying the hazards from batteries and capacitors in a WTG environment

Note *Alternative learning activity to above: lead a brainstorm with participants about battery and capacitor hazards*

7.1.3 Show examples (e.g. pictures or videos) of typical signs of distress and leakage found in batteries and capacitors

7.1.4 Facilitate practice for the participants in identifying typical signs of distress and leakage found in batteries and capacitors and ask the participants involving questions throughout this practice

7.1.5 Facilitate involving learning activities with the participants such as group discussions or scenario-based questions on:

a. the hazards related to transporting batteries and capacitors and ways to reduce the associated risks to these hazards

b. the hazards of improper battery disposal and ways to reduce the associated risks to these hazards

c. the importance of disposing of defective batteries and capacitors in accordance with local legislation

d. the hazards of short circuit in relation to batteries and capacitors and ways to reduce the associated risks to these hazards

7.1.6 Give constructive feedback to the participants' performance throughout the learning activities of this element

The participants shall:

7.1.7 Engage in the practice or the brainstorm and share understandings about battery and capacitor hazards

7.1.8 Engage in practice and answer questions to share their understanding of typical signs of distress and leakage found in batteries and capacitors

7.1.9 Engage in the learning activities and share their understandings about:

a. the hazards related to loose batteries and capacitors and ways to reduce the associated risks to these hazards

b. the hazards of improper battery disposal and ways to reduce the associated risks to these hazards

c. the importance of disposing of defective batteries and capacitors in accordance with local legislation

d. the hazards of short circuit in relation to batteries and capacitors and ways to reduce the associated risks to these hazards

ELEMENT 7.2 - TASK-BASED TRAINING FOR HANDLING BATTERIES AND CAPACITORS IN A SAFE MANNER

Learning objectives:

89) The participants can **act independently** in handling batteries and capacitors in a safe manner (Ability, intermediate level)

90) The participants can **act independently** in selecting and using appropriately insulated tools for working on batteries and capacitors (Ability, intermediate level)

The instructor shall:

7.2.1 Show and demonstrate examples the safe handling of batteries and capacitors. The practice will include isolation of energy to batteries and capacitors mounted on a live circuit, replacement of a battery and a capacitor and disposal of the removed battery and capacitor, all in accordance to points 'a to e' (below):

a. when connected to a circuit, always visually inspect the batteries and capacitors before starting to work on them; look for signs of distress and leakage

b. when removing batteries from a circuit and during transportation, take precautions to guard battery terminals against short circuiting by covering the terminals with insulating tape or insulating mats

c. when installing batteries and capacitors to a circuit, ensure all batteries and capacitors are correctly and securely mounted

d. ensure the batteries and capacitors are wired with the correct polarity, are as per the wiring diagrams and that all terminals are tight

e. defective batteries and capacitors must be disposed of in accordance with local legislation

7.2.2 Explain the safety procedures in the training area

7.2.3 Facilitate participants' practice through relevant training tasks or scenarios on the safe handling of batteries and capacitors

7.2.4 Show and demonstrate the selection and use of appropriately insulated tools for working on batteries and capacitors:

a. insulated tools approved for the rated voltage must be used when working around live exposed conductors

7.2.5 Facilitate participants' practice through relevant training task(s) or scenario(s) in selecting and use appropriately insulated tools for working on batteries

7.2.6 Give constructive feedback or facilitate peer feedback the participants' performance throughout the training tasks or scenario

The participants shall:

7.2.7 Practise handling batteries and capacitors in a safe manner through the training tasks or scenarios

7.2.8 Practise selecting and using appropriately insulated tools for working on batteries and capacitors

LESSON 8 - HAZARDOUS ELECTRICAL SAFETY SCENARIOS

180 min.

The aim of the lesson is to enable the participants to support and care for themselves and others while working in the vicinity of electricity in a variety of scenarios in wind turbine work environments. To the greatest possible extent, the scenarios must challenge the participants to take responsibility for work with electricity or in its vicinity is performed safely.

After successfully completing this lesson of the CoHE Electrical Safety Module, participants can:

91) **Act independently** in selecting and using electrical safe working practices to reduce the associated risks of the electrical hazards related to working around electricity in a WTG environment (Ability, intermediate level)

92) **Act independently** in treating all electrical equipment as live until an electrically safe work condition has been established (Ability, intermediate level)

93) **Act independently** and safely in relation to the hazards posed by similar looking or adjacent energised equipment that is in reach (Ability, intermediate level)

94) **Take responsibility** for establishing an electrically safe work condition (Ability, intermediate level)

95) **Act independently** in following and completing safety documentation such as permits (Ability, intermediate level)

The instructor shall:

8.1.1 Explain safety procedures in the training area

8.1.2 Facilitate scenario-based practice, where each participant must practise and demonstrate the following in relevant scenarios with varying degree of complexity and fading instructor guidance and support:

a. preparing for and planning the work

b. following and completing safety documentation such as permits

c. using electrical safe working practices to reduce the associated risks to the hazards related to working around electricity in a WTG environment

Note *The instructor shall, as a minimum, ensure that each of the participants practise the applicable following electrical safe working practices during the scenario-based training:*

1) working in accordance with an approved work instruction

2) using electrical diagrams

3) minimum electrical PPE and prohibited articles

4) approach boundaries

5) alertness

6) blind reaching prohibited

7) illumination

8) alerting techniques

9) body positioning

10) job briefing / pre-task briefing

11) good housekeeping

12) deranged equipment

a. treating all electrical equipment as live until an electrically safe work condition has been established

b. acting independently and safely in relation to the hazards posed by similar looking or adjacent energised equipment that is in reach

c. establishing an electrically safe work condition

8.1.3 Give constructive feedback or facilitate peer feedback throughout the scenario(s)

The participants shall:

8.1.4 Engage in scenarios and practise and demonstrate:

a. using safe electrical working practices to reduce the associated risks to the hazards related to working around electricity

b. treating all electrical equipment as live until an electrically safe work condition has been established

c. acting independently and safely in relation to the hazards posed by similar looking or adjacent energised equipment that is in reach

d. establishing an electrically safe work condition

8.1.5 Think on the received feedback and use the feedback to improve their performance

Note *Relevant electrical measuring equipment and electrical PPE shall be available and used at all times during the scenario-based training*

LESSON 9 - TRAINING REVIEW

10 min.

The aim of this lesson is to enable the participants to reflect on and process their learning outcome and key takeaways from the module, aiming to achieve a high learning transfer from the module to their way of working.

ELEMENT 9.1 - TRAINING REVIEW

The instructor shall:

9.1.1 Re-present the overall aims and learning objectives of the module for the participants' comparison of their learning outcome and the achievement of their previously stated expectations for the module

The participants shall:

9.1.2 Reflect on their learning outcome and key take-aways from the CoHE Electrical Safety Module, aiming to achieve a high learning transfer from the module to their way of working by means of e.g.:

a. group discussions or walk and talk

b. questions and answers in class, or where suitable

Note *The instructor may additionally conduct a local evaluation of the training*

ELEMENT 9.2 - FEEDBACK SESSION

The instructor shall:

9.2.1 Give overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training review session

9.2.2 Encourage the participants to examine and become aware of which specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualise and enhance learning transfer)

9.2.3 Encourage the participants to discuss after the module completion with colleagues about how the CoHE Electrical Safety Module's methods and techniques are similar or different to the local specific conditions identified

GLOBAL WIND ORGANISATION

Pressure Fluid Safety Module

(PFS)

12. MODULE 3 – COHE PRESSURE FLUID SAFETY MODULE

12.1 Aims and Objectives of the CoHE Pressure Fluid Safety Module

The aim of GWO's CoHE Pressure Fluid Safety training module is to enable the participants to support and care for themselves and others while working with and in the vicinity of pressure fluids in the wind industry and to perform assigned tasks safely and efficiently.

Upon successful completion of GWO's CoHE Pressure Fluid Safety Module, the participants will be able to reduce the associated risks to and work safely with pressure fluid tasks in the wind industry by being able to select the correct and required PPE for working with hydraulic fluids and fluids under pressure, using safe work practices and establishing a safe work condition when working with and in the vicinity of pressure fluids in the wind industry.

Overall learning objectives for the CoHE Pressure Fluid Safety Module, the participants can:

1) **Take responsibility** for their own and others safety while working with and in the vicinity of pressure fluids in the wind industry (Ability, intermediate level)

2) **Take responsibility** for correctly completing a simple permit to work from beginning to end as the person responsible for establishing a safe work condition (Ability, intermediate level)

Note *The GWO CoHE Pressure Fluid Safety Module is aimed towards improving the participants´ ability to "work safely" with pressure fluids. This means that the CoHE Pressure Fluid Safety Module is not aimed at improving candidates´ technical knowledge, skills, and abilities regarding pressure fluids. Participants should already possess these technical knowledge, skills, and abilities before attending the module. Similarly, it is not the intention of the GWO CoHE standard to promote the acquisition of advanced knowledge, such as troubleshooting.*

12.2 Duration of the CoHE Pressure Fluid Safety Module

The total contact time for completing this module is 7 hours and 0 minutes. This is based on the times given in the module timetable.

The training provider must not exceed the times per day given in table 12-2 below.

	Maximum Duration Per Day
Contact time	8 hours
Total training day	10 hours

Table 12.2.1 - Maximum durations for training day

Note *Contact time includes delivery of course lesson contents, practical exercises and activities directly related to these. The total training day includes contact time, meals and breaks and travel between training sites (where applicable)*

12.3 CoHE Pressure Fluid Safety Module - Instructor to Participant Ratio

The table below shows the maximum number of participants permitted (per instructor) in an instructor-led training for the Pressure Fluid Safety Module:

Module	Instructor to Participant Ratio
CoHE Pressure Fluid Safety Module	1:8

Table 12.3.1 - GWO CoHE Pressure Fluid Safety Module instructor to participant ratio

12.4 Equipment for CoHE Pressure Fluid Safety Module

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements of the country where the training is taking place.

12.5 CoHE Pressure Fluid Safety Module Timetable

The order in which elements of this module are delivered may vary according to the didactical choices of the delivering training provider.

The delivery of this module must comply with the requirements described in the GWO Requirements for Training.

Lesson	Element		Duration
1. **Introduction to the training**	1.1	Safety instructions and emergency procedures	
	1.2	Facilities	
	1.3	Introduction	
	1.4	Scope and main learning objectives	
	1.5	Ongoing assessments (participants assessment form)	
	1.6	Motivation	
	1.7	Human factors	
		TOTAL	20 min.
2. **Qualified Pressure fluids person – requirements and role**	2.1	Role and responsibilities of a qualified pressure fluids person	

			TOTAL	30 min.
3.	Pressure fluid hazards	3.1	Hazards of fluids under pressure	
		3.2	Trapped pressure and stored energy in a pressure system	
		3.3	Circumstances in which oil injection is possible into the human body	
		3.4	High temperature fluids in pressure systems	
		3.5	Hazards with taking an oil sample	
		3.6	Hazards related to pre-charging an accumulator	
		3.7	Stored energy hazards related to pre-charge pressure in an accumulator	
			TOTAL	75 min.
4.	PPE	4.1	Hydraulic fluids and fluids under pressure PPE	
			TOTAL	30 min.
5.	Safe Work Practices	5.1	Work instructions	
		5.2	Pre-task briefing	
		5.3	Pre-use check on pressure fluid test equipment and hoses	
		5.4	Test for the absence of pressure	
		5.5	Safe isolation and safe dissipation of pressure in a pressure system	
		5.6	Component replacement in pressure systems	
		5.7	Searching for leaks in pressurised system safely	
			TOTAL	90 min.
6.	Response to pressure fluid incidents	6.1	Response to pressure fluid incidents	
			TOTAL	45 min.
7.	Hazardous pressure fluid scenarios	7.1	Scenarios	
			TOTAL	120 min.
8.	Training review	8.1	Training review	
		8.2	Feedback session	
			TOTAL	10 min.
			GRAND TOTAL	420 min.

Table 12.5.1 – GWO High Pressure Fluid Safety Module timetable

12.6 Detailed Description of the Pressure Fluid Safety Module

LESSON 1 - INTRODUCTON TO THE TRAINING

20 min.

The aim of this lesson is for the participants to become motivated and to engage in the CoHE Pressure Fluid Safety Module safely at a training facility, while recognising what is expected of them during the training.

After successfully completing this lesson of the CoHE Pressure Fluid Safety Module, participants can:

1) **Recognise** the course content and the facilities involved to ensure a clear understanding of what is expected during the course (Knowledge, intermediate level)

2) **Name** and point out local emergency procedures and facilities (Knowledge, basic level)

3) **Discuss** relevant human factors and the implications of these (Knowledge, basic level)

ELEMENT 1.1 - SAFETY INSTRUTIONS AND EMERGENCY PROCEDURES

Learning objective:

4) The participants **show interest** in the safety and emergency procedures (Ability, basic level)

The instructor shall:

1.1.1 Explain and ask involving questions aiming at

a. safety instructions according to internal procedures

b. emergency procedures and emergency exit in the areas where the participants can be expected to be located during the course

c. site specific chemical safety rules and instructions

The participants shall:

1.1.2 Engage in answering questions raised in the above points

ELEMENT 1.2 - FACILITIES

Learning objective:

5) The participants can **recognise** the facilities at the training location (Knowledge, basic level)

The instructor shall:

1.2.1 Present general description of the facilities at the training location (administration, dining area, restrooms, toilets, etc)

1.2.2 Alternative activity: lead a tour and point out facilities

The participants shall:

1.2.3 Note relevant facilities and ask question when in doubt about facilities

ELEMENT 1.3 - INTRODUCTION

Learning objective:

6) The participants **show interest** in fellow participants and the programme of the Pressure Fluid Safety Module (ability, basic level)

The instructor shall:

1.3.1 Explain and ask involving questions about the programme of the CoHE Pressure Fluid Safety Module including breaks and mealtimes

1.3.2 Give a short introduction of themselves including their backgrounds as instructors

1.3.3 Ask for participants' expectations for the training and on their learning outcome

The participants shall:

1.3.4 Give a short introduction on themselves, including their job function, and share their expectations of the training and learning outcome expectation for the training

ELEMENT 1.4 - SCOPE AND MAIN LEARNING OBJECTIVES

Learning objective:

7) The participants can **recognise** the scope and main objectives of the CoHE Pressure Fluid Safety Module (Knowledge, basic level)

The instructor shall:

1.4.1 Present the scope and main objectives of the Pressure Fluid Safety Module through a challenge, a scenario or "your goal with this module, should you choose to accept is…"-message

Note *A suggested learning activity could be to share stories, present scenarios or personal experiences that show the importance of being able to support and care for themselves and others while working with, and in the vicinity of, pressure fluids in the wind industry and to perform assigned tasks safely and efficiently (shows what is in it for the participants)*

Note *Where possible avoid using "learning objectives – PowerPoint slide(s)". Instead use stories, examples or personal experiences that shows the importance of being able to support and care for oneself and others: while working with, and in the vicinity of, pressure fluid in the wind industry; to perform assigned tasks safely and efficiently; and the importance of the CoHE Pressure Fluid Safety Module*

Note *Please visit https://toolbox.energyinst.org/ for scenarios, incident lessons and safety information shared by global energy companies*

1.4.2 Involve participants through questions about the participants' understandings and individual experiences about the CoHE Pressure Fluid Safety Module

The participants shall:

1.4.3 Engage in answering questions and share experiences with Pressure Fluid Safety Module

ELEMENT 1.5 - ONGOING ASSESSMENTS (PARTICIPANTS ASSESSMENT FORM)

Learning objective:

8) The participants can **recognise** the assessment procedure and the aim of the ongoing assessment (Knowledge, basic level)

The instructor shall:

1.5.1 Explain the reasons for the ongoing assessment

1.5.2 Explain the layout of the GWO participants assessment form and how it will be used

1.5.3 Ask for the participants' thoughts on the assessment procedure presented

The participants shall:

1.5.4 Engage in discussions on the assessment procedure and ask questions when in doubt in relation to the assessment procedure

ELEMENT 1.6 - MOTIVATION

Learning objective:

9) The participants **show interest** in engaging in the learning activities (Ability, basic level)

The instructor shall:

1.6.1 Explain and lead a discussion on:

a. the importance of personal involvement in the course

b. the need for Pressure Fluid Safety for a Qualified Person Module when working in the wind industry

The participants shall:

1.6.2 Engage themselves in discussions about the importance of personal involvement in the course and the need for pressure fluid safety for a Qualified Person

ELEMENT 1.7 - HUMAN FACTORS

The aim of the element is to draw the participant's attention to how human behaviour and taking responsibility influences a safe work environment, and to prepare for the continued focus on human factors during practical training and exercises.

Learning objectives:

10) Participants can **discuss** the relevant human factors and explain the implications of these (Knowledge, intermediate level)

11) Participants **show interest** and willingness to focus on human factors during the following practical exercises (Ability, basic level)

The instructor shall:

1.7.1 Present how human factors influence accidents in the wind industry (relevant statistics may be given)

1.7.2 Lead a discussion about the role of the individual in improving human performance and how this improvement can benefit safety when working with pressure fluid systems within the wind industry, by considering factors like:

a. attention and perception

b. group behaviour and peer pressure

c. weather conditions

d. weather delays

e. noise levels

f. site layout and housekeeping

g. fitness and health

h. domestic and work-related stress

i. workload (both overload and underload)

j. fatigue

k. time pressure and deadlines

l. alcohol, medication, and substance abuse

m. confusing labelling and equipment identification

n. procedure use and place keeping

o. use of peer checks with independent and concurrent verification

p. pre-planning and staging of the workplace

The participants shall:

1.7.3 Engage in discussions and share experiences of how human factors influence accidents in the wind industry

1.7.4 Engage in and reflect on received feedback and take responsibility for their own performance and development during the training

LESSON 2 - QUALIFIED PRESSURE FLUIDS PERSON -REQUIREMENTS AND ROLE

30 min.

The aim of this lesson is to enable the participants to ensure the safety of other workers by being able to fulfil the requirements and role of a qualified pressure fluids person in the wind industry.

After successfully completing this lesson of the Pressure Fluid Safety Module, participants can:

12) **Solve** the challenge of how to fulfil the responsibilities of a Qualified Pressure Fluids Person (Ability, basic level)

ELEMENT 2.1 - ROLE AND RESPONSIBILITIES OF A QUALIFIED PRESSURE FLUIDS PERSON

Learning objectives:

13) The participants can **explain** the role and responsibilities of a Qualified Pressure Fluids Person (requirements & responsibilities) (Knowledge, intermediate level)

14) The participants **show interest** in never initiating work without having obtained company specific or site-specific safety documentation and work instructions (Ability, basic level)

15) The participants can **explain** what a Qualified Pressure Fluids Person should do in a given situation to fulfil the responsibilities of a Qualified Pressure Fluids Person (Knowledge, intermediate level)

The instructor shall:

2.1.1 Lead a brainstorm with the participants about the Qualified Pressure Fluids Person role and requirements in the wind industry to give an overview of:

a. training requirements

b. experience requirements

c. responsibilities

2.1.2 Show examples of what a Qualified Pressure Fluids Person can, and cannot, do

2.1.3 Facilitate an exercise with examples of different situations or branching scenarios in a WTG environment where the participants have to practise deciding what a Qualified Pressure Fluids Person should do in the given situation:

a. for example, what can a Qualified Pressure Fluids Person do compared to a "ordinary person" in these situations? (e.g., supervising an ordinary person or establishing a safe working condition for others to work within. For examples of more responsibilities, please refer to section 3.3 Pressure Fluid Safety Module and the role of a Qualified Pressure Fluid Person) and,

b. what are the reasons for these role boundaries?

2.1.4 Give constructive feedback to the participants' actions/answers about the role and responsibilities of a Qualified Pressure Fluids Person and explain the reasons why the actions/answers were correct, or incorrect, and show the realistic consequences of a correct, or incorrect, action/answer to each situation to provide the participants with a sense of the real world consequences

Note *Please emphasise that participants should always comply with company specific rules and procedures along with national and regional legislation. This means that the answers to the situations or scenarios could change depending on regional/company/WTG model rules*

The participants shall:

2.1.5 Engage in the brainstorm and share understandings about Qualified Pressure Fluids Person role and requirements

2.1.6 Engage in the exercise and practise deciding what a Qualified Pressure Fluids Person should do in the situations or branching scenarios

LESSON 3 - PRESSURE FLUID HAZARDS

75 min.

The aim of this lesson is to enable the participants to reduce the associated risks to the hazards posed by pressure fluids and thereby reduce the risk of injury for themselves and others working in a WTG environment.

After successfully completing this lesson of the Pressure Fluid Safety Module, participants can:

16) **Solve** the challenge of how to reduce the associated risks and avoid the hazards of pressure fluids when working in a WTG environment (ability, basic level)

ELEMENT 3.1 - HAZARDS OF FLUIDS UNDER PRESSURE

Learning objectives:

17) The participants can **explain** the hazards of fluids under pressure in a WTG environment (Knowledge, intermediate level)

18) The participants can **assess** situations with hazards of fluids under pressure in a WTG environment and decide on relevant and responsible actions and/or mitigation measures to reduce the risk of injury (Knowledge, advanced level)

19) The participants **show interest** in avoiding the hazards of fluids under pressure in a WTG environment (Ability, basic level)

The instructor shall:

3.1.1 Facilitate involving learning activities such as asking the participants scenario-based questions or leading discussions with the participants about:

a. The pressure fluid hazards that has the highest risk of injury

b. Examples of actions to take and/or mitigation measures to reduce the risk of injury with these hazards

Note *Examples of pressure fluid hazards (injection hazards will be covered later on):*

a. injection

b. stored energy

c. unexpected movement

d. heat and burns through contact with hot oils

e. asphyxiation

f. eye injuries

g. freeze

3.1.2 Present examples to the participants of relevant situations or scenarios from a WTG environment with hazards of fluids under pressure

3.1.3 Facilitate practice for the participants in identifying these hazards and deciding on relevant actions and/or mitigation measures to avoid these hazards of fluids under pressure

3.1.4 Give constructive feedback to the participants´ performance throughout the activities in this element

The participants shall:

3.1.5 Engage in the learning activities and share understandings about the hazards of fluids under pressure

3.1.6 Engage in identifying the hazards of fluids under pressure in the examples and share understandings about mitigation measures to avoid the hazards of fluids under pressure

ELEMENT 3.2 - TRAPPED PRESSURE AND STORED ENERGY IN A PRESSURE SYSTEM

Learning objectives:

20) The participants can **explain** the hazards of trapped pressure and stored energy in a pressure system in a WTG environment (Knowledge, intermediate level)

21) The participants can **explain** how to handle the hazards of, and mitigation measures, for trapped pressure and stored energy in a pressure system in a WTG environment (Knowledge, intermediate level)

The instructor shall:

3.2.1 Present examples to the participants of situations or scenarios in a WTG environment with hazards of trapped pressure and stored energy in a pressure system (e.g. pressured trapped behind valves or created by temperature changes)

3.2.2 Facilitate practice for the participants to identifying the hazards of trapped pressure and stored energy in a pressure system in the situations or scenarios from a WTG environment

3.2.3 Ask the participants key questions about how to handle the hazards of, and mitigation measures for, trapped pressure and stored energy in a pressure system. Examples of mitigation measures:

a. controlled release of pressure (venting a pressure fluid system e.g. an accumulator)

b. removing load from the system (removing the force acting on a cylinder e.g. locking a blade)

3.2.4 Give constructive feedback to the participants´ identifications of and answers about the mitigation measures for the risks related to trapped pressure and stored energy in a pressure system

The participants shall:

3.2.5 Engage in identifying the hazards of trapped pressure and stored energy in a pressure system and share understandings about how to handle the hazards of and mitigation measures for risks related trapped pressure and stored energy in a pressure system

ELEMENT 3.3 - CIRCUMSTANCES IN WHICH OIL INJECTION IS POSSIBLE INTO THE HUMAN BODY

Learning objectives:

22) The participants can **explain** the circumstances in which oil injection is possible into the human body and how to prevent an oil injection from happening in a WTG environment (Knowledge, intermediate level)

23) The participants can **solve** the challenge of avoiding an oil injection from happening and avoiding circumstances where an oil injection into the human body is possible (Ability, basic level)

The instructor shall:

3.3.1 Facilitate an exercise (e.g. using pictures, videos, situations, or scenarios) where the participants must practise identifying circumstances in which oil injection is possible in a WTG environment and decide how to prevent this from happening (e.g. working on the hydraulic pitch system and when working with torque and tensioning tools)

3.3.2 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

3.3.3 Engage in the exercise and practise identifying circumstances in which oil injection is possible in a WTG environment and deciding how to prevent this from happening

3.3.4 Think about received feedback and use the feedback to improve their performance

ELEMENT 3.4 - HIGH TEMPERATURE FLUIDS IN PRESSURE SYSTEMS

Learning objectives:

24) The participants can **explain** the hazards posed by high temperature fluids in pressure systems in a WTG environment (Knowledge, intermediate level)

25) The participants can **explain** how to reduce the associated risks to high temperature fluids and burns, fire, and vapour hazards in a safe manner in a WTG environment (Knowledge, intermediate level)

The instructor shall:

3.4.1 Facilitate a learning activity such as a group discussion or lead a brainstorm with the participants about the hazards posed by high temperature fluids in pressure systems

3.4.2 Present examples of situations or scenarios in a WTG environment with hazards of high temperature fluids in pressure systems

3.4.3 Facilitate practice for the participants in identifying the hazards of high temperature fluids in pressure systems in the situations or scenarios

3.4.4 Ask the participants involving questions about how to reduce the associated risks to high temperature fluids and burns, fire, and vapour hazards in a safe manner

3.4.5 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

3.4.6 Engage in the learning activity about the hazards posed by high temperature fluids in pressure systems

3.4.7 Engage in the practice of identifying hazards of high temperature fluids in pressure systems in the situations or scenarios

3.4.8 Engage in answering questions and share understandings about the hazards posed by high temperature fluids in pressure systems: how to handle, or how to reduce, the associated risks to high temperature fluids and burns, fire, and vapour hazards

3.4.9 Think about received feedback and use the feedback to improve their performance

ELEMENT 3.5 - HAZARDS WITH TAKING AN OIL SAMPLE

Learning objective:

26) The participants can **explain** the hazards related to, and safety measures needed, when taking an oil sample from a hydraulic system (Knowledge, intermediate level)

The instructor shall:

3.5.1 Facilitate a learning activity with the participants about the hazards related to, and safety measures needed when, taking an oil sample from a hydraulic system. Examples of safety measures could be:

a. follow a manufacturers guideline e.g. an approved work instruction

b. reducing the system pressure

The participants shall:

3.5.2 Engage in the learning activity and share understandings about the hazards related to, and safety measures needed when, taking an oil sample from a hydraulic system

ELEMENT 3.6 - HAZARDS RELATED TO PRE-CHARGING AN ACCUMULATOR

Learning objective:

27) The participants can **explain** the hazards related to, and safety measures for, applying pre-charge to an accumulator in a WTG environment (Knowledge, intermediate level)

The instructor shall:

3.6.1 Present examples of situations, or scenarios, in a WTG environment with hazards related to applying pre-charge to an accumulator:

a. environment aspect (asphyxiation)

b. freeze burns from use of gases

c. unexpected movement

Note *Accumulators are part of a system that is used to move an actuator (normally a piston/cylinder like in the blades or a brake calliper) The unexpected movement refers to these actuators moving due to other external forces, like for instance with a blade, if the pressure is released from the accumulator, but the blade is not locked in place*

3.6.2 Facilitate practice for the participants in identifying the hazards related to applying pre-charge to an accumulator in the situations or scenarios

3.6.3 Ask the participants to provide answers to key questions about how to reduce the associated risks to the hazards of applying pre-charge to an accumulator in the situations or scenarios

3.6.4 Give constructive feedback to the participants´ performance throughout the activities of this element

The participants shall:

3.6.5 Engage in the practice of identifying the hazards related to applying pre-charge to an accumulator in the situations or scenarios

3.6.6 Engage in answering questions about how to reduce the associated risks to the hazards related to applying pre-charge to an accumulator in the situations or scenarios

ELEMENT 3.7 - STORED ENERGY HAZARDS RELATED TO PRE-CHARGE PRESSURE IN AN ACCUMULATOR

Learning objectives:

28) The participants can **explain** the stored energy hazards related to pre-charge pressure in an accumulator in a WTG environment (Knowledge, intermediate level)

29) The participants can **solve** the challenge of how to avoid the stored energy hazards and reduce the associated risks related to pre-charge pressure in an accumulator in a WTG environment (Ability, basic level)

The instructor shall:

3.7.1 Present examples of situations or scenarios in a WTG environment that show the stored energy hazards related to pre-charge pressure in an accumulator e.g. unexpected release of stored energy in an accumulator

3.7.2 Facilitate practice for the participants in identifying the stored energy hazards related to pre-charge pressure in an accumulator and determining how to avoid these hazards through relevant actions and/or mitigations measures in the examples of situations or scenarios (previous point)

The participants shall:

3.7.3 Engage in the practice of identifying the stored energy hazards related to pre-charge pressure in an accumulator and determining how to avoid these hazards through relevant actions and/or mitigation measures in the examples previously presented

LESSON 4 - PPE

30 min.

The aim of this lesson is to enable the participants to reduce the risk of injury for themselves and others by being able to select the correct and required PPE for working with hydraulic fluids and fluids under pressure in the wind industry.

After successfully completing this lesson of the CoHE Pressure Fluid Safety Module, participants can:

30) **Take responsibility** for selecting and using appropriate PPE for working with hydraulic fluids (Ability, intermediate level)

31) **Take responsibility** for selecting and using appropriate PPE for working with fluids under pressure (Ability, intermediate level)

ELEMENT 4.1 - HYDRAULIC FLUIDS AND FLUIDS UNDER PRESSURE PPE

Learning objectives:

32) The participants can **describe** the importance of wearing the right PPE when working with pressure fluid systems (Knowledge, basic level)

33) The participants can **describe** how to select and pre-use check the correct PPE for working with hydraulic fluids and fluids under pressure (Knowledge, basic level)

34) The participants can pre-use check and **select** the correct PPE for working with hydraulic fluids and fluids under pressure (Skills, advanced level)

The instructor shall:

4.1.1 Lead a discussion or brainstorm with the participants about the importance of wearing the right PPE (including what could the consequences be of not wearing the right PPE when working with hydraulic fluids or fluids under pressure?):

a. for working with hydraulic fluids (chemicals)

b. with fluids under pressure (injections, abrasions, and gasses)

4.1.2 Facilitate exercise(s) for the participants in practising how to select and pre-use check the correct PPE for working with hydraulic fluids and fluids under pressure including:

a. show examples of, and explain, which gloves are suitable for hydraulic work and fluids under pressure

b. which gloves are not suitable (and why) for hydraulic work and work with fluids under pressure

c. which goggles can be used for hydraulic work and the importance of wearing them

4.1.3 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

4.1.4 Engage in discussions or the brainstorm about the importance of wearing the right PPE:

a. for working with hydraulic fluids (chemicals)

b. with fluids under pressure (injections, abrasions, and gasses)

4.1.5 Engage in the exercises and practise selecting, pre-use checking and wearing the correct PPE for working with hydraulic fluids and fluids under pressure

LESSON 5 - SAFE WORK PRACTICES

90 min.

The aim of this lesson is to enable the participants to reduce the associated risks of the safety hazards posed by pressure fluids by following and using safe work practices.

After successfully completing this lesson of the Pressure Fluid Safety Module, participants can:

35) **Solve** the challenge of how to reduce the associated risks of the safety hazards posed by pressure fluids by following and using safe work practices (Ability, basic level)

Note *As far as possible, this lesson must be facilitated by the instructor in an interactive and practical way with engagement of the participants. There must also be a minimum of lecturing and the amount of detail in the explanations must be kept to what is required and no more e.g. only covering the listed elements in the pre-task briefing element 5.2 (below)*

The interactive and practical facilitation can be achieved by combining multiple safe working practices into a step-by-step demonstration(s) (worked example(s)) by the instructor of how to perform pressure fluid work tasks safely. As part of the demonstration(s), the participants must be engaged through, e.g. questions or comparison assignments. Following the demonstration(s), the participants could then be provided with guided and independent practice opportunities in how to perform pressure fluid work tasks safely using the safe working practices

ELEMENT 5.1 - WORK INSTRUCTIONS

Learning objectives:

36) The participants can **discuss** the importance of always following work instruction when working with pressure fluid systems (Knowledge, intermediate level)

37) The participants **show interest** in and willingness to always obtaining the most up to date and correct company specific work instruction before starting to work with pressure fluid systems (Ability, basic level)

The instructor shall:

5.1.1 Facilitate a learning activity, such as a group discussion, about the importance of always following a method statement or work instruction when working with pressure fluid systems

5.1.2 Facilitate a learning activity such as a group discussion about what to do when the most up to date and correct company specific work instruction has not been provided to them

Note *In the group discussions, there should be an emphasis on, if the most up to date and correct company specific work instruction has not been provided, the participants should always obtain this by e.g. contacting a site lead or company representative before starting to work with pressure fluid systems*

The participants shall:

5.1.3 Engage in a group discussion and share experiences about the importance of always following a method statement or work instruction when working with pressure fluid systems

5.1.4 Engage in a group discussion and share experiences about the importance of always obtaining the most up to date and correct company specific method statement or work instruction before initiating work with pressure fluid systems

ELEMENT 5.2 - PRE-TASK BRIEFING (ALSO KNOWN AS TOOLBOX TALKS)

Learning objectives:

38) The participants can **explain** examples of the elements that a pre-task briefing for pressure fluid work contain (Knowledge, intermediate level)

39) The participants can **discuss** the reasons for having a pre-task briefing prior to working on pressure fluid systems (Knowledge, intermediate level)

40) The participants can **perform** a pre-task briefing prior to work on a pressure fluid system (Skills, intermediate level)

41) The participants **show interest** in and a willingness to ensure that pre-task briefings (toolbox talks) are always performed prior to working on pressure fluid systems (ability, basic level)

The instructor shall:

5.2.1 Facilitate a learning activity such as group discussions with the participants about the reasons and the importance of having a pre-task briefing (also known as job briefing / toolbox talk) prior to working on pressure fluid systems

5.2.2 Emphasise that the required elements in a pre-task briefing for work on pressure fluid systems can vary between companies and that participants must always follow and seek out company specific rules for a pre-task briefing prior to working on pressure fluid systems

5.2.3 Explain and demonstrate an example of how a pre-task briefing for a common pressure fluid task, such as replacing of a hydraulic accumulator, can be performed prior to working on pressure fluid systems. Examples of a pre-task briefing could be:

a. hazards involved

b. work procedures

c. work areas (prove that the work area is safe)

d. special precautions (specific non-standard precautions to be able to perform the task i.e. precautions that are not always required)

e. energy sources controls (isolation points and how to isolate the energy source)

f. emergency response

g. PPE requirements

h. other works related

5.2.4 Ask the participants involving questions about the pre-task briefing:

a. what were the elements of the pre-task briefing?

b. can the participants restate or summarise the elements in their own words?

c. why were these elements preformed in the pre-task briefing?

d. how does this pre-task briefing relate to what the participants have already seen?

5.2.5 Facilitate practice for all participants in performing a pre-task briefing before common pressure fluid tasks covering these elements:

a. hazards involved

b. work procedures

c. special precautions (specific non-standard precautions to be able to perform the task e.g., precautions that are not always required)

d. energy source controls (isolation points and how to isolate the energy source)

e. emergency response

f. PPE requirements

g. other works related

5.2.6 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

5.2.7 Engage in a group discussion and share their understandings about the reasons for having a pre-task briefing prior to working on pressure fluid systems

5.2.8 Engage in answering the questions and share understandings about the elements of a pre-task briefing

5.2.9 Engage in the practice of performing a pre-task briefing before performing common pressure fluid tasks

ELEMENT 5.3 - PRE-USE CHECK ON PRESSURE FLUID TEST EQUPMENT AND HOSES

Learning objective:

42) The participants can **perform** pre-use check of pressure fluid test equipment and hoses (Skills, intermediate level)

The instructor shall:

5.3.1 Facilitate exercise(s) for the participants in the pre-use inspection of pressure fluid test equipment and hoses (e.g. scenarios where the participants must determine if the equipment is faulty or not)

5.3.2 Give constructive feedback to the participants pre-use inspections on pressure fluid test equipment and hoses

The participants shall:

5.3.3 Engage in the exercise(s) and practise performing pre-use inspections on pressure fluid test equipment and hoses

ELEMENT 5.4 - TEST FOR THE ABSENCE OF PRESSURE

Learning objectives:

43) The participants can **explain** the importance of always testing for the absence of pressure before working on a pressure system (Knowledge, intermediate level)

44) The participants can act **independently** in safely and correctly using a pressure manometer to test for the absence of pressure (Ability, intermediate level)

The instructor shall:

5.4.1 Facilitate a learning activity such as group discussions about the importance of always testing for the absence of pressure before working on a pressure system and give constructive feedback to the participants discussions throughout

5.4.2 Facilitate exercise(s) for the participants in how to safely and correctly use a pressure manometer to check for the absence of pressure and give constructive feedback throughout:

a. selecting the correct manometer / equipment that is in the correct pressure range for the maximum pressure expected

b. pre-use checks

c. use of the manometer / equipment

The participants shall:

5.4.3 Engage in discussions and share their understandings or experiences about the importance of always testing for the absence of pressure before working on a pressure system

5.4.4 Engage in the exercises and practise using a pressure manometer to check for the absence of pressure in a correct and safe manner

ELEMENT 5.5 - SAFE ISOLATION AND SAFE DISSIPATION OF PRESSURE IN A PRESSURE SYSTEM

Learning objectives:

45) The participants can **perform** safe isolation and safe dissipation of pressure in a pressure system (Skills, intermediate level)

46) The participants can **select** the correct test or measurement points in accordance with a hydraulic diagram (Skills, advanced level)

The instructor shall:

5.5.1 Explain and demonstrate how to perform safe isolation and safe dissipation of pressure in a pressure system and selecting the correct test or measurement points in accordance with a hydraulic diagram:

a. identify the isolation

b. perform the isolation

c. dissipate any pressure

d. secure the isolation against re-energisation

e. prove absence of pressure

5.5.2 Lead discussions with the participants about the steps performed in the safe isolation and pressure system and the selection of the correct test or measurement points in accordance with a hydraulic diagram:

a. which steps were performed?

b. how was each step performed?

c. why was each step performed?

5.5.3 Lead discussion about the differences in the safe dissipation of pressure in a compressible pressure fluid (e.g. nitrogen) system versus a non-compressible pressure fluid (e.g. hydraulic) system

5.5.4 Facilitate practice for the participants in performing safe isolation and safe dissipation of pressure in a pressure system and selecting the correct test or measurement points in accordance with a hydraulic diagram and give constructive feedback to the participants´ practice throughout:

a. identify the isolation (normally the CB that supplies the electrical motor that moves the pressure pump)

b. perform the isolation (needs to be a (Safe Isolation) Authorised Person)

c. dissipate any pressure

d. secure the isolation against re-energisation

e. prove absence of pressure

The participants shall:

5.5.5 Engage in the discussions and share understandings about:

a. The steps performed in the safe isolation and pressure system and the selection of the correct test or measurement points in accordance with a hydraulic diagram

b. The differences in the safe dissipation of pressure in a compressible pressure fluid (e.g. nitrogen) system versus a non-compressible pressure fluid (e.g. hydraulic) system

5.5.6 Practise performing safe isolation and safe dissipation of pressure in a pressure system and select the correct test or measurement points in accordance with a hydraulic diagram:

a. identify the isolation and ensure the isolation is carried (*If an electrical isolation is required, it must be performed by the instructor as an Electrical Qualified Person)

b. perform the hydraulic isolation

c. dissipate any pressure

d. secure the isolation against re-energisation

e. prove absence of pressure

ELEMENT 5.6 - COMPONENT REPLACEMENT IN PRESSURE SYSTEMS

Learning objectives:

47) The participants can **perform** component replacement in pressure systems in a safe and correct manner (Skills, intermediate level)

48) The participants can **act independently** in connection to component replacement in pressure systems (Ability, intermediate level)

Note *The demonstration and practice in this element should be done using the equipment that remains in a safe condition from the previous element (element 5.5) The key issue for the combined practise is to be able to put the pressure system in a safe condition so a component can be replaced. There could be many options with different complexity (including not only pressure, but electrical and mechanical energy) An example could be a "pressure relief valve" or a "manual directional control valve" that requires isolation of the pressure (motor pump) and dissipation of stored energy on a system accumulator*

The instructor shall:

5.6.1 Demonstrate how to perform component replacement safely and correctly in pressure systems:

a. ensure good housekeeping

b. ensure cleanliness

c. torque up

d. even after proving the pressure is zero, extreme caution must be taken when removing any component in case of trapped pressure

5.6.2 Ask the participants key questions about how to perform component replacement safely and correctly in pressure system e.g.:

a. how would the participants restate or summarise how to perform component replacement safely and correctly in pressure systems in their own words?

b. what happened i.e. what actions were performed by the instructor to perform the component replacement safely and correctly?

c. why were these actions performed?

5.6.3 Facilitate practice for the participants in performing component replacement safely and correctly in pressure systems

5.6.4 Give constructive feedback to the participants' performance throughout the activities of this element

The participants shall:

5.6.5 Engage in answering questions and share their understanding about how to perform component replacement safely and correctly in pressure systems

5.6.6 Practise performing component replacement safely and correctly in pressure systems

ELEMENT 5.7 - SEARCHING FOR LEAKS IN A PRESSURISED SYSTEM SAFELY

Learning objective:

49) The participants can **act independently** in searching for leaks in a pressurised system (using paper or similar to avoid injection and keeping maximum distance) (Ability, intermediate level)

The instructor shall:

5.7.1 Present briefly how increasing the distance from a leakage minimises the probability of suffering an injection

5.7.2 Demonstrate how to search for leaks in a pressurised system (using paper or similar) to avoid injection and keeping maximum distance

5.7.3 Facilitate a short exercise for the participants in how to search for leaks in a pressurised system (using paper or similar) to avoid injection and keeping maximum distance and give constructive feedback throughout this practice

The participants shall:

5.7.4 Engage in the exercise and practise searching out leaks in a pressurised system (using paper or similar) to avoid injection and keeping maximum distance

LESSON 6 - RESPONSE TO PRESSURE FLUID INCIDENTS

45 min.

The aim of this lesson is to enable the participants to limit the consequences of a pressure fluid incident by being able to act as a responder to a pressure fluid incident and immediately seeking out specialised medical attention in case of a fluid injection.

After successfully completing this lesson of the CoHE Pressure Fluid Safety Module, participants can:

50) **Solve** the challenge of how to act as a responder to a pressure fluid incident (Ability, basic level)

51) **Explain** the importance of fast and specialised medical evaluation after suffering a fluid injection (e.g. hydraulic oil, compressed gas) independently of the symptoms (Knowledge, intermediate level)

52) **Explain** the consequences of suffering a pressure fluid incident and not receiving prompt specialised medical attention (Knowledge, intermediate level)

53) **Show interest** in and **willingness** to immediately seek specialised medical attention in case of a fluid injection (Ability, basic level)

The instructor shall:

6.1.1 Emphasis that company specific procedures to a pressure fluid incident should be checked and always followed

6.1.2 Explain and demonstrate to the participants a response to a pressure fluid incident being applied:

a. respond immediately to the incident

b. seek specialised medical attention

c. report all fluid incidents (specifically fluid injections)

6.1.3 Facilitate a learning such as questions or a test about the response to the pressure fluid incident:

a. what happened?

b. how did the responder(s) to the pressure fluid incident act, i.e. what were the sequence of actions?

c. of those actions, which were the most important?

d. why were these key actions performed?

Note *In the group discussions, the instructor shall focus on the need to seek fast and specialised medical evaluation after suffering a fluid injection (e.g., hydraulic oil, compressed gas) whatever the symptoms.*

6.1.4 Give constructive feedback to the participants' group discussions

6.1.5 Facilitate practice (through e.g. a challenge or a scenario) for the participants in deciding on the correct actions and how to perform these actions performance when responding to a pressure fluid incident

Note *An example of a scenario could be the participants deciding and practicing how to act as first responders to a pressure fluid incident where the injured person does not want to seek out prompt specialised medical attention after being injured in a pressure fluid incident*

6.1.6 Give constructive feedback to the participants above practice

6.1.7 Give the participants a challenge, which shall enable the participants in groups to discuss and share their personal experiences or believes about:

a. why individuals do NOT seek prompt specialised medical attention after suffering a pressure fluid incident?

b. how, in the participants' opinion, could it be ensured that all individuals seek prompt specialised medical attention after suffering a pressure fluid incident?

c. consequences of suffering a pressure fluid incident and not receiving prompt specialised medical attention

The participants shall:

6.1.8 Engage in learning activity and share understandings about the response to the pressure fluid incident

6.1.9 Practise deciding on the correct actions and their delivery when responding to a pressure fluid incident

6.1.10 Engage in the challenge, discuss, and share personal experiences and believes about:

a. why individuals do NOT seek prompt specialised medical attention after suffering a pressure fluid incident?

b. how could it be ensured that all individuals will seek prompt specialised medical attention after suffering a pressure fluid incident in the participants opinion?

c. consequences of suffering a pressure fluid incident and not receiving prompt specialised medical attention

LESSON 7 - HAZARDOUS PRESSURE FLUID SCENARIOS

120 min.

The aim of the lesson is to enable the participants to support and care for themselves and others while working with, and in the vicinity of, pressure fluids in the wind industry in a variety of scenarios in wind turbine work environments. To the greatest possible extent the scenarios must challenge participants to take responsibility for work (with or in the vicinity of, pressure fluids) is performed safely.

After successfully completing this lesson of the CoHE Pressure Fluid Safety Module, participants can:

54) **Act independently** in selecting and using safe work practices to reduce the associated risks to the hazards related to working around pressure fluids (Ability, intermediate level)

55) **Act independently** in treating all pressure systems as pressurised until a safe work condition has been established (Ability, intermediate level)

56) **Take responsibility** for establishing a safe work condition (Ability, intermediate level)

57) **Act independently** in following and completing safety documentation such as permits (Ability, intermediate level)

The instructor shall:

7.1.1 Explain safety procedures in the training area

7.1.2 Facilitate scenario-based practice where each participant must practise and demonstrate through relevant scenarios related to hydraulics (oils under pressure) with varying degree of complexity and fading instructor guidance and support

7.1.3 Establishing and maintaining a safe work condition. As a minimum each participant shall practise:

a. preparing for and planning the work

b. following and completing safety documentation such as permits

c. pre-task briefings

d. selecting and using the correct PPE for a given task

e. pre-use check on pressure fluid test equipment and hoses

f. safe isolation and safe dissipation of pressure in a pressure system

g. identifying and mitigating pressure fluid hazards such as trapped pressure

h. identifying deranged equipment

i. testing for absence of pressure

j. apply Lockout-Tagout

k. searching for leaks in a pressurised system safely

7.1.4 Give constructive feedback or facilitate peer feedback throughout the scenarios

The participants shall:

7.1.5 Practise and demonstrate how to establish and maintain a safe work condition

7.1.6 Think on the received feedback and use the feedback to improve their performance

Note *Relevant measuring equipment and PPE shall be available and used at all times during the scenario-based training*

LESSON 8 - TRAINING REVIEW

15 min.

The aim of this lesson is to enable the participants to reflect on and process their learning outcome and key takeaways from the module, aiming to achieve a high learning transfer from the module to their way of working.

ELEMENT 8.1 - TRAINING REVIEW

The instructor shall:

8.1.1 Re-present the overall aims and learning objectives of the module for the participants' comparison of their learning outcome and the achievement of their previously stated expectations for the module

The participants shall:

8.1.2 Reflect on their learning outcome and key takeaways from the CoHE Pressure Fluid Safety Module, aiming to achieve a high learning transfer from the module to their way of working by means of e.g.:

a. group discussion or walk and talk

b. questions and answers in class, or where suitable

Note *The instructor may additionally conduct a local evaluation of the training.*

ELEMENT 8.2 - FEEDBACK SESSION

The instructor shall:

8.2.1 Give an overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training-review-session

8.2.2 Encourage the participants to examine and grow awareness of which specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualise and enhance learning transfer)

8.2.3 Encourage the participants to discuss with colleagues after the module completion about how the CoHE Pressure Fluid Safety Module content, methods and techniques are similar or different to the local specific conditions identified

GLOBAL WIND ORGANISATION

Annexes

ANNEX 1 - EQUIPMENT LIST

The following pages contain the lists of equipment required for delivering the CoHE training standard.

Note *All equipment shall be maintained and where appropriate, inspected and tested in accordance with current national standards/ legislation and manufacturers' recommendations.*

1. CoHE Basic safety Module

The following equipment is required for the instructor during the entire duration of this CoHE Basic Safety Module to meet the needs of the CoHE Basic Safety Module:

- Three kits of basic PPE (gloves, safety goggles, safety shoes or boots and working clothing)
- Lockout-Tagout equipment. As a minimum:
    - 3 x padlocks
    - 3 x caution notices / tags

Any equipment used during this GWO training module shall meet or exceed the minimum requirements of the national standards in the country where the training is taking place. When working in a country where there is no applicable national standard then the equipment shall meet or exceed the minimum requirements of the European standards.

2. CoHE Electrical Safety Module

The following equipment is required during the entire duration of this CoHE Electrical Safety Module to meet the needs of this CoHE Electrical Safety Module.

- PPE suitable for electrical work (Insulating gloves (at least one pair per two participants), googles, safety shoes or boots and suitable clothing)
- Lockout-Tagout equipment. As a minimum:
    - 6 x padlocks
    - 6 x caution notices / tags
    - An example of accessories for locking certain components e.g. different types of circuit breakers, hydraulic needle valves.

Measuring devices:

- Category III 600 V multimeter (at least 1 per four participants)
- Two pole voltage detector (at least 1 per four participants)

An electrical system which as a minimum must be able to:

- Be live.
- Be switched off and on.
- Have accessible measuring points.
- Have Lockout-Tagout applied to the system.
- Have corresponding diagrams which reflect all components and connections.
- Have stored energy (e.g. a 12V dc battery)
- Have at least 2 loads with their respective isolations from the main source.
- All components should be reflected in the electrical diagram showing all connections.

The electrical system should contain at least:

- A 12 V battery.
- Electrical protection.
- Appropriate electrical wires.
- Switches.
- Capacitors.
- Terminals for rail.
- Push buttons (NO and NC)
- 1 contactor or relays for each load.

Any equipment used during this GWO training module shall meet or exceed the minimum requirements of the national standards in the country where the training is taking place. When working in a country where there is no applicable national standard then the equipment shall meet or exceed the minimum requirements of the European standards.

3. CoHE Pressure Fluid Safety module

The following equipment is required during the entire duration of this pressure fluid safety module to meet the need of the pressure fluid safety module:

- PPE suitable for pressure fluids tasks (gloves, safety goggles, safety shoes or boots and suitable clothing or overalls)
- Pressure gauge/manometer

- Lockout-Tagout equipment. As a minimum:
  - 6 x padlocks
  - 6 x caution notices / tags
- An example of accessories for locking certain components e.g., valve

A pressure fluid system which as a minimum must be able to:

- Build pressure
- Release pressure
- Measure pressure (test points)
- Store pressure even with pumps stopped
- A way of applying Lockout-Tagout to part of the system

The pressure fluid system should contain at least:

- Tank with level indicator
- Pump with electrical motor
- Directional valve
- Needle valve
- Pressure relief valve
- Non-return valve
- Pressure switch
- Actuator
- Accumulator
- Test points
- Oil
- Filters

Any equipment used during this GWO training module shall meet or exceed the minimum requirements of the national standards in the country where the training is taking place. When working in a country where there is no applicable national standard then the equipment shall meet or exceed the minimum requirements of the European standards.

ANNEX 2 - TEMPLATE DESCRIPTION FOR A PERMIT TO WORK

This annex includes a template which must be developed by the training provider into a permit to work for use during the Control of Hazardous Energies Standard. It details the required elements in a permit to work and some text as a suggestion of what should be included in each section.

The template is incomplete in some areas and is therefore not intended to be used as is.

This permit to work must be completed at the point of work. A permit to work must not be filled out retrospectively and/or by a 3rd party not directly involved in the work performed. A permit to work must be filled out clearly.

Note *Please emphasise to the participants that a permit to work will vary depending on the company and the site of the work taking place, so the participants should seek out and comply with company specific rules and procedures along with national and regional legislation.*

Permit to work

Company:	Permit to work	Permit number:
Date:		Version:

Note *The permit to work must match the equipment which would be used in the practical exercises*

Work details

Steps	Detail	
1.1	Wind farm location:	WTG NO:
1.2	Equipment:	
1.3	Work instruction:	
1.4	Date:	

Isolations

Isolation details (Clear name of the isolation and operation)	**Time**	**Signature**
Note: *One example could be:* *Close Valve number 5 off ☐*	Time 09:11, 14/12/2021	Signature: Jane Doe
Note: *another example could be:* *Open circuit breaker 123 ☐* *Apply Lockout-Tagout ☐* *Test for absence of voltage ☐*	Time: 09:18, 14/12/2021	Signature: Jane Doe
	Time:	Signature:
	Time:	Signature:
	Time:	Signature:
	Time:	Signature:
	Time:	Signature:

Permit issued:

Do you confirm that all the above isolations have been carried out and a safe work condition have been established? ☐

Do you confirm that the following elements are fully available / implemented? ☐

- All equipment shut down by normal stopping procedures
- All energy sources isolated
- All energy isolating equipment "locked out" with adequate lockout devices
- All energy isolating equipment tagged
- All potentially hazardous sources or residual energy purged or dissipated
- Verification of effectiveness of the isolations
- Adequate rescue means available
- All personnel affected by machine/equipment shutdown notified

- Adequate PPE worn by all concerned person
- All PPEs in good condition
- Work area clear and demarcated
- Nearby workers informed of work to be performed
- Means for preventing access to unqualified persons from the work area in place

Additional safety measures in place - Yes: ☐, No: ☐. If yes, please describe below in detail.

Note *Examples of situations where additional safety measures could be needed:*

Lightning risk on the day

Working at heights in certain areas

Requirements for other permits such as hot work permits

Other tasks being carried

.....

.....

.....

Signature (of the Qualified Person):..... Time:.....

Date:.....

TECHNICIANS PERSONAL INFORMATION (signing to do a task)

Name	Company	Initials

Completion of work:

Do you confirm that the following elements are implemented?☐

- All works requiring the lock out / tag out process are finished

- All individual locks removed
- All affected individuals notified of work completion

Signatures

Qualified Person (Mandatory)

Name: _____Signature_____

Date: _____Time_____

ANNEX 3 - VERSION HISTORY

Amendment date	Version	Approved by & date	Description of changes
2 May 2023	2	GWO TC May 2023	

Changes throughout:

- New layout
- GWO Requirements for Training – title updated

Section 6. Scope:

- Revised and updated

Section 7.4. Duration of the GWO CoHE Standard Modules

- Text updated to clarify instructions

Section 7.7. Physical Prerequisites for the GWO CoHE Training Standard

Medical Fitness

- Section removed

Section 7.8. Physical demands:

- Revised and updated

Section 9. Using this Standard to Develop Training:

- GWO Taxonomy replaced - the section Understanding the GWO taxonomy has been replaced with a referral to the GWO Requirements for Training

CoHE Basic Safety Module

Section 10.2. Duration of the CoHE Basic Safety Module

- Text updated to clarify instructions

Section 10.4. CoHE Basic Safety Module Timetable

Electrical Safety Module

Section 11.2 Duration of the Electrical Safety Module

- Text updated to clarify instructions

Section 11.5. Electrical Safety Module timetable

- Text updated to clarify instructions

Pressure Fluid Safety Module

Duration of the Pressure Fluid Safety Module

- Text updated to clarify instructions

Section 12.5 Pressure Fluid Safety Module timetable

- Text updated to clarify instructions