

Advanced Rescue Training

V4

Publication date: 2 May 2023





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1. LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
ART	Advanced Rescue Training
AS/NZS	Australia and New Zealand Standard
BST	Basic Safety Training
CSA	Canadian Standards Association
EMT	Emergency Medical Treatment
GWO	Global Wind Organization
HSIBR	Hub, Spinner and Inside Blade Rescue
IP	Injured Person / Ill Person
LOTO	Lock Out Tag Out
NTBR	Nacelle, Tower, and Basement Rescue
PPE	Personal Protective Equipment
SAR	Search and Rescue
SRL	Self-Retractable Lifeline
WTG	Wind Turbine Generator

2. TERMS AND DEFINITIONS

Term	Definition
Active Setup (Rescue device in stationary mode setup) WTG)	Rescue device in inverted/reverse mode setup, i.e. the rescue device attached to the injured person (and the rescue device rope's loaded end is rigged in the
Additional fall protection	Describes the use of an independent, additional suitable fall protection system in conjunction with a primary fall protection system. Typically, used during training to provide fall protection to participants as they learn to use fall protection equipment. Additional fall protection may sometimes be referred to as a "backup".



	The additional fall protection system should be chosen in such a way that it will not hinder the exercise. Preferably this additional fall protection is not even noticeable by the participant.
As low as reasonably practicable	This means that a risk is identified and controlled to a lower level weighted against the effort, time and money needed to control it
Clear / precise communication	<ul style="list-style-type: none"> a. technician A is giving information to technician B b. technician B repeats the information c. technician A confirms that the repetition is correct d. if repetition was not correct the technician starts at "a" again.
Fall arrest	Preventing the user of a personal fall protection system from colliding with the ground, structure, or any other obstacle during a free fall
Fall arrest system	Personal fall protection system which limits the impact force on the body of the user during fall arrest
Fall prevention	Preventing the user of a personal fall protection system from going into a free fall
Flexitime	The time that must be utilised in the course, either theory or practical elements, where training provider sees the most valuable for the participants
Generic principle	<p>As opposed to product specific training, a generic approach to teaching safety equipment focuses on the similarities and differences in design, functionality and operation between different equipment products.</p> <p>The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers) enabling the participant to conduct pre-use inspection and to use other rescue equipment products compared to those taught during this Module (based on the manufacturer's user manual) but without additional formal training.</p> <p>Consequently, a potential task is placed upon the participant on course completion, requiring them to familiarise themselves with other rescue equipment products in their own organisation e.g. prior to site or work, based on the manufacturer's user manual.</p>
Hip overhang	A technique used during the rescue of a casualty from a ladder where the rescue line is diverted using the side D-ring located at the hip of the rescuer's harness. This creates greater space between the casualty and the ladder



Injured Person	The affected person requiring first aid treatment and rescue/evacuation
Must	For clarity where the word 'must' is used in this standard it shall have the same meaning as 'shall'.
Passive Setup (Rescue device in stationary mode setup)	Rescue device in standard mode setup, i.e. the rescue device rigged in the WTG
Personal fall protection system	Assembly of components intended to protect the user against falls from height, including a body holding device and an attachment system, which can be connected to a reliable anchorage point
Power driver for rescue device	Detachable power driven unit for operating the ascending function of the rescue device
PPE	Personal Protective Equipment, includes personal fall protection equipment
Rescue head support	A device or technique which will support the head of an injured person during a rescue operation (a cervical collar falls into this description)
Rescue system	Personal fall protection system by which a person can rescue themselves or others, in such a way that a free fall is prevented
Restraint system	Personal fall protection system which prevents the user from reaching zones where the risk of a fall from height exists
Shall	Verbal form used to indicate requirements strictly to be followed in order to conform to this training standard and from which no deviation is permitted.
Should	Verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required.
Single rescuer advanced rescue operation	When an advanced rescue operation is performed by one rescue personnel only. Relevant for personnel working in two-person teams, where advanced rescue preparedness is required
Tensioned line	Aerial ropeway for injured person transportation. Setup horizontally with a rescue device rope rigged between two structural and/or certified anchor points.
TP	Transition piece
Transfer board	A tool that is used to transport the injured person and is not to be used for immobilisation. Examples of a transfer board are a spine board, extraction board, spec pack, half board, half stretcher etc.



Working positioning system	Personal fall protection system which enables the user to work in tension or suspension in such a way that free fall is prevented
Zip Line	In this standard a zip line has the same definition as a tensioned line

3. CHANGE LOG

Amendment date	Version	Approved by & date	Description of changes
May 2023	4	GWO TC May 2023	<p>Changes Throughout:</p> <ul style="list-style-type: none"> • New layout • Mention of MAC is deleted from entire standard • GWO Requirements for Training – title updated <p>Section 2. Terms and definitions:</p> <ul style="list-style-type: none"> • Definition for “as low as reasonably practicable” added • Definition for “additional fall protection” added <p>Section 4. Scope:</p> <ul style="list-style-type: none"> • Revised and updated <p>Section 5.4. Duration:</p> <ul style="list-style-type: none"> • Text updated to clarify instructions <p>Section 5.5 Guidance on delivering lesson elements:</p> <ul style="list-style-type: none"> • Revised and updated <p>Section 5.8 Participant prerequisites for the ART modules:</p> <ul style="list-style-type: none"> • Revised and updated <p>Section 5.9 Physical demands:</p> <ul style="list-style-type: none"> • Replaced by a referral to the GWO Requirements for Training <p>Section 7. Understanding the GWO Taxonomy:</p> <ul style="list-style-type: none"> • The section Understanding the GWO taxonomy has been replaced with a general instruction and referral to the GWO taxonomy found in the GWO Requirements for Training <p>Module 1 – Hub Rescue</p>



Section 8.4 Duration of the hub rescue module:

- Text revised and updated

Section 8.7 Hub rescue module timetable:

- Text revised and updated

Module 2 –Nacelle, Tower and Basement Rescue

Section 9.3 Duration of the nacelle, tower and basement module:

- Text revised and updated

Section 9.6 Nacelle, tower & basement module timetable:

- Text revised and updated

Element 10.2 Rescue up

- 10.2.12 j point added to participant instructions

Module 3 – Single rescuer: Hub spinner and inside blade rescue

Section 10.4 Duration of the single rescuer HSIBR module:

- Text revised and updated

Section 10.7 Timetable of the single rescuer HSIBR module.

- Text revised and updated

Section 11.3 Duration of the single rescuer NTBR module:

- Text revised and updated

Section 11.6 Participant prerequisites for the ART modules:

- Text revised and updated

Module 4 – Single rescuer: Nacelle, tower and basement rescue

Section 12.1 Duration of the combined GWO ART module:

- Text revised and updated

Annex 1.

Equipment list:

- Equipment list for ART has been updated
-



- The following pages contain the lists of equipment required for delivering each of the modules contained within this training standard. All equipment shall meet the criteria defined in the GWO Requirements for Training.
 - The sentence: “including the utilisation of an injured person personal fall protection equipment backup system, if required” has been changed to “including the utilisation of an injured person’s personal fall protection equipment without compromising additional fall protection” throughout the standard.
 - All EN/ANSI/GB/BS EN numbers have been updated
 - “Work restraint lanyards” has been changed to “fall restraint lanyards”
 - “Vertical fall arrest system” has been changes to “vertical fall arrest system on a rigid anchor line”
 - “Fixed length fall arrest lanyard” has been changed to “fall arrest lanyard including energy absorber”
 - “Helmets” have been updated to “industrial safety helmet with a chin strap that is released with a force of no less than 150 N and not more than 250 N”
 - “Carabiners” has been changed to “connectors (carabiners)”
 - “Evacuation and rescue devices” has been split into two categories: “Rescue devices with lifting capacity” (EN 1496) and “devices for emergency decent” (EN 341)
-



4. 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.

This standard describes the requirements for advanced rescue training courses that are recommended by the members of GWO. The full standard comprises of four modules:

1. Hub, Spinner and Inside Blade Rescue (HSIBR)
2. Nacelle, Tower and Basement Rescue (NTBR)
3. Single Rescuer: Hub, Spinner and Inside Blade Rescue (SR:HSIBR)
4. Single Rescuer: Nacelle, Tower and Basement Rescue (SR:NTBR)

This standard has been developed in response to the demand for recognisable advanced rescue training in the industry and has been prepared in co-operation between the members of GWO based on risk assessments and factual incident and accident statistics from G+ and the wind industry.

GWO members agree that everyone working on one of their properties (wind turbine generators, sub stations, etc.) shall complete advanced rescue training courses relevant for their assignments. All work shall be done in teams of at least two competent persons. Exemptions from the above can be made based on internal company rules.

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.

5. GENERAL REQUIREMENTS FOR THE ADVANCED RESCUE TRAINING

Upon completion of the Advance Rescue Training Standard, participants will be able to access and rescue an injured person from the hub and the nacelle, tower, and basement section of a wind turbine. These training modules can be delivered independently of one another or as stand-alone training.

5.1 Overview

The GWO Advanced Rescue Training is divided into the following four modules:

- Module 1: Hub, Spinner and Inside Blade Rescue (HSIBR)
- Module 2: Nacelle, Tower, and Basement Rescue (NTBR)
- Module 3: Single Rescuer: Hub, Spinner and Inside Blade Rescue (SR:HSIBR)
- Module 4: Single Rescuer: Nacelle, Tower and Basement Rescue (SR:NTBR)



5.2 Target Group

Personnel who will be working in the wind industry or related fields and will have their duties in a wind turbine environment.

Personnel that may need or is selected by their employer to perform advanced rescue or lead an advanced rescue operation, where training according to one or more modules of the GWO advanced rescue training may mitigate the identified risks.

5.3 Aims and Objectives

Training in accordance with this Advanced Rescue Training Standard will enable participants to perform entry-type injured person rescue operations, in a WTG, using industry standard rescue equipment, rescue methods and techniques, exceeding those of GWO BST, Working at Height.

5.4 Duration of the Advanced Rescue Training Modules

The total contact time for completing the stand-alone Advanced Rescue Training standard is *29 hours and 0 minutes*. This is based on the times given in the module timetables and summarised in table 5.4.1 below.

The training provider must not exceed the time per day given in table 5.4.2 below.

Modules	Duration
Hub, Spinner and Inside Blade Rescue (HSIBR)	7 hours 0 minutes
Nacelle, Tower, and Basement Rescue (NTBR)	14 hours 0 minutes
Single Rescuer: Hub, Spinner and Inside Blade Rescue (SR:HSIBR)	4 hours 0 minutes
Single Rescuer: Nacelle, Tower and Basement Rescue (SR:NTBR)	4 hours 0 minutes

Table 5.4.1 – Duration of the ART Modules (excluding meals and breaks)

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

Table 5.4.2 – Maximum duration 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 an Advanced Rescue Training module, they shall attend a new Advanced Rescue Training module.

5.5 Guidance on delivering lesson elements

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

Individual exercises may be combined and integrated to create a more challenging scenarios, e.g. connecting the crawl space exercise to the descent exercise into one scenario.

During the exercises the instructor is free to introduce new elements or change the circumstances of the exercise, to challenge the participants and to provide a more dynamic scenario. For example, removing equipment, or marking anchor points as a defect.

5.6 Validity Period

The Advanced Rescue Training is 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 certificates 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.

An e-participant is only allowed to attend a refresher course in the specific training module prior to the date of expiry on the current certificate or training records.

If a certificate is or training record is expired, the participant must attend the applicable Advanced Rescue Training to obtain a new training record.

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

Course/module	Certificate Validity (Months)
Hub, Spinner and Inside Blade Rescue (HSIBR)	24 Months
Nacelle, Tower and Basement Rescue (NTBR)	24 Months
Single Rescue: Hub, Spinner and Inside Blade Rescue (SR:HSIBR)	No Expiry
Single Rescue: Nacelle, Tower and Basement Rescue (SR:NTBR)	No Expiry

Table 5.6.1 – Validity period of GWO ART modules



5.7 Course Codes

Module	Course Code
Hub, Spinner and Inside Blade Rescue	ART-H
Nacelle, Tower and Basement Rescue	ART-N
Single Rescue: Hub, Spinner and Inside Blade Rescue	SART-H
Single Rescue: Nacelle, Tower and Basement Rescue	SART-N

Table 5.7.1 – Course codes for ART modules

5.8 Participant Prerequisites for the ART modules

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

In addition, participants must hold a valid WINDA training record for GWO BST, Working at Heights Module, GWO BST, First Aid and GWO BST Manual Handling are prerequisites for participation.

5.9 Instructor Qualification Prerequisites

A competent GWO Advanced Rescue Training instructor must adhere to the requirements described in the GWO Requirements for Training.

6. GENERAL RESOURCES REQUIRED TO DELIVER GWO ART MODULES

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

6.1 Instructors

The instructor shall possess appropriate qualifications and experience to ensure that all training and supportive activities are carried out in accordance with current legislation and current GWO training provider requirements.

A person with first aid qualifications shall be present during all practical training.

All staff shall possess the appropriate competencies to conduct / assist in the delivery of elements of training they have been assigned to.

The instructor must be:

1. trained in instructional / lecture techniques and / or have documented instructional / teaching experience
2. qualified GWO BST WAH instructor



3. qualified GWO BST Manual Handling instructor
4. trained in GWO BST/BSTR First Aid
5. included in an on-going training program, which includes visits to onshore and/ or offshore WTGs (tower, nacelle, hub) prior to instructing GWO ART modules, to enable them to maintain and update skills related to the GWO modules they instruct. The instructor shall physically visit the tower, nacelle, and hub of WTGs.
6. able to apply knowledge and practical skills in alternative rescue methods, techniques, and rigging setups comparable to those executed by the participants during the practical exercises of the ART modules
7. able to analyse and justify the ART rescue equipment used, uses and limitations of this equipment included.

6.2 Practical Training Facilities

All facilities shall be maintained and where appropriate, inspected and tested in accordance with current national legislation and manufacturers' recommendations.

Risk assessments shall be conducted and documented for all training facilities. The training provider shall hold the required permits to operate the facilities.

The learning process is facilitated by identical or comparable elements comparing the training environment and the participants' working environment. Identical or comparable elements enhances the application of what is learned. The practical training facilities and the training environment are therefore expected to incorporate as many identical or comparable elements to a real wind turbine working environment as possible.

The objective is that the practical training facility should enable each participant to individually and/or as part of a team, see, hear, and practise the taught subject matter in such a way that it resembles the working practises in a real wind turbine environment.

The following training facility items will be required for the ART training:

1. Mock-up with enclosed space to simulate the hub, with a height differentiated crawl way
 - a. figure 6-2.1 provides dimensions to the GWO recommended hub mock-up
 - b. the training provider can deviate from the recommended hub measurements to facilitate a specific turbine design
2. A mock-up to simulate access between hub and blade with a maximum access hatch diameter of 0.6m
 - a. this diameter can be reduced to 0.50m to simulate a pitch cylinder partly blocking the hatch
3. Mock-up for the "rescue up" exercises, to simulate basement/tower rescue
4. Mock-up to simulate under the gearbox with a max. 0.6m diameter access crawl way into the crawl space, a height between 0.6m and 0.3m and minimum 2.0m length (Nacelle, Tower and Basement Rescue Module)
5. Mock-up to simulate the nacelle



- a. figure 6-2.2 provides dimensions to the GWO recommended nacelle mock-up
- b. the training provider can deviate from the recommended nacelle measures to facilitate a specific turbine design
- c. the nacelle mock-up must be filled with sufficient simulated assets, to create a realistic nacelle environment
- d. the maximum available contiguous floor space must be less than 3.0m², excluding walkways of less than 0.6m width
- e. the sides of the nacelle should be designed in such a way as to prevent direct visual contact from within the nacelle to the teams outside of the nacelle
- f. structural and certified anchor points (both modules)

It is recommended to connect the various mock-ups to recreate a realistic sequence. For example, connecting the nacelle mock-up with the hub mock-up. Rather than connecting a blade mock-up with the nacelle mock-up. This would provide a more realistic scenario. However, if there are practical reasons to separate the individual mock-ups, then this is allowed. For example, to allow different teams to train at the same time.

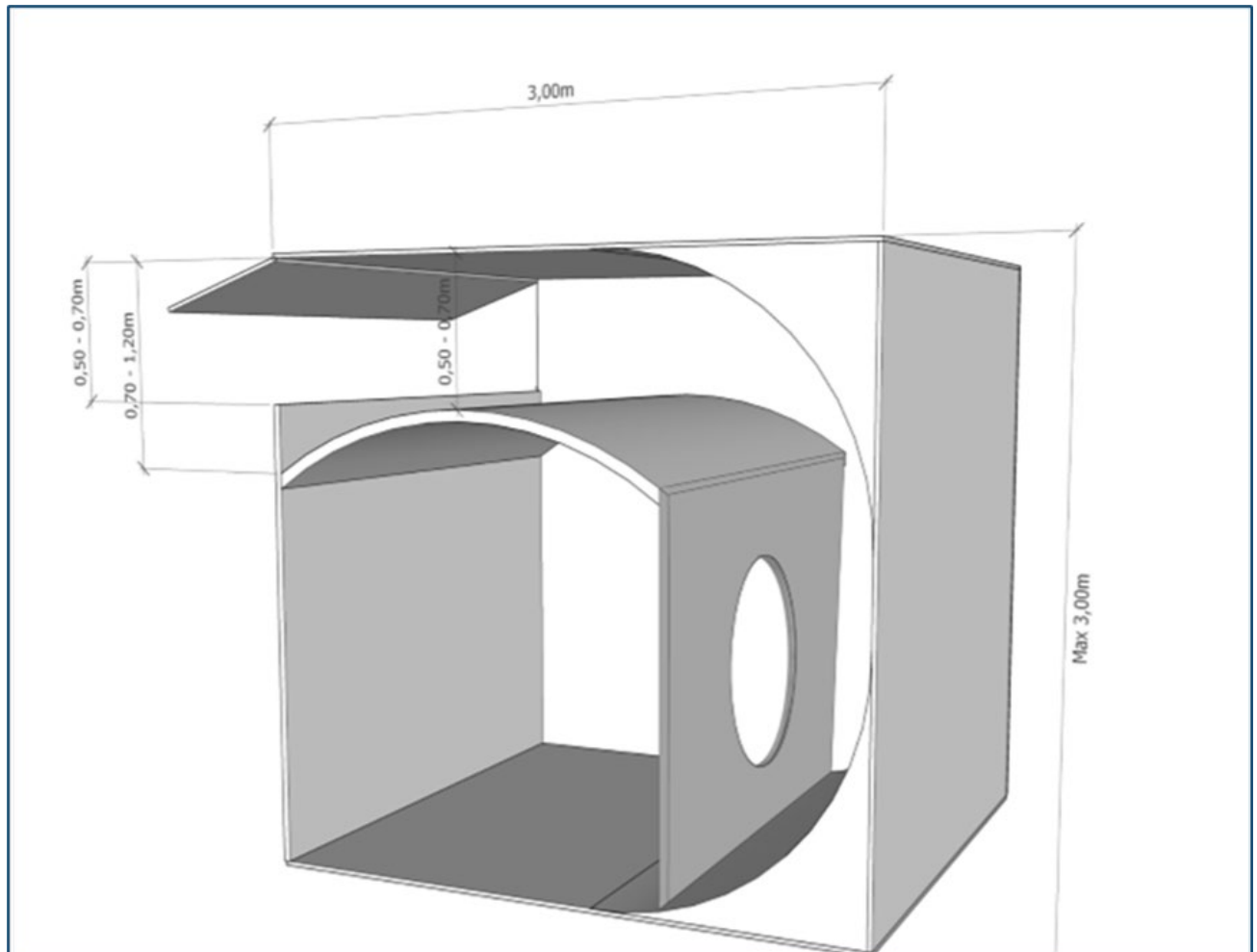


Figure 6.2.1 – Recommended dimensions for the hub mock-up

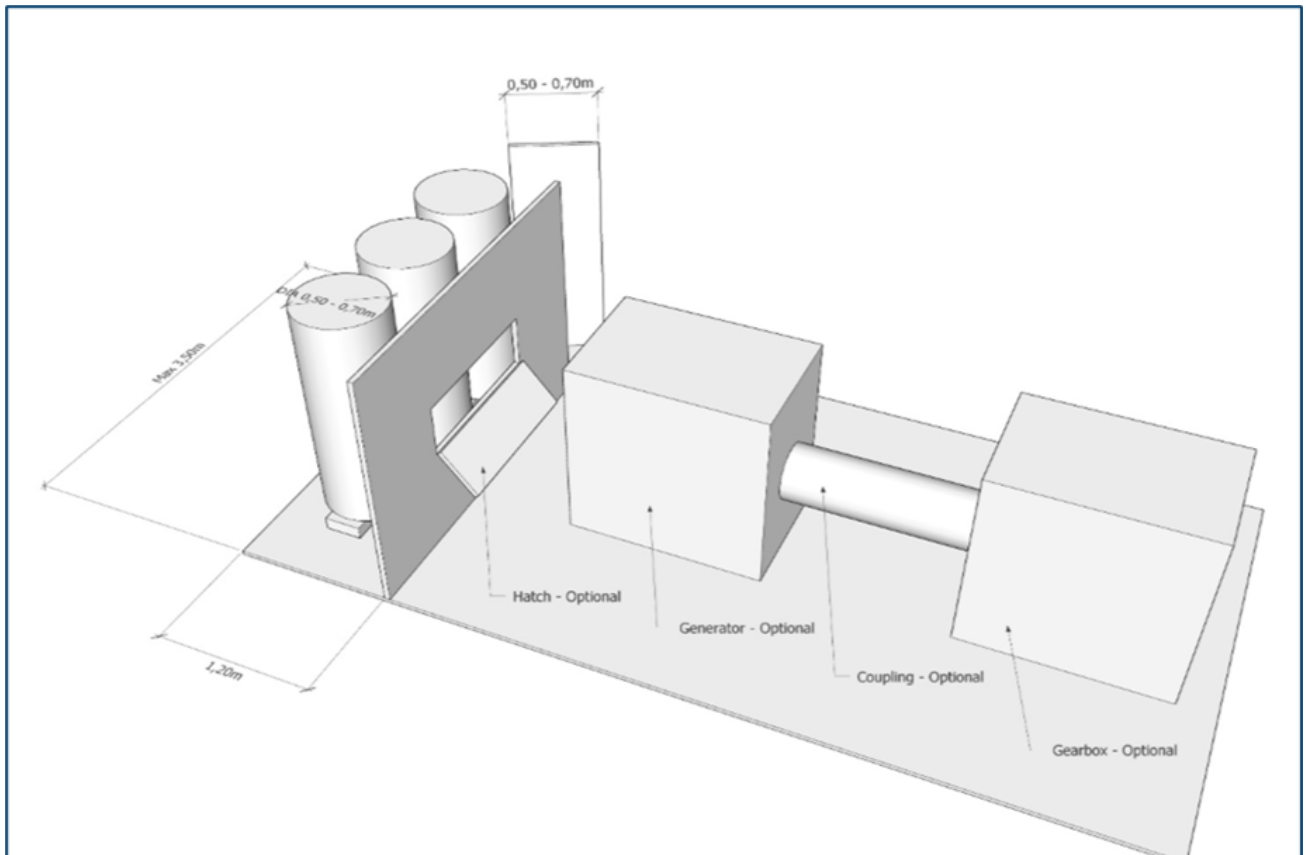


Figure 6.2.2 – Recommended dimensions for the nacelle mock-up

6.3 Wind Turbine Environment Explained

What is a wind turbine training environment?

To apply what participants have learned (e.g. during a course) is a learning process of its own. This process is facilitated by identical elements comparing the training environment and the participants' working environment. Thus, identical elements enhance the application of what participants have learned. The more identical elements; the merrier.

The training providers' goal should be to achieve training facilities and a training environment with as many identical elements to a real wind turbine working environment possible. In addition, 'train as you work' (i.e. executing training end to end the way participants should perform in practice) enhances real work behaviour. So how to 'train as you work' and design a training environment with a high degree of identical elements?

Depending on the participant's job and tasks in the wind industry, many technicians work in the wind turbine tower and nacelle during pre-assembly, erection, commissioning and troubleshooting, or service of the wind turbine.

For access up/down the tower, the tower is in general fitted with ladder sections provided with a vertical fall protection system, and tower section platforms with ladder hatches fitted with certified anchor points for attachment of personal fall protection equipment. The wind turbine may include a basement section fitted as mentioned, and primarily holding electrical cabinets.



In the geared type WTG, access in the nacelle is in general limited to narrow pathways along the left or right side of the main shaft and generator etc. These pathways are often 'fitted' with mechanical components and the like, as well as steps and small ladder sections due to variations in floor level, as part of the WTG design increasing the risk of trips and falls. Access between nacelle and hub is possible through low and often very narrow passageways.

Train as you work training should be executed by doing real work tasks end to end under the actual working procedures, and/or realistic emergency situation (fire, first aid, evacuation or injured person rescue) end to end scenarios, in a wind turbine environment.

6.4 Training Equipment

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements as listed in table A1-1 in Annex 1 where applicable.

A generic approach to teaching safety equipment is applied to this module aiming to avoid potential product specific additional training on completion of this module, which may be required by the participant's organisation e.g. prior to site or work.

The generic approach is achieved by teaching a variety of safety equipment products within each safety equipment category (e.g. guided type fall arresters). This enables the participants to conduct pre-use inspection and to use other safety equipment products compared to those taught during this module (based on the manufacturer's user manual). However, a location specific risk assessment might identify the need for additional instructions.

Additional fall protection must always be used during training activities at height.

The training provider shall introduce control measures that lower the risks and hazards associated with a fall from height to an acceptable level, following the Hierarchy of Controls in their risk assessment.

GWO recommends a maximum fall factor of 0.5. To calculate this the following formula has been used, using the maximum allowed lanyard of length 2.00m and a fall of 1.00m,

$$\text{Fall Factor (FF)} = \frac{\text{Distance Fallen}}{\text{Length of lanyard}}$$

$$\text{Factor (FF)} = \frac{1.00 \text{ m}}{2.00 \text{ m}}$$

$$\text{Factor (FF)} = 0.5$$

During the evacuation exercises in this module the anchor points used for the attachment of fall arrest lanyards with energy absorbers must be high enough above the ground, or structure below them, so that in the event that a person experiences a fall the shock absorber in their fall arrest lanyard can fully deploy and prevent them from contacting the ground (or structure directly below the anchor point).

During the evacuation exercise the participants must be able to experience a minimum amount of descent using an evacuation or rescue device to ensure that they gain the experience of the speed of descent using these devices. This can be achieved by having the participants descend from a minimum height using a rescue or evacuation device.



To ensure that for all fall protection equipment that may be used that there will be enough clearance below the anchor point, and to ensure that the participants can experience a descent of sufficient duration for meaningful learning transfer, the GWO recommends that the anchor point is a minimum of 6.75m above the ground or structure directly below the anchor point. The recommended 6.75m clearance under the anchor point is explained in detail in Annex 1.

If a training provider deviates from the recommended anchor point height of 6.75m to a lower height, then the following additional control measures must be in place,

- a. the training provider shall document a risk assessment for the lower height, this shall include calculations for the equipment to be used during the evacuation exercises, the calculations shall:
 - a.i use the value for shock absorber elongation that is provided by the equipment manufacturer, and,
 - a.ii demonstrate that the equipment will prevent the person from coming into contact with the ground or structure directly below the anchor point, and,
 - a.iii use a formula provided by the equipment manufacturer or national legislation that is for the purpose of calculating anchor point clearance height or, where no such formula exists, use the formula in Annex 1 and,
- b. the potential fall factor shall not exceed 0.5 and,
- c. participants must experience a descent from a platform that is a minimum of 4.5m above the ground

7. 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 safety equipment, a generic approach 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.



Hub, Spiner and Inside Blade Rescue Module

(ART-H)



8. MODULE 1 – HUB, SPINER AND INSIDE BLADE RESCUE

8.1 Aims and objectives for the Hub, Spinner and Inside Hub Rescue Module (HSIBR Module)

The aim of this module is to enable participants, through theoretical and practical training, to perform rescue operations, in a WTG hub, spinner and inside the blade by using industry standard rescue equipment, methods and techniques, exceeding those of GWO Working at Height.

After having successfully complete this HSIBR Module, the participants will have the ability to

- 1) **Take responsibility** to determine rescue and evacuation strategy, performing rescue operations in a WTG hub, spinner and inside the blade (Knowledge, intermediate level).
- 2) **Explain** the concepts of lifting angle, angle factor and deviation considering common risks of hazardous energies and common hazards (Ability, intermediate level).

8.2 Competencies of the Hub, Spinner and Inside Blade Rescue Module (HSIBR Module)

1. **Perform** descending rescue operations from a WTG hub, spinner and from inside a blade, to a primary assembly area (ground or transition piece) or a secondary assembly area (vessel), using industry standard rescue equipment.
2. **Perform** these rescue operations in teams acting as the rescue team coordinator.

Note *Rescue operations performed on the outside of the blades are not included*

8.3 Participant Prerequisites for the Hub, Spinner and Inside Blade Rescue Module (HSIBR Module)

All personnel participating in HSIBR Module training shall be medically fit and capable of fully participating.

Valid GWO BST Working at Heights, GWO BST First aid, and GWO BST Manual Handling module WINDA records are prerequisites for participation.

8.4 Duration of the Hub, Spinner and Inside Blade Rescue Module (HSIBR Module)

The total contact time for completing the HSIBR module is estimated to be 6 hours and 45 minutes. This is based on the times given in the module timetables and summarised in table 8-7.

The training provider must not exceed the time per day given in the table 8-4.1 below.



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

Table 8-4.1 – 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).

8.5 Hub, Spinner and Inside Blade Rescue Module (HSIBR 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.

Module	Session	Instructor to Participant Ratio
Hub Rescue Module	Theory	1:12
	Practical	1:4

Table 8.5.1 – The instructor course participant ratio

8.6 Equipment for the HSIBR Module

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements as listed in Table A1-1 in Annex 1 where applicable.

A generic approach to teaching rescue equipment is applied to this module. This is aimed at avoiding potential additional product specific training on completion of this module, which may be required by the participants organisation (e.g. prior to site or work).

The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers). This enables participants to conduct pre-use inspection and to use, similar rescue equipment products (other than those taught during this module) based on the manufacturer's user manual without additional, formal training.

8.7 HSIBR Module Timetable

The order in which elements of this ART Module training 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
1.1 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	Motivation
	1.6	Ongoing assessments (participant performance assessment form)
	1.7	Human factors
TOTAL		15 min.
2.2 Emergency response plan in own organisation	2.1	Emergency response plan in own organisation
	2.2	Evacuation strategy
TOTAL		30 min.
3.3 Measures to prevent injury during training	3.1	Measures to prevent injury during training
	TOTAL	
4. Head support during rescue	4.1	Risk of using a cervical collar
	4.2	Head support during rescue
TOTAL		25 min.
5. Packaging the injured person	5.1	Packaging the injured person
	TOTAL	
6. Lowering/raising rescue system	6.1	Lowering/raising rescue system
	TOTAL	
7. Hub rescue exercise 1 & 2 (from blade)	7.1	Hub rescue exercise 1 & 2 (from blade)
	TOTAL	
8. Hub rescue exercise 3 & 4 (from spinner)	8.1	Hub rescue exercise 3 & 4 (from spinner)
	8.2	Hub rescue exercise 3 & 4 (from spinner)
TOTAL		80 min.
9. Outside evacuation of injured person	9.1	Outside evacuation of injured person – practical experience



		TOTAL	45 min.
10. Training review	10.1	Training review	
	10.2	Feedback session	
		TOTAL	15 min
		GRAND TOTAL	405 min.

Table 8-7 – HSIBR Module Timetable

8.8 Detailed Description of the Hub Rescue Module

The instructor shall ensure that one rescue scenario training exercise during the entire module is conducted during (simulated) poor lighting conditions.

Note *The administrative part of the registration should be carried out before the course 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 training safely at a training facility, while recognising what is expected of them during the training.

After having successfully completed lesson 1 of the ART HSIBR Module, the participants can:

- 1) **Show interest** in what is expected of them throughout the module (Ability, basic level)
- 2) **Take initiative** to point out local emergency procedures and facilities (Ability, intermediate level)
- 3) **Show interest** in the human factors and explain their implications (Ability, 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 at the training facility (Ability, basic level)



The instructor shall:



1.1.1 Explain and ask involving questions aimed at:

- a. safety instructors according to internal procedures
- b. emergency procedures and emergency exits in the areas where the participants can expect to be located during the course



The participants shall:

1.1.2 Engage in answering questions on local safety and emergency procedures

ELEMENT 1.2 - FACILITIES

Learning objective:

- 5) The participant can **recognise** the location of facilities at the training location (knowledge, basic level)



The instructor shall:

- 1.2.1 Present a general description of the facilities at the training location (administration, dining area, restrooms, toilets, etc.)
- 1.2.2 Alternatively, lead a tour pointing out the facilities



The participants shall:

- 1.2.3 Note relevant facilities and ask questions when in doubt

ELEMENT 1.3 - INTRODUCTION

Learning objective:

- 6) The participants **show interest** in fellow participants and the content and design (Ability, basic level)



The instructor shall:

- 1.3.1 Explain and ask involving questions aimed at the program of the ART HSIBR Module training, including breaks and mealtimes



- 1.3.2 Give a short introduction on themselves, including their background as instructors
- 1.3.3 Ask for participants' expectations of the training and their learning development



The participants shall:

- 1.3.4 Give a short introduction to themselves, including job function and expected primary geographic work location and share expectation of the training

ELEMENT 1.4 - SCOPE AND MAIN LEARNING OBJECTIVES

Learning objective:

- 7) The participant can **recognise** the scope and main objectives of the ART HSIBR Module training (knowledge, basic level)



The instructor shall:

- 1.4.1 Present the scope and main learning objective of the ART HSIBR Module training
- 1.4.2 Involve participants with questions on understanding and individual experiences of ART HSIBR Module



The participants shall:

- 1.4.3 Engage in answering questions and share experiences on ART HSIBR Module

ELEMENT 1.5 - MOTIVATION

Learning objective:

- 8) The participant **shows interest** and willingness to engage in the learning activities (Ability, basic level)



The instructor shall:

- 1.5.1 Explain and lead a discussion on the importance of personal involvement in the course and the definition of, and need for, ART HSIBR Module understanding and abilities
- 1.5.2 Lead a short discussion to ensure participants' understanding of the ART HSIBR Module



Note *Positive motivation is the driving force for commitment, and the instructor should make a focused effort to support growth of the necessary attitude and motivation in the participant*



The participants shall:

1.5.3 Engage themselves in discussion and share experiences on the ART HSIBR Module

Note *When the participants succeed by trying out on their own, bring their relevant experience into play and apply learning points from the instructor's feedback, the participants develop a positive attitude and responsibility towards the subject and the performance in the work situation*

ELEMENT 1.6 - ONGOING ASSESSMENTS (PARTICIPANT PERFORMANCE ASSESMENT FORM)

Learning objective:

9) Participants can **recognise** the assessment procedure and the aim of the ongoing assessment (Knowledge, basic level)



The instructor shall:

1.6.1 Explain the reasons for the ongoing assessment

1.6.2 Explain the layout of the GWO participants' performance assessment form and how it will be used

1.6.3 Facilitate a group discussion to facilitate understanding of the assessment form



The participants shall:

1.6.4 Engage themselves in discussions and ask questions when in doubt in relation to the assessment procedure

ELEMENT 1.7 - HUMAN FACTORS

The aim of the element is to draw the participants' attention on 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 **describe** the relevant human factors, and their implications (Knowledge, basic 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 influence accidents in the wind industry (relevant statistics may be used)
- 1.7.2 Lead a discussion about the role of the individual in improving human performance and how this can improve the safety of wind turbine environments
- 1.7.3 Ensure that constructive feedback on the participants' performance involve human factors criteria when these are defined in the learning objective such as the ability to take responsibility or to act independently

Facts and Human Factors Criteria:

The consequences of human factors in accidents in the wind turbine environment are influenced by the following terms and conditions:

- 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



The participants shall:



- 1.7.4 Engage in discussions and share experiences on how human factors influence accidents related to the ART HSIBR Module. In addition, engage in and reflect on received feedback and take responsibility on their own performance and development during the training

LESSON 2 - EMERGENCY RESPONSE PLAN IN OWN ORGANISATION

30 min.

The aim of this lesson is to inspire the participants to search for information concerning what specific rescue preparations and rescue procedures apply in their own organisation.

After having successfully completed this lesson, the participants can:

- 12) **Show interest** in rescue preparations, emergency communication and the command procedures needed for hub, blade, and spinner rescues (Ability, basic level)
- 13) **Act independently** to recognise the limitations of rescue preparations and evacuation strategies (Ability, intermediate level)

ELEMENT 2.1 - EMERGENCY RESPONSE PLAN IN OWN ORGANISATION

Learning objective:

- 14) The participants can **explain** what hub, blade and spinner rescue preparations, emergency, communication, and command procedures apply in their own organisation (Knowledge, intermediate level)



The instructor shall:

- 2.1.1 Explain what specific hub, blade and spinner rescue preparations and emergency and communication procedures apply in their own organisation, e.g. concerning:
 - a. the number of rescue personnel available (on site) for a rescue operation and availability of additional rescue personnel
 - b. rescue training level depending on your work location in the WTG and number of personnel (e.g. working in the hub, or in the tower)
 - c. communication procedures of operation, e.g. communication to backup/rescue team, emergency medical treatment (EMT) i.e. ambulance and fire service, site lead, service vessel, helicopter search and rescue (SAR), and the means of communication - radio or phone (cell, IP or satellite phone)



- d. command procedures of operation, e.g. site lead command or command in rescue team
- e. national and/or local requirements, e.g. confined space regulations and procedures
- f. estimated time for professional emergency response providers to arrive
- g. what to be aware of (during this training) concerning which specific elements in their own WTG type/WTG environment might differ from the training scenario environment (to visualise and enhance learning transfer), for example:
 - g.i turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, helipad)
 - g.ii anchor points (certified/structural/location)
 - g.iii rescue equipment (type/quantity/location)
 - g.iv emergency light (system/equipment)

2.1.2 Facilitate a group Q&A activity on the above to check understanding of specific hub, blade and spinner rescue preparations and emergency and communication procedures



The participants shall:

2.1.3 Share their understanding of specific hub, blade and spinner rescue preparations and emergency, communication procedures and command procedures, apply in their own organisation by taking part in a discussion

ELEMENT 2.2 - EVACUATION STRATEGY

Learning objectives:

- 15) The participants can **discuss** the limitations of the rescue preparations available, when deciding on the rescue strategy (Knowledge, intermediate level)
- 16) The participants can **explain** what to consider when deciding on evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower (Knowledge, intermediate level)
- 17) The participants can **perform** how to safely rig rescue devices in both passive and active setup with an evaluation of a loose or unsupported rope attachments possible effects (Skills, intermediate level)
- 18) The participants can **explain** when and how to use a fall lanyard to maintain a person in a horizontal position (Knowledge, intermediate level)
- 19) The participants can **explain** how to change from a rescue device active setup to passive configuration (Knowledge, intermediate level)

**The instructor shall:**

- 2.2.1 Explain how to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower, by considering the following:
 - a. medical condition of the injured person
 - b. time constraints
 - c. transition piece size and configuration
 - d. nacelle position to the wind
 - e. evacuation hatch location
 - f. interfering wind speed and wind directions
 - g. temperatures and wind chill factors
- 2.2.2 Explain how to mitigate transition piece size and configuration; nacelle position to the wind; evacuation hatch location; interfering wind speeds and wind directions and bringing down an injured person via an outside evacuation:
 - a. from a hub/nacelle to a transition piece by means of a passive rescue device setup and (if beneficial) tagline
 - b. from a transition piece to a vessel by means of an active or passive rescue device setup and (if beneficial) tagline
- 2.2.3 Explain the challenges, methods, and techniques of evacuating an injured person from a transition piece to a vessel highlighting:
 - a. the pros and cons passive or active rescue device setup
 - b. communication with vessel crew
 - c. procedures and techniques on how to put down the injured person cautiously on a vessel moving up/down in the swell
- 2.2.4 Demonstrate proper use of a specific rescue device
- 2.2.5 Demonstrate how to attach and rig the rescue device in passive setup and how to secure the rope
- 2.2.6 Explain the requirements, applications, and limitations of the device
- 2.2.7 Explain the common additional rope's length compared to the specific WTG height



- 2.2.8 Explain the potential consequence of a passive and an active setup rescue device, slowing down or being blocked by the weight of a loose hanging / unsupported length of the unloaded rope's end
- 2.2.9 Explain the pros and cons of using (for an outside evacuation) different rescue stretcher types. For example, comparing rescue stretchers with lifting bridles with a rescue stretcher/transfer board without lifting bridles versus no rescue stretcher/transfer board
- 2.2.10 Explain and demonstrate how to attach and rig the rescue device in a passive and active setup respectively and how to utilise a fall restraint lanyard in the setup to balance the injured person in a perfect horizontal configuration, if required and possible
- 2.2.11 Explain how to load the injured person out of the WTG preferably feet first to avoid neck/head injury of the injured person due to hatchway opening contact, or load the injured person out of the WTG head first if this risk cannot be mitigated
- 2.2.12 Explain how to extract a suspended, unconscious, injured person from a WTG using a tagline to cautiously manipulate (and balance/let go of) them while avoiding a head down configuration and so preventing stomach content release
- 2.2.13 Explain why it might be required to transition a rescue device setup from active to passive setup configuration without detaching the active setup loaded rope's end from its original anchor point (e.g. following tower descent) while lowering the injured person to a vessel. In this way the rescuer maintains control of the rescue device)
- 2.2.14 Demonstrate how to transition from a rescue device active setup into a passive setup configuration without detaching the active setup's loaded rope's end from its original anchor point, including:
- how to enable a passive setup by pulling the rope's end from the rope bag through the device and attaching it to the injured persons harness, enabling a reverse passive setup
 - how to rig a configuration where the passive setup loaded rope's end is deviated through a pulley in the TP crane boom (or similar) and the rescue device is attached within reach on the transition piece (or similar) and can be controlled without the risk of a fall from height
 - how to secure the rope by securing the hand wheel or locking mechanism
 - how to control the descent using the devices friction component or by applying a deflection connector
- 2.2.15 Provide constructive feedback on the participants' efforts during the exercise with focus on their ability to perform correctly, safely, and responsibly

Note *Explain and demonstrate the above mentioned based on the manufacturer's user manual*



The participants shall:

- 2.2.16 Discuss the best method to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower, by considering the following:



- a. medical condition of the injured person
 - b. time constraints
 - c. transition piece size and configuration
 - d. nacelle position to the wind
 - e. evacuation hatch location
 - f. interfering wind speed and wind directions
 - g. temperatures and wind chill factor
- 2.2.17 Describe and explain how to mitigate transition piece size and configuration, nacelle position to the wind, evacuation hatch location and interfering wind speeds and wind directions, bringing down an injured person by an outside evacuation
- a. from a hub/nacelle to a transition piece by means of a passive rescue device setup, and (if beneficial) tagline
 - b. from a transition piece to a vessel by means of an active or passive rescue device setup, and (if beneficial) tagline
- 2.2.18 Discuss the challenges, methods, and techniques of evacuating an injured person from a transition piece to a vessel highlighting pros and cons of the following:
- a. passive or active rescue device setup
 - b. communication with vessel crew
 - c. procedures and techniques on how to put down the injured person cautiously on a vessel moving up/down in the swell
- 2.2.19 Practise the proper use of a specific rescue device
- 2.2.20 Practise how to attach and rig the rescue device in passive setup and how to secure the rope
- 2.2.21 Discuss the requirements, applications, and limitations of the device
- 2.2.22 Discuss the common additional rope's length compared to the specific WTG height
- 2.2.23 Discuss the potential consequence of a passive and an active setup rescue device slowing down or being blocked by the weight of a loose hanging / unsupported length of the unloaded rope's end.
- 2.2.24 Discuss the pros and cons of using (for an outside evacuation) different rescue stretcher types. For example, comparing rescue stretchers with lifting bridles with a rescue stretcher/transfer board without lifting bridles versus no rescue stretcher/transfer board



- 2.2.25 Discuss and practise how to attach and rig the rescue device in a passive and active setup respectively and how to utilise a fall restraint lanyard in the setup to balance the injured person in a perfect horizontal configuration, if required and possible
- 2.2.26 Discuss how to load the injured person out of the WTG, preferably feet first, attending to avoid neck/head injury of the injured person due to hatchway opening contact, or load the injured person out of the WTG headfirst if this risk cannot be mitigated
- 2.2.27 Discuss how to cautiously manipulate and balance/let go of the injured person out of the WTG when suspended by utilising a tagline, at the same time aiming to avoid head down configuration of the unconscious injured person preventing stomach content release
- 2.2.28 Discuss why it might be required to transition a rescue device setup from active to passive setup configuration without detaching the active setup loaded rope's end from its original anchor point (e.g. following tower descent and lowering the injured person to a vessel so that the rescuer maintains control of the rescue device)

LESSON 3 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The aim of this lesson is to reduce the risk of injury during training by ensuring that the participants are briefed in the control measures employed in the training area and how to warm up prior to performing rescue exercises.

After having successfully completed this lesson, the participants can:

- 20) **Take responsibility** for reducing the risk of injury by understanding and demonstrating effective risk control measures (Ability, intermediate level)



The instructor shall:

- 3.1.1 Explain further control measures relevant for the specific training facilities and training to avoid injury during the training
- 3.1.2 Verify that the participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions
- 3.1.3 Ensure that any hazardous energy sources which may affect the participants during the practical training sessions are isolated and locked out and that the status of the isolation has been communicated to the participants
- 3.1.4 Lead a warm-up session of the major muscle groups of the body and the ankles wrists and back. See suggested exercises in Annex 4
- 3.1.5 It is the instructor's responsibility to physically verify that each participant who is working at height (including both casualty and rescuer) is always attached to additional fall protection. GWO recommends that a SRL is used as additional fall protection.



- 3.1.6 Give constructive feedback on the participants' understanding of how to reduce injury using control measures including the use of PPE and the proper use of harnesses



The participants shall:

- 3.1.7 Take part in the warm-up session of the major muscle groups and ankles, wrists and back
- a. Practise a pre-use inspection of their personal fall protection equipment
 - b. Practise a 'buddy check' of another participants' personal fall protection equipment

Note *During the remaining rescue exercises on this course the instructor shall observe and coach the participants in manual handling planning, techniques, execution, and improvement*

It is important that the participants understand how to apply manual handling planning and techniques into their daily work environment

LESSON 4 - HEAD SUPPORT DURING RESCUE

25 min.

Warning *According to various international first-aid guidelines there is a risk that the routine application of a rigid or semi-rigid cervical collar can increase the intracranial pressure and present difficulties in maintaining the airway of the person wearing the collar*

It is of utmost importance during exercises where a rigid or semi-rigid cervical collar is used that participants and instructors are aware of these risks and that steps are taken to mitigate against these risks

The aim of this lesson is to enable the participants to use various methods (e.g. a cervical collar) to support the head of an unconscious injured person during extraction from an enclosed space. In addition, this lesson will enable the participants to understand the risks posed to the injured person by using a cervical collar and to be able to mitigate against those risks.

After having successfully completed this lesson, the participants can:

- 21) **Take initiative** to select the correct safety equipment, fit a helmet and safety glasses correctly to an unconscious person (Ability, intermediate level)
- 22) **Act independently** to fit a cervical collar to an unconscious person and perform a primary survey, understanding the risks involved in the fitting of a cervical collar (Ability, intermediate level)



ELEMENT 4.1 - RISK OF USING A CERVICAL COLLAR

Learning objectives:

- 23) The participants can **explain** the risks posed by using a cervical collar covering the following (Knowledge, intermediate level):
 - a. increased intercranial pressure
 - b. compromised airway
- 24) The participants can **recognise** and discuss the measures needed to mitigate the risks posed to an unconscious injured person who is wearing a cervical collar (Knowledge, basic level)



The instructor shall:

- 4.1.1 Explain the risks to an unconscious injured person posed by using a cervical collar, covering the following:
 - a. intercranial pressure increase
 - b. airway management
- 4.1.2 Explain that a cervical collar shall only be used as a last resort and in the following circumstances:
 - a. the injured person is unconscious, and
 - b. it is not possible to support the head and / or maintain the airway by other means during the extraction of an unconscious injured person from an enclosed space, and
 - c. that the cervical collar shall only be used for the minimum amount of time required to extract the unconscious injured person from an enclosed space
- 4.1.3 Explain how to reduce the risks posed by using a cervical collar through the following:
 - a. correct sizing and fitting of the collar, according to the manufacturer instructions
 - b. continuously performing primary survey checks on the unconscious injured person airway, breathing and circulation during extraction from an enclosed space
 - c. removal of the cervical collar as soon as it is practicable to do so (i.e. the airway can be managed by other methods and head support is no longer required)
- 4.1.4 Facilitate a group discussion or Q&A activity on the risks to an unconscious injured person posed by using a cervical collar



The participants shall:

- 4.1.5 Explain the risks posed to an unconscious injured person who is wearing a cervical collar
- 4.1.6 Explain how to reduce the risks posed to an unconscious injured person who is wearing a cervical collar

ELEMENT 4.2 - HEAD SUPPORT DURING RESCUE

Learning objectives:

- 25) The participants can **perform** a pre-use inspection of rescue equipment for head support (Skills, intermediate level)
- 26) The participants can **perform** unaided the following activities to an unconscious injured person; correctly size, prepare and fit a cervical collar (Skills, intermediate level)
- 27) The participants can **perform** how to check correct application of a cervical collar to the injured person (Skills, intermediate level)
- 28) The participants can **perform** the primary survey of an injured person wearing a cervical collar with focus on the following (Skills, intermediate level):
 - a. Airway
 - b. Breathing
 - c. Circulation (e.g. checking the colour of the injured person for indications that the neck veins are under excessive pressure)
- 29) The participants can **perform** the following activities: fit helmet and safety glasses on an unconscious, injured person who is wearing a cervical collar (Skills, intermediate level)

Note *The use of a cervical collar during rescue operations in this standard is intended only as a means to support the head and as a result help in maintaining an open airway of an unconscious injured person during parts of rescue operations where this is not possible by other means.*

In addition it is intended that the collar is removed as soon as it is possible to support the head and maintain the airway by other means. The use of collars in this instance is not considered as routine. For further information please refer to Annex 3

Note *There shall be at least two exercises per participant - 1 sitting, 1 lying down; a 'live' injured person recommended*



Note *Each participant shall be able to demonstrate the above mentioned skills on an injured person sitting and on an injured person lying down*



The instructor shall:

Note *The following should be carried out on an injured person both sitting and lying down*

- 4.2.1 Briefly introduce the generic approach to rescue equipment as described in the equipment annex to this module
- 4.2.2 Explain that a pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer's criteria, or the participants' own organisation
- 4.2.3 Demonstrate how to perform a pre-use inspection of the rescue equipment for head support required / chosen to instruct this module, by the following principles and covering:
 - a. markings and labels
 - b. operating size range, if applicable
 - c. equipment is within the period of formal inspections
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. adjusting, locking, and securing mechanisms work correctly
 - f. observe manufacturer's user manual for specific or additional requirements
- 4.2.4 Explain and demonstrate how to support the head and maintain the airway of an injured person during extraction by means other than a cervical collar
- 4.2.5 Explain and demonstrate how to measure the neck of the injured person and select the correct size of cervical collar
- 4.2.6 Explain and demonstrate how to prepare and fit a cervical collar
- 4.2.7 Explain and demonstrate how to ensure correct application by doing product specific checks of the cervical collar
- 4.2.8 Explain and demonstrate how to fit PPE (i.e. helmet and safety glasses) to an unconscious injured person wearing a cervical collar
- 4.2.9 Explain and demonstrate how to continuously perform the primary survey of the injured person wearing a cervical collar with a focus on the following:



- a. Airway
- b. Breathing
- c. Circulation (e.g. checking the injured person for indications that the neck veins are under excessive pressure)

- 4.2.10 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on similarities and differences in design, functionality, and operation between different products
- 4.2.11 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations,
- 4.2.12 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 4.2.13 Practise how to use methods other than a cervical collar to support the head and maintain the airway of an injured person during extraction
- 4.2.14 Practise how to, unaided, correctly prepare, fit, and check a cervical collar and fit helmet and safety glasses on both an injured person sitting and on an injured person lying down
- 4.2.15 Practise how to, unaided, correctly and continuously perform the primary survey on an injured person who is wearing a cervical collar

LESSON 5 - PACKAGING THE INJURED PERSON

50 min.

The aim of this lesson is to enable the participants to fit a harness onto the injured person and package them onto a rescue stretcher or a transfer board, to enable safe transportation of the injured person.

After having successfully completed this lesson, the participants can:

- 30) **Take initiative** and perform: a pre-use inspection of a rescue stretcher and transfer board; how to fit a harness and package an unconscious injured person on a rescue stretcher; and how to create an attachment point on a transfer board by attaching / choking an anchor sling through the handles of the foot and top of a transfer board with a carabine attached (Ability, intermediate level)

Note *Where possible the participants shall work in teams of two: one exercise per participant.*

Note *It is recommended that a live 'injured person' is used for this exercise.*



Note *If possible, medical advice according to site emergency response plan should be sought before securing an IP to a transfer board.*

Note *An injured person must always be attached to an approved attachment point.*

ELEMENT 5.1 - PACKING THE INJURED PERSON

Learning objective:

- 31) The participants can **perform** a rescue by packaging an injured person on a rescue stretcher and transfer board in a vertical or horizontal configuration to enable safe transportation. This is achieved by doing regular checks, using rescue equipment such as cervical collar, and avoiding head down configuration of the unconscious injured person (Skills, intermediate level)

Note *Whenever possible, an injured person should be lowered in a horizontal configuration.*



The instructor shall:

- 5.1.1 Explain that a pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer's criteria, or the participants' own organisation
- 5.1.2 Demonstrate a pre-use inspection of the transfer board(s) and rescue stretcher(s) required / chosen to instruct in this module, by following the principles and covering:
- a. markings and labels
 - b. operating weight and temperature range, if applicable
 - c. equipment is within the period of formal inspections
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. checking for the absence of significant wear of the equipment
 - f. straps
 - g. stitching
 - h. locks and connectors
 - i. metal parts



- j. attachment points
 - k. back protection
 - l. observe manufacturer's user manual for specific or additional requirements:
- 5.1.3 Explain how to fit a harness onto an unconscious injured person, highlighting the importance of loosening the injured person's shoulder straps prior to fitting (to more easily fit the harness correctly onto the injured person)
- 5.1.4 Demonstrate how to create an attachment point on a transfer board by attaching / choking an anchor sling through the handles at the foot and top of the transfer board with a connector attached
- 5.1.5 Explain how to package an unconscious injured person on a rescue stretcher and on a transfer board, adhering to the manufacturer's user manual
- 5.1.6 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products
- 5.1.7 Explain the potential task placed upon the participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products
- 5.1.8 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 5.1.9 Practise how to prepare, fit, and check rescue head support and fit PPE helmet and safety glasses on an unconscious injured person
- 5.1.10 Practise how to, unaided, correctly, and continuously perform the primary survey on an injured person who is wearing rescue head support
- 5.1.11 Practise how to fit a harness onto an unconscious injured person
- 5.1.12 Practise how to create an attachment point on a transfer board by attaching / choking an anchor sling through the handles at the foot and top of the transfer board with a connector attached
- 5.1.13 Practise how to package an unconscious injured person on a rescue stretcher and on a transfer board, adhering to the manufacturer's user manual and ensuring a tight fit of restrain straps

Note *If permitted (in the transfer board and / or restrain strap manufacturer's user manual) a crossing strap configuration packaging the injured person is preferred*

LESSON 6 - LOWERING / RAISING RESCUE SYSTEM

25 min.



The aim of this lesson is for participants to take responsibility in the lowering/raising of a rescue system for limited distance rescue purpose (rescue device, pulley system or similar), rigging setup options included.

After having successfully completed this lesson, the participants can:

- 32) **Show interest** in how to perform a pre-use inspection of a random pulley system and rescue device (Ability, basic level)
- 33) **Act independently** to correctly utilise a pulley system, demonstrate how to attach, rig, secure, the rigging setup options, and the requirements, applications, and limitations of the system (Ability, intermediate level)

ELEMENT 6.1 - LOWERING / RAISING RESCUE SYSTEM

Learning objective:

- 34) The participants can **apply** rescue methods and techniques in performing descending and ascending rescue operations, from a WTG hub, spinner and inside a blade using a rescue stretcher and transfer board, manually operated lowering/raising rescue system for limited distance rescue (rescue device, pulley system or similar), and other rescue equipment relevant to the participants (Skills, intermediate level)



The instructor shall:

- 6.1.1 Explain that the pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer criteria, or the participants own organisation
- 6.1.2 Demonstrate a pre-use inspection of the pulley system and rescue device (and their accessories) required / chosen to instruct in this module covering the characteristics and principles of the following:
 - a. markings and labels
 - b. equipment is within the period of formal inspections
 - c. the rope has no damage, and the end terminations are in good condition
 - d. the rope runs freely through the system / device in both directions
 - e. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - f. checking for the absence of significant wear of the system / device
 - g. rope securing mechanism works correctly



- h. the product operating temperature range
- i. checking webbing, rope, connectors, and other hardware accessories following the same principles
- j. observe manufacturer's user manual for specific or additional requirements

6.1.3 Explain the proper utilisation of a specific lowering/raising rescue system

6.1.4 Demonstrate how to attach and rig the system and how to secure the rope

6.1.5 Explain the requirements, applications, and limitations of the system, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection, i.e. when the lowering/raising rescue system is not approved for person lifting

6.1.6 Explain the system's maximum raising distance possible

6.1.7 Explain the principles of lifting angle, angle factor, deviation, and edge protection

Note *The above to be based on the manufacturer's user manual*

6.1.8 Demonstrate how to use the rescue device to prepare and rig a tensioned line (zip line) in both a single line and double line configuration in a nacelle (in accordance with manufacturer's user manual) and transport for horizontal transportation

6.1.9 Show examples of (and explain ways to) combining rescue equipment and PPE lanyards to achieve an efficient rigging setup with the equipment available, and a minimum of re-rigging during the rescue operation

6.1.10 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality and operation between different products and associated accessories

6.1.11 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations

6.1.12 Provide constructive feedback on the participants' efforts during the practice



The participants shall:

6.1.13 Discuss the pre-use inspection of rescue equipment. This may be omitted only if it is permitted by the manufacturer's user manual, the manufacturer criteria, or by the participant's own organisation

6.1.14 Practise a pre-use inspection of the pulley system and rescue device (and their accessories) required / chosen to instruct in this module covering the characteristics and principles of the following:

- a. markings and labels
- b. equipment is within the period of formal inspections
- c. the rope has no damage, and the end terminations are in good condition



- d. the rope runs freely through the system / device in both directions
 - e. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - f. checking for the absence of significant wear of the system / device
 - g. rope securing mechanism works correctly
 - h. the product operating temperature range
 - i. checking webbing, rope, connectors, and other hardware accessories following the same principles
 - j. observe manufacturer's user manual for specific or additional requirements
- 6.1.15 Discuss the proper utilisation of a specific lowering/raising rescue system
- 6.1.16 Practise how to attach and rig the system and how to secure the rope
- 6.1.17 Discuss the requirements, applications, and limitations of the system, i.e. when the lowering/raising rescue system is not approved for person lifting
- 6.1.18 Discuss the system's maximum raising distance possible
- 6.1.19 Discuss the principles of lifting angle, angle factor, deviation, and edge protection
- 6.1.20 Practise how to use the rescue device, prepare and rig a tensioned line (zip line) in both a single line and double line configuration, in accordance with manufacturer's user manual, in a nacelle and transport for horizontal transportation
- 6.1.21 Discuss the best ways to combine rescue equipment and PPE lanyards to achieve an efficient rigging setup with the equipment available, and a minimum of re-rigging during the rescue operation
- 6.1.22 Discuss the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality and operation between different products and associated accessories
- 6.1.23 Discuss the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations

LESSON 7 - HSIBR EXERCISE 1 & 2 (FROM BLADE)

100 min.

There are several locations on the turbine with reduced horizontal and vertical space where occasionally work needs to take place, for example a hub, spinner, or blade.

The aim of this lesson is to enable the participants to perform a rescue of an injured person, from a WTG blade and out of the hub to a safe place.



After having successfully completed this lesson, the participants can:

- 35) **Take initiative** to understand common hazards/risks and control measures/risk mitigation in a WTG (Ability, intermediate level)
- 36) **Manage** a rescue operation, using the correct techniques to fit a harness or improvised harness by the use of a rescue sling around the injured person's chest, and other PPE (e.g. helmet, safety glasses) onto an injured person, in an enclosed space in a WTG (Ability, advanced level)

Note *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person.*

The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally.

An improvised harness must never be used for lifting or lowering an injured person.

- 37) **Act independently** to utilise a manually operated lowering/raising rescue system whilst adhering to the manufacturer's user manual (Ability, intermediate level)
- 38) **Manage** an exercise rescue using an injured person's personal fall protection equipment without compromising additional fall protection and show how to balance an injured person from a horizontal to a vertical configuration (and vice versa) (Ability, advanced level)
- 39) **Act independently** to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy (Ability, intermediate level)
- 40) **Take initiative** to ensure clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Ability, intermediate level)

Note *Where possible the participants shall work in teams of two, one exercise per team, with one participant acting as team coordinator*

Note *It is recommended that a live 'injured person' is used for this exercise*

ELEMENT 7.1 - HSIBR EXERCISE 1 & 2 (FROM BLADE)

Learning objectives:



- 41) The participants can **perform** rescue operations, in a WTG hub, spinner and inside a blade, using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment (Skills, intermediate level)
- 42) The participants can **perform** rescue operations, in a WTG hub, spinner and inside a blade, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection (i.e. when the manually operated lowering/raising rescue system is not certified for person lifting) (Skills, intermediate level)
- 43) The participants can **recognise** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it (Knowledge, basic level)
- 44) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skills, intermediate level)



The instructor shall:

- 7.1.1 Highlight specific control measures to avoid injury during training relevant to this specific exercise scenario (according to Lesson 3- Measures to avoid injury during training)
- 7.1.2 Introduce the specific exercise, including (to the extent needed):
 - a. appointing a team coordinator for the exercise, and introduce the tasks and responsibilities related to this function
 - b. different rescue strategies, methods, and techniques in order to optimise the rescue set up
 - c. highlighting the considerations needed to determine where in the WTG to package the injured person on a rescue stretcher/transfer board
 - d. guiding and supporting the participants in exploring different rigging options for attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
 - e. highlighting the correct injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - f. highlighting how to organise the rescue team to the specific rescue operation scenario (who does what)
- 7.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
 - a. positive feedback
 - b. improvement proposals and alternative solutions



- c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
 - d. participants' risk mitigation during the exercise
 - e. participants' manual handling risk mitigation and application of further control measures
- 7.1.4 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality and operation between different products and associated accessories
- 7.1.5 Explain the potential task placed upon the participants in their own organisations on completion requiring them to familiarise themselves with other rescue equipment products
- 7.1.6 Facilitate a group discussion or Q&A activity on rescue strategies and different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board



The participants shall:

- 7.1.7 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation, covering the following:
- a. hazardous energies (mechanical, electrical, magnetic, pressurised systems) - i.e. LOTO
 - b. enclosed space areas
 - c. poor lighting conditions
 - d. dropped objects
 - e. poor manual handling
 - f. temperature/working conditions (dehydration, heat stroke, exhaustion)
 - g. injured person suspension trauma (repetition from GWO WAH put into an advanced rescue context)
 - h. slips and trips
- 7.1.8 Practise how to assess and determine the optimum rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for a rescue scenario in a WTG blade
- 7.1.9 Practise how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package them on a rescue stretcher or transfer board)
- 7.1.10 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection if the lowering / raising rescue system is not approved for person lifting



- 7.1.11 Practise how to apply rescue methods, techniques, and clear communication in performing safe lowering/raising rescue operations from inside a WTG blade
- 7.1.12 Practise regular checks of the injured person during the entire rescue operation
- 7.1.13 Practise rescue operation, from a WTG blade, through the hub and e.g. out of the hub or into the nacelle
- 7.1.14 Practise a rescue effort as a team member or team coordinator
- 7.1.15 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable

LESSON 8 - HSIBR EXERCISE 3 & 4 (FROM SPINNER)

80 min.

The aim, learning objectives and elements given in the Lesson 7 (before) apply to this lesson within the context of operating inside the spinner.

After having successfully completed this lesson, the participants can:

- 45) **Take responsibility** for transporting the injured person to the escape hatch by means of a zip line (aerial ropeway), to control the handling of injured person more efficiently and reduce manual handling (Ability, intermediate level)

Note *Where possible the participants shall work in teams of two, one exercise per team, with one participant acting as the team coordinator*

Note *It is recommended that a rescue dummy is used for this exercise*

ELEMENT 8.1 - HSIBR EXERCISE 3 & 4 (FROM SPINNER)

Learning objectives:

- 46) The participants can **perform** a manual transport of an injured person (while in balance) on a rescue stretcher or transfer board in a WTG (Skills, intermediate level)
- 47) The participants can **perform** changing an injured person directly from balancing horizontally to a vertical configuration (and vice versa) while suspended (Skills, intermediate level)
- 48) The participants can **perform** rescue operations (in a WTG hub, spinner and inside a blade) as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy and exercising clear communication (Skills, intermediate level)



- 49) The participants can **perform** rescue operations, in a WTG hub, spinner and inside a blade using personal flashlight (e.g. helmet light), if required due to poor lighting conditions (Skills, intermediate level)
- 50) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skills, intermediate level)

The instructor shall conduct the elements mentioned in the lesson elements above (Lesson 7) which applies to this element as well - but related to the spinner.



The instructor shall:

- 8.1.1 Highlight the relevant differences in rescue strategy of this specific exercise scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)
- 8.1.2 Explain the concept of tensioned line (zip line) in a nacelle, how to rig it and adhering hazards and risks
- 8.1.3 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 8.1.4 Distinguish between the relevant differences in rescue strategy of the spinner rescue scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)
- 8.1.5 Discuss and understand the concept of tensioned line (zip line) in a nacelle, how to rig it and adhering hazards and risks

ELEMENT 8.2 - HSIBR EXERCISE 3 & 4 (FROM SPINNER)

Learning objectives:

- 51) The participants can **perform** rescue operations, in a WTG hub, spinner and inside a blade using personal flashlight (e.g. helmet light), if required due to poor lighting conditions (Skills, intermediate level)
- 52) The participants can **perform** rescue operations, in a WTG hub, spinner and inside a blade, as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy and exercising clear communication (Skills, intermediate level)
- 53) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skills, intermediate level)



The instructor shall:

- 8.2.1 Highlight the relevant differences in rescue strategy of this specific exercise scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)
- 8.2.2 Further explain the concept of tensioned line (zip line) in a nacelle, how to rig it and adhering hazards and risks
- 8.2.3 Provide constructive feedback on the participants' performance during the practice

Note *The participants shall demonstrate and on request explain, (working as teams), how to conduct the elements mentioned in the lesson elements above (Lesson 7) which applies to this element as well (but related to the spinner).*



The participants shall:

- 8.2.4 Practise how to rig a tensioned line (zip line) in a nacelle and transport the injured person to the escape hatch
- 8.2.5 Practise rescue operations using a headlamp, if required due to poor lighting conditions

LESSON 9 - OUTSIDE OF EVACUATION OF INJURED PERSON

45 min.

The aim of this lesson is to enable the participants to evacuate an injured person (in a safe and secure manner) from the hub or nacelle (located outside the tower) to a primary assembly area (ground or transition piece) and from transition piece to a secondary assembly area (vessel)

After having successfully completed this lesson, the participants can:

- 54) **Take responsibility** for determining the evacuation strategy during a rescue operation, include a clear preferred evacuation route outside or inside the tower and explain how to mitigate against interfering winds when moving to the transition piece (Ability, intermediate level)

Note *Where possible the participants shall work in teams of two:*

- a. one exercise per team:*
- b. passive rescue device setup with tagline*

Note *It is recommended that a rescue dummy is used for this exercise.*



ELEMENT 9.1 - OUTSIDE EVALUATION OF INJURED PERSON – PRACTICAL EXERCISE

Learning objectives:

- 55) The participants can **take responsibility** for giving clear communication and guidance to other emergency responders (e.g. vessel or ambulance crews) including coordinating the handover of an injured person (Ability, intermediate level)
- 56) The participants can **perform** the preparation of the injured person for safe transportation, utilising safe and suitable anchor points (Skills, intermediate level)
- 57) The participants can **select** safe lifting angles of the rescue equipment and apply deviation and edge protection to the evacuation device rigging (Skills, advanced level)
- 58) The participants can **perform** the use of a rescue device in a passive setup (i.e. the rescue device fixed in the WTG) and attach the rescue device descending rope to the injured person harness (Skills, intermediate level)
- 59) The participants can **perform** the rigging of a fall restraint lanyard between the foot of the rescue stretcher/transfer board and the rescue device attachment connector on the injured person (Skills, intermediate level)
- 60) The participants can continuously **perform** the first aid primary survey (Skills, intermediate level)
- 61) The participants can **perform** the transfer of an injured person out of the WTG, preferably feet first (while avoid neck/head injury of the injured person due to hatchway opening contact), or transferring the injured person out of the WTG headfirst if this risk cannot be mitigated (Skill, intermediate, level)
- 62) The participants can **take responsibility** for giving clear guidance and precise communication to other emergency responders while in a stressful rescue operation (Ability, intermediate level)
- 63) The participants can **take responsibility** for conducting an outside evacuation with the injured person in a horizontal configuration from a WTG hub or nacelle to a primary assembly area (Skills, intermediate level)



The instructor shall:

- 9.1.1 Highlight specific control measures relevant to this specific exercise scenario. For example: when to open evacuation hatch and/or provide fall restraint or fall arrest in (training) situations where fall from height is a risk (according to local legal requirements)
- 9.1.2 Introduce the specific exercise, including:
 - a. injured person, which configuration to apply (horizontal, or vertical configuration)
 - b. organise the rescue team to the specific evacuation scenario



- c. what the participants must focus on during this exercise

9.1.3 Recapture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:

- a. positive feedback
- b. improvement proposals and alternative solutions
- c. the pros and cons related to descent control and communication: comparing a passive and an active setup for evacuating an injured person from the transition piece to a vessel
- d. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
- e. participants' risk mitigation during the exercise
- f. participants' manual handling risk mitigation and application of further control measures

9.1.4 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the differences in design, functionality, and operation between different rescue equipment products

9.1.5 Explain the potential task participants have (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations



The participants shall, in a team:

9.1.6 Explain how to identify and control the specific hazards / risks in the WTG during the rescue operation, covering the following:

- a. hazardous energy sources (mechanical, electrical, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature / working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
- h. slips and trips

9.1.7 Practise how to assess and determine evacuation strategy for an evacuation scenario from a WTG hub or nacelle outside the tower, including:



- a. relevant evacuation route
- b. method
- c. technique
- d. certified equipment
- e. required personnel

9.1.8 Practise how to prepare the injured person for safe transportation (i.e. apply head support, harness and other PPE, and package them on a rescue stretcher or transfer board)

9.1.9 Practise:

- a. how to manually transport an injured person (in a balanced way) on a rescue stretcher or transfer board or by means of a zip line (aerial ropeway) when relevant
- b. how to attach the rescue device to the injured person in a safe and proper manner
- c. how to utilise tagline(s) during one exercise, when performing outside evacuation
- d. how to balance an injured person from a horizontal to a vertical position (and vice versa), in order to move the injured person downwards through hatches, or similar
- e. how to select and utilise certified and structural anchor points
- f. how to apply the theory of lifting angle, angle factor, deviation, and edge protection to the rescue scenario
- g. how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of; an injured person personal fall protection equipment additional fall protection system; if the lowering / raising rescue system is not approved for person lifting
- h. how to apply rescue methods, techniques, and clear and precise communication in a safe ascending/descending rescue operations from a WTG
- i. regular checks of the injured person during the entire rescue operation, including first aid primary survey
- j. the rescue effort as a team member or team coordinator
- k. how to reduce the risks associated with manual handling and apply further control measures where applicable
- l. how to perform an outside evacuation with the injured person in a horizontal configuration, and the rescue device in passive setup, from a WTG hub or nacelle to a primary assembly area (ground or transition piece)



- m. how to perform an outside evacuation with the injured person in a horizontal configuration, and the rescue device in an active setup, from a transition piece to a secondary assembly area (vessel)

LESSON 10 - 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 10.1 - TRAINING REVIEW



The instructor shall:

- 10.1.1 Re-present the overall aims and learning objectives of the module for the participants' comparison of their learning outcomes and the achievement of their previously stated expectations for the module:



The participants shall:

- 10.1.2 Reflect on their learning outcome and key takeaways from ART HSIBR 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 & talk
 - b. questions & answers in class, or where suitable

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

ELEMENT 10.2 - FEEDBACK SESSION



The instructor shall:

- 10.2.1 Give an overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training-review-session
- 10.2.2 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) and to discuss with colleagues about how the ART HSIBR Module content, methods and techniques are similar or different to the local specific conditions identified after the module completion



GLOBAL WIND
ORGANISATION

Nacelle, Tower & Basement Rescue

(ART-N)



9. MODULE 2 – NACELLE, TOWER & BASEMENT RESCUE

9.1 Aims and objectives of Nacelle, Tower & Basement Rescue Module

The aim of this module is to enable the participants to perform injured person rescue operations in a WTG nacelle, tower, and basement, by using industry standard rescue equipment, methods, and techniques, exceeding those of GWO work at height.

The Nacelle, Tower and Basement Rescue Module shall ensure that the participants are able to:

1. Perform:
 - a. rescue operations using the casualties personal fall protection on the injured
 - b. rescue operations in a WTG nacelle, tower and basement using a handheld lamp
 - c. transportation of an injured person horizontally over the length of the turbine
 - d. transportation of an injured person to a higher platform using rescue up techniques and equipment (both manual and power-driven)
2. Apply clear communication and guidance to other emergency responders (e.g. vessel or ambulance crew) including coordinating the handover of an injured person (Skills, intermediate level)

The participants shall:

1. acknowledge the benefits of having a coordinator in a rescue team, and the responsibility that comes with it
2. take part in discussing which advanced rescue preparations and emergency & communication procedures apply in their own organisation
3. commit to demonstrating a pro-active approach and role model behaviour

9.2 Competencies of Nacelle, Tower & Basement Rescue Module

1. **Perform** descending and ascending rescue operations from an enclosed space in a WTG nacelle, tower, or basement to a primary assembly area (ground or transition piece) or a secondary assembly area (vessel), using industry standard rescue equipment (Skills, intermediate level)

Note *Rescue scenarios where the injured person is located on the outside of the nacelle and on the outside of the tower are not included*

2. **Perform** these rescue operations in teams acting as the rescue team coordinator (Skills, intermediate level)
3. **Perform** the preparation of an injured person for helicopter rescue from a WTG (Skills, intermediate level)



9.3 Duration of the Nacelle, Tower & Basement Rescue Module

The total contact time for completing this module is estimated to be 14 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 9-3.1 below.

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

Table 9.3.1 – Maximum durations for training day

Note *Contact time includes delivery of 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)

9.4 Nacelle, Tower & Basement Rescue Module instructor to course participant ratio

The ratio shown indicates the maximum number of participants that can attend the course per instructor. The lower ratio in the practical session means more than one instructors are necessary if more than four participants are present.

Module	Session	Instructor to Participant Ratio
Nacelle, Tower, and Basement Module	Theory	1:12
	Practical	1:4

Table 9.4.1 – Instructor to course participant ratio

9.5 Equipment for Nacelle, Tower & Basement Rescue Module

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements as listed in table A-1 in Annex 1 where applicable

A generic approach to teaching rescue equipment is applied to this module aiming to avoid potential additional product specific training on completion of this module, which may be required by the participants organisation (e.g. prior to site or work)

The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers), enabling the participant to conduct pre-use inspection and to use other, similar, rescue equipment products compared to those taught during this module – based on the manufacturer's user manual but without additional formal training



9.6 Nacelle, Tower & Basement Rescue 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.

Note *The stated 'FLEXITIME' of the timetable must be utilised for theoretical and/or practical course.*

Lesson	Element	Duration
1. Introduction to the training	1.1	Safety instructions and emergency procedures
	1.2	Facilities
	1.3	Instructor & participants presentation
	1.4	Overall aim, objectives, and agenda
	1.5	Motivation
	1.6	Ongoing assessments (participant performance assessment form)
	1.7	Human factors
TOTAL		15 min.
2. Emergency response plan in own organisation	2.1	Emergency response plan in own organisation
	2.2	Evacuation strategy
TOTAL		30 min.
3. Measures to prevent injury during training	3.1	Measures to prevent injury during training
	TOTAL	
4. Head support during rescue	4.1	Risk of using a cervical collar
	4.2	Head support during rescue
TOTAL		25 min.
5. Packaging the injured person	5.1	Packaging the injured person
	TOTAL	
6. Lowering/raising rescue system	6.1	Lowering/raising rescue system
	TOTAL	
7. Evacuation of an injured person from the nacelle to the base of the tower	7.1	Practical exercise evacuation inside and outside of tower



TOTAL			120 min.
8.	Rescue from enclosed space	8.1	Rescue from enclosed space exercises
TOTAL			110 min.
9.	Rescue from crawl space	9.1	Rescue from crawl space exercises
TOTAL			200 min.
10.	Rescue up	10.1	Introduction
		10.2	Rescue up, inside and outside of tower – practical exercises
TOTAL			90 min.
11.	Training review	11.1	Training review
		11.2	Feedback session
TOTAL			15 min
SUB TOTAL			720 min.
FLEXITIME			120 min.
GRAND TOTAL			840 min.

Table 9.6.1 – GWO Nacelle, Tower & Basement Module timetable

9.7 Detailed Description of the Nacelle, Tower & Basement Module

The learning outcomes specifies for the Nacelle, Tower & Basement Module are:

Note *The administrative part of the registration should be carried out before the course commence*

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 training safely at a training facility, while recognising what is expected of them during the training.

After having successfully completed Lesson 1 of ART Nacelle, Tower & Basement Rescue Module, the participants can:

- 1) **Show interest in** what is expected of them throughout the module (Ability, basic level)
- 2) **Show interest** and explain local emergency procedures and facilities (Ability, basic level)
- 3) **Show interest in** human factors and explain their implications (Ability, basic level)



ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

Learning objective:

- 4) The participants **show interest** in the safety and emergency procedures at the training facility (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 exits in the areas where the participants can be expected to be located during the course
- 1.1.2 Check understanding within the group by facilitating a group discussion:



The participants shall:

- 1.1.3 Engage in answering questions on local safety and emergency procedures

ELEMENT 1.2 - FACILITIES

Learning objective:

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



The instructor shall:

- 1.2.1 Present a general description of the facilities at the training location (administration, dining area, restrooms, toilets, etc)
- 1.2.2 Alternatively, give a tour and point out facilities:



The participants shall:

- 1.2.3 Note relevant facilities and ask questions when in doubt



ELEMENT 1.3 - INSTRUCTORS & PARTICIPANTS PRESENTATION

Learning objective:

- 6) The participant **show interest** in fellow participants and the course content and design (Ability, basic level)



The instructor shall:

- 1.3.1 Ensure that all participants are registered with a personal profile in GWO's WINDA platform and have provided their WINDA ID prior to completing the training course
- 1.3.2 Give a short introduction to themselves, including their backgrounds as instructors
- 1.3.3 Ask for participants' expectations of the training and their learning or development
- 1.3.4 Facilitate a group discussion or Q & A activity on participants expectations overall:



The participants shall:

- 1.3.5 Give a short introduction to themselves, including job function and expected primary geographic work location and share expectations on the training

ELEMENT 1.4 - OVERALL AIM, OBJECTIVES AND AGENDA

Learning objective:

- 7) The participants can **recognise** the scope and the main objectives of the ART Nacelle, Tower & Basement Rescue Training Module (Knowledge, basic level)



The instructor shall:

- 1.4.1 Present the scope and main learning objectives of the ART Nacelle, Tower & Basement Rescue Training Module
- 1.4.2 Involve participants with questions on understanding and individual experiences on ART Nacelle, Tower & Basement Rescue Training Module
- 1.4.3 Facilitate a group discussion on overall course objectives:



The participants shall:

- 1.4.4 Engage in answering questions and share experiences on ART Nacelle, Tower & Basement Rescue Training Module

ELEMENT 1.5 - MOTIVATION

Learning objective:

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



The instructor shall:

- 1.5.1 Explain and lead a discussion on:
- a. the importance of personal involvement in the course
 - b. the definition of, and the need for, ART Nacelle, Tower & Basement Rescue Training Module understandings and abilities:

Note *Positive motivation is the driving force for commitment, and the instructor should make a focused effort to support growth of the necessary attitude and motivation in the participant.*



The participants shall:

- 1.5.2 Engage themselves in discussions and share experiences on ART Nacelle, Tower & Basement Rescue Training Module

Note *When the participants succeed by trying out on their own, bring their relevant experience into play and apply learning points from the instructor's feedback, the participant develops a positive attitude and responsibility towards the subject and the performance in the work situation*

ELEMENT 1.6 - ONGOING ASSESSMENTS (PARTICIPANT PERFORMANCE ASSESMENT FORM)

Learning objective:

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



The instructor shall:

- 1.6.1 Explain the reason for the ongoing assessment
- 1.6.2 Explain the layout of the GWO participants' performance assessment form and how it will be used
- 1.6.3 Facilitate a group discussion on the importance of the participants' performance assessment form



The participants shall:

- 1.6.4 Engage themselves in discussions and ask questions when in doubt in relation to the assessment procedure

ELEMENT 1.7 - HUMAN FACTORS

The aim of the element is to draw the participants' attention on 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 **describe** the relevant human factors, and their implications (Knowledge, basic 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 influence accidents in the wind industry (relevant statistics may be used)
- 1.7.2 Lead a discussion about the role of the individual in improving human performance and how this can improve the safety of wind turbine environments
- 1.7.3 Ensure that constructive feedback on the participants' performance involve human factors criteria when these are defined in the learning objective such as the ability to take responsibility or to act independently:

Facts and Human Factors Criteria:

The consequences of human factors in accidents in the wind turbine environment are influenced by the following terms and conditions:

- 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



The participants shall:

- 1.7.4 Engage in discussions and share experiences on how human factors influence accidents related to the ART Nacelle, Tower & Basement Rescue Training Module. In addition, engage in and reflect on received feedback and take responsibility on their own performance and development during the training

LESSON 2 - EMERGENCY RESPONSE PLAN IN OWN ORGANISATION

30 min.

The aim of this lesson is to raise awareness on emergency response planning and evacuation strategy in a wind turbine environment. This is to inspire the participants on what information to search for concerning what specific rescue preparations and rescue procedures apply in their own organisation.

After having successfully completed this lesson, the participants can:

- 12) **Show interest** in specific rescue preparations, emergency communication and command procedures as applied in their own organisation (Ability, basic level)
- 13) **Act independently** to recognise the limitations of rescue preparations and evacuation strategies. (Ability, intermediate level)



ELEMENT 2.1 - EMERGENCY RESPONSE PLAN IN OWN ORGANISATION

Learning objective:

- 14) The participants can **explain** what nacelle, tower and basement rescue preparations, emergency, communication, and command procedures apply in their own organisation (Knowledge, intermediate level)



The instructor shall:

- 2.1.1 Explain what specific nacelle / tower / basement rescue preparations and emergency and communication procedures apply in their own organisation, e.g. concerning:
- a. number of rescue personnel available (on site) for a rescue operation and availability of additional rescue personnel
 - b. rescue training level depending on your work location in the WTG and number of personnel (e.g. working in the hub or in the tower)
 - c. communication procedures of operation e.g.
 - c.i communication to additional fall protection/rescue team, emergency medical treatment (EMT) i.e. ambulance and fire service
 - c.ii site lead
 - c.iii service vessel
 - c.iv helicopter search and rescue (SAR)
 - c.v the means of communication radio or phone (cell, IP or satellite phone)
- 2.1.2 Command procedures of operation, e.g. site lead command or command in rescue team
- 2.1.3 National and/or local requirements (e.g. confined space regulations and procedures)
- 2.1.4 Estimated time for professional emergency response providers to arrive
- 2.1.5 Which specific elements in their own WTG type/WTG environment may differ from the training scenario environment (and so visualise and enhance learning transfer) e.g.
- a. turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, helipad)
 - b. anchor points (certified / structural / location)
 - c. rescue equipment (type / quantity / location)



d. emergency light (system / equipment)

2.1.6 Facilitate a group Q&A activity on the above to check understanding of specific nacelle tower and basement rescue preparations and emergency and communication procedures



The participants shall:

2.1.7 Share their understanding of specific nacelle tower and basement rescue preparations and emergency, communication procedures and command procedures, apply in their own organisation by taking part in a discussion

ELEMENT 2.2 - EVACUATION STRATEGY

Learning objectives:

- 15) The participants can **perform** the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios (Skills, intermediate level)
- 16) The participants can **explain** and apply the concept of lifting angle, angle factor and deviation (Knowledge, intermediate level)
- 17) The participants can **explain** and control common risks of hazardous energies and common hazards of enclosed space areas, when performing rescue operations (Knowledge, intermediate level)
- 18) The participants can **apply** rescue methods and techniques in performing descending and ascending rescue operations, from a WTG nacelle, tower, and basement, using a rescue stretcher and transfer board, manually and power-driven lowering/raising rescue system (rescue device, pulley system or similar) (Skills, intermediate level)
- 19) The participants can **apply** a harness and other PPE (e.g. helmet, safety glasses) onto an injured person, in an enclosed space (Skills, intermediate level)
- 20) The participants can **perform** the packaging of an injured person on a rescue stretcher and transfer board in a vertical or horizontal configuration to enable safe transportation, by doing regular checks, using rescue equipment such as cervical collar, and avoiding head down configuration of the unconscious injured person (Skills, intermediate level)

Note *Whenever possible, an injured person should be lowered in a horizontal configuration*

- 21) The participants can **perform** manual transport (in balance) of an injured person on a rescue stretcher or transfer board way (Skills, intermediate level)
- 22) The participants can **perform** the skill of changing directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa) when suspended (Skills, intermediate level)



- 23) The participants can **perform** rescue operations, in the nacelle, tower and basement, using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment (Skills, intermediate level)



The instructor shall:

- 2.2.1 Explain how to assess and determine evacuation strategy during a rescue operation, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower by considering:
- the medical condition of the injured person
 - time constraints
 - transition piece size and configuration
 - nacelle position to the wind
 - evacuation hatch location
 - interfering wind speeds
 - wind directions
 - temperatures
 - wind chill factor
- 2.2.2 Explain how to mitigate transition piece size and configuration, nacelle position to the wind, evacuation hatch location and interfering wind speeds and wind directions, when bringing down an injured person by an outside evacuation:
- from a nacelle to a transition piece by means of a passive rescue device setup and (if beneficial) tagline
 - from a transition piece to a vessel by means of a passive rescue device setup and (if beneficial) tagline
- 2.2.3 Explain the challenges, methods, and techniques of evacuating an injured person from a transition piece to a vessel highlighting:
- the pros and cons of passive or active rescue device setup
 - communication with vessel crew
 - procedures and techniques on how to put down the injured person cautiously on a vessel moving up/down in the swell



- d. the pros and cons of having rescue personnel board the vessel to administer the descent and receive the injured person

2.2.4 Demonstrate proper use of a specific rescue device

2.2.5 Demonstrate how to attach and rig the rescue device in passive and active setup and how to secure the rope

2.2.6 Explain the requirements, applications, and limitations of the device

2.2.7 Explain the common additional rope's length compared to the specific WTG height

2.2.8 Explain the potential consequence of an active setup rescue device slowing down or being blocked by the weight of a loose hanging / unsupported length of the unloaded rope's end

Note *Explain and demonstrate the above mentioned based on the manufacturer's user manual*

2.2.9 Explain the pros and cons of using (for an outside evacuation) different rescue stretcher types. For example, comparing: rescue stretchers with lifting bridles, with a rescue stretcher/transfer board without lifting bridles, and no rescue stretcher/transfer board

2.2.10 Explain and demonstrate how to attach and rig the rescue device in a passive and active setup respectively, and how to utilise a fall restraint lanyard onto the setup to balance the injured person in a perfect horizontal configuration (if required and possible)

2.2.11 Explain how to extract the injured person out of the WTG preferably feet first (avoiding neck/head injury of the injured person due to contact with hatchway opening), or extract the injured person from the WTG head first (if this risk cannot be mitigated)

2.2.12 Explain how to cautiously manipulate and balance/release the injured person (when suspended) out of the WTG by utilising a tagline. At all times avoid a head down configuration of the unconscious injured person and so prevent stomach content release

2.2.13 Explain why it might be required to transition a rescue device setup from active to passive setup configuration without detaching the active setup loaded rope's end from its original anchor point (e.g. Following tower descent and lowering the injured person to a vessel so that the rescuer maintains control of the rescue device)

2.2.14 Demonstrate how to transition from a rescue device active setup into a passive setup configuration without detaching the active setup's loaded rope's end from its original anchor point, including:

- a. how to enable a passive setup by pulling the rope's end from the rope bag through the device and attaching it to the injured persons harness, enabling a reverse passive setup
- b. how to rig a configuration where the passive setup loaded rope's end is deviated through a pulley in the TP crane boom (or similar) and the rescue device is attached within reach on the transition piece (or similar) and can be controlled without the risk of a fall from height
- c. how to secure the rope by securing the hand wheel or locking mechanism
- d. how to control the descent using the devices friction component or by applying a deflection connector



2.2.15 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 2.2.16 Engage in a discussion and answer questions regarding the evacuation strategy, challenges, and the proper use of equipment needed for a successful rescue
- 2.2.17 Practise a transition from a rescue device active setup into a passive setup configuration without detaching the active setup's loaded rope's end from its original anchor point, including:
- a. how to enable a passive setup by pulling the rope's end from the rope bag through the device and attaching it to the injured persons harness, enabling a reverse passive setup
 - b. how to rig a configuration where the passive setup loaded rope's end is deviated through a pulley in the TP crane boom (or similar) and the rescue device is attached within reach on the transition piece (or similar) and can be controlled without the risk of a fall from height
 - c. how to secure the rope by securing the hand wheel or locking mechanism
 - d. how to control the descent using the devices friction component or by applying a deflection connector

LESSON 3 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The aim of this lesson is to reduce the risk of injury during training by ensuring that the participants are briefed in the control measures employed in the training area and warm-up prior to performing rescue exercises.

After having successfully completed the lesson participants can:

- 24) **Take responsibility** for reducing the risk of injury by understanding and demonstrating effective risk control measures (Ability, intermediate level)



The instructor shall:

- 3.1.1 Explain further control measures relevant for the specific training facilities and training to avoid injury during the training
- 3.1.2 Verify that the participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions



- 3.1.3 Ensure that any hazardous energy sources which may affect the participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the participants
- 3.1.4 Lead a warm-up session of the major muscle groups of the body, the ankles, wrists and back. See suggested exercises in Annex 4
- 3.1.5 It is the instructor's responsibility to physically verify that each participant who is working at height (including both casualty and rescuer) is always attached to additional fall protection. GWO recommends that a SRL is used as additional fall protection



The participants shall:

- 3.1.6 Take part in the warm-up session of the major muscle groups, ankles, wrists and back
- 3.1.7 Practise a pre-use inspection of their personal fall protection equipment
- 3.1.8 Practise a 'buddy check' of another participant's personal fall protection equipment

Note *During the remaining rescue exercises on this course the instructor shall observe and coach the participants in manual handling planning, techniques, execution, and improvement*

It is important that the participants understand how to apply manual handling planning and techniques to their daily work environment

LESSON 4 - HEAD SUPPORT DURING RESCUE

25 min.

Warning *According to various international first aid guidelines there is a risk that the routine application of a rigid or semi-rigid cervical collar can increase the intracranial pressure and present difficulties in maintaining the airway of the person wearing the collar*

It is of utmost importance during exercises where a rigid or semi-rigid cervical collar is used that participants and instructors are aware of these risks and that steps are taken to mitigate against these risks

The aim of this lesson is to enable the participants to use various methods (e.g. a cervical collar) to support the head of an unconscious injured person during extraction from an enclosed space. In addition, this lesson will enable the participants to understand the risks posed to the injured person by using a cervical collar and to be able to mitigate against those risks.

After having successfully completed this lesson, the participants can:

- 25) **Take initiative** to select the correct safety equipment, fit a helmet and safety glasses correctly to an unconscious person (Ability, intermediate level)



- 26) **Act independently** to fit a cervical collar to an unconscious person and perform a primary survey, understanding the risks involved in the fitting of a cervical collar (Ability, intermediate level)

ELEMENT 4.1 - RISK OF USING A CERVICAL COLLAR

Learning objectives:

- 27) The participants can **recognise** the risks posed by using a cervical collar in increased intercranial pressure or a compromised airway (Knowledge, basic level)
- 28) The participants can **act independently** to mitigate the risks posed to an unconscious injured person who is wearing a cervical collar (Ability, intermediate level)



The instructor shall:

- 4.1.1 Explain the risks to an unconscious injured person posed by using a cervical collar, covering the following:
- a. intercranial pressure increase
 - b. airway management
- 4.1.2 Explain that a cervical collar shall only be used as a last resort and in the following circumstances:
- a. the injured person is unconscious, and
 - b. it is not possible to support the head and / or maintain the airway by other means during the extraction of an unconscious injured person from an enclosed space, and
 - c. that the cervical collar shall only be used for the minimum amount of time required to extricate the unconscious injured person from an enclosed space
- 4.1.3 Explain how to reduce the risks posed by using a cervical collar through the following:
- a. correct sizing and fitting of the collar, according to the manufacturer instructions
 - b. continuously performing primary survey checks on the unconscious injured person airway, breathing and circulation during extraction from an enclosed space
 - c. removal of the cervical collar as soon as it is practicable to do so (i.e. the airway can be managed by other methods and head support is no longer required)
- 4.1.4 Facilitate a group discussion or Q&A activity on the risks to an unconscious injured person posed by using a cervical collar:



The participants shall:

- 4.1.5 Explain the risks posed to an unconscious injured person who is wearing a cervical collar
- 4.1.6 Explain how to reduce the risks posed to an unconscious injured person who is wearing a cervical collar

ELEMENT 4.2 - HEAD SUPPORT DURING RESCUE

Learning objectives:

- 29) The participants can **perform** a pre-use inspection of rescue equipment for head support (Skill, intermediate level)
- 30) The participants can **perform**, unaided, the following activities on an unconscious injured person: correctly size, prepare and fit a cervical collar (Skill, intermediate level)
- 31) The participants can **perform** how to check correct application of a cervical collar to the injured person (Skill, intermediate level)
- 32) The participants can **perform** the primary survey of an injured person wearing a cervical collar with focus on the following (Skill, intermediate level):
 - a. Airway
 - b. Breathing
 - c. Circulation (e.g. checking the colour of the injured person for indications that the neck veins are under excessive pressure)
- 33) The participants can **perform** the following activities: fit helmet and safety glasses, on an unconscious, injured person who is wearing a cervical collar (Skill, intermediate level)

Note *The use of a cervical collar during rescue operations in this standard is intended only as a means to support the head and as a result help in maintaining an open airway of an unconscious injured person during parts of rescue operations where this is not possible by other means*

It is intended that the collar is removed as soon as it is possible to support the head and maintain the airway by other means. The use of collars in this instance is not considered to be routine. For further information please refer to Annex 3

Note There shall be at least two exercises per participant: one sitting, one lying down. A 'live', injured person is recommended

Note *The following should be carried out on an injured person both sitting and lying down*



The instructor shall:

- 4.2.1 Briefly introduce the generic approach to rescue equipment as described in the equipment annex (Annex 1) to this module
- 4.2.2 Explain that a pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual, the manufacturer's criteria, or the participants' own organisation
- 4.2.3 Demonstrate how to perform a pre-use inspection of the rescue equipment for head support required / chosen to instruct this module, by the following principles and covering:
 - a. markings and labels
 - b. operating size range, if applicable
 - c. equipment is within the period of formal inspections
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. adjusting, locking, and securing mechanisms work correctly
 - f. observe manufacturer's user manual for specific or additional requirements
- 4.2.4 Explain and demonstrate how to support the head and maintain the airway of an injured person during extraction by means other than a cervical collar
- 4.2.5 Explain and demonstrate how to measure the neck of the injured person and select the correct size of cervical collar
- 4.2.6 Explain and demonstrate how to prepare and fit a cervical collar
- 4.2.7 Explain and demonstrate how to ensure correct application by doing product specific checks of the cervical collar
- 4.2.8 Explain and demonstrate how to fit PPE, (i.e. Helmet and safety glasses) to an unconscious injured person wearing a cervical collar
- 4.2.9 Explain and demonstrate how to continuously perform the primary survey of the injured person wearing a cervical collar with a focus on the following:
 - a. Airway
 - b. Breathing
 - c. Circulation (e.g. checking the injured person for indications that the neck veins are under excessive pressure)



- 4.2.10 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on similarities and differences in design, functionality, and operation between different products
- 4.2.11 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations
- 4.2.12 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 4.2.13 Practise how to use methods other than a cervical collar to support the head and maintain the airway of an injured person during extraction
- 4.2.14 Practise how to (unaided) correctly prepare, fit, and check a cervical collar and fit helmet and safety glasses on both an injured person sitting and on an injured person lying down
- 4.2.15 Practise how to (unaided) correctly, and continuously practise the primary survey on an injured person who is wearing a cervical collar

LESSON 5 - PACKAGING THE INJURED PERSON

50 min.

The aim of this lesson is to enable the participants to fit a harness onto the injured person and package them onto a rescue stretcher or a transfer board, to enable safe transportation of the injured person.

After having successfully completed this lesson, the participants can:

- 34) **Take initiative** for fitting helmet and safety glasses correctly on an unconscious injured person wearing a rescue head support device (Ability, intermediate level)
- 35) **Act independently** to fit a harness onto an unconscious injured person (Ability, intermediate level)
- 36) **Act independently** to package an unconscious injured person on a rescue stretcher and on a transfer board (Ability, intermediate level)
- 37) **Take responsibility** for creating an attachment point on a transfer board by attaching / choking an anchor sling through the handles of the foot and top of a transfer board with a connector attached (Ability, intermediate level)

Note *Where possible the participants shall work in teams of two: one exercise per participant.*

Note *It is recommended that a live 'injured person' is used for this exercise.*

Note *If possible, medical advice according to site emergency response plan should be sought before securing an IP to a transfer board.*



Note *An injured person must always be attached at an approved attachment point.*

ELEMENT 5.1 - PACKAGING THE INJURED PERSON

Learning objective:

- 38) The participants can **perform** a rescue by packaging an injured person on a rescue stretcher and transfer board in a vertical or horizontal configuration to enable safe transportation. This is achieved by doing regular checks, using rescue equipment such as cervical collar, and avoiding head down configuration of the unconscious injured person (Skills, intermediate level)

Note *Whenever possible, an injured person should be lowered in a horizontal configuration.*



The instructor shall:

- 5.1.1 Explain that a pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer's criteria or the participants' own organisation
- 5.1.2 Demonstrate how to perform a pre-use inspection of the transfer board(s) and rescue stretcher(s) required / chosen to instruct in this module, by following the principles and covering:
- a. markings and labels
 - b. operating weight and temperature range, if applicable
 - c. equipment is within the period of formal inspections
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. checking for the absence of significant wear of the equipment
 - f. straps
 - g. stitching
 - h. locks and connectors
 - i. metal parts
 - j. attachment points
 - k. back protection



- I. observe manufacturer's user manual for specific or additional requirements
- 5.1.3 Explain how to fit a harness onto an unconscious injured person, highlighting the importance of loosening the injured person's shoulder straps prior to fitting (to easily fit the harness correctly onto the injured person)
- 5.1.4 Demonstrate how to create an attachment point on a transfer board by attaching / choking an anchor sling through the handles at the foot and top of the transfer board with a connector attached
- 5.1.5 Explain how to package an unconscious injured person on a rescue stretcher and on a transfer board, adhering to the manufacturer's user manual
- 5.1.6 Stress the generic approach to teaching the use of rescue equipment focusing on the similarities and differences in design, functionality, and operation between different products
- 5.1.7 Explain the potential task placed upon the participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products
- 5.1.8 Provide constructive feedback on the participants' efforts during the practice



The participants shall:

- 5.1.9 Practise how to prepare, fit, and check rescue head support and fit PPE helmet and safety glasses on an unconscious injured person
- 5.1.10 Practise how to, unaided, correctly, and continuously perform the primary survey on an injured person who is wearing rescue head support
- 5.1.11 Practise how to fit a harness onto an unconscious injured person
- 5.1.12 Practise how to create an attachment point on a transfer board by attaching / choking an anchor sling through the handles at the foot and top of the transfer board with a connector attached
- 5.1.13 Practise how to package an unconscious injured person on a rescue stretcher and on a transfer board, adhering to the manufacturer's user manual and ensuring a tight fit of restrain straps.

Note *If permitted (in the transfer board and / or restrain strap manufacturer's user manual) a crossing strap configuration packaging the injured person is preferred.*

LESSON 6 - LOWERING/RAISING RESCUE SYSTEM

25 min.

The aim of this lesson is for participants to take responsibility in the lowering/raising of a rescue system for limited distance rescue purpose (rescue device, pulley system or similar), rigging setup options included.

After having successfully completed this lesson, the participants can:



- 39) **Show interest** in the pre-use inspection of a random pulley system and rescue device (Ability, basic level)
- 40) **Act independently** to correctly use lowering and raising pulley systems (Ability, intermediate level)

ELEMENT 6.1 - LOWERING/RAISING RESCUE SYSTEM

Learning objective:

- 41) The participants can **apply** rescue methods and techniques in performing descending and ascending rescue operations, from a WTG hub, spinner and inside a blade. This to be using a rescue stretcher and transfer board, manually operated lowering/raising rescue system for limited distance rescue (rescue device, pulley system or similar), and other rescue equipment relevant to the participants (Skills, intermediate level)



The instructor shall:

- 6.1.1 Explain that the pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer criteria, or the participants' own organisation
- 6.1.2 Demonstrate how to perform a pre-use inspection of the pulley system and rescue device (and their accessories) required / chosen to instruct in this module covering the characteristics and principles of the following:
- a. markings and labels
 - b. equipment is within the period of formal inspections
 - c. the rope has no damage, and the end terminations are in good condition
 - d. the rope runs freely through the system / device in both directions
 - e. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - f. checking for the absence of significant wear of the system / device
 - g. rope securing mechanism works correctly
 - h. the product operating temperature range
 - i. checking webbing, rope, connectors, and other hardware accessories following the same principles
 - j. observe manufacturer's user manual for specific or additional requirements
- 6.1.3 Explain the proper utilisation of a specific lowering/raising rescue system



- 6.1.4 Demonstrate how to attach and rig the system and how to secure the rope
- 6.1.5 Explain the requirements, applications, and limitations of the system
- 6.1.6 Explain the system's maximum raising distance possible
- 6.1.7 Explain the principles of lifting angle, angle factor, deviation, and edge protection
- 6.1.8 Demonstrate how to use a rescue device to prepare and rig a tensioned line (zip line) in both a single line and double line configuration in a nacelle (in accordance with manufacturer's user manual) and transport for horizontal transportation
- 6.1.9 Show examples of (and explain ways to) combine, rescue equipment and PPE lanyards to achieve an efficient rigging setup with the equipment available and a minimum of re-rigging during the rescue operation.
- 6.1.10 Stress the generic approach to teaching the use of rescue equipment focusing on the similarities and differences in design, functionality and operation between different products and associated accessories
- 6.1.11 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations
- 6.1.12 Provide constructive feedback on the participants' performance during the practice

Note *The above to be based on the manufacturer's user manual*



The participants shall:

- 6.1.13 Understand the pre/use inspection process. Take part in a discussion on the proper utilisation of a specific lowering/raising rescue system the requirements, applications, and limitations of the system, the system's maximum raising distance possible and the principles of the lifting angle, angle factor, deviation, and edge protection
- 6.1.14 Practise a pre-use inspection of the pulley system and rescue device (and their accessories) required / chosen to instruct in this module covering the characteristics and principles of the following:
 - a. markings and labels
 - b. equipment is within the period of formal inspections
 - c. the rope has no damage, and the end terminations are in good condition
 - d. the rope runs freely through the system / device in both directions
 - e. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination



- f. checking for the absence of significant wear of the system / device
- g. rope securing mechanism works correctly
- h. the product operating temperature range
- i. checking webbing, rope, connectors, and other hardware accessories following the same principles
- j. observe manufacturer's user manual for specific or additional requirements
- k. practise how to attach and rig the system and how to secure the rope
- l. practise how to use the rescue device to prepare and rig a tensioned line (zip line) in both a single line and double line configuration, in accordance with manufacturer's user manual, in a nacelle and transport for horizontal transportation

LESSON 7 - EVACUATION OF AN INJURED PERSON FROM THE NACELLE TO THE BASE OF THE TOWER

120 min.

The aim of this lesson is to enable the participants to evacuate an injured person in a safe and secure manner from the hub or nacelle, inside and outside the tower, to a primary assembly area (ground or transition piece) and from transition piece to a secondary assembly area (vessel).

After having successfully completed this lesson, the participants can:

- 42) **Take initiative and responsibility** to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower (Ability, intermediate level)
- 43) **Act independently** in identifying a suitable selection of certified and structural anchor points, relevant for various rescue scenarios, relevant for various rescue scenarios (Ability, intermediate level)
- 44) **Take responsibility** to apply the concept of lifting angle, angle factor and deviation (Ability, intermediate level)
- 45) **Act independently** to control common risks of hazardous energies and common hazards of enclosed space areas in a WTG, when performing rescue operations (Ability, intermediate level)
- 46) **Take responsibility** to apply rescue methods and techniques in performing descending rescue operations, from a WTG to a primary assembly area (ground or transition piece) and a secondary assembly area (vessel), using a rescue stretcher and transfer board, lowering/raising rescue system (rescue device, pulley system or similar) (Ability, intermediate level)
- 47) **Take initiative** for transitioning from an active to a passive rescue device setup configuration without detaching the active setup's loaded rope's end from its original anchor point. (Ability, intermediate level) This includes:



- a. attaching the passive setup rescue device within reach
- b. deviating the configuration over the transition piece crane boom (or similar)
- c. securing the rope by securing the hand wheel or locking mechanism
- d. controlling the descent using the rescue device's friction component or by applying a deflection connector

48) **Act independently** to fit a harness or improvised harness to be used as a rescue sling around the injured person's chest, and fit other relevant PPE (e.g. helmet, safety glasses) onto an injured person in an enclosed space (Ability, intermediate level)

Note *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person*

The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally

An improvised harness must never be used for lifting or lowering an injured person

- 49) **Take responsibility** to package and transport an injured person on a rescue stretcher and transfer board in a vertical or horizontal configuration to enable safe transportation, by doing regular checks, using rescue equipment such as cervical collar, and avoiding head down configuration of the unconscious injured person (Ability, intermediate level)
- 50) **Take responsibility** to directly change balancing a suspended, injured person in a horizontal position to a vertical configuration (and vice versa) using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment (Ability, intermediate level)
- 51) **Take responsibility** to perform rescue operations, using the casualty's personal fall protection on them- as additional fall protection, if required (Ability, intermediate level)
- 52) **Take responsibility** to perform an evacuation of an injured person from the nacelle to the base of the tower using personal lamp (e.g. helmet lamp), if required due to poor lighting conditions (Ability, intermediate level)
- 53) **Take initiative** to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy. Communicate clearly as a team coordinator and team member to emergency responders (Ability, intermediate level)
- 54) **Show interest** in the benefits of having a coordinator in a rescue team and the responsibility that comes with it (Ability, basic level)

Note *For inside evacuation, where possible, the participants shall work in teams of two to four. One inside evacuation exercise per participant from the nacelle to primary assembly area (either ground or transition piece). Rescue device is in an active setup.*



- Note** *For outside evacuation, where possible, the participants shall work in teams of two. One outside evacuation exercise per team from the nacelle to primary assembly area (either ground or transition piece). Rescue device is in a passive setup and using a tagline.*
- Note** *During each exercise the participants shall act as team coordinator for the team performing the exercise.*
- Note** *It is recommended that a rescue dummy is used as the injured person for these exercises.*
- Note** *Each exercise includes: rescue strategy planning, rescue efforts and instructor-led evaluation.*

ELEMENT 7.1 - PRACTICAL EXERCISE EVACUATION INSIDE AND OUTSIDE OF THE TOWER

Learning objectives:

- 55) The participants can **discuss** relevant rescue strategies and the safety considerations prior to the practical exercise (Knowledge, intermediate level)
- 56) The participants can **evaluate** differing courses of action based on various rescue scenarios and select the appropriate rescue strategy (Skills, advanced level)
- 57) The participants can **perform** a training rescue as a team member or coordinator including a transition from active to passive set up (Skills, intermediate level)
- 58) The participants can **act independently** in reducing the risks of manual handling and apply further control measures as required (Ability, intermediate level)



The instructor shall:

- 7.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario according to control measures to avoid injury during training
- 7.1.2 Introduce the specific exercise, including (to the extent needed):
 - a. appoint a team coordinator for the exercise and introduce the tasks and responsibilities related to this function
 - b. introduce relevant rescue strategy, method and technique including transitioning from an active to a passive rescue device setup configuration
 - c. highlight the considerations that determine where in the WTG to package the injured person on a rescue stretcher/transfer board



- d. highlight which injured person configuration to apply (i.e. horizontal, or vertical configuration)
- e. highlight where to attach the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point)
- f. highlight how to organise the rescue team to the specific rescue operation scenario (who does what)
- g. what specific elements/course contents the instructor's assessment will include

7.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:

- a. positive feedback
- b. improvement proposals and alternative solutions
- c. the pros and cons related to descent control and communication comparing a passive setup to an active setup during evacuation of an injured person from the transition piece to a vessel
- d. participants' reflections on what and how specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
- e. participants' risk mitigation during the exercise
- f. participants' manual handling risk mitigation and application of further control measures

7.1.4 Guide and support the participants when applying:

- a. manually operated lowering and raising systems.
- b. additional fall protection of injured person, if required

7.1.5 Stress the generic approach to teaching the use of rescue equipment focusing on the similarities in design, functionality, and operation between different products

7.1.6 Explain the potential task placed upon the participants on course completion requiring them to familiarise themselves with other rescue equipment products in their own organisations

7.1.7 Facilitate a group discussion or Q & A activity on hazards and risks during rescue operations and evacuation strategies



The participants shall:

7.1.8 Explain how to identify and control the specific hazards / risks in the WTG during the rescue operation, covering the following:

- a. hazardous energy sources (mechanical, electrical, hydraulic, pressurised systems i.e. LOTO)
- b. enclosed space areas



- c. poor lighting conditions
 - d. dropped objects
 - e. poor manual handling
 - f. temperature/ working conditions (dehydration, heat stroke, exhaustion)
 - g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
 - h. slips and trips
- 7.1.9 Explain how to assess and determine evacuation strategy (relevant rescue method, route technique, certified equipment, and required personnel) for a rescue scenario in a WTG
- 7.1.10 Practise how to prepare the injured person (live injured person preferred) for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package them on a rescue stretcher or transfer board)
- 7.1.11 Practise how to manually transport an injured person in balance (dummy) on a rescue stretcher or transfer board in a way or by means of a tensioned line (zip line) when relevant
- 7.1.12 Practise how to attach the rescue device to the injured person (dummy) in a safe and proper manner
- 7.1.13 Practise how to utilise tagline(s) during one exercise, when performing outside evacuation
- 7.1.14 Practise how to balance an injured person (dummy) from a horizontal to a vertical position (and vice versa) in order to move the injured person downwards through hatches or similar.
- 7.1.15 Practise how to select and utilise certified and structural anchor points
- 7.1.16 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection
- 7.1.17 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection
- 7.1.18 Practise how to apply rescue methods, techniques and clear, precise communication when performing safe ascending/descending rescue operations from a WTG
- 7.1.19 Practise how to perform regular checks of the injured person during the entire rescue operation
- 7.1.20 Practise how to perform the rescue effort as a team member or team coordinator
- 7.1.21 Practise how to perform an evacuation (dummy), with the rescue device in a passive setup for evacuation (outside of the tower) from the WTG nacelle to a primary assembly area (ground or transition piece)
- 7.1.22 Practise how to perform an evacuation (dummy) with the rescue device in an active setup for evacuation (inside the tower) from the WTG nacelle to a primary assembly area (ground or transition piece). In this case the rescuer is carrying the rope bag with them while controlling the descent from below the injured person,



- 7.1.23 Practise how to perform an evacuation (dummy) from a transition piece to a secondary assembly area (vessel), by transitioning the rescue device setup configuration from an active setup (descent inside tower to transition piece) to a passive setup for descent from the transition piece to the vessel, by:
- pulling the rope's end from the rope bag through the device and attaching it to the injured person's harness (enabling a reverse passive setup) and
 - attaching the rescue device on the transition piece ensuring it is within reach and can be controlled (by the use of a pulley) without the risk of a fall from height and deviating the configuration over the transition piece crane boom (or similar)
- 7.1.24 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable

LESSON 8 - RESCUE FROM ENCLOSED SPACE

110 min.

There are several locations on the turbine where occasionally work needs to take place with reduced horizontal and vertical space, such as in the basement/transition piece, yaw section, transformer room or between canopy and generator of a direct drive WTG.

The aim of this lesson is for the participants to be able to apply various techniques to evacuate an injured person from an area with restricted manoeuvrability (filled with sufficient simulated assets) to a location where first aid can be administered.

After having successfully completed this lesson, the participants can:

- 59) **Act independently** to assess and determine rescue strategy in an enclosed space scenario and demonstrate the identification and suitable selection of certified and structural anchor points, for relevant enclosed space scenarios (Ability, intermediate level)
- 60) **Take initiative** to demonstrate how to apply the concept of lifting angle, angle factor and deviation (Ability, intermediate level)
- 61) **Act independently** to identify and control common risks of hazardous energies and common hazards of enclosed space areas in a WTG, when performing rescue operations (Ability, intermediate level)
- 62) **Take responsibility** to assess and determine the suitable attachment point on the injured person and/or transfer board/rescue stretcher (Ability, intermediate level)



ELEMENT 8.1 - RESCUE FROM ENCLOSED SPACE

Learning objectives:

- 63) The participants can **perform** the techniques to successfully rescue the injured person from the enclosed space, in a controlled manner (Skills, intermediate level)
- 64) The participants can **explain** how to assess and determine a rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in an enclosed space scenario (Knowledge, intermediate level)
- 65) The participants can **explain** how to identify and control common risks of hazardous energies and common hazards of enclosed space areas in a WTG, when performing rescue operations (Knowledge, intermediate level)
- 66) The participants can **perform** fitting a harness or improvised harness used as a rescue sling around the injured person's chest and fit other PPE (e.g. helmet, safety glasses) onto an injured person in an enclosed space (Skills, intermediate level)

Note *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person. The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally. An improvised harness must never be used for lifting or lowering an injured person.*

- 67) The participants can **perform** the rescue operation from the incident scene fully aware of where the injured person is stuck and how to slowly lower/raise the injured person and carefully manipulate them out constantly evaluating the rescue efforts (Skills, intermediate level)
- 68) The participants can **perform** packaging an injured person to enable safe transportation on a rescue stretcher and transfer board in a vertical or horizontal configuration by doing regular checks using rescue equipment, such as cervical collar and avoiding a head down configuration of the unconscious injured person (Skills, intermediate level)
- 69) The participants can **perform** directly changing from balancing a suspended injured person in a horizontal position to a vertical configuration (and vice versa), in a WTG (Skills, intermediate level)
- 70) The participants can **perform** rescue operations in a WTG enclosed space using personal lamp (e.g. helmet light), if required due to poor lighting conditions (Skills, intermediate level)
- 71) The participants can **perform** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy (Skills, intermediate level)
- 72) The participants can **perform** clear and precise communication in a stressful rescue operation both with members of the rescue team (as a team coordinator) and as a team member (Skills, intermediate level)



- 73) The participants can **apply** clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person (Skills, intermediate level)
- 74) The participants can **perform** how to transport an injured person horizontally over the length of the turbine, with the use of industry rescue equipment, by means of a tensioned line (zip line) (Skills, intermediate level)
- 75) The participants can **recognise** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it (Knowledge, basic level)

Note *Where possible the participants shall work teams of two. One participant shall act as team coordinator. There shall be two exercises per team.*

Note *It is recommended to use a rescue dummy as the injured person.*

Note *Each exercise includes rescue strategy planning, rescue efforts and instructor-led evaluation.*



The instructor shall:

- 8.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3 - Measures to Prevent Injury During Training
- 8.1.2 Introduce the specific exercise, including:
- a. appoint a team coordinator for the exercise and introduce the tasks and responsibilities related to this function
 - b. discuss different rescue strategies, methods, and techniques in order to optimise the rescue set up
 - c. highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/transfer board
 - d. show guidance and support to participants when exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
 - e. highlight the correct injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - f. highlight how to organise the rescue team to the specific rescue operation scenario (who does what)
 - g. highlight the specific elements/course contents the instructor's assessment will include
- 8.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:



- a. positive feedback
- b. improvement proposals and alternative solutions
- c. participants' reflections on which specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
- d. participants' risk mitigation during the exercise.
- e. participants' manual handling risk mitigation and application of further control measures

8.1.4 Guide and support the participants when applying:

- a. manually operated lowering and raising systems
- b. additional fall protection of injured person, if required

8.1.5 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities in design, functionality, and operation between different products

8.1.6 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations

8.1.7 Provide constructive feedback on the participants' performance during the practice



The participants shall, in a team:

8.1.8 Explain how to Identify and control the specific hazards / risks in the WTG during the rescue operation, covering the following:

- a. hazardous energy sources (mechanical, electrical, hydraulic, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO WAH put into an advanced rescue context)
- h. slips and trips

8.1.9 Explain how to assess and determine evacuation strategy (relevant rescue method, route technique, certified equipment, and required personnel) for a rescue scenario in an enclosed space within a WTG



- 8.1.10 Practise how to prepare the injured person (dummy) for safe extraction from an enclosed space including the use of improvised harness and transition to a stretcher or transfer board
- 8.1.11 Practise how to manually transport an injured person (dummy) in a balanced way on a rescue stretcher or transfer board or by means of a tensioned line (zip line) (when relevant)
- 8.1.12 Practise how to balance an injured person (dummy) from a horizontal to a vertical position (and vice versa), in order to move the injured person downwards through hatches, or similar.
- 8.1.13 Practise how to select and utilise certified and structural anchor points
- 8.1.14 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection
- 8.1.15 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup: including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection
- 8.1.16 Practise how to apply rescue methods, techniques and, clear and precise, communication in performing safe ascending/descending rescue operations from a WTG
- 8.1.17 Practise how to perform regular checks of the injured person during the entire rescue operation
- 8.1.18 Practise how to perform the rescue effort as a team member or team coordinator
- 8.1.19 Practise how to perform an evacuation of a dummy along the length of the turbine with the rescue device in a passive setup for evacuation outside of the tower
- 8.1.20 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable

LESSON 9 - RESCUE FROM CRAWL SPACE

200 min.

There are several locations on the turbine where occasionally work needs to take place with strongly reduced vertical space, such as in a transformer room, behind a generator or underneath a gearbox, main bearing or under the floor.

The aim of this lesson is to enable the participants to rescue an injured person from a crawl space to a location where first aid can be administered.

After having successfully completed this lesson, the participants can:

- 76) **Act independently** to apply the techniques to successfully rescue the injured person from the crawl space, in a controlled manner (Ability, intermediate level)
- 77) **Take initiative** to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in a crawl space scenario (Ability, intermediate level)



- Note** *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person. The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally. An improvised harness must never be used for lifting or lowering an injured person*
- Note** *Where possible the participants shall work teams of two or four. One participant shall act as team coordinator. There shall be a total of six exercises.*
- Note** *It is recommended to use a rescue dummy as the injured person.*
- Note** *Each exercise includes: rescue strategy planning, rescue efforts and instructor led evaluation.*

ELEMENT 9.1 - RESCUE FROM CRAWL SPACE – EXERCISES

Learning objectives:

- 78) The participants can **perform** the rescue operation from the incident scene fully aware of where the injured person is stuck and how to slowly lower/raise the injured person and carefully manipulate them out, constantly evaluating the rescue efforts (Skill, intermediate level)
- 79) The participants can **perform** rescue operations using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment (Skill, intermediate level)
- 80) The participants can **perform** rescue operations, using the casualties personal fall protection on the injured person, as additional fall protection, if required (Skill, intermediate level)
- 81) The participants can **perform** how to prepare the injured person for safe transportation, by doing regular checks, using rescue equipment such as rescue head support and avoiding head down configuration of the unconscious injured person (Skill, intermediate level)
- 82) The participants can **perform** as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy (Skill, intermediate level)
- 83) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skill, intermediate level)
- 84) The participants can **perform** how to apply clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person (Skill, intermediate level)



The instructor shall:



- 9.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3 -Measures to Prevent Injury During Training
- 9.1.2 Introduce the specific exercise within a crawl space, including:
 - a. appointing a team coordinator for the exercise. Introduce the tasks and responsibilities of this function; the different rescue strategies; methods; and techniques relevant to crawl space extraction to optimise the rescue setup
 - b. highlighting the considerations that determine where in the WTG to package the injured person on a rescue stretcher/transfer board
 - c. guiding and supporting the participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
 - d. highlighting how to organise the rescue team to the specific rescue operation scenario (who does what)
 - e. what specific elements/course contents the instructor's assessment will include
- 9.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
 - a. positive feedback
 - b. improvement proposals and alternative solutions
 - c. participants' reflections on which specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
 - d. participants' risk mitigation during the exercise
 - e. participants' manual handling risk mitigation and application of further control measures
- 9.1.4 Guide and support the participants when applying:
 - a. manually operated lowering and raising systems.
 - b. additional fall protection of injured person, if required
- 9.1.5 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products
- 9.1.6 Explain the potential task placed upon the participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products
- 9.1.7 Lead a short discussion on the participants' understanding of control measures



The participants shall:

- 9.1.8 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation, covering the following:
- hazardous energy sources (mechanical, electrical, pressurised systems i.e. LOTO)
 - enclosed space areas
 - poor lighting conditions
 - dropped objects
 - poor manual handling
 - temperature/working conditions (dehydration, heat stroke, exhaustion)
 - injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
 - slips and trips
- 9.1.9 Practise how to prepare the injured person for safe transportation with extraction from the crawl space (i.e. apply rescue head support, temporary harness, fit harness and other PPE, and package them on a rescue stretcher or transfer board)
- 9.1.10 Practise how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way
- 9.1.11 Practise how to select and utilise certified and structural anchor points
- 9.1.12 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection
- 9.1.13 Practise how to rig and operate a manually operated rescue system to horizontally transport the injured person and how to mitigate the challenges of a horizontal rescue enabling a safe rescue operation
- 9.1.14 Practise how to apply rescue methods, techniques, and precise and clear communication in performing safe lowering/raising rescue operations from a WTG
- 9.1.15 Practise how to perform regular checks of the injured person during the entire rescue operation
- 9.1.16 Practise how to perform the rescue effort as a team member or team coordinator
- 9.1.17 Show acknowledgement of the added value of having a team coordinator
- 9.1.18 Practise how to conduct a rescue operation in poor lighting conditions
- 9.1.19 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable



LESSON 10 - RESCUE UP

90 min.

Helicopter transport becomes increasingly important for the offshore wind industry. Without the dependency on helicopters for emergency transport, the evacuation route will always be towards the base of the tower. However, emergency evacuation by helicopter transport from a hoisting platform, requires the rescue team to bring the injured person up to the helicopter hoisting platform, rather than to the base of the tower.

The lesson is also relevant for structures with a considerable basement structure and transition piece. Rescue up may be the best option here as standard evacuation equipment and techniques might not always be suitable for excessive distances in these locations.

The aim is to enable the participants to bring their injured person from a lower platform to the higher platform, outside and inside the tower, by the use of a power driven lowering/raising rescue system.

After having successfully completed this lesson, the participants can:

- 85) **Take initiative** to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower, including a high awareness on the risk of the injured person getting stuck in the WTG (e.g. under a tower-tower section) (Ability, intermediate level)
- 86) **Act independently** to conduct pre-use inspection of a random power driven lowering/raising rescue system (Ability, intermediate level)
- 87) **Take initiative** for the application of rescue methods and techniques in performing rescue up operations in a WTG). In all instances using a rescue stretcher and/or transfer board, raising rescue system (power driven rescue system) (Ability, intermediate level)
 - a. from basement to primary assembly area (ground/transition piece)
 - b. from transition piece inside tower to nacelle/helipad
 - c. from transition piece outside tower to nacelle/helipad
- 88) **Show interest** in the benefits of having a coordinator in a rescue team, and the responsibility that comes with it (Ability, basic level)

Note *Where possible, the participants shall work in teams of two. There shall be a minimum of three exercises per team. Each participant shall practise one inside rescue up exercise from either: the basement to the primary assembly area (transition piece); or the primary assembly area (transition piece), inside the tower, to the nacelle/helipad- hoist platform. Each team shall practise one outside rescue up exercise from the primary assembly area (transition piece), outside the tower, to the nacelle/helipad. Rescue device in a passive setup.*

During each exercise the participants shall each act as team coordinator for the team performing the exercise. It is recommended that a rescue dummy is used as the injured person for these exercises. Each exercise includes rescue strategy planning, rescue efforts and instructor-led evaluation



ELEMENT 10.1 - INTRODUCTION

Learning objectives:

- 89) The participants can **explain** national and local requirements and/or procedures for helicopter rescue in an WTG, including preparing the injured person, preparing the WTG, the helipad safe zones and safe behaviour included (Knowledge, intermediate level)
- 90) The participants can **explain** the identification and suitable selection of certified and structural anchor points relevant for various rescue scenarios (Knowledge, intermediate level)
- 91) The participants can **explain** the proper utilisation of a specific power driven lowering/raising rescue system, including how to properly attach, rig and secure the system. In addition, its requirements, applications, limitations, means of tethering and the maximum raising distance possible for the system and associated battery power source (Knowledge, intermediate level)
- 92) The participants can **explain** national and local regional requirements and/or procedures for helicopter rescue in a WTG, preparing the injured person, preparing the WTG, the helicopter hoisting platform, safe zones, and safe behaviour included (Knowledge, intermediate level)



The instructor shall:

- 10.1.1 Explain the necessity and relevance of this module
- 10.1.2 Explain that the pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual, the manufacturer's criteria, or the participant's own organisations
- 10.1.3 Demonstrate a pre-use inspection of the rescue device driver covering the characteristics and principles of the following:
 - a. marking and labels
 - b. equipment is within the period of formal inspections
 - c. the product operating temperature range, particularly relevant for the associated battery power source in low temperatures
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. operation including taut (drill chuck) attachment to the rescue device
 - f. object attachment and tethering the driver and associated battery power source(s), if applicable
 - g. observe the manufacturer's user manual for specific or additional requirements



- 10.1.4 Demonstrate the method of rigging and operating the power driven devices including:
- a. relevant technical specifications
 - b. requirements
 - c. applications
 - d. limitations
 - e. means of tethering preventing dropped objects
 - f. maximum raising distance possible for the specific complete power driven lowering/raising rescue system and associated battery power source (fully charged)
 - g. if the manufacturer's user manual allow; the option of the rescuer applying fall protection by being attached to the rescue device (detached from the vertical fall arrest systems). With the aim of increased movability for the rescuer
- 10.1.5 Discuss with the participants elements to consider when determining the rescue strategy, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower. Including:
- a. exposure of the injured person to weather
 - b. the potentially dangerous effect of wind pushing the injured person against the tower
 - c. emotional state of the injured person
 - d. the medical status of the injured person
 - e. time constraints
 - f. nacelle configuration and position to the wind
 - g. evacuation hatch location
 - h. obstructions within the evacuation route
- 10.1.6 Discuss with the participants requirements and procedures for helicopter rescue
- 10.1.7 Highlight the specific limitations of lifting distances of rescue devices, designed for lowering an injured person
- 10.1.8 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products
- 10.1.9 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations
- 10.1.10 Lead a short discussion to ensure participants' requirements and procedures for helicopter rescue and rescue strategies are fully understood



The participants shall:

10.1.11 Practise a pre-use inspection of the rescue device driver covering the characteristics and principles of the following

- a. marking and labels
- b. equipment is within the period of formal inspections
- c. the product operating temperature range, particularly relevant for the associated battery power source in low temperatures
- d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
- e. operation including taut (drill chuck) attachment to the rescue device
- f. object attachment and tethering the driver and associated battery power source(s), if applicable
- g. observe the manufacturer's user manual for specific or additional requirements

10.1.12 Practise the method of rigging and operating the power driven devices including:

- a. relevant technical specifications
- b. requirements
- c. applications
- d. limitations
- e. means of tethering preventing dropped objects
- f. maximum raising distance possible for the specific complete power driven lowering/raising rescue system and associated (fully charged) battery power source
- g. if the manufacturer's user manual allow; the option of the rescuer applying fall protection by being attached to the rescue device (detached from the vertical fall arrest systems). With the aim of increased movability for the rescuer

Note *The participant will also take part in a group discussion to ensure participants requirements and procedures for helicopter rescue and rescue strategies are fully understood.*



ELEMENT 10.2 - RESCUE UP, INSIDE AND OUTSIDE OF THE TOWER – PRACTICAL EXERCISES

Learning objectives:

- 93) The participants can **perform** as the informal rescue team coordinator conducting a scene assessment and hazard identification by; assessing and determining the rescue strategy, and exercising clear communication (Skills, intermediate level)
- 94) The participants can **apply** clear and precise communication in a stressful rescue operation both, with members of the rescue team as a team coordinator, and as a team member (Skills, intermediate level)
- 95) The participants can **apply** a rescue device in a passive setup (i.e. the rescue device fixed in the WTG) during a rescue up operation outside of the tower (Skill, intermediate level)
- 96) The participants can **apply** a rescue device in an active setup (i.e. the rescue device attached onto the injured person) during an inside rescue up operation inside of the tower/basement (Skill, intermediate level)



The instructor shall:

- 10.2.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3 Measures to Prevent Injury during Training
- 10.2.2 Introduce the specific exercise, including:
 - a. appoint a team coordinator to the exercise and introduce the tasks and responsibilities related to this function
 - b. introduce relevant rescue strategy, method, and technique, including active or passive rescue device setup
 - c. highlight what injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - d. highlight how to organise the rescue team to the specific rescue operation scenario (who does what)
 - e. what specific elements/course contents the instructor's assessment will include
- 10.2.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
 - a. positive feedback
 - b. improvement proposals and alternative solutions
 - c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
 - d. participants' risk mitigation during the exercise



- e. participants' manual handling risk mitigation and application of further control measures

10.2.4 Guide and support the participants when applying:

- a. power driven raising rescue systems
- b. additional fall protection of injured person

10.2.5 Demonstrate how to use a bridle setup using one anchor sling attached to the front and back attachment points of the injured persons harness, to:

- a. ensure the injured person is suspended as close to vertical as possible
- b. allow room for the rescuer to manoeuvre between the injured person and the rescue device

10.2.6 Explain the potential issue of insufficient lifting height for entering the nacelle when the injured person is suspended in a bridle setup that is too long

10.2.7 Demonstrate how the rescuer can apply fall protection by being attached to the rescue device (detached from the vertical fall arrest system) if the manufacturer's user manual allow

10.2.8 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products

10.2.9 Explain the potential task placed upon the participants (on course completion) requiring them to familiarise themselves with other rescue equipment products in their own organisations

10.2.10 Provide constructive feedback on the participants' efforts during the exercise with focus on their ability to perform correctly, safely, and responsibly



The participants shall:

10.2.11 In a team, explain how to identify and control the specific hazards/risks in the WTG during the rescue up operation, covering the following:

- a. hazardous energy sources (mechanical, electrical, hydraulic, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO WAH put into an advanced rescue context)



- h. slips and trips
- i. if inside tower evacuation, determine rescuer fall protection (vertical fall arrest system or rescue device, if manufacturer's user manual allow)
- j. participants shall participate in the practical exercises as presented by the instructor

LESSON 11 - 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 11.1 - TRAINING REVIEW



The instructor shall:

- 11.1.1 Re-present the overall aims and learning objectives of the module for the participants' comparison of their learning outcomes and the achievement of their previously stated expectations for the module



The participants shall:

- 11.1.2 Reflect on their learning outcome and key takeaways from ART Nacelle, Tower & Basement Rescue training, 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 & talk
 - b. questions & answers in class, or where suitable

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

ELEMENT 11.2 - FEEDBACK SESSION



The instructor shall:

- 11.2.1 Give an overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training-review-session
- 11.2.2 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) and to discuss with colleagues about how the ART Nacelle, Tower & Basement Rescue training



content, methods and techniques are similar or different to the local specific conditions identified after the module completion



Single Rescuer: Hub, Spinner & Inside Blade

(SART-H)



10. MODULE 3 – SINGLE RESCUER: HUB, SPINNER & INSIDE BLADE RESCUE (SR:HSIBR)

10.1 Aims and objectives of the Single Rescuer HSIBR Module

The aim of this module is to enable the participants to perform single rescuer advanced rescue operations, in a WTG hub, spinner and inside the blade by using industry standard rescue equipment, methods and techniques, exceeding those of GWO's Basic Safety Training, Working at Heights Module.

Based on the participants HSIBR module qualifications, the single rescuer HSIBR module (SR:HSIBR) shall ensure that participants are able to:

1. Assess and determine single rescuer rescue strategy (relevant rescue method, technique, certified equipment and how to organise the rescue efforts and incident scene) for various rescue scenarios, in a WTG hub, spinner and inside a blade
2. Apply rescue methods and techniques in performing descending and ascending single rescuer rescue operations, from a WTG hub, spinner and inside a blade using: a rescue stretcher and transfer board; manually operated lowering/raising rescue system for limited distance rescue (rescue device, pulley system or similar); and other rescue equipment relevant to the participant

10.2 Competencies of the Single Rescuer HSIBR Module

1. Perform single rescuer descending rescue operations from a WTG hub, spinner and from inside a blade, to a primary assembly area (ground or transition piece) or a secondary assembly area (vessel), using industry standard rescue equipment

Note *Single rescuer rescue operations performed on the outside of the blades are not included*

10.3 Participant Prerequisites for the Single Rescuer HSIBR Module

The Single Rescuer (SR:HSIBR) Module is an add on to the HSIBR Module, hence it is a prerequisite to have a valid HSIBR certificate. Valid GWO BST Working at Heights, GWO BST First Aid, and GWO BST Manual Handling training records are also prerequisites for participation.

10.4 Duration of the Single Rescue HSIBR Module

The total contact time for completing this module is 4 hours and 20 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 10-4.1 below.

	Maximum Duration Per Day
Contact time	8 hours



Total training day	10 hours
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Table 10.4.1 – Maximum durations for training day

Note *Contact time includes delivery of 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)

10.5 Instructor to Course Participant Ratio for the Single Rescuer HSIBR Module

The ratios shown for theory and practical sessions indicates the maximum number of participants that can attend the course per instructor during each activity.

Module	Session	Instructor to Participant Ratio
Single Rescuer HSIBR Module	Theory	1:12
	Practical	1:4

Table 10.5.1 – Instructor to course participant ratio

10.6 Equipment for the Single Rescuer HSIBR Module

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements as listed in table A1-1 in Annex 1 where applicable.

A generic approach to teaching rescue equipment is applied to this module aiming to avoid potential product specific additional training on completion of this module, which may be required by the participants organisation (e.g. prior to site or work).

The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers), enabling the participants to use other rescue equipment products compared to those taught during this module (based on the manufacturer's user manual) but without additional formal training.

10.7 Timetable of the Single Rescuer HSIBR Module

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 (participant performance assessment form)	
	1.6	Motivation	
	1.7	Human factors	
		TOTAL	15 min.
2.	Single rescuer rescue strategy	2.1	Organisational strategy, in own organisation, singular rescuer
		2.2	Evacuation strategy, single rescuer
		TOTAL	30 min.
3.	Measures to prevent injury during training	3.1	Measures to prevent injury during training
		TOTAL	20 min.
4.	Hub rescue exercise 1 & 2 (from blade)	4.1	Hub rescue exercise 1 & 2 (from blade)
		TOTAL	90 min.
5.	Hub rescue exercise 3 & 4 (from spinner)	5.1	Hub rescue exercise 3 & 4 (from spinner)
		5.2	Hub rescue exercise 3 & 4 (from spinner)
		TOTAL	90 min.
6.	Training review	6.1	Training review
		6.2	Feedback session
		TOTAL	15 min
		GRAND TOTAL	260 min.

Table 10.7.1 – GWO SR HSIBR Module timetable

10.8 Detailed Description of the Single Rescuer HSIBR Module

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 training safely at a training facility, while recognising what is expected of them during the training.

After having successfully completed Lesson 1 of ART, Single Rescuer HSIBR Module, the participants can:



- 1) **Show interest** in what is expected of them throughout the module (Ability, basic level)
- 2) **Show interest** and explain local emergency procedures and facilities (Ability, basic level)
- 3) **Show interest** in human factors and explain their implications (Ability, basic level)

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

Learning objective:

- 4) The participants can **describe** the safety and emergency procedures at the training facility (Knowledge, 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 exits in the areas where the participants can be expected to be located during the course



The participants shall:

- 1.1.2 Discuss local safety and emergency procedures

ELEMENT 1.2 - FACILITIES

Learning objective:

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



The instructor shall:

- 1.2.1 Present a general description of the facilities at the training location (administration, dining area, restrooms, toilet, etc.)
- 1.2.2 Alternatively, lead a tour pointing out facilities



The participants shall:

- 1.2.3 Recognise relevant facilities and ask questions when in doubt

ELEMENT 1.3 - INTRODUCTION

Learning objective:

- 6) The participants can **discuss** with fellow participants about themselves and the course content and design (Knowledge, intermediate level)



The instructor shall:

- 1.3.1 Explain and ask involving questions aiming at the programme of the ART Single Rescuer HSIBR Module, including breaks and mealtimes
- 1.3.2 Give a short introduction to themselves, including their backgrounds as instructors
- 1.3.3 Ask for participants' expectations of the training and their learning or development



The participants shall:

- 1.3.4 Give a short introduction to themselves, including job function and expected primary geographic work location and share expectations on the training

ELEMENT 1.4 - SCOPE AND MAIN LEARNING OBJECTIVES

Learning objective:

- 7) The participants can **recognise** the scope and main objectives of the ART Single Rescuer HSIBR Module (Knowledge, basic level)



The instructor shall:

- 1.4.1 Present the scope and main learning objective of the ART Single Rescuer HSIBR Module
- 1.4.2 Involve participants with questions on understanding and individual experiences on ART Single Rescuer HSIBR Module training



The participants shall:

- 1.4.3 Engage in answering questions and share experiences on ART Single Rescuer HSIBR Module

ELEMENT 1.5 - ONGOING ASSESSMENTS (PARTICIPANT PERFORMANCE ASSESSMENT FORM)

Learning objective:

- 8) The participants can **describe** 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' performance assessment form and how it will be used
- 1.5.3 Facilitate a group discussion or Q&A activity on participant assessments



The participants shall:

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

ELEMENT 1.6 - MOTIVATION

Learning objective:

- 9) The participants can **apply** skill and willingness to engage in the learning activities (Skill, intermediate level)



The instructor shall:

- 1.6.1 Explain and lead a discussion on:
- a. the importance of personal involvement in the course
 - b. the definition of, and the need for, ART Single Rescue understandings and abilities



Note *Positive motivation is the driving force for commitment and the instructor should make a focused effort to support growth of the necessary attitude and motivation in the participant*



The participants shall:

1.6.2 Engage themselves in discussion and share experiences on ART Single Rescuer HSIBR Module

Note *When the participants succeed by trying out on their own, bring their relevant experience into play and apply learning points from the instructor's feedback, the participant develops a positive attitude and responsibility towards the subject and the performance in the work situation.*

ELEMENT 1.7 - HUMAN FACTORS

The aim of the element is to draw the participants' attention on 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 **describe** the relevant human factors, and their implications (Knowledge, basic level)
- 11) The participants can **recognise** human factors during the following practical exercises (Knowledge, basic level)



The instructor shall:

- 1.7.1 Present how human factors influence accidents in the wind industry (relevant statistics may be used)
- 1.7.2 Lead a discussion about the role of the individual in improving human performance and how this can improve the safety of WTG operations
- 1.7.3 Ensure that constructive feedback on the participant's performance involves human factors criteria when these are defined in the learning objective such as the ability to take responsibility or to act independently

Human Factors Criteria:

The consequences of human factors in accidents in WTG environments are influenced by the following terms and conditions:

- 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. facilitate a group discussion or Q&A activity on human factors



The participants shall:

- 1.7.4 Engage in discussions and share experiences on how human factors influence accidents in relationship to ART Single Rescuer HSIBR Module
- 1.7.5 Engage in and reflect on received feedback and take responsibility on their own performance and development during the training

LESSON 2 - SINGLE RESCUER RESCUE STRATEGY

30 min.

The aim of this lesson is to raise awareness on the impact strategic choices have during a singular rescue, both on organisational level and on the practical evacuation.

After having successfully completed this lesson, the participants can:

- 12) **Show interest** in how, and which, single rescuer advanced rescue operations are most likely to have greater consequence when compared to advanced rescue operations performed as a team operation (Ability, basic level)
- 13) **Show interest** in explaining what specific rescue preparations and emergency, communication, and command procedures, apply in their own organisation (Ability, basic level)



- 14) **Take responsibility** in assessing the limitations of the rescue preparations available, when deciding on the single rescuer rescue strategy, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower (Ability, intermediate level)

ELEMENT 2.1 - ORGANISATIONAL STRATEGY, IN OWN ORGANISATION, SINGLE RESCUER

Learning objective:

- 15) The participants can **recognise** specific rescue, communication, and emergency procedures (Knowledge, basic level)



The instructor shall lead a discussion about:

- 2.1.1 What specific rescue preparations and emergency and communication procedures apply in their own organisation, e.g. concerning:
- a. number of rescue personnel available (on site) and the required response time for additional (advanced rescue) back up
 - b. rescue training level depending on your work location in the WTG and number of personnel (e.g. working in the hub, or in the tower)
 - c. communication procedures of operation, e.g. communication to backup/rescue team, emergency medical treatment (EMT) i.e. ambulance and fire service, site lead, service vessel, helicopter search and rescue (SAR), and the means of communication radio or phone (cell, IP or satellite phone)
 - d. national and/or local requirements (e.g. confined space regulations and procedures)
 - e. estimated time for professional emergency response providers to arrive
- 2.1.2 What to be aware of concerning what specific elements in their own WTG type/WTG environment might differ from the training scenario environment (to visualise and enhance learning transfer)
- 2.1.3 Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, helipad)
- 2.1.4 Facilitate Q&A activity on communication procedures to check learning



The participants shall:

- 2.1.5 Actively engage in the discussion and share experiences



ELEMENT 2.2 - EVACUATION STRATEGY, SINGLE RESCUER

Learning objectives:

- 16) The participants can **describe** the evacuation strategies utilising the correct rescue equipment while establishing a means of escape (Knowledge, basic level)
- 17) The participants can **discuss** possible personal injury or difficulty in rescue and the actions to be taken (Knowledge, intermediate level)



The instructor shall:

- 2.2.1 Explain the consequences of performing a rescue operation as a single rescuer, as compared to a team operation, as elaborated below
- 2.2.2 Explain the importance of end to end rescue strategy planning and how to organise the entire setup and operation i.e. what to do, when and how
- 2.2.3 Explain that PPE lanyards available are limited to two of each type (fall restraint and fall arrest)
- 2.2.4 Explain what equipment to rig /utilise /lay out, where, to achieve a correct setup the first time
- 2.2.5 Explain how to evaluate where you should be located and how you can move from one side of the IP to the other (if relevant), e.g. by removing hatch between hub and nacelle
- 2.2.6 Explain how to assess and determine evacuation strategy during a rescue operation, ensuring a clear and preferred evacuation route and the limitations related to the singular rescue



The participants shall:

- 2.2.7 Practise how to establish means of escape with an end-to-end rescue strategy
- 2.2.8 Practise how to establish means of communication with incident/site command in own organisation
- 2.2.9 Explain why a single person rescue operation could take more time than a team rescue operation and the effect this could have on the medical condition of the IP.
- 2.2.10 Describe the limitations on own capacity, e.g. due to mental stress or physical stress like exhaustion/fatigue and dehydration and how to cope with this. This includes acknowledging when an individual is not able to successfully complete the rescue operation, and what to do in this situation
- 2.2.11 Practise how to reduce manual handling to minimise the risk from injury and/or exhaustion/fatigue



LESSON 3 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The aim of this lesson is to reduce the risk of injury during training by ensuring that the participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

After having successfully completed the lesson participants can:

- 18) **Take responsibility** for reducing the risk of injury by understanding and demonstrating effective risk control measures (Ability, intermediate level)



The instructor shall:

- 3.1.1 Explain further control measures relevant for the specific training facilities and training to avoid injury during the training
- 3.1.2 Verify that the participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions
- 3.1.3 Ensure that any hazardous energy sources which may affect the participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the participants
- 3.1.4 Lead a warm-up session of the major muscle groups of the body, ankles, wrists and back. See suggested exercises in Annex 4
- 3.1.5 It is the instructor's responsibility to physically verify that each participant who is working at height (including both casualty and rescuer) is always attached to additional fall protection. GWO recommends that a SRL is used as additional fall protection.
- 3.1.6 Give constructive feedback on the participants' understanding of how to reduce injury using control measures including the use of PPE and the proper use of harnesses



The participants shall:

- 3.1.7 Take part in the warm-up session of the major muscle groups, ankles, wrists and back
- 3.1.8 Perform a pre-use inspection of their personal fall protection equipment
- 3.1.9 Perform a 'buddy check' of another participant's personal fall protection equipment

Note *During the remaining rescue exercises on this course the instructor shall observe and coach the participants in manual handling planning, techniques, execution, and improvement*



It is important that the participants understand how to apply manual handling planning and techniques to their daily work environment

LESSON 4 - HUB RESCUE EXERCISE 1 & 2 (FROM BLADE)

90 min.

There are several locations on the turbine where occasionally work needs to take place with reduced horizontal and vertical space; such as in a hub, spinner, or blade.

The aim of this lesson is to enable the participants to successfully practise injured person rescue operations, in a WTG blade and out of the hub, as a single rescuer.

After having successfully completed this lesson, the participants can:

- 19) **Show interest** in the value of, and explain the importance of, end to end rescue strategy planning prior to single rescuer advanced rescue operations and explain the potential consequences in lack of planning (Ability, basic level)
- 20) **Act independently** to communicate with (simulated) incident/site commands in own organisation (Ability, intermediate level)
- 21) **Show interest** in own limitations and capacity. Explain the coping mechanisms the participants would use and what they would do during this type of situation (Ability, basic level)
- 22) **Show interest** in how to reduce manual handling to a minimum (Ability, basic level)
- 23) **Take responsibility** for the rescue operation using an injured person's personal fall protection equipment without compromising additional fall protection (i.e. if the manually operated lowering/raising rescue system is not certified for person lifting) (Ability, intermediate level)
- 24) **Take responsibility** for a scene assessment and hazard identification, assessing and determining the rescue strategy (Ability, intermediate level)
- 25) **Take initiative** for giving clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew), including coordinating the handover of an injured person (Ability, intermediate level)

Note *One participant per exercise. It is recommended that a rescue dummy is used for these exercises*

ELEMENT 4.1 - HUB RESCUE EXERCISE 1 & 2 (FROM BLADE)

Learning objectives:



- 26) The participants can **select** the equipment to rig/utilise/lay out. Aiming to achieve a correct and efficient setup the first time therefore minimising re-rigging during the rescue operation (Skill, advanced level)
- 27) The participants can **perform** a rigging setup to ensure it can be operated as intended, by one person (Skill, intermediate level)
- 28) The participants can **explain** and demonstrate where they should be located during the rescue operation and how they can move from one side of the IP to the other (if relevant) (Knowledge, intermediate level)
- 29) The participants can **explain** and demonstrate how to establish means of escape (Knowledge, intermediate level)



The instructor shall:

- 4.1.1 Highlight specific control measures to avoid injury during training relevant to this specific exercise scenario, according to the section on control measures to avoid injury during training
- 4.1.2 Introduce the specific exercise
- 4.1.3 Appoint a single rescuer for the exercise and introduce the task
- 4.1.4 Highlight that the single rescuer is expected to apply the principles, methods, and techniques from hub rescue operations in a team, and incorporate the mentioned single rescuer focal areas in their efforts
- 4.1.5 Guide and support the participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
- 4.1.6 Highlight the correct injured person configuration that should be applied (i.e. horizontal, or vertical configuration)
- 4.1.7 Highlight the considerations that should be made to determine where in the WTG to package the injured person should be on a rescue stretcher/transfer board
- 4.1.8 Highlight what specific elements/course contents the instructor's assessment will include
- 4.1.9 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
 - a. positive feedback
 - b. improvement proposals and alternative solutions
 - c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)



- d. the importance of planning
- e. participants' risk mitigation during the exercise.
- f. participants' manual handling risk mitigation and application of further control measures

4.1.10 Guide and support the participants when applying additional fall protection of injured person, if required

4.1.11 Provide constructive feedback on the participants' performance during the practice



The participants shall:

4.1.12 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation, by covering the following:

- a. hazardous energy sources (mechanical, electrical, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
- h. slips and trips

4.1.13 Explain how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment) for a rescue scenario in a WTG blade

4.1.14 Practise how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE and package them on a rescue stretcher or transfer board)

4.1.15 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection

4.1.16 Practise rescue methods, techniques, and clear communication in performing safe lowering/raising rescue operations from inside a WTG blade

4.1.17 Practise regular checks of the injured person during the entire rescue operation

4.1.18 Practise a rescue operation, from a WTG blade, through the hub and e.g. out of the hub or into the nacelle



- 4.1.19 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable

LESSON 5 - HUB RESCUE EXERCISE 3 & 4 (FROM SPINNER)

90 min.

The aim, learning objectives and elements mentioned in Lesson 4 (above) apply equally to this lesson but from inside the spinner.

After having successfully completed this lesson, the participants can:

- 30) **Act independently** during rescue operations, in a WTG spinner as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy and exercising clear communication (Ability, intermediate level)
- 31) **Take initiative** during rescue operations, in a WTG spinner using personal lamp (e.g. helmet lamp), if required due to poor lighting conditions (Ability, intermediate level)
- 32) **Take responsibility** in transporting the injured person to the escape hatch by means of a zip line (arial ropeway), to control the handling of injured person more efficiently and reduce manual handling (Ability, intermediate level)

Note *One participant per exercise. It is recommended that a rescue dummy is used for these exercises.*

ELEMENT 5.1 - HUB RESCUE EXERCISE 3 (FROM SPINNER)

Learning objectives:

- 33) The participants can **perform** a manual transport (in balance) of an injured person on a rescue stretcher or transfer board in a WTG (Skills, intermediate level)
- 34) The participants can **perform** a safety skill by changing directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa) when suspended (Skills, intermediate level)
- 35) The participants can **perform** rescue operations, in a WTG spinner as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy and exercising clear communication (Skills, intermediate level)
- 36) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skills, intermediate level)



The instructor shall:

- 5.1.1 Highlight the relevant differences in rescue strategy of this scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)
- 5.1.2 Explain the concept of a tensioned line (zip line) in a nacelle, how to rig it, adhering to the hazards and risks
- 5.1.3 Provide constructive feedback on the participants' performance during the practice



The participants shall:

- 5.1.4 Distinguish between the relevant differences in rescue strategy of this scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)
- 5.1.5 Discuss and understand the concept of tensioned line (zip line) in a nacelle, how to rig it, adhering to the hazards and risks
- 5.1.6 Practise a rescue scenario from a WTG spinner as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy whilst exercising clear communication

ELEMENT 5.2 - HUB RESCUE EXERCISE 4 (FROM SPINNER)

The participants shall demonstrate and, on request, explain how to conduct the elements mentioned in the Lesson 4 (above) which equally apply to this element; but in relation to the spinner

Learning objective:

- 37) The participants can **perform** a rescue operation, in a WTG spinner as the informal rescue team coordinator performing scene assessment and hazard identification, assessing, and determining the rescue strategy and exercising clear communication (Skill, intermediate level)



The instructor shall:

- 5.2.1 Highlight the relevant differences in rescue strategy of this scenario, compared to the blade rescue strategy (anchor points, rigging of the lowering/raising rescue system, deviation, techniques, etc.)



The participants shall:

- 5.2.2 Practise rescue operations, in a WTG spinner using a personal lamp (e.g. helmet lamp), if required due to poor lighting conditions



- 5.2.3 Practise how to rig a tensioned line (zip line) in a nacelle and transport the injured person to the escape hatch

LESSON 6 - 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 6.1 - TRAINING REVIEW



The instructor shall:

- 6.1.1 Re-present the overall aims and learning objectives of the module for the participants' comparison of their learning outcomes and the achievement of their previously stated expectations for the module



The participants shall:

- 6.1.2 Reflect on their learning outcome and key takeaways from ART Single Rescuer HSIBR 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 & talk
 - b. questions & answers in class, or where suitable

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

ELEMENT 6.2 - FEEDBACK SESSION



The instructor shall:

- 6.2.1 Give an overall feedback and feed forward on the participants' learning outcome inspired by the training as well as from the training-review-session
- 6.2.2 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) and to discuss with colleagues about how the ART Single Rescuer HSIBR Module content, methods and techniques are similar or different to the local specific conditions identified after the module completion



GLOBAL WIND
ORGANISATION

Single Rescuer: Nacelle, Tower & Basement

(SART-N)



11. MODULE 4 – SINGLE RESCUER: NACELLE, TOWER & BASEMENT RESCUE (SR:NTBR)

11.1 Aims and objectives of the Single Rescuer NTBR Module

The aim of this module is to enable the participants to perform single rescuer advanced rescue operations, in a WTG nacelle, tower and basement, by using industry standard rescue equipment, methods and techniques, exceeding those of GWO's BST Working at Heights Module.

Based on the participants' NTBR Module qualifications, the Single Rescuer NTBR Module shall ensure that participants are able to:

1. Assess and determine single rescuer rescue strategy (relevant rescue method, technique, certified equipment and how to organise the rescue efforts and incident scene) for various rescue scenarios, in a WTG nacelle, tower and basement
2. Apply rescue methods and techniques in performing descending and ascending single rescuer rescue operations, from a WTG nacelle, tower and basement using a rescue stretcher and transfer board, manually operated and power-driven lowering/raising rescue system (rescue device and pulley system or similar), and other rescue equipment relevant to the participants

11.2 Competencies of the Single Rescuer NTBR Module

1. Perform Single Rescuer descending and ascending rescue operations from an enclosed space in a WTG nacelle, tower, and basement, to a primary assembly area (ground, transition piece, or helicopter hoisting platform) or a secondary assembly area (vessel), using industry standard rescue equipment

Note *Rescue scenarios where the injured person is located on the outside of the nacelle and on the outside of the tower are not included.*

Note *Participant prerequisites for the Single Rescuer NTBR Module. The single rescuer NTBR module is an add on to the NTBR module, hence it is a prerequisite to have a valid NTBR training record. Valid GWO BST Working at Heights, GWO BST First Aid, and GWO BST Manual Handling certificates are also prerequisites.*

11.3 Duration of the Single Rescuer NTBR Module

The total contact time for completing this module is 4 hours and 20 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 11-3.1 below.

Maximum Duration Per Day	
Contact time	8 hours



Total training day	10 hours
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Table 11.3.1 – Maximum durations for training day

Note *Contact time includes delivery of 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)

11.4 Instructor to course participant ratio for the Single Rescuer NTBR Module

The ratios shown for theory and practical sessions indicates the maximum number of participants that can attend the course per instructor during each activity.

Module	Session	Instructor to Participant Ratio
Single Rescuer NTBR Module	Theory	1:12
	Practical	1:4

Table 11.4.1 – Instructor to course participant ratio

11.5 Equipment for the Single Rescuer NTBR Module

The equipment required for training as listed in Annex 1 must be available and must fulfil national legal requirements as listed in table A1-1 in Annex 1 where applicable.

A generic approach to teaching rescue equipment is applied to this module aiming to avoid potential product specific additional training on completion of this module, which may be required by the participants organisation (e.g. prior to site or work).

The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers), enabling the participants to use other rescue equipment products compared to those taught during this module based on the manufacturer's user manual but without additional formal training.

11.6 Timetable of the Single Rescuer NTBR Module

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	1.1	Safety instructions and emergency procedures
	1.2	Facilities



	1.3	Scope and main learning objectives	
	1.4	Ongoing assessments (participant performance assessment form)	
	1.5	Motivation	
	1.6	Human factors	
		TOTAL	15 min.
2.	Single rescuer rescue strategy	2.1	Organisational strategy, in own organisation, singular rescuer
		2.2	Evacuation strategy, single rescuer
		TOTAL	30 min.
3.	Measures to prevent injury during training	3.1	Measures to prevent injury during training
		TOTAL	20 min.
4.	Evacuation of an injured person from the nacelle to the base of the tower	4.1	Practical exercise, evacuation inside of tower
		TOTAL	40 min.
5.	Rescue from enclosed space	5.1	Rescue from enclosed space rescue - exercises
		TOTAL	50 min.
6.	Rescue from crawl space	6.1	Rescue from crawl space - exercises
		TOTAL	50 min
7.	Rescue up	7.1	Rescue up – introduction
		7.2	Rescue up, inside the tower – practical exercises
		TOTAL	40 min.
		GRAND TOTAL	260 min.

Table 11.6.1 – GWO SR NTBR Module timetable

11.7 Detailed Description of the Single Rescuer NTRB Module

LESSON 1 - INTRODUCTION

15 min.

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

After having successfully completed lesson, the participants can:



- 1) **Show interest** in what is expected of them throughout the module (Ability, basic level)
- 2) **Take initiative** to point out local emergency procedures and facilities (Ability, intermediate level)
- 3) **Show interest** in the understanding the main learning objectives and expectations of the course (Ability, 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 at the training facility (Ability, basic level)



The instructor shall:

1.1.1 Explain and ask involving questions aiming at:

- a. safety instructors according to internal procedures
- b. emergency procedures and emergency exits in the areas where the participants can expect to be located during the course



The participants shall:

1.1.2 Engage in answering questions on local safety and emergency procedures

ELEMENT 1.2 - FACILITIES

Learning objective:

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



The instructor shall:

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



1.2.2 Alternatively, lead a tour pointing out facilities



The participants shall:

1.2.3 Note relevant facilities and ask questions when in doubt

ELEMENT 1.3 - SCOPE AND MAIN LEARNING OBJECTIVES

Learning objective:

- 6) The participants can **recognise** the scope and main objectives of the Single Rescuer NTBR Module (Knowledge, basic level)



The instructor shall:

1.3.1 Present the scope and main learning objectives of the Single Rescuer NTBR Module

1.3.2 Involve participants with questions on understanding and individual experiences on Single Rescuer NTBR Module



The participants shall:

1.3.3 Engage in answering questions and share experiences on Single Rescuer NTBR Module

ELEMENT 1.4 - ONGOING ASSESSMENTS (PARTICIPANT PERFORMANCE ASSESSMENT FORM)

Learning objective:

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



The instructor shall:

1.4.1 Explain the reasons for the ongoing assessment

1.4.2 Explain the layout of GWO's participant performance assessment form and how it will be used

1.4.3 Facilitate a group discussion on understanding the assessment form



The participants shall:

- 1.4.4 Engage themselves in discussions and ask questions when in doubt in relation to the assessment procedure

ELEMENT 1.5 - MOTIVATION

Learning objective:

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



The instructor shall:

- 1.5.1 Explain and lead a discussion on the importance of personal involvement in the course and the definition of, and need for, Single Rescuer NTBR Module understanding and abilities
- 1.5.2 Lead a short discussion to ensure participants' understanding of the Single Rescuer NTBR Module

Note *Positive motivation is the driving force for commitment, and the instructor should make a focused effort to support growth of the necessary attitude and motivation in the participant*



The participants shall:

- 1.5.3 Engage themselves in discussion and share experiences on Single Rescuer NTBR Module

Note *When the participants succeed by trying out on their own, bring their relevant experience into play and apply learning points from the instructor's feedback, the participant develops a positive attitude and responsibility towards the subject and the performance in the work situation*

ELEMENT 1.6 - HUMAN FACTORS

The aim of the element is to draw the participants' attention on 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:

- 9) The participants can **describe** the relevant human factors, and their implications (Knowledge, basic level)



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



The instructor shall:

- 1.6.1 Present how human factors influence accidents in the wind industry (relevant statistics may be used)
- 1.6.2 Lead a discussion about the role of the individual in improving human performance and how this can improve the safety of offshore operations
- 1.6.3 Ensure that constructive feedback on the participant's performance involve human factor criteria when these are defined in the learning objective such as the ability to take responsibility or to act independently

Human Factors Criteria:

The consequences of human factors in accidents in WTG environment are influenced by the following terms and conditions:

- 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



The participants shall:



- 1.6.4 Engage in discussions and share experiences of how human factors influence accidents in relation to the ART Single Rescuer HSIBR Module. In addition, engage in and reflect on received feedback and take responsibility on their own performance and development during the training

LESSON 2 - SINGLE RESCUER RESCUE STRATEGY

30 min.

The aim of this lesson is to raise awareness on the impact strategic choices have both, at an organisational level, and on the practical evacuation during a singular rescue.

After having successfully completed this lesson participants can:

- 11) **Show interest** in how, and which, single rescuer advanced rescue operations are most likely to have greater consequence when compared to advanced rescue operations performed in teams (Ability, basic level)

ELEMENT 2.1 - ORGANISATIONAL STRATEGY, IN OWN ORGANISATION, SINGULAR RESCUER

Learning objective:

- 12) The participants can **discuss** what specific rescue preparations and emergency, communication, and command procedures, apply in their own organisation in order to support the single person rescue operation (Knowledge, intermediate level)



The instructor shall discuss:

- 2.1.1 What specific rescue preparations and emergency and communication procedures apply in their own organisation, e.g. concerning:
- 2.1.2 Number of rescue personnel available (on site) and the required response time for additional (advanced rescue) back up
- 2.1.3 Rescue training level depending on your work location in the WTG and number of personnel (e.g. working in the nacelle, or in the tower)
- 2.1.4 Communication procedures of operation, e.g. communication to backup rescue team, emergency medical treatment (EMT) i.e. ambulance and fire service, site lead, service vessel, helicopter search and rescue (SAR) and the means of communication: radio or phone (cell, IP or satellite phone)
- 2.1.5 National and/or local requirements (e.g. confined space regulations and procedures)
- 2.1.6 Estimated time for professional emergency response providers to arrive



- 2.1.7 What to be aware of (during this training) concerning what specific elements in their own WTG type/WTG environment might differ from the training scenario environment (to visualise and enhance learning transfer)
- 2.1.8 Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, helipad)
- 2.1.9 Engage in Q&A activity on communication procedures to check learning



The participants shall:

- 2.1.10 Engage in the discussion and share experiences

ELEMENT 2.2 - EVACUATION STRATEGY, SINGULAR RESCUER

Learning objective:

- 13) **Show interest** in the limitations of the rescue preparations available, when deciding on the single rescuer rescue strategy, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower (Ability, basic level)



The instructor shall:

- 2.2.1 Discuss the consequences of performing a rescue operation as a single rescuer, as compared to a team operation, as elaborated below
- 2.2.2 Discuss the importance of end to end rescue strategy planning and how to organise the entire setup and operation i.e. what to do, when and how
- 2.2.3 Discuss that PPE lanyards are limited to two of each type (fall restraint and fall arrest)
- 2.2.4 Discuss what equipment to rig/utilise /lay out; how to achieve a correct setup the first time
- 2.2.5 Discuss how to evaluate the correct location and how to move from one side of the IP to the other (if relevant), e.g. by removing hatch between hub and nacelle
- 2.2.6 Discuss how to assess and determine evacuation strategy during a rescue operation, ensuring clear and preferred evacuation route (e.g. removing hatches within the rescue route), where you should be located during the rescue operation, in relation to moving past the injured person and the limitations related to the singular rescue.
- 2.2.7 Discuss how single rescuer may be limited by mental and physical health
- 2.2.8 Initiate a Q&A session on communications strategies
- 2.2.9 Initiate a Q&A session on manual handling to reduce injury



The participants shall:

- 2.2.10 Explain the consequences of performing a rescue operation as a single rescuer, as compared to a team operation, as elaborated below
- 2.2.11 Explain the importance of end to end rescue strategy planning and how to organise the entire setup and operation i.e. what to do, when and how
- 2.2.12 Explain that PPE lanyards are limited to two of each type (fall restraint and fall arrest)
- 2.2.13 Explain what equipment to rig/utilise/lay out; to achieve a correct setup the first time
- 2.2.14 Explain how to evaluate the correct location and how to move from one side of the IP to the other (if relevant), e.g. by removing hatch between hub and nacelle
- 2.2.15 Explain how to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route (e.g. removing hatches within the rescue route), where you should be located during the rescue operation, in relation to moving past the injured person and the limitations related to the singular rescue
- 2.2.16 Practise how to establish means of communication with incident/site command in own organisation
- 2.2.17 Be aware that a single person rescue operation could take more time than a team rescue operation and the effect this could have on the medical condition of the IP
- 2.2.18 Be aware of limitations in own capacity, e.g. due to mental stress or physical stress like exhaustion/fatigue and dehydration and how to cope with this. This includes acknowledging when not able to successfully complete the rescue operation and what to do in this situation
- 2.2.19 Practise how to reduce manual handling to minimise the risk from injury and/or exhaustion/fatigue

LESSON 3 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The aim of this lesson is to reduce the risk of injury during training by ensuring that the participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

After having successfully completed this lesson, the participants can:

- 14) **Take responsibility** for reducing the risk of injury by understanding and demonstrating effective risk control measures (Ability, intermediate level)



The instructor shall:

- 3.1.1 Explain further control measures relevant for the specific training facilities and training to avoid injury during the training
- 3.1.2 Verify that the participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions
- 3.1.3 Ensure that any hazardous energy sources which may affect the participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the participants
- 3.1.4 Lead a warm-up session of the major muscle groups of the body, ankles, wrists and back. See suggested exercises in Annex 4
- 3.1.5 It is the instructor's responsibility to physically verify that each participant who is working at height (including both casualty and rescuer) is always attached to additional fall protection. GWO recommends that a SRL is used as additional fall protection.
- 3.1.6 Check knowledge by a Q&A session



The participants shall:

- 3.1.7 Take part in the warm-up session of the major muscle groups, ankles, wrists and back
- 3.1.8 Perform a pre-use inspection of their personal fall protection equipment
- 3.1.9 Perform a 'buddy check' of another participants personal fall protection equipment

Note *During the remaining rescue exercises on this course the instructor shall observe and coach the participants in manual handling planning, techniques, execution, and improvement*

It is important that the participants understand how to apply manual handling planning and techniques to their daily work environment

LESSON 4 - EVACUATION OF AN INJURED PERSON FROM THE NACELLE TO THE BASE OF THE TOWER

40 min.

The aim of this lesson is to enable the participants to evacuate an injured person in a safe and secure manner from the nacelle, inside or outside the tower, to a primary assembly area (ground or transition piece) and from transition piece to a secondary assembly area (vessel), as a singleton rescuer.

After having successfully completed this module, participants can:



- 15) **Take responsibility** to assess and determine evacuation strategy during a rescue operation, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower (Ability, intermediate level)
- 16) **Act independently**, as a single rescuer, to apply rescue methods and techniques in performing descending rescue operations, from a WTG to a primary assembly area (ground or transition piece) and a secondary assembly area (vessel), using a rescue stretcher and transfer board, lowering/raising rescue system (rescue device, pulley system or similar) (Ability, intermediate level)

ELEMENT 4.1 - PRACTICAL EXERCISE, EVACUATION INSIDE OF TOWER

Learning objectives:

- 17) The participants can **perform** how to package an injured person on a rescue stretcher and transfer board in a vertical or horizontal configuration to enable safe transportation, by doing regular checks, using rescue equipment such as cervical collar, and avoiding head down configuration of the unconscious injured person (Skill, intermediate level)

Note One exercise for one participant. It is recommended that a rescue dummy is used for these exercises.

Note Exercise includes: rescue strategy planning, rescue efforts and instructor led evaluation.



The instructor shall:

- 4.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3, Measures to Prevent Injury During Training
- 4.1.2 Introduce the specific exercise
 - a. introduce relevant rescue strategy, method, and technique
 - b. highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/transfer board
 - c. highlight what injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - d. highlight where to attach the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point,
 - e. what specific elements/course contents the instructor's assessment will include
- 4.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
 - a. positive feedback



- b. improvement proposals and alternative solutions
- c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
- d. participants' risk mitigation during the exercise
- e. participants' manual handling risk mitigation and application of further control measures

4.1.4 Guide and support the participants when applying additional fall protection of injured person's, if required

4.1.5 Check understanding by holding a Q&A session



The participants shall:

4.1.6 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation, by covering the following

- a. hazardous energy sources (mechanical, electrical, pressurised systems - i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO WAH put into an advanced rescue context)
- h. slips and trips

4.1.7 Explain how to assess and determine evacuation strategy (relevant rescue method, route technique, certified equipment) for a singleton rescue scenario in a WTG

4.1.8 Practise how to prepare the injured person (live 'injured' person preferred) for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package them on a rescue stretcher or transfer board)

4.1.9 Practise how to manually transport a balanced, injured person (dummy) on a rescue stretcher or transfer board or by means of a zip line (aerial ropeway) when relevant

4.1.10 Practise how to attach the rescue device to the injured person (dummy) in a safe and proper manner

4.1.11 Practise how to balance an injured person (dummy) from a horizontal to a vertical position (and vice versa), in order to move the injured person downwards through hatches, or similar

4.1.12 Practise how to select and utilise certified and structural anchor points



- 4.1.13 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection
- 4.1.14 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection
- 4.1.15 Practise how to apply rescue methods, techniques, and clear and precise communication in performing safe ascending/descending rescue operations from a WTG
- 4.1.16 Practise how to perform regular checks of the injured person during the entire rescue operation
- 4.1.17 Practise how to perform an inside evacuation, with the rescue device in an active setup, from the nacelle to a primary assembly area (ground or transition piece). In this scenario the rescuer controlling the descent should be located below the injured person
- 4.1.18 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable
- 4.1.19 Practise how to apply clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person.

LESSON 5 - RESCUE FROM ENCLOSED SPACE

50 min.

There are several locations in the nacelle where occasionally work needs to take place with reduced horizontal and vertical space. Such as the yaw section, transformer room or between canopy and generator of a direct drive WTG.

The aim of this lesson is for the participants (as single rescuers) to be able to apply various techniques to evacuate an injured person from an area with restricted manoeuvrability, filled with sufficient simulated assets, to a location where first aid can be administered.

After having successfully completed this module, participants can:

- 18) **Take responsibility** to apply the techniques to successfully rescue the injured person from the enclosed space, in a controlled manner (Ability, intermediate level)
- 19) **Show interest** in how to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in an enclosed space scenario (Ability, basic level)

ELEMENT 5.1 - RESCUER FROM ENCLOSED SPACE – EXERCISES

Learning objectives:



- 20) The participants can **perform** how to apply rescue methods and techniques in performing descending and ascending rescue operations, from a WTG, using a rescue stretcher and transfer board, lowering/raising rescue system (rescue device, pulley system or similar) (Skill, intermediate level)
- 21) The participants can **perform** fitting a harness or improvised harness by the use of a rescue sling around the injured person's chest, and other PPE (e.g. apply rescue head support, fit helmet, safety glasses etc.) onto an injured person, in an enclosed space (Skill, intermediate level)

Note *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person.*

The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally. An improvised harness must never be used for lifting or lowering an injured person.

Note *One exercise for one participant. It is recommended that a rescue dummy is used for these exercises. Exercise includes; rescue strategy planning, rescue efforts and instructor-led evaluation.*



The instructor shall:

- 5.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3 Measures to Prevent Injury During Training
- 5.1.2 Introduce the specific exercise, including:
- a. appoint a team coordinator for the exercise, and introduce the tasks and responsibilities related to this function
 - b. discuss different rescue strategies, methods, and techniques in order to optimise the rescue set up
 - c. highlight the considerations that determine where in the WTG to package the injured person on a rescue stretcher/transfer board
 - d. show guidance and support to participants when exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
 - e. highlight the correct injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - f. highlight how to organise the rescue team to the specific rescue operation scenario (who does what)
 - g. highlight the specific elements/course contents the instructor's assessment will include
- 5.1.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
- a. positive feedback



- b. improvement proposals and alternative solutions
- c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
- d. participants' risk mitigation during the exercise
- e. participants' manual handling risk mitigation and application of further control measures

5.1.4 Guide and support the participants when applying:

- a. manually operated lowering and raising systems
- b. additional fall protection of injured person, if required

5.1.5 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities in design, functionality, and operation between different products

5.1.6 Explain the potential task placed upon the participants (on completion), requiring them to familiarise themselves with other rescue equipment products in their own organisations

5.1.7 Provide constructive feedback on the participants' performance during the practice



The participants shall:

5.1.8 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation by covering the following:

- a. hazardous energy sources (mechanical, electrical, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions (dehydration, heat stroke, exhaustion)
- g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
- h. slips and trips

5.1.9 Explain how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment) for a single person rescue scenario in a WTG

5.1.10 Practise how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package them on a rescue stretcher or transfer board)



- 5.1.11 Practise how to balance an injured person from a horizontal to a vertical position (and vice versa), in order to move the injured person downwards through hatches, or similar
- 5.1.12 Practise how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way
- 5.1.13 Practise how to select and utilise certified and structural anchor points
- 5.1.14 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection
- 5.1.15 Practise how to rig and operate the lowering/raising rescue system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilisation of an injured person's personal fall protection equipment without compromising additional fall protection
- 5.1.16 Practise how to apply rescue methods, techniques, and precise and clear communication in performing safe lowering/raising rescue operations from a WTG
- 5.1.17 Practise how to perform regular checks of the injured person during the entire rescue operation
- 5.1.18 Practise how to conduct a rescue operation in poor lighting conditions
- 5.1.19 Practise how to transport the injured person to the escape hatch by means of a zip line (aerial ropeway), to control the handling of injured person more efficiently and reduce manual handling
- 5.1.20 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable

LESSON 6 - RESCUE FROM CRAWL SPACE

50 min.

There are several locations on the turbine where occasionally work needs to take place with strongly reduced vertical space, such as in a transformer room, behind a generator or underneath a gearbox, main bearing or under the floor.

The aim of this lesson is to enable the participants (as single rescuers) to rescue an injured person from a crawl space to a location where first aid can be administered.

After having successfully completed this module participants can:

- 22) **Take initiative** to apply the techniques to successfully rescue the injured person from the crawl space, in a controlled manner (Ability, intermediate level)
- 23) **Act independently** to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in a crawl space scenario (Ability, intermediate level)



- 24) **Take initiative** to apply rescue methods and techniques in performing a rescue operation, from a crawl space, covering efforts with and without rescue equipment to ensure the most optimum result (Ability, intermediate level)

ELEMENT 6.1 - RESCUER FROM CRAWL SPACE

Learning objectives:

- 25) The participants can **perform** the rescue operation from the incident scene fully aware of where the injured person is stuck and how to slowly lower/raise the injured person and carefully manipulate them out, constantly evaluating the rescue efforts (Skill, intermediate level)
- 26) The participants can **perform** rescue operations using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment (Skill, intermediate level)



The instructor shall:

- 6.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to Lesson 3 Measures to Prevent Injury During Training
- 6.1.2 Introduce the specific exercise,
- 6.1.3 Discuss different rescue strategies, methods, and techniques in order to optimise the rescue set up
- 6.1.4 Highlight the considerations needed to determine where in the WTG to package the injured person on a rescue stretcher/transfer board
- 6.1.5 Guide and support the participants when exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/transfer board (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/transfer board)
- 6.1.6 Discuss the specific elements/course contents the instructor's assessment will include
- 6.1.7 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
- a. positive feedback
 - b. improvement proposals and alternative solutions
 - c. participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)



- d. participants' risk mitigation during the exercise
- e. participants' manual handling risk mitigation and application of further control measures

6.1.8 Support guide the participants when applying:

- a. manually operated lowering and raising systems
- b. additional fall protection of injured person, if required

6.1.9 Discuss the exercise and check participants understanding through Q&A session



The participants shall:

6.1.10 Explain how to identify and control the specific hazards/risks in the WTG during the rescue operation by covering the following:

- a. hazardous energy sources (mechanical, electrical, pressurised systems i.e. LOTO)
- b. enclosed space areas
- c. poor lighting conditions
- d. dropped objects
- e. poor manual handling
- f. temperature/working conditions
- g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
- h. slips and trips

6.1.11 Practise how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package them on a rescue stretcher or transfer board)

6.1.12 Practise how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way

6.1.13 Practise how to select and utilise certified and structural anchor points

6.1.14 Practise how to apply the theory of lifting angle, angle factor, deviation, and edge protection

6.1.15 Practise how to rig and operate a manually operated rescue system to horizontally transport the injured person and how to mitigate the challenges of a horizontal rescue enabling a safe rescue operation

6.1.16 Practise how to apply rescue methods, techniques, and precise and clear communication in performing safe lowering/raising rescue operations from a WTG



- 6.1.17 Practise how to perform regular checks of the injured person during the entire rescue operation
- 6.1.18 Practise how to conduct the rescue operation in poor lighting conditions
- 6.1.19 Practise how to reduce the risks associated with manual handling and apply further control measures where applicable
- 6.1.20 Practise how to apply clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person

Note *The use of a rescue sling as an improvised harness is only to be used in an enclosed space where it is not possible to fit a full body harness on an injured person.*

The improvised harness must only be used as a means of extracting an injured person from an enclosed space horizontally. An improvised harness must never be used for lifting or lowering an injured person.

Note *One exercise for one participant. It is recommended that a rescue dummy is used for these exercises*

Note *Exercise includes rescue strategy planning, rescue efforts and instructor led evaluation*

LESSON 7 - RESCUE UP

40 min.

Using power driven devices can be an important mitigating measure to avoid over exhaustion when performing single rescue operations.

Helicopter transport becomes increasingly important for the offshore wind industry. Without the dependency on helicopters for emergency transport, the evacuation route will always be towards the base of the tower. However, emergency evacuation by helicopter transport from a hoisting platform, requires the rescue team to bring the injured person up to the helicopter hoisting platform, rather than to the base of the tower.

The lesson is also relevant for structures with a considerable basement structure and transition piece. Standard evacuation equipment and techniques might not always be suitable for excessive distances rescue up from inside these locations.

The aim is to enable the participants to bring their injured person from a lower platform to the higher platform, outside and inside the tower, by the use of a power-driven lowering/raising rescue system.

After having successfully completed this module participants can:

- 27) **Take initiative** to assess and determine evacuation strategy during a rescue operation, attending to a clear and preferred evacuation route for the injured person outside or inside the tower, including a high awareness on the risk of the injured person getting stuck in the WTG (e.g. under a tower-tower sections) (Ability, intermediate level)



- 28) **Act independently** to conduct pre-use inspection of a random power-driven lowering / raising rescue system (Ability, intermediate level)
- 29) **Take initiative** for the application of rescue methods and techniques in performing rescue up operations in a WTG from basement to primary assembly area (ground/transition piece), from transition piece inside tower to nacelle/heli-platform and from transition piece outside tower to nacelle/heli-platform, using a rescue stretcher and/or transfer board, raising rescue system (power driven rescue system) (Ability, intermediate level)

Note *One inside rescue up exercise for one participant. It is recommended that a rescue dummy is used for the following exercises.*

Note *Preparing the injured person, rescue up from either basement to primary assembly area (ground/transition piece) or from transition piece inside tower to nacelle/heli-platform, and rescue device in active setup. Exercise includes: rescue strategy planning, rescue efforts and instructor-led evaluation*

ELEMENT 7.1 - RESCUE UP - INTRODUCTION

Learning objectives:

- 30) The participants can **explain** national and local requirements and/or procedures for helicopter rescue in an WTG, including preparing the injured person, preparing the WTG, the helipad safe zones and safe behaviour included (Knowledge, intermediate level)
- 31) The participants can **explain** the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios, relevant for various rescue scenarios (Knowledge, intermediate level)
- 32) The participants can **explain** the proper utilisation of a specific power driven lowering/raising rescue system, including how to properly attach, rig and secure the system, and requirements, applications, limitations, means of tethering and the maximum raising distance possible for the system and associated battery power source (Knowledge, intermediate level)
- 33) The participants can **explain** national and local regional requirements and/or procedures for helicopter rescue in an onshore/offshore WTG, preparing the injured person, preparing the WTG, the helicopter hoisting platform, safe zones, and safe behaviour included (Knowledge, intermediate level)



The instructor shall:

- 7.1.1 Explain the necessity and relevance of this module
- 7.1.2 Explain that the pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's user manual and the manufacturer's criteria, or the participants own organisations



- 7.1.3 Demonstrate a pre-use inspection of the rescue device driver covering the characteristics and principles of the following:
- a. marking and labels
 - b. equipment is within the period of formal inspections
 - c. the product operating temperature range, particularly relevant for the associated battery power source in low temperatures
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. operation including taut (drill chuck) attachment to the rescue device
 - f. object attachment and tethering the driver and associated battery power source(s), if applicable
 - g. observe the manufacturer's user manual for specific or additional requirements
- 7.1.4 Demonstrate the method of rigging and operating the power-driven devices including:
- a. relevant technical specifications
 - b. requirements
 - c. applications
 - d. limitations
 - e. means of tethering preventing dropped objects
 - f. maximum raising distance possible for the specific complete power-driven lowering/raising rescue system and associated battery power source (fully charged)
 - g. the option of the rescuer applying fall protection by being attached to the rescue device (detached from the vertical fall arrest systems) if the manufacturer's user manual allow: so aiming for increased movability for the rescuer
- 7.1.5 Discuss with the participants elements to consider when determining the rescue strategy, ensuring a clear and preferred evacuation route for the injured person outside or inside the tower. Including:
- a. exposure of the injured person to weather
 - b. the potentially dangerous effect of wind pushing the injured person against the tower
 - c. emotional state of the injured person
 - d. the medical status of the injured person
 - e. time constraints



- f. nacelle configuration and position to the wind
- g. evacuation hatch location
- h. obstructions within the evacuation route

- 7.1.6 Discuss with the participants requirements and procedures for helicopter rescue
- 7.1.7 Highlight the specific limitations of lifting distances of rescue devices, designed for lowering an injured person
- 7.1.8 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products
- 7.1.9 Explain the potential task placed upon the participants in their own organisations on completion, requiring them to familiarise themselves with other rescue equipment products
- 7.1.10 Lead a short discussion to ensure participants requirements and procedures for helicopter rescue and rescue strategies are fully understood



The participants shall:

- 7.1.11 Practise a pre-use inspection of the rescue device driver covering the characteristics and principles of the following:
 - a. marking and labels
 - b. equipment is within the period of formal inspections
 - c. the product operating temperature range, particularly relevant for the associated battery power source in low temperatures
 - d. checking integrity and the absence of damage, corrosion, saltwater / chemical / lubricant / dirt exposure or contamination
 - e. operation including taut (drill chuck) attachment to the rescue device
 - f. object attachment and tethering the driver and associated battery power source(s), if applicable
 - g. observe the manufacturer's user manual for specific or additional requirements
- 7.1.12 Practise the method of rigging and operating the power-driven devices including:
 - a. relevant technical specifications
 - b. requirements
 - c. applications
 - d. limitations



- e. means of tethering preventing dropped objects
- f. maximum raising distance possible for the specific complete power-driven lowering/raising rescue system and associated battery power source (fully charged)
- g. the option of the rescuer applying fall protection by being attached to the rescue device (detached from the vertical fall arrest systems) if the manufacturer's user manual allow aiming for increased movability for the rescuer

Note *The participants will also take part in a group discussion to ensure participants requirements and procedures for helicopter rescue and rescue strategies are fully understood*

ELEMENT 7.2 - RESCUE UP, INSIDE OF THE TOWER – PRACTICAL EXERCISE

Learning objectives:

- 34) The participants can **perform** as the informal rescue team coordinator conducting a scene assessment and hazard identification, assess, and determining the rescue strategy and exercising clear communication (Skills, intermediate level)
- 35) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skills, intermediate level)
- 36) The participants can **perform** clear and precise communication in a stressful rescue operation, both with members of the rescue team as a team coordinator and as a team member (Skill, intermediate level)
- 37) The participants can **apply** a rescue device in a passive setup (i.e. the rescue device fixed in the WTG) during a rescue up operation outside of the tower (Skill, intermediate level)
- 38) The participants can **apply** a rescue device in an active setup (i.e. the rescue device attached onto the injured person) during an inside rescue up operation inside of the tower/basement (Skill, intermediate level)



The instructor shall:

- 7.2.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to lesson 3.1 measures to prevent injury during training
- 7.2.2 Introduce the specific exercise, including (to the extent needed):
 - a. appoint a team coordinator for the exercise, and introduce the tasks and responsibilities related to this function
 - b. introduce relevant rescue strategy, method, and technique, including active or passive rescue device setup



- c. highlight what injured person configuration to apply (i.e. horizontal, or vertical configuration)
 - d. highlight how to organise the rescue team to the specific rescue operation scenario (who does what)
 - e. what specific elements/course contents the instructor's assessment will include
- 7.2.3 Capture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the participants) on completion of the rescue exercise efforts with a focus on:
- a. positive feedback
 - b. improvement proposals and alternative solutions
 - c. participants' reflections on what specific elements in their own WTG, environment/practice differ from the training scenario environment (to visualise and enhance learning transfer)
 - d. participants' risk mitigation during the exercise
 - e. participants' manual handling risk mitigation and application of further control measures
- 7.2.4 Guide and support the participants when applying:
- a. power driven raising rescue systems
 - b. additional fall protection of injured person
- 7.2.5 Demonstrate how to use a bridle setup using one anchor sling attached to the front and back attachment points of the injured persons harness, to:
- a. ensure the injured person is suspended as close to vertical as possible
 - b. allow room for the rescuer to manoeuvre between the injured person and the rescue device
- 7.2.6 Explain the potential issue of insufficient lifting height for entering the nacelle when the injured person is suspended in a bridle setup that is too long
- 7.2.7 Demonstrate how the rescuer can apply fall protection by being attached to the rescue device (detached from the vertical fall arrest system) if the manufacturer's user manual allow
- 7.2.8 Stress the generic approach to teaching the use of rescue equipment in this lesson focusing on the similarities and differences in design, functionality, and operation between different products
- 7.2.9 Explain the potential task placed upon the participants in their own organisations on completion, requiring them to familiarise themselves with other rescue equipment products
- 7.2.10 Provide constructive feedback on the participants' efforts during the exercise with focus on their ability to perform correctly, safely, and responsibly



The participants shall:

- 7.2.11 In a team, explain how to identify and control the specific hazards/risks in the WTG during the rescue up operation, covering the following:
- a. hazardous energy sources (mechanical, electrical, hydraulic, pressurised systems i.e. LOTO)
 - b. enclosed space areas
 - c. poor lighting conditions
 - d. dropped objects
 - e. poor manual handling
 - f. temperature/working conditions (dehydration, heat stroke, exhaustion)
 - g. injured person suspension trauma (repetition from GWO BST WAH put into an advanced rescue context)
 - h. slips and trips

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 outcomes 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 ART Single NTBR 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 & talk
 - b. questions & 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) and to discuss with colleagues about how the ART Single Rescuer NTBR Module content, methods and techniques are similar or different to the local specific conditions identified after the module completion



Combined GWO ART



12. COMBINED GWO ADVANCED RESCUE TRAINING

The combined GWO ART consist of all four ART modules: Hub, Spinner and Inside Blade Rescue, Nacelle, Tower and Basement Rescue, Single Rescuer: Hub, Spinner and Inside Blade and Single Rescuer: Nacelle, Tower and Basement.

12.1 Duration of the Combined GWO ART Module

The total contact time for completing this module is 20 hours and 30 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 12-1.1, below.

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

Table 12.1.1 – Maximum durations for training day

Note *Contact time includes delivery of 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)

12.2 Instructor to course participant ratio for the Combined GWO ART Module

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

The ratio shown for practical sessions indicates the maximum number of course participants to be supervised by one instructor during each activity.

Module	Session	Instructor to Participant Ratio
Combined GWO ART Module	Theory	1:12
	Practical	1:4

Table 12.2.1 – Combined GWO ART instructor to course participant ratio

12.3 Requirement to upload training record in WINDA

Training providers are responsible for uploading a record of training to WINDA, the GWO online database of training records. This must be done as soon as possible and no later than 10 working days after completion of the training programme. For the combined GWO ART the below four training records must be uploaded separately.



Module	Course Code
Hub, Spinner and Inside Blade Rescue	ART-H
Nacelle, Tower and Basement Rescue	ART-N
Single Rescue: Hub, Spinner and Inside Blade Rescue	SART-H
Single Rescue: Nacelle, Tower and Basement Rescue	SART-N

Table 12.3.1 – Course codes for ART modules

12.4 Timetable of the Combined GWO ART Module

The order in which the elements of this training module are delivered may vary.

Within the module timetables, approximate duration of each of the lessons are given. The training provider may choose to deliver elements of the training according to other timetables, as long as the total duration is not reduced, and duration of practical elements is not reduced in length. Theoretical elements may be delivered during the practical exercises when feasible.

Note *The stated 'FLEXITIME' of the timetable must be utilised for theoretical and/or practical course contents, where the training provider finds it provides most value to the course Participants.*

Lesson	Element	Duration
1. Introduction (Ref. modules 1 & 2: lesson 1)	1.1	Safety instructions and emergency procedures
	1.2	Facilities
	1.3	Introduction
	1.4	Scope and main learning objectives
	1.5	Motivation
	1.6	Ongoing assessments (participant performance assessment form)
	1.7	Human factors
TOTAL		15 min.
2. Emergency response plan in your own organisation (Ref. modules 1 & 2: lesson 2)	2.1	Emergency response plan in your own organisation
	2.2	Evacuation strategy
TOTAL		30 min.



3.	Measures to prevent injury during training (Day 1, 2 & 3) (Ref. modules 1 & 2: lesson 3)	3.1	Measures to prevent injury during training	
			TOTAL	60 min.
4.	Head support during rescue (Ref. modules 1 & 2: lesson 4)	4.1	Risk of using a cervical collar	
		4.2	Head support during rescue	
			TOTAL	25 min.
5.	Packaging the injured person (Ref. modules 1 & 2: lesson 5)	5.1	Packaging the injured person	
			TOTAL	50 min.
6.	Lowering/raising rescue system (Ref. modules 1 & 2: lesson 6)	6.1	Lowering/raising rescue system	
			TOTAL	25 min.
7.	Hub rescue exercise 1 & 2 (from blade) (Ref. module 1: lesson 7)	7.1	Hub rescue exercise 1 & 2 (from blade)	
			TOTAL	100 min.
8.	Hub rescue exercise 3 & 4 (from spinner) (Ref. module 1: lesson 8)	8.1	Hub rescue exercise 3 & 4 (from spinner)	
			TOTAL	80 min.
9.	Evacuation of an injured person from the nacelle to the base of the tower (Ref. module 2: lesson 7)	9.1	Practical exercise evacuation inside and outside of tower	
			TOTAL	120 min.
10.	Rescue from enclosed space (Ref. module 2: lesson 8)	10.1	Rescue from enclosed space – exercises	
			TOTAL	110 min.
11.	Rescue from crawl space (Ref. module 2: lesson 9)	11.1	Rescue from crawl space – exercises	
			TOTAL	200 min.
12.	Rescue up (Ref. module 2: lesson 10)	12.1	Introduction	



	12.2	Rescue up, inside and outside of the tower – practical exercises	
		TOTAL	90 min.
13. Single rescuer (Ref. module 3 & 4: lesson 7)	13.1	Single rescuer – introduction	
	13.2	Single rescuer – practical exercises	
		<ul style="list-style-type: none"> • HSIBR Module hub rescue exercise 1 (from blade) • NTBR Module rescue from crawl space • NTBR Module evacuation of an injured person from the nacelle to the base inside of the tower • NTBR Module rescue up, inside and outside of the tower 	
		TOTAL	200 min
14. Evaluation	14.1	Reflection session	
	14.2	Formative evaluation	
		TOTAL	15 min.
		SUB TOTAL	1120 min.
		FLEXITIME	110 min.
		GRAND TOTAL	1230 min.

Table 12.4.1 – ART combined module timetable



Annexes



ANNEX 1 - EQUIPMENT LIST

The following pages contain the lists of equipment required for delivering each of the modules contained within this training standard. All equipment shall meet the criteria defined in the GWO Requirements for Training.

The following equipment is required during the entire duration of the modules in this advanced rescue training standard to meet the needs of the specific training module:

1. Rescue stretcher
 - a. at least two different products
 - b. transfer board
 - c. product is required to have an attachment point* rigged at the top and bottom

*This can be achieved by attaching / choking an anchor sling through the handles of the foot / top of the transfer board with a connector attached

Note *Transfer board is not to be used for immobilisation. Whenever it is possible, an injured person should be lowered in horizontal configuration*

- a. cervical collar for rescue purpose
- b. at least two different products:
 - b.i one rigid collar
 - b.ii one soft collar

Note *The use of a cervical collar during rescue operations in this standard is intended only as a means to support the head and as a result help in maintaining an open airway of an unconscious injured person during parts of rescue operations where this is not possible by other means. It is intended that the collar is removed as soon as it is possible to support the head and maintain the airway by other means. The use of collars in this instance is not considered as routine. For further information please refer to Annex 3.*

- a. manually operated lowering/raising rescue systems for limited distance rescue
- b. pulley system, with rope grab
- c. at least two different products
- d. rescue device
- e. at least two different products – must have differences in design, functionality, and operation
- f. must be compatible with a power driver for a rescue device



- g. power driver for a rescue device
- h. pulleys
- i. edge protector for rope
- j. tag line
- k. headlamp
- l. radios when applicable
- m. rescue dummy min. 50kg.

GWO BST/BSTR Working at Heights related equipment:

1. full body harness
 - a. at least two different products
 - b. work restraint lanyards
 - c. at least two different products
 - d. length falls arrest lanyards with an energy absorber
 - e. one flexible Y-type
 - f. one fixed adjustable Y- or I-type
 - g. recommended, but not required: one fixed or flexible V-type
 - h. helmets and safety glasses
 - i. vertical fall arrest system
 - j. self-retractable lifeline (SRL)
 - k. rescue slings

Note *The European standard for slings specifies safety requirements and test methods for slings used for mountaineering (slings are used as anchor points and since there are no industrial standard for slings, they must also comply with the requirements listed in table A1-1)*

- a. connector with mandatory automatic locking system
- b. anchor points (certified and structural)



Note *The height of the anchor point shall ensure that in the event of a fall there will be enough space below the anchor point to allow the shock absorber in a fall arrest lanyard to fully deploy whilst preventing the person who is falling from coming into contact with the ground or structure below the anchor point*

The GWO recommends an anchor point height of 6.75m for the rescue and evacuation exercises.

The recommended height is based upon the following formula,

$$RD = LL + DD + HH + C,$$

Where,

<i>RD</i>	=	Required fall distance clearance (minimum anchor point height)
<i>LL</i>	=	Length of lanyard
<i>DD</i>	=	Deceleration distance (fall distance)
<i>HH</i>	=	Height of suspended worker
<i>C</i>	=	Safety factor

The value for *HH* is the length of the suspended worker after a fall and includes factors like the height of the person and harness stretch, to account for these variables this is set to 2.00m.

Using the value for *HH* (2.00m), the maximum allowed values for *LL* (2.00m) & *DD* (1.75m), and the minimum allowed value for *C* (1.00m), we get,

$$RD = LL + DD + HH + C$$

and,

$$RD = 2.00 \text{ m} + 1.75 \text{ m} + 2.00 \text{ m} + 1.00 \text{ m},$$

therefore,

$$RD = 6.75 \text{ m}.$$

Therefore, GWO recommends that the anchor points used during the evacuation exercises are placed a minimum of 6.75m above the ground or any structure which a person may come into contact with, in the event of a fall.

Note *Any equipment used during this GWO training module shall meet or exceed the minimum requirements of the national standards listed in table A1-1*

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



Table A1-1 Country specific equipment standards

Equipment	Country Specific Equipment Standards			
	Europe	North America	China	United Kingdom
Full Body Harness	EN 361+358	ANSI/ASSP Z359.11	GB 6095 +GB 6095 W/GB 6095 Q	BS EN 361+358
Fall restraint lanyards	EN 358	ANSI/ASSP Z359.3	GB 24543 W/GB 24543 Q	BS EN 358
Fall arrest lanyard including energy absorber	EN 354 and/or EN 355	ANSI/ASSP Z359.13	GB 24543 Z+GB/T 24538	BS EN 354 and/or BS EN 355
Industrial safety helmet with a chinstrap that is released with a force of no less than 150 N and no more than 250 N	EN 397 +A1	ANSI Z89.1 Type I	GB 2811	BS EN 397 +A1
Vertical fall arrest system on a rigid anchor line	EN 353-1	ANSI/ASSP Z359.15	GB 24542/GB 24537/GB 24543 Z/GB 30862+GB/T 24538/GB 24544	BS EN 353-1
Self Retracting Lifelines (Retractable type fall arresters)	EN 360	ANSI/ASSP Z359.14	GB 24544	BS EN 360
Anchor Points	EN795	ANSI/ASSP Z359.18	GB 30862	BS EN795
Slings	EN 354 + 795	ANSI/ASSP Z359.12	GB 24543 Z+GB 30862	BS EN 354 + 795
Connectors (Carabiners)	EN 362	ANSI/ASSP Z359.12	GB/T 23469	BS EN 362
Static ropes	EN 1891	ANSI/ASSP Z459.1 NFPA 1983	GB/T 23268.2	BS EN 1891
Rescue devices with lifting capacity	EN 1496	ANSI/ASSP Z359.4	-	BS EN 1496
Devices for emergency decent	EN 341	ANSI/ASSP Z359.4	GB/T 38230 A or GB/T 38230 B or GB/T 38230 C	BS EN 341



ANNEX 2 - ART GUIDELINE: RECOMMENDATIONS FOR IMPLEMENTATION

1. Introduction

Wind turbines are increasingly placed in remote areas far away from established medical facilities both offshore and onshore. The time from placing the emergency/distress call until the professional emergency responders arrive at the location is also increasing. Working in remote areas requires the wind turbine personnel teams to have a high level of self-reliance in emergency situations especially when it can be questioned if professional help can be expected in the nacelle of modern wind turbines, due to increasing heights and their limited skills to climb the turbine and perform the rescue from the turbine.

2. Purpose

The GWO training provides the foundation for the development of the advanced rescue competencies. This document serves as a guideline for when GWO members should implement Advanced Rescue Training (ART) and special equipment for wind personnel working at sites. Whether advanced rescue is integrated into the emergency response plan of a company or site should be the result of a risk assessment.

By providing advanced rescue training, GWO is providing employers with an effective tool to control the risks associated with rescue operations, as well as ensuring a more efficient rescue operation from a wind turbine successfully. The course elevates the level of rescuer self-reliance and enables rescuer to successfully transport the colleague who cannot self-evacuate, to an assembly point until professional emergency responders arrive at the location.

GWO Advanced Rescue Training supports the employer by mitigating numerous common wind turbine emergency rescue related hazards including, but not limited to:

1. Injured person getting stuck due to structure interference
 - a. use of improper anchor point for injured person transportation
 - b. ropes, slings and similar breaking due to sharp edges
 - c. improper rescue method and technique
 - d. physical shock, mental stress, exhaustion, fatigue due to time-consuming rescue
 - e. challenging weather conditions for rescue wind speed, extreme temperatures and alike
 - f. due to limited space, difficulties in putting harness and other rescue equipment onto an injured person and prepare the injured person for safe transportation
 - g. collision of injured person and vessel when delivering the injured person down to the vessel, due to vessel moving up and down
 - h. burns from contact HV-cables or hyperthermia during rescue operation
 - i. improper PPE of rescuer and/or placing improper PPE onto injured person



- j. improper means of communication during rescue operation
- k. improper positioning of turbine parts
- l. movable parts of the wind turbine not locked properly.

To implement GWO ART, the employer will need to have the following:

1. an integrated emergency response plan including:
 - a. sufficiently trained personnel
 - b. dedicated advanced rescue equipment

3. Sufficiently Trained Personnel

GWO recommends that decisions concerning the ratio of advanced rescue (AR) trained personnel is based on the employer's risk assessment and work specific characteristics.

The basic elements to consider when determining the ratio of AR trained personnel are:

1. The activities being undertaken (risk & complexity) e.g. service or construction tasks or special projects
 - a. organisational limitations to ensure that the required AR trained personnel are available. Such as variations in the team's composition and size.
 - b. the reasonably expected support of professional emergency responders, including availability of personnel trained for heights and their reasonable expected response time.

The guiding principle when determining the required number of trained staff, is that the emergency response time of a trained emergency responder should be as small as is reasonable possible. In other words, if training additional employees in advanced rescue provides a significant reduction in response time, then GWO advice is to train those additional employees.

Personnel must meet the prerequisites of GWO Advanced Rescue Training as stated in GWO Advanced Rescue Training Standards.

4. Advanced Rescue Equipment

Suitable equipment for rescue purpose ensures successful rescue operations as much as personnel with the right competencies, thus in addition to equipment specified in GWO Basic Safety Training Standard, GWO recommends ensuring the availability of the below equipment for advanced rescuers executing advanced rescue operations:

1. Rescue stretcher and/or transfer board, suitable to manoeuvre within the turbine
 - a. cervical collar
 - b. manually operated lowering/raising rescue systems for limited distance rescue



- c. rescue device and/or pulley system with rope grab
- d. power driven lowering/raising rescue system, if rescue up is a potential scenario, e.g. evacuation to a hoisting platform, or rescue from a tower basement
- e. pulleys
- f. edge protector for rope
- g. tag line of sufficient length
- h. flashlight (helmet light)
- i. radios

A full list of the training equipment required for each module and the applicable standards that equipment must satisfy can be found in Annex 1.



ANNEX 3 - HEAD SUPPORT DURING RESCUE

1. Purpose

The purpose of this annex is to:

- a. explain the risks associated with using a rigid or, semi rigid, cervical collar.
- b. explain the mitigation steps to minimise the risks
- c. describe how the use of a cervical collar in a rescue setting is not considered routine and
- d. present some alternative methods to support the head and manage the airway of an unconscious injured person during extraction from an enclosed space.

The current ERC, AHA and ANZCOR first aid guidelines recommend against the routine application of a cervical collar by a first aider. The context for these recommendations is in the case of a suspected spinal injury where traditionally it has been normal practice to apply a cervical collar to immobilise the spine and prevent further injury.

2. Non-Routine use of a cervical collar during rescue

The context for the recommendations in the first aid guidelines is routine use for spinal immobilisation. The context for the use of a cervical collar during a rescue is to support the head and maintain the airway of an unconscious injured person.

Extraction of an unconscious injured person from an enclosed space or moving an unconscious injured person in a wind turbine creates the possibility of causing further injuries to the injured person. Additionally, the head and limbs of an injured person are free to move and can impede the extraction or movement of an injured person. While the limbs are relatively easy and risk free to control the head presents unique challenges.

Head injuries could result from unintended movement of the head striking an object and or the movement of the head could actively compress the airway, or the head could become an obstruction to the movement of an injured person through a restricted opening.

The risk of further injuries and the risk of airway obstruction during extraction and movement of an unconscious injured person are significant and therefore, controlling head movement and maintaining the airway of an unconscious injured during these activities is of the utmost importance.

Head support and airway maintenance can be achieved through manual in-line stabilisation (MILS) where a rescuer actively supports the head with their hands, or through the use of a transfer board with headblocks. The application of MILS protocols requires that that rescuer is only doing that and cannot perform other practical rescue operations and therefore requires more than one rescuer. With limited space the use of a transfer board with headblocks can be a hindrance or a complete obstruction to the extraction of an unconscious injured person from an enclosed space.

In many cases technicians work in turbines in teams of two and therefore the possibility exists that if one of them is injured and unconscious and there is a need to move them before help arrives that the other technician may need to perform a rescue operation by themselves as a single rescuer. Due to this possibility, it is very important that the rescuing technician is able to support the head of an unconscious injured person without the use of MILS or a transfer



board with head blocks. In this case the use of a cervical collar is an effective means of controlling head movement and maintaining the airway of an unconscious injured person. There are risks involved in the use of a cervical collar, and therefore they must be used sparingly, for the minimum duration necessary and only as a last resort where no other possibility for head support and or maintaining an airway exist. Technicians trained in advanced rescue techniques must be aware of the risks and be able to demonstrate risk mitigation techniques where an unconscious injured person is wearing a cervical collar. Furthermore, they must be able to accurately size and correctly fit a cervical collar to an unconscious injured person.

To summarise, the use of a cervical collar during rescue is intended only as a means to support the head and maintain the airway of an unconscious injured person during rescue activities where no other possibilities to do so exist. For these reasons the use in this context is not considered routine and the teaching of these is not considered to be contradictory to the first aid guidelines recommendations.

3. Risk of routine application of cervical collar

All of the first aid guidelines point to the risks, amongst others, of raising the intercranial pressure and complications with airway management of a person who is wearing a collar.

Intercranial pressure increase

By applying a cervical collar, or any other device, to a person's neck there is a risk that the jugular veins can be compressed thereby reducing the amount of blood flowing from the head. The restricted venous drainage from the head increases the blood pressure in and around the brain (the intercranial pressure (ICP)). The pressure and discomfort of wearing a collar could also lead to an increase of agitation and movement in a person thereby increasing the blood pressure and exacerbating the rise in ICP.

Airway management complications

Applying a cervical collar can also restrict the opening of a person's mouth. By restricting the mouth opening there is a risk that, in the event of vomiting, the oral cavity will not be able to be cleared sufficiently leading to a risk of the airway being obstructed. Additionally, a cervical collar could, through the compression of the airway, also restrict the airway.

In both cases the risks can be exacerbated by an incorrectly sized or incorrectly fitted cervical collar which can in some cases completely obstruct the airway.

4. Mitigation of the risks

When assessing methods to support the head during a rescue the principles of the hierarchy of control should be applied to the use of a cervical collar in that the use of a cervical collar must be avoided whenever possible.

Other considerations should include not moving the injured person as a single rescuer unless there is a pressing need to do so. For example, if the injured person is safe and stable it might be better to wait with extracting or moving them until help arrives.

Where the use of a cervical collar cannot be avoided during a rescue then the following principles should be followed to minimise the risks:

1. accurately size the cervical collar



2. correctly fit the cervical collar
3. continuously monitor the injured persons airway and breathing
4. continuously monitor the injured persons facial colour for indications of jugular vein compression, this could be indicated by a change in facial colour
5. remove the cervical collar as soon as it is possible to support the head and maintain the airway by other means.



ANNEX 4 - GUIDELINE FOR WARM-UP EXERCISES

Monday Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes. The exercises are put together to achieve full-body warm-up and stretching.



1. Chest and shoulder stretch

Fold your hands behind you, push your chest forward and pull your arms back until you feel a good stretch in your chest and shoulders. Hold for 30 seconds.

Duration: 30 sec, Sets: 2



2. Arm Scissors

Stand with your feet together. Raise your arms forwards and upwards to approximately chest height. Breathe out and lift one arm towards the ceiling while lowering the other arm towards the floor with both palms facing forward. Continue moving both arms backwards until you feel a stretch in your pectoral muscles. Avoid arching your back.

Duration: 30 sec, Sets: 2



3. Stretch the back of your thigh and calf

Stand with one knee slightly bent and the other leg straight. Support your hands on the knee and keep your back straight. Slowly lower your upper body forwards until you feel a stretch on the back of your leg. Hold for 30 seconds and switch legs.

Duration: 30 sec, Sets: 2



4. Swing leg back and forth

Find support against a wall or hold onto a partner and swing your leg forwards and backwards. Try to keep your upper body steady in a good posture. Continue for 30 seconds, then switch legs. You can also practise your balance by not holding onto anything.

Duration: 30 sec, Sets: 2

Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



Tuesday

Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes.
The exercises are put together to achieve full-body warm-up and stretching.



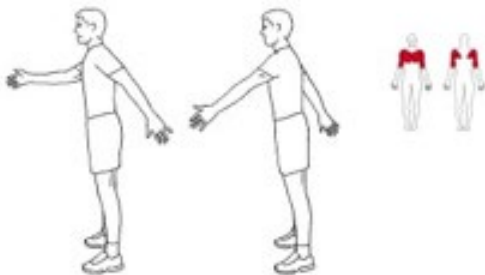
5. Sideward lunge

Stand with your legs together and your hands on your hips. Use your active leg to step to the side and place your weight on your active leg.

The movement stops when your foot hits the floor. In the end position, your active leg is bent and your supporting leg is almost straight. Press up and return to the starting position.

Repeat to the other side.

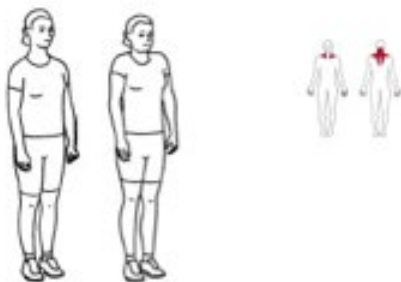
Sets: 2 , Reps: 10



6. Standing back and forth arm swing

Stand with the arms hanging straight down along your side. Relax the shoulders and swing the arms alternately back and forth.

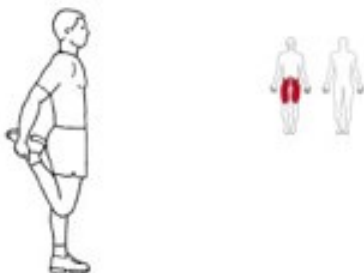
Sets: 2 , Duration: 30 sec



7. Shoulder Shrugs

Lift your shoulders as high as possible while you take a deep breath in, lower your shoulders while you exhale. Push your shoulders down as much as possible.

Sets: 2 , Duration: 30 sec



8. Stretch front side thigh and hip

Stand up straight. Grab one ankle and pull your heel towards your buttocks. Push your hips forwards until you feel the stretch on the front of your thigh. Keep your knees together. Hold for 30 seconds and switch legs.

Duration: 30 sec, Sets: 2

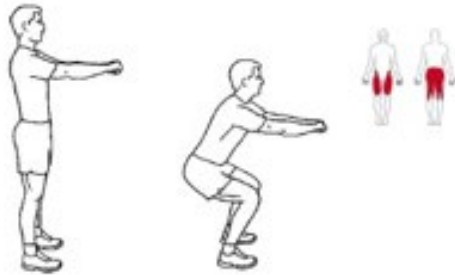
Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



Wednesday

Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes. The exercises are put together to achieve full-body warm-up and stretching.

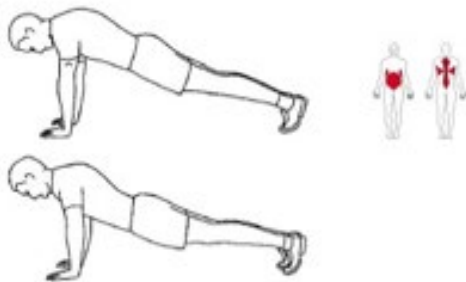


9. Static squat hold

Stand with your feet shoulder-width apart and your arms straight out in front of you. Move into a sitting position with your thighs approximately in a horizontal position and hold this position.

Hold the position until you feel a stinging/warm sensation in your thighs (minimum 30 seconds). Push yourself back up again.

Sets: 2 , Duration: 30 sec



10. Scapular Push-ups

Support yourself on your arms and toes. Keep your body straight throughout the exercise. Try separating your shoulder blades by extending your upper back towards the ceiling.

Slowly lower your upper back, pulling your shoulder blades together.

Sets: 2 , Duration: 30 sec

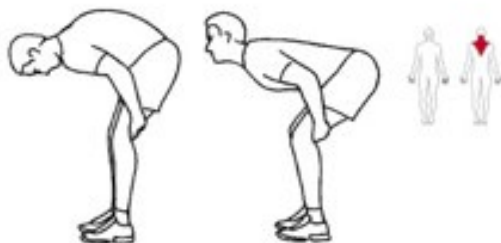


11. Shoulder rotation w/ 90 degree abduction

Lift your arms with your elbows pointing to the sides. Bend your elbows to an approximately 90-degree angle. Move your arms so that they point upwards and downwards in an alternating motion.

The movement should take place in the shoulder joints.

Sets: 2 , Duration: 30 sec



12. Stretch and bend your back

Stand on a mat with feet hip-width apart. Bend the knees and hips, and clasp your hands behind your knees. Breathe in and round your back, exhale while arching your back.

Sets: 2 , Duration: 30 sec

Warm-up program and illustrations developed and provided by
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Thursday

Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes.
The exercises are put together to achieve full-body warm-up and stretching.



13. Push-ups

Rest on your hands and feet with your body straight and tense.

Your hands must be placed at a distance that is slightly wider than shoulder-width apart. Lower your upper body towards the floor and push up again without flexing your hips. If you cannot do 10 repetitions, perform the exercise on your knees.

Sets: 2 , Reps: 10



14. Squat

Stand with your feet shoulder-width apart and your arms straight out in front of you. Bend your knees to 90 degrees then press up again. Keep your back straight and your eyes looking straight ahead throughout the motion. Alternatively, hold the deep position for a few seconds before pressing back up.

Sets: 2 , Reps: 10



15. Neck stretch

Hold your hand over your collar bone. Bend your neck towards the opposite side of where your hand is and rotate your head to the same side as you bend your neck. Look down. Feel the stretch on the front of your neck. Hold for about 30 seconds.

Duration: 30 sec, Sets: 2



16. Standing side stretch

Lift one arm above your head and slowly bend your upper body to the opposite side. Feel the stretch on the side of your body. Hold the position for 30 seconds.

Change sides and repeat the exercise.

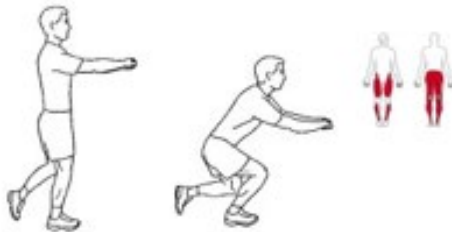
Duration: 30 sec, Sets: 2

Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



Friday Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes. The exercises are put together to achieve full-body warm-up and stretching.



17. Single leg squat

Stand on one leg with your arms straight, in front of you. Your passive leg may be put behind your active leg for support only. Bend your knee 90 degrees and push back up. Keep your back straight and look ahead throughout the movement. Repeat with opposite leg.

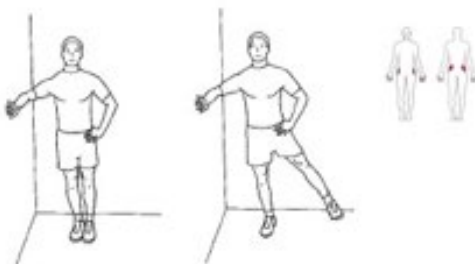
Sets: 2 , Reps: 10



18. Neck stretch

Place one hand on your head and gently pull your head down towards your shoulder. Relax the opposite shoulder. When you feel the stretch on the side of your neck, hold for 30 seconds. Switch sides and repeat the exercise.

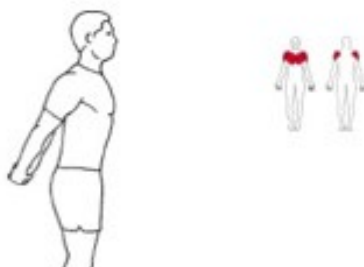
Sets: 2 , Duration: 30 sec



19. Standing outward leg lift

Stand next to a wall, using one hand for support. Extend your leg to the side and slowly return to the starting position. Keep your pelvis stable. You may also do the exercise without the wall or with the support of a partner.

Gentagelser: 10 , Sets: 2



20. Stretch your chest and shoulders

Fold your hands behind your back, open your chest and push your arms backwards until you feel a stretch in your chest and shoulders. Hold for 30 seconds.

Sets: 2 , Duration: 30 sec

Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



Saturday Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes. The exercises are put together to achieve full-body warm-up and stretching.



21. Backwards leglift

Start in the push-up position with your hands placed under your shoulders. Pull your belly button towards your spine and tighten your leg and upper body muscles. Breathe in, lifting one straight leg towards the ceiling, then lower it again.

Switch legs until you have done a total of 10 repetitions.

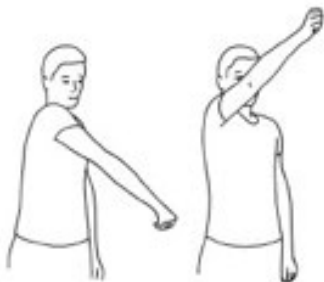
Sets: 2 , Reps: 10



22. Hand on the back

Place your hand on your back and try to reach the opposite shoulder blade. Hold the position for 30 seconds. Switch arms.

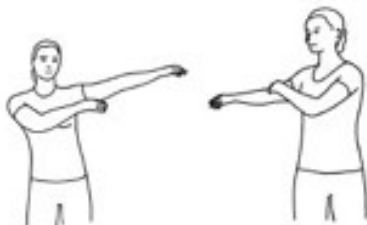
Duration: 30 sec, Sets: 2



23. Write the number eight

Stand with one arm straight at shoulder height. Write the number eight with this arm, switch arms and repeat. Perform the exercise for approximately 30 seconds with each arm.

Sets: 2 , Duration: 30 sec



24. Arm Swing w/torso rotation

Swing your arms freely from side to side. Let your upper body, hips and pelvis follow the motion. Stand balanced and steady on your feet. Keep the shoulders relaxed during the motion. Breathe naturally.

Sets: 2 , Duration: 30 sec

Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



Sunday Warm-up routine for wind technicians

Seven programmes, each with four exercises to be repeated twice; total duration approx. 10 minutes. The exercises are put together to achieve full-body warm-up and stretching.



25. Reverse lunge

Stand with your feet together and your hands on your hips. Lift one leg and take a large step backwards shifting your weight backwards. When your leg touches the floor, slowly descend until your knee almost touches the floor and briefly hold the position. Press up and return to the starting position.

Sets: 2 , Reps: 10



26. Stretch of back and shoulders

Stand with your hands folded behind your head. Move your elbows slowly forwards and backwards. For each repetition, push a little bit further, increasing the range. But remember that it must not be painful.

Duration: 30 sec, Sets: 2



27. Stretch of neck and shoulder

Keep your hands behind your back, lower both shoulders and lean your head down toward one shoulder. Hold for 30 seconds and repeat for opposite side.

Duration: 30 sec, Sets: 2



28. Stretch of shoulders and upper back

Reach one arm up and behind your neck with fingers pointing towards the opposite shoulder blade. Reach the other arm behind your lower back with fingers pointing towards the opposite shoulder blade. Move your hands towards each other and if possible make your finger tips touch and grab hold. Hold the position for 30 seconds if you can. Do the same to the opposite side.

Duration: 30 sec, Sets: 2

Warm-up program and illustrations developed and provided by
ExorLive.com [www.exorlive.com]



ANNEX 5 - MANUAL HANDLING RISK ASSESSMENT

This is an instructor guidance elaborating the concept of aggravating factors related to manual handling risk assessment.

The baseline of assessing manual lifts is the load weight and the distance from the spine in the lower back (the reaching distance), respectively.

While assessing manual handling, number of additional risk factors to the lift must be considered, which, individually and especially combined, will enhance the strain on the musculoskeletal system. These factors are the so-called aggravating factors.

Prior to delivering manual handling training, instructors should review local instructors and risks assessments for the tasks planned, including assessment of whether a given task should be solved by the participants by using a handling aid.

1. Load weight and reaching distance

The following guidance introduces some simple tools to help identify 'low-risk' manual handling tasks and introduces a hierarchy of control that can be used to help identify simple solutions to reduce risk from manual handling further. Tasks outside of these guidelines should be assessed by an appropriately qualified professional using more detailed assessment tools or a full manual handling risk assessment for the task.

Lifting and lowering filters

Use the guideline filters for lifting and lowering in Figure Annex 5.1 to help you identify low-risk tasks. The guideline filters do not set specific weight limits, so the guidelines are not 'safe limits' for lifting and carrying. They use broad assumptions or generalisations where, if met, the risk of injury is considered to be low.

Working outside the limits is likely to increase the risk of injury, which can lead to ill health. The guidelines are derived from lifting capacity data which show differences between men and women in the population (rather than individuals). Where the handling task falls within the filter guidelines, you do not normally need to do any other form of risk assessment unless you have individual workers who may be at significant risk. If you are unsure, complete a more detailed assessment.



Figure Annex 5.1 - Lifting and lowering filters

Note *Figure Annex 5.1 assumes that the load is easily grasped with both hands and is handled in reasonable working conditions, with the worker in a stable body position*

Risk assessment, lifting and lowering

1. Each box in Figure Annex 5.1 contains a filter value for lifting and lowering in that zone. The filter values in the boxes are reduced if handling is done with arms extended, or at high or low levels, as that is where injuries are most likely to happen and will most likely be harmful to health. Such lifts must be evaluated separately.
2. Observe the work activity you are assessing and compare it to Figure Annex 5.1. First, decide which zone or zones the worker's hands pass through when moving the load. Then assess the maximum weight being handled. If it is less than the value given in the matching box, it is within the guidelines.
3. If the worker's hands enter more than one zone during the operation, use the smallest weight. Use an in-between weight if the hands are close to a boundary between zones.
4. Lifting and lowering: Do I need to make a more detailed assessment? You will need to make a more detailed assessment using an appropriate tool, e.g. full risk assessment checklists (or equivalent) if:
 - a. the handling operation must take place with the hands outside the zones in Figure Annex 5.1



- b. the weight exceeds those in Figure Annex 5.1
- c. the handling involves torso twisting
- d. the handling is more frequent than one lifts every two minutes
- e. the handling is done by a team
- f. the handling operations are complex, for example, the weights vary significantly or there are several start and finish locations
- g. the lift does not meet the conditions given for using the guidelines, for example, if the load is difficult to grasp or handle
- h. the person lifting may be at significant risk, for example, new or expectant mothers, young workers, those new to the job, or those with a disability, significant health problem or recent injury

Carrying risk assessment

You can apply the filter weights for lifting and lowering in Figure Annex 5.1 to carrying operations where the load:

- a. is held against the body
- b. is carried no further than about 10m without resting
- c. does not prevent the person from walking normally
- d. does not obstruct the view of the person carrying it
- e. does not require the hands to be held below knuckle height or much above elbow height
- f. Where you can carry the load securely on the shoulder without lifting it first (for example, by sliding it onto your shoulder), you can apply the filter values up to 20m

Pushing and pulling risk assessment

In pushing and pulling operations, the load might be slid, rolled, or moved on wheels. Observe the worker's general posture during the



operation. Figure 2 shows some acceptable push/pull postures. The task is likely to be low risk if:

- a. the force is applied with the hands
- b. the torso is largely upright and not twisted
- c. the hands are between hip and shoulder height
- d. the distance moved without a pause or break is no more than about 20m



When do I need to make a more detailed assessment?

If the load can be moved and controlled very easily, for example with one hand, you do not need to do a more detailed assessment. You should make a more detailed assessment using, for example, the RAPP tool or full risk assessment checklists (or equivalent) if:

- a. the posture shows that the task requires significant forces, for example, leaning
- b. here are extra risk factors like slopes, uneven floors, constricted spaces or trapping hazards

Figure Annex5.2- Acceptable push/pull postures¹

2. Aggravating factors

The aggravating factors of the lifting operation must be considered which, individually and especially in combination, will enhance the strain on the musculoskeletal system posing a risk of injury and manual handling harmful to health.

Examples of aggravating factors - categorised related to the four elements of the TILE principle:

¹ UK Government Copyright (by permission)



Basic dynamic risk assessment – TILE principle

All manual handling tasks should be preceded by a basic dynamic risk assessment carried out by the persons planning to carry out the task before commencing the activity. This can be conducted using the simple and well known 'TILE' approach.

T – Task	I – Individual(s)	L – Load	E - Environment
----------	-------------------	----------	-----------------

For Task considerations should include:

- a. no suitable handling aid available
- b. holding loads away from torso
- c. lifting below knee height or above shoulder height
- d. carrying, pushing, pulling or precise positioning of the load reaching upwards
- e. twisting or stooping
- f. large vertical movement
- g. long carrying distances
- h. strenuous pushing or pulling
- i. unpredictable movement of loads
- j. frequent or prolonged physical effort
- k. lifting for a longer period of time
- l. insufficient rest or recovery
- m. team effort
- n. a work rate imposed by a process

For Individual(s) capability considerations should include:

- a. pose a risk to those with a health problem or a physical or learning difficulty
- b. no warm-up
- c. require unusual capability previous and pre-existing injuries
- d. pose a risk to those who are pregnant
- e. pose a risk to new workers/young people



- f. require special information/training
- g. unusual strength or height required for the activity
- h. specialist knowledge or training required

For the Load considerations should include:

- a. heavy
- b. bulky or unwieldy
- c. difficult to grasp
- d. difficult to grip
- e. unstable or unpredictable
- f. contents likely to move or shift
- g. intrinsically harmful (e.g. sharp/hot)
- h. sharp edges

For the (work) Environment considerations should include:

- a. constraints on posture, e.g. working on knees, laying on back
- b. restricted spaces
- c. poor floors, e.g. greasy, wet, uneven
- d. variations in levels, e.g. stairs, thresholds
- e. hot/cold/humid conditions
- f. strong air movements, e.g. outside of tower, nacelle, etc.
- g. poor lighting conditions
- h. weather conditions; rain, gust, wind, temperature

Additionally, it is recommended to consider additional factors including whether the activity is hindered or enhanced by wearing particular protective clothing or PPE and work/organisation (psychosocial) factors such as training, sudden changes in workload, communication, consultation, etc.

3. Good handling technique

A good handling technique is no substitute for other risk-reduction steps, such as providing lifting aids, or improvements to the task, load or working environment. Moving the load by rocking, pivoting, rolling or sliding is



preferable to lifting it in situations where there is limited scope for risk reduction. However, good handling technique forms a very valuable addition to other risk-control measures. To be successful, good handling technique needs both training and practice. The training should be carried out in conditions that are as realistic as possible, emphasising its relevance to everyday handling operations in the workplace.

There is no single correct way to lift and there are many different approaches, each with merits and advantages in particular situations or individual circumstances. The content of training in good handling technique should be tailored to the particular handling operations likely to be carried out, beginning with relatively simple examples and progressing to more specialised handling operations as appropriate. For example:

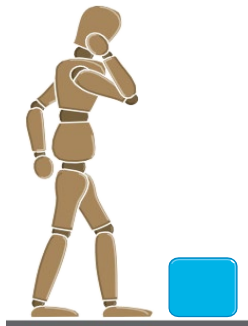
- a. employees should be able to identify loads that may cause injury when handled. Increases in size often indicate an increase in weight and difficulty of handling
- b. where the size of the item is less important than how full it is, e.g. in the case of a dustbin containing refuse, they should assess the load by looking inside it or use techniques such as rocking the load from side to side before attempting to lift it
- c. they should also treat unfamiliar loads with caution. Drums which appear to be empty or other closed containers should be tested, e.g. by trying to raise one end
- d. they should apply force gradually when testing loads. If employees feel too much strain, they should be encouraged to look for another way of handling the load safely

The following list illustrates some important points which are relevant to a basic two-handed symmetrical lift a lift using both hands that takes place in front of and close to the body, without any twisting.

Basic lifting operations



Rocking a load to assess its ease of handling.



Think before handling/lifting. Plan the lift/ handling activity. Where is the load going to be placed? Use appropriate handling aids where possible. Will help be needed with the load? Remove obstructions, such as discarded wrapping materials. For long lifts, such as from floor to shoulder height, consider resting the load mid-way on a table or bench to change grip.



Keep the load close to the waist. Keep the load close to the waist for as long as possible while lifting. The distance of the load from the spine at waist height is an important factor in the overall load on the spine and back muscles. Keep the heaviest side of the load next to the body. If a close approach to the load is not possible, try to slide it towards the body before attempting to lift it.



Adopt a stable position. The feet should be apart with one leg in front of the other (alongside the load if it is on the ground) to increase the stability of the worker's posture. The worker should be prepared to move their feet during the lift to maintain a stable posture. Wearing over-tight clothing or unsuitable footwear may make this difficult.

Figure Annex 5.3 – Basic lifting operations²

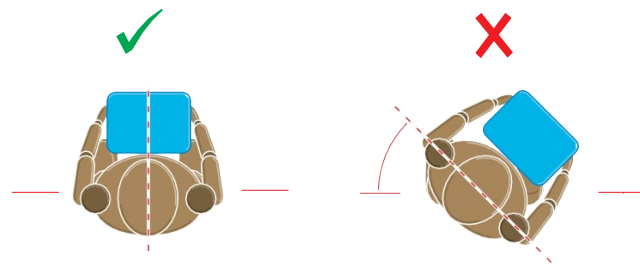
² UK Government Copyright (by permission)



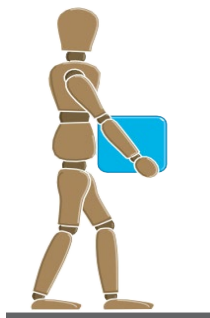
Ensure a good hold on the load. Where possible, hug the load as close as possible to the body. This may be better than gripping it tightly only with the hands.

Moderate flexion (slight bending) of the back, hips and knees at the start of the lift is preferable to either fully flexing the back (stooping) or fully flexing the hips and knees (full/ deep squatting)

Don't flex the back any further while lifting. This can happen if the legs begin to straighten before starting to raise the load. The worker should start the movement with the strong leg muscles while keeping the back posture constant.



Avoid twisting the back or leaning sideways especially while the back is bent. Keep shoulders level and facing in the same direction as the hips. Turning by moving the feet is better than twisting and lifting at the same time.



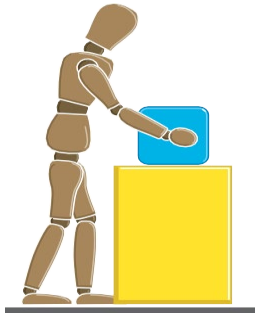
Keep the head up when handling. Look ahead not down at the load once it has been held securely.

Move smoothly. Do not jerk or snatch the load as this can make it harder to keep control and can increase the risk of injury.

Don't lift or handle more than can be easily managed. There is a difference between what people can lift and what they can safely lift. If in doubt, seek advice or get help.

Figure Annex 5.4 – Basic lifting operations³

³ UK Government Copyright (by permission)



Put down, then adjust. If precise positioning of the load is necessary, put it down first, then slide it into the desired position.

Figure Annex 5.5 – Basic lifting operations⁴

Sources of reference

This Annex is based upon:

- a. legal requirements and guidelines of the Danish and UK EHS authorities and legislation on manual handling
- b. G+ Manual Handling Case Studies doc.
- c. <https://www.hse.gov.uk/pubns/books/l23.htm>
- d. Equinor Ergonomics and Manual Handling Study 2018
- e. contains public sector information published by the UK Health and Safety Executive and licensed under the Open Government Licence'

Note *Local legal requirements must always be adhered to when performing manual handling*

⁴ UK Government Copyright (by permission)



ANNEX 6 - VERSION HISTORY

Amendment date	Version	Approved by & date	Description of changes
5 th Dec 2022	3.1	GWO	<p>In Annex 1 Equipment (Table A1-1 Country specific equipment standards) PP 144/145.</p> <p>Full Body Harness reference for Europe and UK. The following erroneous reference removed "...or EN 813" (Europe). In UK, "...or BS EN 813".</p>

Amendment date	Version	Approved by & date	Description of changes
1 st April 2022	02	GWO TC April 2022	<p>Taxonomy alignment throughout</p> <p>The section Understanding GWO learning objectives has been updated to reflect the reviewed GWO Taxonomy Framework.</p> <p>All learning objectives have been updated with action verbs that reflect the taxonomic levels (basic, intermediate, and advanced level) and the domain (knowledge, skills, and ability) without changing the content of the element.</p> <p>Action verb 'demonstrate' in learning objectives is changed to relevant action verb level/domain.</p> <p>Learning activity "demonstrate" was changed to 'practise' because during training activities, the participants are in a learning process and abilities should be trained, not evaluated.</p> <p>Learning activities have been aligned to match the updated learning objectives with a focus on participant engagement.</p> <p>Delegates have been changed to Participants, as participant is the proper designation for a person participating in an activity.</p> <p>Training staff has been changed to Instructors.</p> <p>The instructor's perspective has been changed to a generic perspective accommodating different types of training.</p> <p>All instructor guidelines have been compiled in one section under the individual elements.</p> <p>More guidelines on the use of feedback have been added to emphasise its importance and ensure its effective use by involving the participants.</p> <p>All learning objectives have been numbered throughout the standard.</p>



New learning objectives have been created for all lessons that describe the overall ability the participants should acquire during the specific lesson. This focuses the attention on how knowledge and skills support the responsible performance of the employee in the context of the job and the deeper involvement enables participants to learn and remember more deeply.

Learning objectives previously positioned at the beginning of a training lesson have been moved to the relevant lesson elements and updated with new taxonomic levels (basic, intermediate, and advanced) and action verbs that reflect these levels. This makes more evident the connection between the learning objectives, the instructor actions, and the participants actions.

The Introduction lesson for all standards has been updated to ensure alignment between all GWO training standards for generic lessons.

The Training Review lesson for all standards has been updated to ensure alignment between all GWO training standards for generic lessons.

For all modules, the title of lesson Learning outcomes of the XXX Module changed to Detailed description of the XXX Module.

There are no changes to the technical content and the time duration of the standard.

Amendment date	Version	Approved by & date	Description of changes
Oct. 2018	1	GWO TC OCT 2018	
First edition			
