GLOBAL WIND ORGANISATION

TRAINING STANDARD

Advanced Rescue Training (ART)

(Onshore/Offshore)

Version 2

April 2020

1 LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
AS/NZS	Australia and New Zealand Standard
ART	Advanced Rescue Training
BST	Basic Safety Training
CSA	Canadian Standards Association
EMT	Emergency Medical Treatment
GWO	Global Wind Organisation
HSIBR	Hub, Spinner and Inside Blade Rescue
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
IP	Injured person / Ill Person

2 TERMS AND DEFINITIONS

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
Must	For clarity where the word must is used in this standard it shall have the same meaning as shall
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
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 prevention	Preventing the user of a personal fall protection system from going into a free fall
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
Restraint system	Personal fall protection system which prevents the user from reaching zones where the risk of a fall from height exists
Work 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
Fall arrest system	Personal fall protection system which limits the impact force on the body of the user during fall arrest
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
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.
Clear / precise communication	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.
Flexitime	The time that must be utilized in the course, either theory or practical elements, where training provider sees the most valuable for the Course Participants.
Injured Person	The affected person requiring first aid treatment and rescue/evacuation
PPE	Includes Personal Fall Protection Equipment

Passive Setup (rescue device in stationary mode setup)	Rescue device in standard mode setup, i.e. the rescue device rigged in the WTG
Active Setup (rescue device in mobile mode setup)	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 WTG)
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.
Zip line	In this standard a zip line has the same definition as a tensioned line.
Generic principle	As oppose 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. The generic approach is achieved by teaching a variety of rescue equipment products within each rescue equipment category (e.g. rescue stretchers), enabling the delegate 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. Consequently, a potential task is placed upon the delegate on course completion, requiring him to familiarize himself with other rescue equipment products in his own organization e.g. prior to site or work, based on the manufacturer's manual.
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)
Power driver for rescue device	Detachable power driven unit for operating the ascending function of the rescue device

3 CHANGE LOG

Amendment Date		Approved by & date	
Version		Description of changes	

Amendment Date	**1st April 2020**	Approved by & date	**GWO TC April 2020**
Version	**02**	Description of changes	

First Review of ART standard

- Comprehensive review of the ART modules.

Document changes

- Formatting of document changed and aligned throughout, this includes numbering all sections, lessons, elements, sub-sections and tables for ease of reference and reading.
- The term 'delegate' changed to 'course participant' or 'participant'.
- Equipment lists for all modules have been moved to Annex 3.

Anchor point height review

- The requirement for and anchor point height has been changed to a recommendation, with additional control measures if using a lower height.

Cervical collar review

- The applicable lessons have been updated with risk reduction measures.
- New Annex 6 inserted.

Manual handling review

- The applicable lessons have been updated with manual handling elements to focus the instructor and participants mindset to reduce manual handling injuries.

Overall changes

- Version changed from 01 to 02.
- Added taxonomy domain and level to all learning objectives (e.g. L2- knowledge), additionally taxonomy action verbs have been highlighted in bold text.
- Taxonomy action verbs have been moved to each lesson element.
- Spelling and grammar corrections throughout

Section specific changes

1. **Table of contents**
   - Updated to reflect changes to the standard.
2. **Terms and definitions**
   - Updated with additional items.

3. Change log

- Format and layout changed for ease of reading.

5.6 Duration of ART Modules

- Section reworked to give clarity to contact time and total training day.
- Duration given as total contact time.
- Inserted table 5-7 to clarify maximum durations per day.

6.1 Training staff

- Inserted requirement 3 for a manual handling instructor.

6.4 Practical training facilities

- Section reworked for ease of reading.

6.6 Training equipment

- Added generic approach explanation.
- Inserted description of fall factor.
- Inserted additional requirements if anchor point height is not achieved.
- Inserted references to Annex 3.

Section 9 Hub Rescue module

9.2 Competencies of the hub rescue module

- Inserted section, original list content the same.

9.3 Course participants prerequisites

- Inserted section.

9.4 Duration of the hub rescue module

- Section reworked to give clarity to contact time and total training day.
- Duration given as total contact time.
- Inserted table 9-3 to clarify maximum durations per day.

9.6 Equipment for hub rescue module

- Added generic approach explanation.
- Equipment list moved to annex 3.

9.7 Hub rescue module timetable

- Removed flexitime wording from section as this does not appear in table 9-6.
- Times adjusted in line with module changes.

9.8 Detailed description of the Hub rescue module

Lesson 1 – introduction

- Time reduce to 15 minutes.

Lesson 2 – Emergency response plan in your own organisation

- 2.2.1, 2.2.2 & 2.2.3 layout changed for ease of reading.
- 2.2.3.d Inserted.
- 2.2.8, 2.2.13 & 2.2.14 Inserted.

Lesson 3 – Measures to prevent injury during training

- Name changed.

- Content and duration aligned with BST W@H.
- Note added to assess manual handling aspects.

Lesson 4 – Head support during rescue

- Name changed to reflect the aim of the lesson.
- Warning about cervical collars inserted.
- Aim updated to reflect the aim of head support as opposed to cervical collar.
- Instructor notes moved to after learning objectives.
- Learning objective 1 inserted.
- Learning objective 2 inserted.
- Other learning objectives reworded.
- Element 4.1 inserted.

Lesson 5 – Packaging the injured person

- Learning objective 1 inserted.
- Learning objective 5 inserted.
- 5.1.1, 5.1.2, 5.1.4, 5.1.5, 5.1.11 & 5.1.6 inserted.
- 5.1.10 updated and note inserted.

Lesson 6 – Lowering / raising rescue system

- Learning objective 1 inserted.
- 6.1.1, 6.1.2, 6.1.10 & 6.1.11 inserted.
- 6.1.8 zip line terminology changed to tensioned line.

Lesson 7 – Hub rescue exercise 1 & 2 (from blade)

- Instructor notes moved to after learning objectives.
- Note added after learning objective 5.
- Learning objective 9 *cervical collar* changed to *rescue head support*.
- 7.1.3.e inserted.
- 7.1.6 layout changed for ease of reading.
- 7.1.14 inserted.

Lesson 8 – Hub rescue exercise 3 & 4 (from spinner)

- Instructor notes moved to after learning objectives.
- 8.1.2 & 8.2.1 zip line terminology changed to tensioned line.
- 8.2.2 flashlight changed to headlamp

Lesson 9 – Outside evacuation of injured person

- Instructor notes moved to after learning objectives.
- Learning objective 11 updated with first aid primary survey wording.
- Learning objective 16 amended to passive only rescue.
- 9.1.3.c & 9.1.3.e inserted.
- 9.1.4 & 9.1.5 inserted.
- 9.1.6 & 9.1.7 layout changed for ease of reading.
- 9.1.20 inserted.

Section 10 NTB Rescue module

10.2 Competencies of the NTB rescue module

- Inserted section, original list content the same.

10.3 Course participants prerequisites

- Inserted section

10.4 Duration of the NTB rescue module

- Section reworked to give clarity to contact time and total training day.
- Duration given as total contact time.
- Inserted table 9-3 to clarify maximum durations per day.

10.6 Equipment for NTB rescue module

- Added generic approach explanation.
- Equipment list moved to annex 3.

10.7 NTB rescue module timetable

- Times adjusted in line with module changes.

10.8 Detailed description of the NTB rescue module

Lesson 1 – introduction

- Time reduce to 15 minutes.

Lesson 2 – Emergency response plan…

- 2.1.4, 2.2.1 & 2.2.3 layout changed for ease of reading.
- 2.2.3.d Inserted.
- 2.2.8, 2.2.13 & 2.2.14 Inserted.

Lesson 3 – Measures to prevent injury during training

- Name changed.
- Content and duration aligned with BST W@H.
- Note added to assess manual handling aspects.

Lesson 4 – Head support during rescue

- Name changed to reflect the aim of the lesson.
- Warning about cervical collars inserted.
- Aim updated to reflect the aim of head support as opposed to cervical collar.
- Instructor notes moved to after learning objectives.
- Learning objective 1 inserted.
- Learning objective 2 inserted.
- Other learning objectives reworded.
- Element 4.1 inserted.

Lesson 5 – Packaging the injured person

- Learning objective 1 inserted.
- Learning objective 5 inserted.
- 5.1.1, 5.1.2, 5.1.4, 5.1.5, 5.1.11 & 5.1.6 inserted.
- 5.1.10 updated and note inserted.

Lesson 6 – Lowering / raising rescue system

- Learning objective 1 inserted.
- 6.1.1, 6.1.2, 6.1.10 & 6.1.11 inserted.
- 6.1.8 zip line terminology changed to tensioned line.

Lesson 7 – Evacuation of an injured person …

- Instructor notes moved to after learning objectives.
- Learning objective 6 inserted.

- Note inserted after learning objective 7.
- 7.1.2.b updated.
- 7.1.3.c & 7.1.3.f inserted.
- 7.1.5 & 7.1.6 inserted
- 7.1.7 layout changed for ease of reading.
- 7.1.19 updated.
- 7.1.21 inserted.

Lesson 8 – Rescue from enclosed space …

- Instructor notes moved to after learning objectives.
- Note inserted after learning objective 7.
- 8.1.3.e inserted.
- 8.1.5 & 8.1.6 inserted
- 8.1.7 layout changed for ease of reading.
- 8.1.21 inserted.

Lesson 9 – measures to prevent injury during training

- New lesson reflecting two-day training course. (copied from lesson 3).

Lesson 10 – Rescue from crawl space

- Renumbered from lesson 9.
- Instructor notes moved to after learning objectives.
- Note inserted after learning objective 7.
- 10.1.3.e inserted.
- 10.1.5 & 10.1.6 inserted.
- 10.1.7 layout changed for ease of reading.
- 10.1.18 inserted.

3.1 Lesson 11 – Rescue up

- Renumbered from lesson 10.
- Instructor notes moved to after learning objectives.
- Learning objective 2 inserted.
- 11.1.2, 11.1.3, 11.1.8 & 11.1.9 inserted.
- 11.1.4.g inserted.
- 11.2.3.e inserted.
- 11.2.5, 11.2.6, 11.2.7, 11.2.8 & 11.2.9 inserted.
- 11.2.10 layout changed for ease of reading.
- 11.2.21 updated.
- 11.2.23 inserted.

Lesson 12 – Evaluation

- Renumbered from lesson 11.
- Time reduced to 15 minutes.

a. Section 11 SR:HSIB Rescue module

11.2 Competencies of the SR:HSIB rescue module

- Inserted section, original list content the same.

11.4 Duration of the SR:HSIB rescue module

- Section reworked to give clarity to contact time and total training day.

- Duration given as total contact time.
- Inserted table 11-4 to clarify maximum durations per day.

11.6 Equipment for SR:HSIB rescue module

- Added generic approach explanation.
- Equipment list moved to annex 3.

11.7 SR:HSIB rescue module timetable

- Times adjusted in line with module changes.

11.8 Detailed description of the SR:HSIB rescue module

Lesson 1 – introduction

- Time reduce to 15 minutes.

Lesson 2 – Organisational strategy …

- 2.1.1 layout changed for ease of reading.

Lesson 3 – Measures to prevent injury during training

- Name changed.
- Content and duration aligned with BST W@H.
- Note added to assess manual handling aspects.

Lesson 4 – Hub rescue exercise 1 & 2 (from blade)

- Instructor notes moved to after learning objectives.
- 4.1.9.f inserted.
- 4.1.10 layout changed for ease of reading.
- 4.1.18 inserted.

Lesson 5 – Hub rescue exercise 3 & 4 (from spinner)

- Instructor notes moved to after learning objectives.

Section 12 SR:NTB Rescue module

12.2 Competencies of the SR:NTB rescue module

- Inserted section, original list content the same.

12.4 Duration of the SR:NTB rescue module

- Section reworked to give clarity to contact time and total training day.
- Duration given as total contact time.
- Inserted table 12-4 to clarify maximum durations per day.

12.6 Equipment for SR:NTB rescue module

- Added generic approach explanation.
- Equipment list moved to annex 3.

12.7 SR:NTB rescue module timetable

- Times adjusted in line with module changes.

12.8 Detailed description of the SR:NTB rescue module

Lesson 1 – introduction

- Time reduce to 15 minutes.

Lesson 3 – Measures to prevent injury during training

- Name changed.
- Content and duration aligned with BST W@H.
- Note added to assess manual handling aspects.

Lesson 4 – Evacuation of an injured person …

- Instructor notes moved to after learning objectives.
- 4.1.2, 4.1.3 & 4.1.4 layout changed for ease of reading.
- 4.1.3.e inserted.
- 4.1.17 inserted.

Lesson 5 – Rescue from an enclosed space

- Instructor notes moved to after learning objectives.
- Note added to learning objective 4.
- 5.1.8.e inserted.
- 5.1.9 layout changed for ease of reading.
- 5.1.22 inserted.

Lesson 6 – Rescue from crawl space

- Instructor notes moved to after learning objectives.
- Note added to learning objective 4.
- 6.1.7.e inserted.
- 6.1.8 layout changed for ease of reading.
- 6.1.18 inserted.

Lesson 7 – Rescue up

- Instructor notes moved to after learning objectives.
- Learning objective 3 layout changed for ease of reading.
- 7.1.2, 7.1.3, 7.1.8 & 7.1.9 inserted.
- 7.2.7.e inserted.
- 7.2.9 layout changed for ease of reading.
- 7.2.19 inserted.

Section 13 Combined GWO ART

13.1 Duration of the combined GWO ART module

- Section reworked to give clarity to contact time and total training day.
- Duration given as total contact time.
- Inserted table 13-1 to clarify maximum durations per day.

13.4 Timetable of the GWO combined ART module

- Times adjusted in line with module changes.

Annex 3 – Equipment lists

- Updated and aligned with BST W@H and generic approach.
- Condensed into one equipment list covering all four modules.

Annex 6 – Head support during rescue

- Inserted to explain / justify the teaching of cervical collars in light of ILCOR members recommendations against their routine use.

Amendment Date	**Oct. 2018**	Approved by & date	
Version	**1**	Description of changes	
- First edition			

4 SCOPE

The Global Wind Organisation (GWO) is an association of wind turbine owners and manufacturers with the aim of supporting an injury-free work environment in the wind industry. An objective of GWO is to develop common industry training and best practice standards for health and safety as a vital and necessary way forward to reduce risks for personnel in the wind industry working on site and to reducing environmental risks across Europe and the globe.

This standard has been developed in response to the demand for recognizable 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 pertaining to the installation, service and maintenance of wind turbine generators and wind power plants.

This standard describes the requirements for advanced rescue training courses that are recommended by the members of GWO. The full standard covers 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)

The members of the Global Wind Organisation (GWO) recognize trained persons as competent within advanced rescue in the wind industry and accept the trained person as possessing the required knowledge to conduct rescue operations, in a WTG, using standard wind turbine industry rescue and fall protection. Training is verified through the GWO database WINDA.

Where national legislation sets higher requirements for the specific training, the training provider shall incorporate these requirements into the training program.

Additional training may be required for company or country specific reasons.

This standard has been developed by the GWO Training committee. Disputes and potential non-conformities should be brought to the attention of the GWO Audit and compliance committee.

The standard has been approved by the GWO Executive committee.

5 General Requirement to GWO Advanced Rescue Training

Upon completion of the Global Wind Organisation (GWO) Advanced Rescue training (ART) Course Participants will be able to access and rescue an injured person from the Hub and the Nacelle, Tower and Basement section. 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:

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)

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

The ART modules shall enable Course 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 Working at Height.

5.4 Conformity with other Training

The GWO ART standard sets out minimum requirements.

The modules, learning objectives, lessons and elements may be delivered in the order that fits best for the specific training situation. Provided the minimum requirements of the ART are met the Training Provider may choose to incorporate delivery of other similar certified training.

5.5 Legal requirements

The Training Provider shall identify whether national legislation sets additional requirements for Advanced Rescue Training or prohibits delivery of certain elements. If so, the Training Provider shall incorporate these identified requirements in the training.

5.6 Duration of ART Modules

The total contact time for completing the stand-alone modules in this advanced rescue training standard is estimated to be ***29 hours***. This is based on the time estimates given in the module timetables and summarised in table 5-6 below.

The training provider must not exceed the times per day given in table 5-7 below.

The training provider must ensure that sufficient time is allowed for Course Participants with prior experience to share their experiences related to the modules of the basic training standard in a way that is constructive for the entire class.

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

Table 5-6 - Duration of the ART Modules (Excluding meals & Breaks)

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 5-7 - Maximum durations for training days

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

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

5.7 Guidance on delivering lesson elements

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 the duration of practical elements is not reduced in length. Theoretical elements may be delivered during the practical exercises when feasible.

Individual exercises can 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 Course Participants and to provide a more dynamic scenario. For example, removing equipment, or marking anchor points as defect.

5.8 Validity period

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

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

A Course 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 or training record is expired, the Course Participant must attend the full advanced rescue training module(s) to obtain a new training record.

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

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

Table 5-8 - Validity period of GWO ART Modules

5.9 Course participant prerequisites for the ART modules

All personnel participating in advanced rescue training shall be medically fit and capable of fully participating.

Training providers shall have a procedure that requires Course Participants to sign a statement stating that they are medically fit to participate in the safety training and that they do not suffer from any medical illness or are under influence of any narcotic substance or alcohol. The Annex 2: Medical Self-Assessment Form shall be used if no other equivalent procedure is in place.

Course Participants' signatures testifying to their medical fitness shall be collected prior to the start of the advanced rescue training course.

Valid GWO BST module Working at Heights, GWO First aid and GWO Manual Handling certificates are prerequisites for participation. Furthermore, Course Participants shall have created a personal Course Participant profile in WINDA and provide their own WINDA ID prior to completing the training.

5.10 Physical demands

The GWO advanced rescue training modules are expected to be physically demanding.

If there is any doubt regarding the medical fitness of any Course Participant, the Training Provider shall stop training the Course Participant and seek a physician's advice.

Note: Practical exercises shall be designed and delivered solely to meet this Standard and shall not place any physical or mental demands on the Course Participants other than those required to meet this Standard.

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 Course Participants.

6.1 Training Staff

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.

The Instructor must be:

1) Trained in instructional / lecture techniques and / or have documented instructional / teaching experience
2) Qualified GWO WAH instructor
3) Qualified GWO 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 Course 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.

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.

6.2 Facilities and Equipment

The full range of facilities and equipment relevant to the modules delivered shall be available during the training. The following facilities criteria shall be adhered to. Turbine manufacturer specifics may limit the application of the training requiring additional methods, techniques and equipment.

6.3 Theory training facilities

Facilities shall be designed to enable each Course Participant to see, hear and fully participate in the taught subject matter.

6.4 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 course 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 course participant to individually and/or as part of a team, see, hear and practice the taught subject matter in such a way, that it resembles the working practices 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.
    b. Figure 6-41 provides dimensions to the GWO recommended Hub mock-up.
    c. 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 0.60 m.
    a. This diameter can be reduced to 0.50 m 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. 60 cm diameter access crawl way into the crawl space, a height between 60 and 30 cm and minimum 200 cm length (Basement/Tower/Nacelle module)
5) Mock-up to simulate the nacelle.
    a. Figure 6-42 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 m_2, excluding walkways of less than 60 cm 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
6) 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.

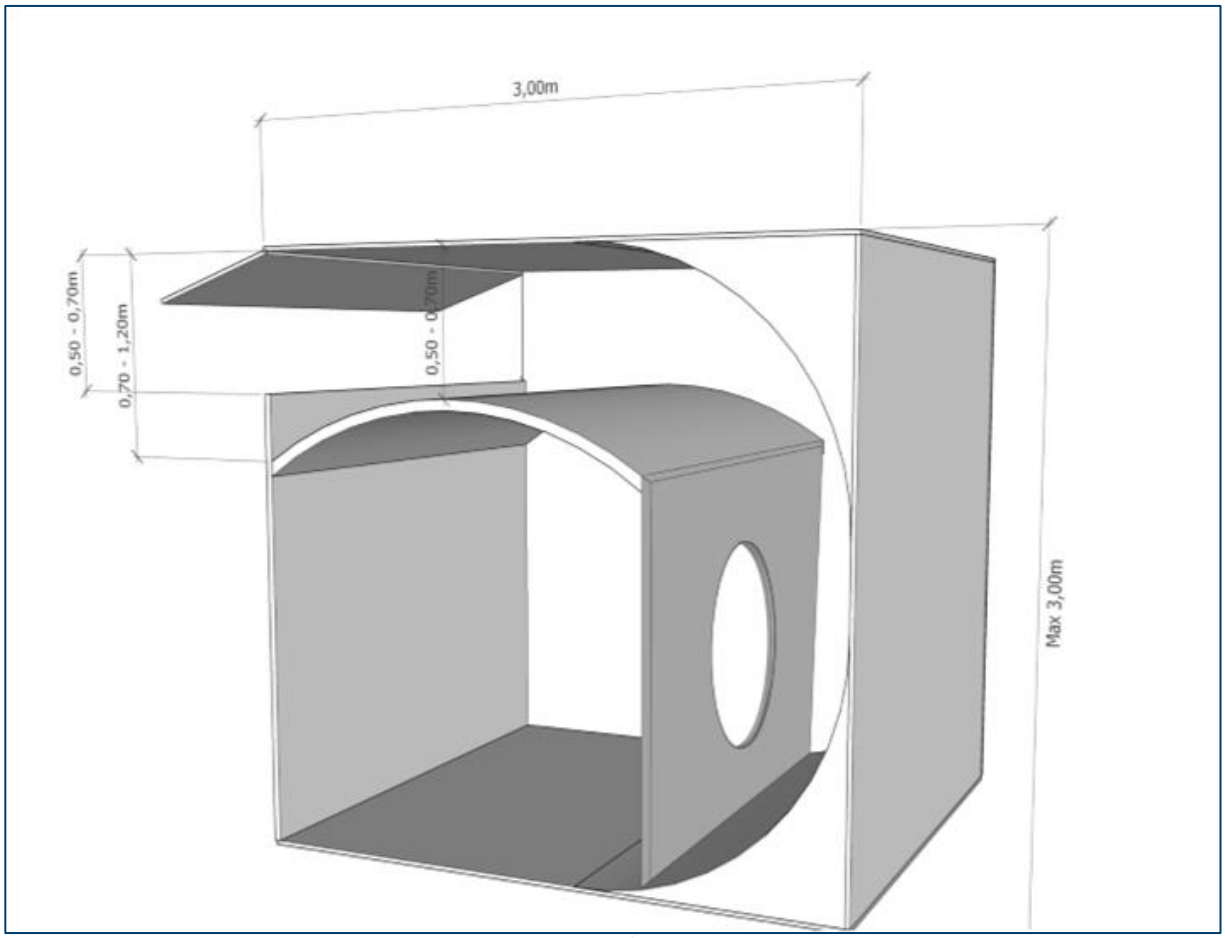

Figure 6-41 - Recommended dimensions for the Hub Mock-up

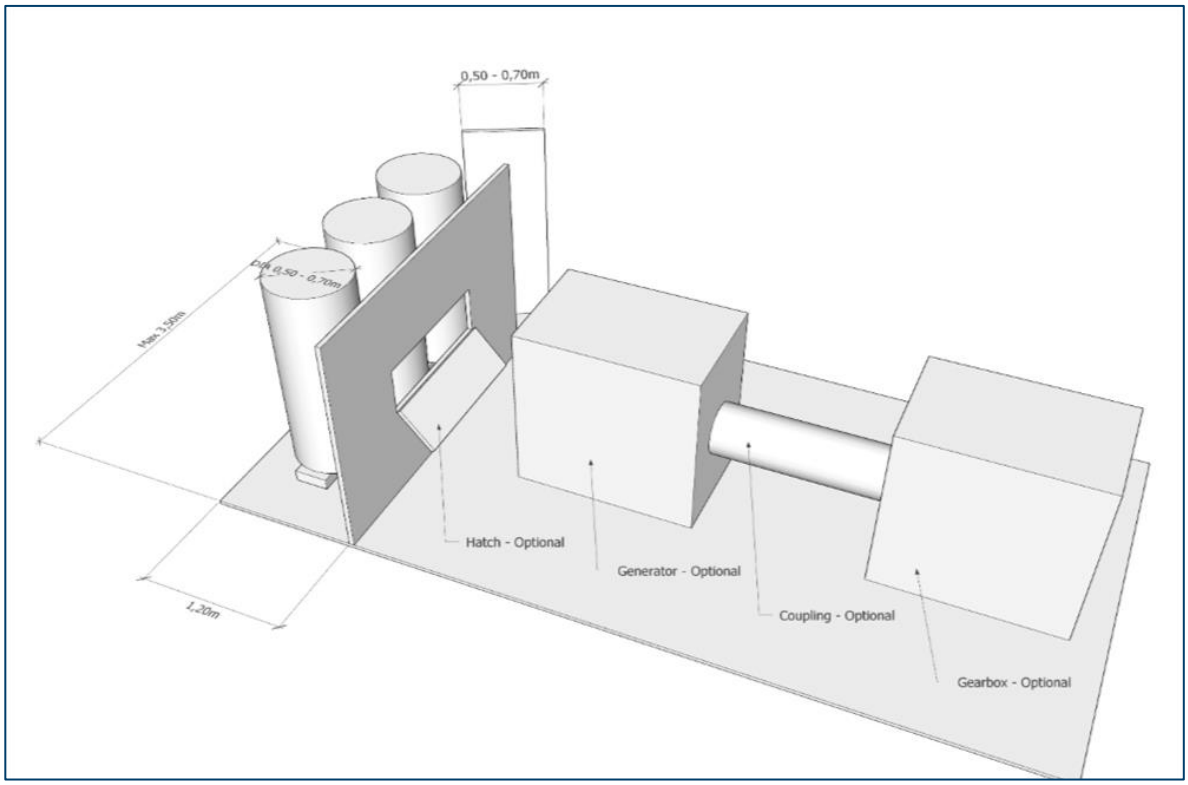

Figure 6-42 - Recommended dimensions for the Nacelle Mock-up

6.5 Wind turbine environment explained

What is a wind turbine training environment?

To apply what you 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 Course Participants' working environment. Thus, identical elements enhance the application of what you have learned - The more identical elements, the merrier.

As training provider your 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 Course Participants should perform in practice, enhances real work behaviour.

So how do you "train as you work" and design a training environment with a high degree of identical elements?

Depending on the Course 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 hold 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.

To "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.

6.6 Training Equipment

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements as listed in table A3-4 in annex 3 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 Course 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. rescue stretchers), enabling the Course Participant 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 but without additional formal training.

Where reasonably practicable the training provider shall eliminate the risk of a fall from height. Where it is not possible to eliminate the risk of a fall then the fall factor experienced by any person shall be kept as low as is reasonably practicable.

GWO recommends a maximum fall factor of 0.5. To calculate this the following formula has been used,

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

using the maximum allowed lanyard of length 2.00 m and a fall of 1.00 m,

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

$$Factor\ (FF) = 0.5.$$

During the evacuation exercises in this module the anchor points used for the attachment of fixed length fall arrest lanyards 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 Course 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 Course Participant 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 Course Participants can experience a descent of sufficient duration for meaningful learning transfer, the GWO recommends that the anchor point is a minimum of 6.75 m above the ground or structure directly below the anchor point. The recommended 6.75 m clearance under the anchor point is explained in detail in annex 3.

If a training provider deviates from the recommended anchor point height of 6.75 m 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;
    1. use the value for shock absorber elongation that is provided by the equipment manufacturer, and,
    2. demonstrate that the equipment will prevent the person from coming into contact with the ground or structure directly below the anchor point, and,
    3. 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 3 section 4, and,
b. the potential fall factor shall not exceed 0.5, and,
c. Course Participants must experience a descent from a platform that is a minimum of 4.5 m above the ground.

7 UNDERSTANDING GWO LEARNING OBJECTIVES

The described learning objectives (expected learning outcome) are the foundation of the course contents and what the Course Participant performance assessment must be based upon.

Traditionally learning objectives are prepared within three different domains of learning – knowledge, skills and attitude. A learning objective describes the expected learning outcome on completion of a module or a course, within one or more learning domains.

If a learning objective is related to more than one domain of learning, e.g. to knowledge *and* skills, one learning objective per learning domain is often prepared – to enable a better understanding of the learning objective.

The GWO Training Provider may apply teaching methods (didactics) that are appropriate to the course participants prior training, education and cultural backgrounds, but should always aim to provide course participants ample possibility to perform hands-on demonstrations and learning reflection.

7.1 Taxonomy

To formulate a measurable learning objective, taxonomy is used to describe the *level* of expected learning outcome within a learning domain.

As an example, belonging to the learning domain of knowledge, to have a Course Participant *name* or ***recognize*** something, as oppose to have him ***explain*** it in his own words, or even *apply* or ***demonstrate*** what he has learned – describes different performance levels, i.e. different taxonomy levels.

Different taxonomies are associated with different learning domains, for instance:

Knowledge: such as Bloom's "cognitive taxonomy"

- Intellectual knowledge, mental skills and procedures

Skills: such as Simpson's "psychomotor taxonomy"

- Physical skills, cognitive controlled and observable

Attitude: such as Krathwohl's "affective taxonomy"

- Attitude and feelings to the learning

Selecting a suitable taxonomy level, an ***action verb*** expresses the expected behaviour of the course participant, thus describing the taxonomy level of a learning objective.

Action verbs are usually highlighted in bold in this standard. The table below presents the three learning domains with taxonomy level 1-3, provided with associated *action verbs* applicable in the learning objective wording, defining the taxonomy level. In the GWO training standard, the learning objectives are in general described as level 2 or 3.

	Knowledge	Skills	Attitude
3	**Application / Applying** To use in a new situation. Solving problems by applying acquired knowledge, facts, techniques and rules in a different way. Applying a procedure to a familiar or unfamiliar task. Using a manual to calculate and operate. **Action verbs** Apply, Change, Choose, Compute, Modify, Operate, Practice, Prepare, Schedule, Solve, Write.	**Guided response** Follows instructions to build a model. Using a tool after observing an expert demonstrate how to use it. Be able to demonstrate an activity to other learners. Can complete the steps involved in the procedure as directed. **Action verbs** Accomplish, Achieve, Calibrate, Complete, Control, Demonstrate, Perform, Refine, Show.	**Value** Demonstrates belief in the company described process. Shows the ability to solve problems. Informs management on matters that one feels strongly about. Decide worth and relevance of ideas and tasks. **Action verbs** Argue, Challenge, Confront, Complete, Debate, Criticize, Justify, Join, Propose.
2	**Comprehension / Understanding** Construct a meaning from instructional messages, including oral, written and graphic communication. Demonstrating basic understanding of facts and ideas. Explain in your own words the steps of performing a complex task. **Action verbs** Classify, Distinguish, Estimate, Explain, Express, Give, Illustrate, Indicate, Locate, Predict, Summarize, Translate.	**Set** Awareness or knowledge of the ability needed to use the skill. Carry out tasks from verbal or written instructions. Showing eagerness to assemble components to complete a task. Knows and acts upon a sequence of steps in a process. **Action verbs** Access, Build, Complete, Conduct, Execute, Implement, Operate, Perform, Recreate.	**Respond** Completing work assignments with highly respect to the agreement. Participating in team problem solving activities. Questions new ideas and concepts in order to fully understand them. Participate actively and respectful in discussions. Showing enthusiasm. **Action verbs** Assist, Contribute, Discuss, Present, Question, Report, Respond, Tell, Write.
1	**Knowledge / Remembering** Memory of facts, terminology, rules, sequences, procedures, etc. Locating knowledge in long-term memory and retrieving relevant knowledge from long-term memory. **Action verbs** Arrange, Define, Describe, Find, Identify, List, Name, Outline, Recognize, Relate, Recall, Retrieve.	**Perception** Watch instructor and repeat action, process or activity. Recognizing sounds or pictures that indicate certain functionalities. Estimate the event of a certain function and be prepared for it. **Action verbs** Attempt, Copy, Duplicate, Follow, Organize, Repeat, Sketch, Replicate, Reproduce.	**Receive** Listening to discussions of controversial issues with an open mind. Respecting the rights of others. Listen to others and remember their opinions. Be positive and creative to what is being taught. **Action verbs** Ask, Be open to, Concentrate, Discuss, Focus, Follow, Listen, Reply, Take part.

Table 7-1 - Taxonomy used by GWO

Note: Higher taxonomy levels exist.

In the lesson elements in each of the modules the taxonomy action verb is highlighted in **bold text**.

Following each learning objective, the taxonomy level and domain are indicated in brackets e.g. (L2 – Knowledge)

8 ADMINISTRATION AND CERTIFICATION OF GWO ART **ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.**MODULES

8.1 Administrative arrangements

Appropriate for the enrolment and certification of course participants and all aspects of the delivery of training shall be in accordance with this Standard.

8.2 Course participant performance assessment

Course participants will be assessed by means of direct observation and supplementary oral questions where appropriate (formative evaluation).

Throughout the entire course the instructor will enforce the course participant assessment Form (see annex 2) and adhere to it, accordingly, with a high focus on evaluating the course participant's practical skills.

The instructor keeps a course participant assessment form (or adaptation) for each course participant until the completion / evaluation of the GWO module

The course participant assessment form (or adaption) is a final evaluation tool for the instructors to assess course participants during practical elements. It allows measurement of the number of violations in regard to safety, competency, or attitude.

It shall be used as a progressive evaluation tool to discuss the performance of a course participant in guiding them to success and it also serves as supporting documentation if a course participant passes or fails the module. If a course participant fails to meet the demands of the module, they shall attend a new module.

Training providers may adapt the course participant assessment form to other media. Training providers shall have a documented procedure in place for dealing with course participants not meeting the stated learning outcomes.

8.3 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 program.

Each record shall contain the following:

1) Course participant's WINDA ID
2) Course code (As shown in table 8-3)
3) Course completion date

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

Table 8-3 - Course codes for ART modules

The training provider shall in accordance with the requirements for GWO Training providers maintain own records of course participants.

Upon request from GWO or any of the members of GWO, the training provider shall be able to verify the training and competence records of any specific personnel either attending a course and/or performing training of a course by name and nationality.

Training providers may issue other additional proof of training, e.g. as paper certificate or plastic cards. If the training provider chooses to do so, it is recommended (not a requirement) to include the course participant WINDA id.

9 HUB RESCUE

9.1 Aims and objectives of the Hub Rescue Module

The aim of this module is to enable the course participants 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.

The Hub Rescue module shall ensure that the course participants are able to;

1) Assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for various rescue scenarios, in a WTG hub, spinner and inside a blade
2) 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
3) Explain and demonstrate the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios, in a WTG hub, spinner and inside a blade
4) Explain and apply the concept of lifting angle, angle factor and deviation
5) Explain and control common risks of hazardous energies and common hazards of enclosed space areas in a WTG, when performing rescue operations
6) 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 spineboard, manually operated lowering/raising rescue system for limited distance rescue (rescue device, pulley system or similar), and other rescue equipment relevant to the Course Participants
7) Fit a harness and other PPE (e.g. helmet, safety glasses) onto an injured person, in an enclosed space in a WTG
8) Package an injured person on a rescue stretcher and spineboard 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
9) Manually transport an injured person on a rescue stretcher or spineboard - in a balanced way, in a WTG
10) Change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa) when suspended
11) 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

12) Perform rescue operations, in a WTG hub, spinner and inside a blade, using an injured person personal fall protection equipment backup system, when required (i.e. when the manually operated lowering/raising rescue system is not certified for person lifting)
13) 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
14) 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
15) 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
16) Apply clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person

Course participants show signs of;

17) Acknowledging the benefits of having a coordinator in a rescue team, and the responsibility that comes with it
18) Taking part in discussing what advanced rescue preparations, and emergency, communication and command procedures, apply in their own organization
19) Committing themselves to avoid incidents from where they may be exposed to a rescue operation
20) Committing themselves to act out this value by demonstrating a pro-active approach and role model behaviour.

9.2 Competencies of the Hub Rescue 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

9.3 Course Participant prerequisites for the hub rescue module

All personnel participating in hub rescue training shall be medically fit and capable of fully participating.

Valid GWO BST module Working at Heights, GWO First aid and GWO Manual Handling certificates are prerequisites for participation. Furthermore, Course Participants shall

have created a personal Course Participant profile in WINDA and provide their own WINDA ID prior to completing the GWO training.

9.4 Duration of the Hub rescue Module

The total contact time for completing this hub rescue module is estimated to be 7 hours. This is based on the time estimate given in the module timetable.

The training provider must not exceed the times per day given in table 9-2 below.

The training provider must ensure that sufficient time is allowed for Course Participants with prior experience to share their experiences related to the module in a way that is constructive for the entire class.

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 9-3 - Maximum durations for training day

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

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

9.5 Hub Rescue Instructor to Course Participant Ratio

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

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

Module	Session	Trainer – Course Participant Ratio
Hub Rescue Module	Theory	1:12
	Practical	1:4

Table 9-4 - GWO ART Instructor to Course Participant ratios

9.6 Equipment for Hub Rescue Module

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements as listed in table A3-1 in annex 3 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.

9.7 Hub Rescue Module Timetable

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 the practical elements are not reduced in length. Theoretical elements may be delivered during the practical exercises when feasible**.**

Lesson		Element		Approx. Duration
1	Introduction	1.1	Safety Instructions and Emergency Procedures	
		1.2	Facilities	
		1.3	Instructor & Course Participant Presentation	
		1.4	Overall Aim & Objectives and Agenda	
		1.5	Motivation	
		1.6	On-Going Assessment	
			TOTAL	**15 min.**
2	Emergency Response Plan in Your Own Organization	2.1	Emergency Response Plan in Your Own Organization	
		2.2	Evacuation Strategy	
			TOTAL	**30 min.**
3	Measures to prevent injury during training	3.1	Control measures and warm up	
			TOTAL	**20 min.**
4	Head Support During Rescue	4.1	Risks of a cervical collar	
		4.2	Head support during rescue	
			TOTAL	**25 min.**
5	Packaging the injured person	5.1	Packaging the injured person	
			TOTAL	**50 min.**
6	Lowering/Raising Rescue System	6.1	Lowering/Raising Rescue System	
		6.2	Rigging setup options - combining rescue equipment and PPE lanyards	
			TOTAL	**25 min.**
7	Hub Rescue Exercise 1 & 2 (From Blade)	7.1	Hub Rescue Exercise 1 & 2 (From Blade)	
			TOTAL	**100 min.**
8	Hub Rescue Exercise 3 & 4 (From Spinner)	8.1	Hub Rescue Exercise 3 & 4 (From Spinner)	
			TOTAL	**80 min.**

9	Outside Evacuation of injured person	9.1	Outside Evacuation of injured person – Practical Exercise	
			TOTAL	**45 min.**
10	Evaluation	10.1 10.2	Reflection Session Formative Evaluation	
			TOTAL	**15 min.**
			GRAND TOTAL	**405 min.**

Table 9-6 - GWO Hub rescue Module Timetable

9.8 Detailed description of the Hub Rescue Module

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

The learning outcomes specified for the Hub Rescue Module are:

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

Lesson 1 - INTRODUCTION

15 min.

The aim of this lesson is to introduce the course participants to the course, each other, the facilities and what is expected of them during the course.

To successfully complete this lesson of the module, course participants must be able to:

1) Explain the safety rules and emergency procedures of the training facilities
2) Locate emergency exits and equipment, and relevant training facilities
3) Recognize who the instructor and other Course Participants are
4) Describe the main aim and main learning objectives
5) Explain the on-going assessment according to Course Participants assessment form
6) State own expectations for the course.

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

The Instructor shall:

1.1.1 **Explain** the safety instructions according to internal procedures

1.1.2 **Explain** the emergency procedures and emergency exits in the areas where the Course Participants can be expected to be located during the course

ELEMENT 1.2 - FACILITIES

The Instructor shall:

1.2.1 Give a general description of the on-site facilities (Administration, dining area, restrooms, etc.)

ELEMENT 1.3 - INSTRUCTOR & COURSE PARTICIPANT PRESENTATION

The Instructor shall:

1.3.1 Ensure that all Course Participants are registered with a personal Course Participant profile in WINDA and have provided their WINDA ID prior to completing the training course.

1.3.2 Give a short introduction, including their backgrounds as instructors

Course Participants shall:

1.3.3 Give a short introduction, including their job function, onshore/offshore experience, time of employment in the wind industry, and expected primary geographic work location, etc.

1.3.4 Present his/her own expectations for the course

ELEMENT 1.4 - OVERALL AIM & OBJECTIVES AND AGENDA

The Instructor shall:

1.4.1 Explain the overall aim & objectives and agenda of this ART Module, highlighting the rescue team coordinator functionality

ELEMENT 1.5 - MOTIVATION

The Instructor shall:

1.5.1 Explain why advanced rescue preparedness and skills are relevant

1.5.2 Explain the importance of personal involvement in the course

1.5.3 Explain how the Course Participants will be challenged, and why

ELEMENT 1.6 - ON-GOING ASSESSMENT

The Instructor shall:

1.6.1 Explain the reasons for the on-going assessment

1.6.2 Explain the GWO Course Participant Assessment Form and its use

1.6.3 Explain what is expected of the Course Participants

Lesson 2 - EMERGENCY RESPONSE PLAN IN YOUR OWN ORGANISATION

30 min.

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

To successfully complete this lesson of the module, course participants must:

1) Take part in discussing what specific hub/blade/spinner rescue preparations, and emergency, communication and command procedures, apply in their own organization (L2 – Knowledge)
2) Recognize the limitations of the rescue preparations available, when deciding on the rescue strategy (L2 – knowledge)
3) **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. (L2 – Knowledge)

ELEMENT 2.1 - EMERGENCY RESPONSE PLAN IN YOUR OWN ORGANISATION

The Instructor and Course Participants shall discuss:

2.1.1 What specific hub/blade/spinner rescue preparations and emergency and communication procedures apply in their own organization, 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. 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 what specific elements in their own WTG type/WTG environment might differ from the training scenario environment (to visualize and enhance learning transfer), e.g.

h. Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, Heli pad)

i. Anchor points (certified/structural/location)

j. Rescue equipment (type/quantity/location)

k. Emergency light (system/equipment)

ELEMENT 2.2 - EVACUATION STRATEGY

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 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, 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 tagline if beneficial

b. From a transition piece to a vessel - by means of an active or passive rescue device setup, and tagline if beneficial

2.2.3 **Explain** 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

2.2.4 **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.

Note: Explain and demonstrate the above mentioned based on the manufacturer's specifications

2.2.9 **Explain** the pros and cons of utilizing a rescue stretcher type with lifting bridles versus a rescue stretcher/spineboard type without lifting bridles versus no rescue stretcher/spineboard, for an outside evacuation

2.2.10 **Explain** and **demonstrate** how to attach and rig the rescue device in a passive and active setup, respectively, and how to utilize 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 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 head first if this risk cannot be mitigated

2.2.12 **Explain** how to cautiously manipulate and balance/let go of the injured person out of the WTG when suspended by utilizing a tagline, at the same time aiming to avoid head down configuration of the unconscious injured person - 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 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 carabiner

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 Course Participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

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 Course 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 Course Participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the Course 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 Verify that each Course Participant who is working at height (either as a casualty or a rescuer) during the following practical exercises is always attached to a backup line prior to and at all times whilst working at height. GWO recommends that a SRL is used as a backup line.

Course Participants shall:

3.1.6 Take part in the warm-up session of the major muscle groups and ankles, wrists and back

3.1.7 **Perform** a pre-use inspection of their Personal Fall Protection Equipment

3.1.8 **Perform** a 'buddy check' of another Course Participants personal fall protection equipment

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

It is important that the course 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 intercranial pressure and present difficulties in maintaining the airway of the person wearing the collar.

It is of upmost importance during exercises where a rigid or semi-rigid cervical collar is used that Course 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 course participants to use various methods (e.g. a cervical collar) to support the head of an unconscious injured person during extrication from an enclosed space. Furthermore, it will enable the course participants to understand the risks posed to the injured person by using a cervical collar and to be able to mitigate against those risks.

To successfully complete this lesson of the module, each course participant must be able to:

1) **Explain** the risks posed by using a cervical collar covering the following (L2 – Knowledge):
    a. Increased intercranial pressure
    b. Compromised airway
2) **Demonstrate** how to mitigate the risks posed to an unconscious injured person who is wearing a cervical collar (L3 – Skill)
3) **Demonstrate** how to perform a pre-use inspection of rescue equipment for head support (L3 – Skill)
4) **Demonstrate** how to, unaided, correctly size, prepare and correctly fit a cervical collar to an unconscious injured person (L3 – Skill)
5) **Demonstrate** how to, check correct application of cervical collar on fitting onto the injured person (L3 – Skill)
6) **Demonstrate** how to continuously perform the primary survey of an injured person wearing a cervical collar with focus on the following (L3 – Skill):
    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)
7) **Demonstrate** how to fit helmet and safety glasses on an unconscious injured person who is wearing a cervical collar (L3 – Skill)

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.

Furthermore, 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.

Therefore, the use of collars in this instance is not considered as routine. For further information please refer to annex 6.

Note: There shall be at least 2 exercises per Course Participant - 1 sitting, 1 lying down; live injured person recommended

Note: Each Course Participant shall be able to demonstrate the above-mentioned skills on an injured person sitting and on an injured person lying down.

ELEMENT 4.1 - RISKS OF USING A CERVICAL COLLAR

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 extrication 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 extrication 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

Each Course Participant shall:

4.1.4 **Explain** the risks posed to an unconscious injured person who is wearing a cervical collar

4.1.5 **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

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 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 extrication 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 in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products

Each course participant shall:

4.2.12 Practice and **demonstrate** how to use methods other than a cervical collar to support the head and maintain the airway of an injured person during extrication

4.2.13 Practice and **demonstrate** 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

4.2.14 Practice and **demonstrate** 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 course participants to fit a harness onto the injured person and package him onto a rescue stretcher or a spineboard, to enable safe transportation of the injured person.

To successfully complete this lesson of the module, course participants must, unassisted:

1) **Demonstrate** how to carry out a pre-use inspection of a rescue stretcher and spineboard (L3 – Skill)
2) **Demonstrate** how to fit helmet and safety glasses on an unconscious injured person wearing a rescue head support device (L3 – Skill)
3) **Demonstrate** how to fit a harness onto an unconscious injured person (L3 – Skill)
4) **Demonstrate** how to package an unconscious injured person on a rescue stretcher and on a spineboard. (L3 – Skill)
5) **Demonstrate** how to create an attachment point on a spineboard by attaching / choking an anchor sling through the handles of the foot and top of a spine board with a carabine attached (L3 – Skill)

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

1 exercise per Course Participant

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

ELEMENT 5.1 - PACKAGING THE INJURED PERSON

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 manual and the manufacturer's criteria or the participants own organisation

5.1.2 **Demonstrate** how to perform a pre-use inspection of the spineboard(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 carabiners
i. Metal parts
j. Attachment points
k. Back protection
l. Observe manufacturer's 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 spine board by attaching / choking an anchor sling through the handles at the foot and top of the spineboard with a carabiner attached

5.1.5 **Explain** how to package an unconscious injured person on a rescue stretcher and on a spineboard, adhering to the manufacturer's specifications

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

Each course participant shall:

5.1.8 Practice and **demonstrate** how to prepare, fit and check rescue head support and fit PPE helmet and safety glasses on an unconscious injured person

5.1.9 Practice and **demonstrate** how to, unaided, correctly and continuously perform the primary survey on an injured person who is wearing rescue head support

5.1.10 Practice and **demonstrate** how to fit a harness onto an unconscious injured person

5.1.11 Practice and **demonstrate** how to create an attachment point on a spine board by attaching / choking an anchor sling through the handles at the foot and top of the spineboard with a carabiner attached

5.1.12 Practice and **demonstrate** how to package an unconscious injured person on a rescue stretcher and on a spineboard, adhering to the manufacturer's specifications and ensuring a tight fit of restrain straps.

Note: If the spineboard and / or restrain strap manufacturer specifications allow, a crossing strap configuration packaging the injured person is preferred

Lesson 6 - LOWERING / RAISING RESCUE SYSTEM

25 min.

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

To successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to perform a pre-use inspection of a random pulley system and rescue device (L3 – Skill)
2) **Explain** the proper utilization of a pulley system (L2 – Knowledge)
3) **Explain** how to attach, rig and secure the system (L2 – Knowledge)
4) **Explain** requirements, applications and limitations of the system (L2 – Knowledge)
5) **Explain** the system's maximum raising distance possible (L2 – Knowledge)
6) **Explain** rigging setup options i.e. ways to combine rescue equipment and PPE lanyards (L2 – knowledge)

ELEMENT 6.1 - LOWERING/RAISING RESCUE SYSTEM

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 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, by following the principles of and covering:

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, carabiners and other hardware accessories following the same principles
j. Observe manufacturer's 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 to use a personal fall protection equipment backup system, when required 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 mentioned based on the manufacturer's specifications

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 accordance with manufacturers specifications, in a nacelle 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 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 in their own organisations on course completion requiring them to familiarise themselves with other rescue equipment products

Lesson 7 - HUB RESCUE EXERCISE 1 & 2 (FROM BLADE)

100 min.

There are several locations on the turbine were 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 course participants to perform injured person rescue operations, in a WTG blade and out of the hub.

To successfully complete this lesson of the module, course participants must be able to:

1) **Explain** common hazards/risks and control measures/risk mitigation in a WTG
2) **Demonstrate** how to apply rescue methods and techniques in performing lowering/raising rescue operations, in a WTG blade
3) **Demonstrate** how to perform rescue operations in a WTG blade using a headtorch, if required due to poor lighting conditions
4) **Demonstrate** how to prepare, fit and check rescue head support and fit PPE helmet and safety glasses on the unconscious injured person

5) **Demonstrate** how 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

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 extricating an injured person from an enclosed space *horizontally*.

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

6) **Demonstrate** how to assess and determine the suitable attachment point on the injured person and/or spineboard/rescue stretcher, i.e. harness front or back attachment point and in the top or bottom of the spineboard/rescue stretcher

7) **Demonstrate** how to 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 him out, constantly evaluating the rescue efforts

8) **Demonstrate** how to package the unconscious injured person on a rescue stretcher or on a spineboard in a vertical configuration, adhering to the manufacturer's manual specifications

9) **Demonstrate** how to package an injured person to enable safe transportation, by doing regular checks, using rescue equipment such as rescue head support and avoiding head down configuration of the unconscious injured person

10) **Demonstrate** how to utilize safe and suitable (certified or structural) anchor points

11) **Demonstrate** how to adhere to safe lifting angles of the rescue equipment

12) **Explain** the strain to the rescue equipment and anchor points, depending on the lifting angle

13) **Demonstrate** how to apply deviation and edge protection to the lowering/raising rescue system rigging

14) **Demonstrate** how to utilize a manually operated lowering/raising rescue system for limited distance rescue in a safe and proper manner as taught previously, adhering to the manufacturer's manual specifications

15) **Demonstrate** how to perform the rescue operation using an injured person personal fall protection equipment backup system, if required (i.e. if the manually operated lowering/raising rescue system is not certified for person lifting)

16) **Demonstrate** how to balance an injured person from a horizontal to a vertical configuration (and vice versa)

17) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy

18) **Demonstrate** how to 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

19) **Acknowledge** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it.

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

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

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. Point out 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 optimize the rescue set up.

c. Highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

d. To guide and support the Course Participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard)

e. Highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)

f. Highlight how to organize the rescue team to the specific rescue operation scenario (who does what)

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

a. Positive feedback

b. Improvement proposals and alternative solutions

c. Course participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)

d. Course participant's risk mitigation during the exercise

e. Course 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 course completion requiring them to familiarise themselves with other rescue equipment products

Each course participant shall:

7.1.6 **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, pressurized 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

7.1.7 **Demonstrate** how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for a rescue scenario in a WTG blade

7.1.8 **Demonstrate** how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

7.1.9 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system, if the lowering / raising rescue system is not approved for person lifting

7.1.10 **Demonstrate** how to apply rescue methods, techniques and clear communication in performing safe lowering/raising rescue operations from inside a WTG blade

7.1.11 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

7.1.12 **Demonstrate** how to perform a rescue operation, from a WTG blade, through the hub and e.g. out of the hub or into the nacelle

7.1.13 **Demonstrate** how to perform the rescue effort as a team member or team coordinator

7.1.14 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 8 - HUB RESCUE EXERCISE 3 & 4 (FROM SPINNER)

80 min.

The aim, learning objectives and elements mentioned in the lesson above (lesson 7) applies to this lesson as well - but from inside the spinner.

Additionally, to successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to transport the injured person to the escape hatch by means of a zip line (areal ropeway), to control the handling of injured person more efficiently and reduce manual handling.

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

1 exercise per team, with one participant acting as team coordinator

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

ELEMENT 8.1 - HUB RESCUE EXERCISE 3 & 4 (FROM SPINNER)

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

Additionally, 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.

ELEMENT 8.2 - HUB RESCUE EXERCISE 3 & 4 (FROM SPINNER)

Course participants shall demonstrate and on request explain, in a team, 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

Additionally, course participants shall:

8.2.1 **Demonstrate** how to rig a tensioned line (zip line) in a nacelle and transport the injured person to the escape hatch

8.2.2 **Demonstrate** how to perform rescue operations using a headlamp, if required due to poor lighting conditions.

Lesson 9 - OUTSIDE EVACUATION OF INJURED PERSON

45 min.

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

To successfully complete this lesson of the module, course participants must be able to:

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
2) **Explain** how to mitigate against interfering winds bringing down an injured person onto the transition piece during an outside evacuation by means of a passive rescue device setup, with tagline (to control the final descent of the injured person onto the transition piece)
3) **Demonstrate** how to prepare the injured person for safe transportation (i.e. fit head support, harness and other PPE, and package him on a rescue stretcher or spineboard)
4) **Demonstrate** how to manually transport an injured person on a rescue stretcher or spineboard - in a balanced way, in a WTG
5) **Demonstrate** how to utilize safe and suitable (certified or structural) anchor points
6) **Demonstrate** how to adhere to safe lifting angles of the rescue equipment
7) **Demonstrate** how to apply deviation and edge protection to the evacuation device rigging
8) **Demonstrate** how to utilize 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 and if possible, to the rescue stretcher/spineboard, according to the injured person configuration (horizontal or vertical)

9) **Demonstrate** how to utilize a rescue device in an active setup (i.e. the rescue device attached onto the injured person) but fix the rescue device carabiner to an extended connection to the injured person harness to avoid head injury and if possible connect it to the rescue stretcher/spineboard, according to the injured person configuration (horizontal or vertical)

10) **Demonstrate** how to rig a fall restraint lanyard between the foot of the rescue stretcher/spineboard and the rescue device attachment carabiner on the injured person to balance the injured person in a perfect horizontal configuration, if required and possible

11) **Demonstrate** how to continuously perform the first aid primary survey on an injured person prior to and during the entire rescue operation

12) **Demonstrate** 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 head first if this risk cannot be mitigated

13) **Demonstrate** how to cautiously manipulate and balance/let go of the injured person out of the WTG when suspended by utilizing a tagline, at the same time aiming to avoid head down configuration of the unconscious injured person - preventing stomach content release

14) **Demonstrate** how to 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

15) **Demonstrate** 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

16) **Demonstrate** how to perform an outside evacuation with the injured person in a horizontal configuration - from a WTG hub or nacelle to a primary assembly area (ground or transition piece) by means of a passive rescue device setup; or from a transition piece to a secondary assembly area (vessel) by means of a passive rescue device setup.

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

Note: 1 exercise per team:

a. Passive rescue device setup with tagline.

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

ELEMENT 9.1 - OUTSIDE EVACUATION OF INJURED PERSON - PRACTICAL EXERCISE

The Instructor shall:

9.1.1 Highlight specific control measures relevant to this specific exercise scenario, e.g. 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 configuration to apply (i.e. horizontal or vertical configuration)

b. Organise the rescue team to the specific evacuation scenario

c. What the course participant 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 course 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 and injured person from the transition piece to a vessel

d. Course participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)

e. Course Participant's risk mitigation during the exercise

f. Course participant’s 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 placed upon the course participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products

Course 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 WAH put into an advanced rescue context)
h. Slips and trips

9.1.7 **Demonstrate** 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 **Demonstrate** how to prepare the injured person for safe transportation (i.e. apply head support, harness and other PPE, and package him on a rescue stretcher or spineboard)

9.1.9 **Demonstrate** how to manually transport an injured person on a rescue stretcher or spineboard - in a balanced way - or by means of a zip line (areal ropeway) when relevant

9.1.10 **Demonstrate** how to attach the rescue device to the injured person in a safe and proper manner.

9.1.11 **Demonstrate** how to utilize tagline(s) during one exercise, when performing outside evacuation

9.1.12 **Demonstrate** 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.

9.1.13 **Demonstrate** how to select and utilize Certified and structural anchor points

9.1.14 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection to the rescue scenario

9.1.15 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system if the lowering / raising rescue system is not approved for person lifting.

9.1.16 **Demonstrate** how to apply rescue methods, techniques and clear and precise communication in performing safe ascending/descending rescue operations from a WTG

9.1.17 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation, including first aid primary survey

9.1.18 **Demonstrate** how to perform the rescue effort as a team member or team coordinator

9.1.19 **Demonstrate** how to perform an outside evacuation with the injured person in a horizontal configuration, and the rescue device in a;

a. Passive setup, from a WTG hub or nacelle to a primary assembly area (ground or transition piece), or an

b. Active setup, from a transition piece to a secondary assembly area (vessel)

9.1.20 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 10 - EVALUATION

15 min.

The aim of this lesson is to enable the course 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 his/her way of work. Additionally, the aim is to give the course participants the opportunity to conduct an open-minded written and oral formative evaluation of the training.

To successfully complete this lesson of the module, course participants must:

1) Show commitment to avoid incidents requiring a rescue operation
2) Show commitment to act out this value by demonstrating a pro-active approach and role model behaviour
3) Participate in the formative evaluation of the module in a constructive manner

ELEMENT 10.1 - REFLECTION SESSION

The Instructor shall:

10.1.1 Give the course participants final feedback on the formal course participant performance assessment and inform them whether they have passed (failed course participants must be informed individually prior to the reflection session)

10.1.2 Help the course participant to do a summative self-evaluation, i.e. mentally overview and assort what is learned, identify key takeaways and bridge the gap between what is learned during the module and applying it in his/her way of work. This can be achieved e.g. by an individual reflection session, question session and/or class discussion

10.1.3 Re-present the overall aims and objectives of the course for the course participants' comparison on their learning outcome and meeting of their previously stated expectations of the course

10.1.4 Give an overall feedback and feed forward on the course participants' learning outcome

10.1.5 Encourage the course participants to examine and grow awareness of what specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualize and enhance learning transfer) and to discuss with colleagues advanced rescue methods and techniques under the local specific conditions identified after course completion

10.1.6 Motivate the course participants to avoid incidents requiring rescue efforts during daily work and demonstrating a pro-active approach and role model behaviour

Course participants shall:

10.1.7 Conduct an online or written formative evaluation of the module, as a minimum.

The Instructor shall:

10.1.8 Respond on relevant elements of any oral feedback from the course participants.

10 NACELLE, TOWER & BASEMENT RESCUE

10.1 Aims and objectives of Nacelle, Tower & Basement Module

The aim of this module is to enable the course participant 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 course participants are able to;

1) Assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for various rescue scenarios, from the nacelle, tower or basement of a WTG
2) 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
3) Explain and demonstrate the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios
4) Explain and apply the concept of lifting angle, angle factor and deviation
5) Explain national and local requirements and/or procedures for helicopter rescue in an WTG, including preparing the injured person, preparing the WTG, the Heli-pad safe zones and safe behaviour included
6) Explain and control common risks of hazardous energies and common hazards of enclosed space areas, when performing rescue operations
7) Apply rescue methods and techniques in performing descending and ascending rescue operations, from a WTG nacelle, tower and basement, using a rescue stretcher and spineboard, manually and power-driven lowering/raising rescue system (rescue device, pulley system or similar)
8) Fit a harness and other PPE (e.g. helmet, safety glasses) onto an injured person, in an enclosed space
9) Package an injured person on a rescue stretcher and spineboard 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.
10) Manually transport an injured person on a rescue stretcher or spineboard - in a balanced way
11) Change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa) when suspended
12) 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

13) Perform rescue operations using the casualties personal fall protection on the injured person - as fall protection backup, when required

14) Perform rescue operations in a WTG nacelle, tower and basement using personal flashlight (e.g. helmet light), if required due to poor lighting conditions

15) Act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy and exercising clear communication

16) 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

17) Apply clear communication and guidance to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person

18) Transport an injured person horizontally over the length of the turbine, with the use of industry rescue equipment (zip line)

19) Transport an injured person to a higher platform, using rescue up techniques and equipment (both manual and power-driven) in a controlled and secure manner

Course Participants will show signs of:

20) Acknowledging the benefits of having a coordinator in a rescue team, and the responsibility that comes with it

21) Taking part in discussing which advanced rescue preparations, and emergency and communication procedures, apply in their own organization

22) Committing themselves to avoid incidents from where they may be exposed to a rescue operation

23) Committing themselves to act out this value by demonstrating a pro-active approach and role model behaviour.

10.2 Competencies of the Nacelle, Tower & Basement Module

1) Perform descending and ascending rescue operations from an enclosed space in a WTG nacelle, tower and basement, to a primary assembly area (ground or transition piece) 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

2) Perform these rescue operations in teams acting as the rescue team coordinator

3) Prepare an injured person for helicopter rescue from a WTG.

10.3 Course Participant prerequisites for the NTB rescue module

All personnel participating in nacelle, tower and basement rescue training shall be medically fit and capable of fully participating.

Valid GWO BST module Working at Heights, GWO First aid and GWO Manual Handling certificates are prerequisites for participation. Furthermore, Course Participants shall have created a personal Course Participant profile in WINDA and provide their own WINDA ID prior to completing the training.

10.4 Duration of the Nacelle, Tower & Basement Module

The total contact time for completing this module is estimated to be 14 hours. This is based on the time estimate given in the module timetable.

The training provider must not exceed the times per day given in table 10-3 below.

The training provider must ensure that sufficient time is allowed for Course Participants with prior experience to share their experiences related to the module in a way that is constructive for the entire class.

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 10-3 - Maximum durations for training day

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

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

10.5 Nacelle, Tower & Basement instructor to course participant Ratio

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

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

Module	Session	Trainer – Course Participant Ratio
Nacelle, Tower and Basement Module	Theory	1:12
	Practical	1:4

Table 10-4 - GWO NTB instructor to course participant ratio

10.6 Equipment for Nacelle, Tower & Basement Module

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements as listed in table A3-2 in annex 3 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.

10.7 Nacelle, Tower & Basement Module Timetable

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 total 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 utilized for theoretical and/or practical course

Lesson		Element		Approx. Duration
1	Introduction	1.1	Safety Instructions and Emergency Procedures Facilities Instructor & Course Participant Presentation Overall Aim & Objectives and Agenda Motivation On-Going Assessment	
			TOTAL	**15 min.**
2	Emergency Response Plan in Your Own Organization	2.1	Emergency Response Plan in Your Own Organization	
		2.2	Evacuation Strategy	
			TOTAL	**30 min.**
3	Measures to prevent injury during training	3.1	Control measures and warm-up	
			TOTAL	**20 min.**
4	Head Support during rescue	4.1 4.2	Risks of using a cervical Collar Head support during rescue	
			TOTAL	**25 min.**
5	Packaging the Injured person	5.1	Packaging the Injured person	

			TOTAL	**50 min.**
6	Lowering/Raising Rescue System	6.1	Lowering/Raising Rescue System	
			TOTAL	**25 min.**
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	Enclosed Space Rescue - Exercises	
			TOTAL	**110 min.**
9	Measures to prevent injury during training	9.1	Control measures and warm-up	
			TOTAL	**20 min.**
10	Rescue from Crawl Space		Rescue from Crawl Space - Exercises	
			TOTAL	**200 min.**
11	Rescue Up	10.1 10.2	Rescue Up - Introduction Rescue Up, Inside and Outside of the Tower - Practical Exercises	
			TOTAL	**90 min.**
12	Evaluation	11.1 11.2	Reflection Session Formative Evaluation	
			TOTAL	**15 min.**
			SUB TOTAL	**720 min.**
			FLEXITIME	120 min.
			GRAND TOTAL	**840 min.**

Table 10-6 - GWO Nacelle, Tower & Basement module timetable

10.8 Detailed description of the Nacelle, Tower & Basement Module

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

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

Lesson 1 - INTRODUCTION

15 min.

The aim of this lesson is to introduce the course participants to the course, each other, the facilities and what is expected of them during the course.

To successfully complete this lesson of the module, course participants must be able to:

1) Explain the safety rules and emergency procedures of the training facilities
2) Locate emergency exits and equipment, and relevant training facilities
3) Recognize who the instructor and other Course Participants are
4) Describe the main aim and main learning objectives
5) Explain the on-going assessment according to Course Participants assessment form.
6) State own expectations for the course

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

The Instructor shall explain:

1.1.1 Safety instructions according to internal procedures

1.1.2 Emergency procedures and emergency exits in the areas where the Course Participants will be located during the course.

ELEMENT 1.2 - FACILITIES

The Instructor shall give:

1.2.1 A general description of the on-site facilities (Administration, dining area, restrooms, etc.)

ELEMENT 1.3 - INSTRUCTOR & COURSE PARTICIPANT PRESENTATION

The Instructor shall:

1.3.1 Ensure that all Course Participants are registered with a personal Course Participant profile in WINDA and have provided their WINDA ID prior to completing the training course.

1.3.2 Give a short introduction, including their backgrounds as instructors

Course Participants shall:

1.3.3 Give a short introduction, including their job function, onshore/offshore experience, time of employment in the wind industry, and expected primary geographic work location, etc.

1.3.4 Present his/her own expectations for the course.

ELEMENT 1.4 - OVERALL AIM & OBJECTIVES AND AGENDA

The Instructor shall explain:

1.4.1 The overall aim & objectives and agenda of this ART Module, highlighting the rescue team coordinator functionality.

ELEMENT 1.5 - MOTIVATION

The Instructor shall explain:

1.5.1 Why advanced rescue preparedness and skills are relevant

1.5.2 The importance of personal involvement in the course

1.5.3 How the Course Participants will be challenged, and why

ELEMENT 1.6 - ON-GOING ASSESSMENT

The Instructor shall explain:

1.6.1 The reasons for the on-going assessment

1.6.2 The GWO Course Participant assessment form and its use

1.6.3 What is expected of the Course Participants

Lesson 2 - EMERGENCY RESPONSE PLAN IN YOUR OWN ORGANISATION

30 min.

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

To successfully complete this lesson of the module, course participants must:

1) Take part in discussing what specific rescue preparations, and emergency, communication and command procedures, apply in their own organization. (L2 – knowledge)
2) Recognize the limitations of the rescue preparations available, when deciding on the rescue strategy. (L1 – Knowledge)
3) 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. (L2 – knowledge)

ELEMENT 2.1 - EMERGENCY RESPONSE PLAN IN YOUR OWN ORGANIZATION

The Instructor and Course Participant's shall discuss:

2.1.1 What specific nacelle / tower / basement rescue preparations and emergency and communication procedures apply in their own organization, 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)

2.1.2 Communication procedures of operation, e.g.

a. communication to backup/rescue team, Emergency Medical Treatment (EMT) i.e. ambulance and fire service
b. Site Lead
c. service vessel
d. helicopter Search And Rescue (SAR)
e. the means of communication - radio or phone (cell, IP or satellite phone)

2.1.3 Command procedures of operation, e.g. site lead command or command in rescue team

2.1.4 National and/or local requirements (e.g. confined space regulations and procedures)

2.1.5 Estimated time for professional emergency response providers to arrive

2.1.6 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 visualize and enhance learning transfer), e.g.

a. Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, Heli pad)
b. Anchor points (certified / structural / location)
c. Rescue equipment (type / quantity / location)
d. Emergency light (system / equipment)

ELEMENT 2.2 - EVACUATION STRATEGY

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:

a. The 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 speeds
g. Wind directions
h. Temperatures
i. 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;

a. From a nacelle to a transition piece - by means of a passive rescue device setup, and tagline if beneficial
b. From a transition piece to a vessel - by means of a passive rescue device setup, and tagline if beneficial

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 of 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

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 specifications

2.2.9 **Explain** pros and cons of utilizing a rescue stretcher type with lifting bridles versus a rescue stretcher/spineboard type without lifting bridles versus no rescue stretcher/spineboard, for an outside evacuation

2.2.10 **Explain** and **demonstrate** how to attach and rig the rescue device in a passive and active setup, respectively, and how to utilize 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 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 head first if this risk cannot be mitigated

2.2.12 **Explain** how to cautiously manipulate and balance/let go of the injured person out of the WTG when suspended by utilizing a tagline, at the same time aiming to avoiding head down configuration of the unconscious injured person - 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 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 carabiner

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 course participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

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 course 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 course participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the course 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 Verify that each course participant who is working at height (either as a casualty or a rescuer) during the following practical exercises is always attached to a backup line prior to and at all times whilst working at height. GWO recommends that a SRL is used as a backup line.

Course Participants shall:

3.1.6 Take part in the warm-up session of the major muscle groups and ankles, wrists and back

3.1.7 Perform a pre-use inspection of their Personal Fall Protection Equipment

3.1.8 Perform a 'buddy check' of another course participants personal fall protection equipment

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

It is important that the course 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 intercranial pressure and present difficulties in maintaining the airway of the person wearing the collar.

It is of upmost importance during exercises where a rigid or semi-rigid cervical collar is used that Course 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 course participants to use various methods (e.g. a cervical collar) to support the head of an unconscious injured person during extrication from an enclosed space. Furthermore, it will enable the course participants to understand the risks posed to the injured person by using a cervical collar and to be able to mitigate against those risks.

To successfully complete this lesson of the module, each course participant must be able to:

1) **Explain** the risks posed by using a cervical collar covering the following (L2 – Knowledge):
    a. Increased intercranial pressure
    b. Compromised airway
2) **Demonstrate** how to mitigate the risks posed to an unconscious injured person who is wearing a cervical collar (L3 – Skill)
3) **Demonstrate** how to perform a pre-use inspection of rescue equipment for head support (L3 – Skill)
4) **Demonstrate** how to, unaided, correctly size, prepare and correctly fit a cervical collar to an unconscious injured person (L3 – Skill)
5) **Demonstrate** how to, check correct application of cervical collar on fitting onto the injured person (L3 – Skill)
6) **Demonstrate** how to continuously perform the primary survey of an injured person wearing a cervical collar with focus on the following (L3 – Skill):
    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)

7) **Demonstrate** how to fit helmet and safety glasses on an unconscious injured person who is wearing a cervical collar (L3 – Skill)

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.

Furthermore, 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.

Therefore, the use of collars in this instance is not considered as routine. For further information please refer to annex 6.

Note: There shall be at least 2 exercises per Course Participant - 1 sitting, 1 lying down; live injured person recommended

Note: Each Course Participant shall be able to demonstrate the above-mentioned skills on an injured person sitting and on an injured person lying down.

ELEMENT 4.1 - RISKS OF USING A CERVICAL COLLAR

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 extrication 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 extrication 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

Each Course Participant shall:

4.1.4 **Explain** the risks posed to an unconscious injured person who is wearing a cervical collar

4.1.5 **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

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 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 extrication 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 in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products

Each course participant shall:

4.2.12 Practice and **demonstrate** how to use methods other than a cervical collar to support the head and maintain the airway of an injured person during extrication

4.2.13 Practice and **demonstrate** 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

4.2.14 Practice and **demonstrate** 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 course participants to fit a harness onto the injured person and package him onto a rescue stretcher or a spineboard, to enable safe transportation of the injured person.

To successfully complete this lesson of the module, course participants must, unassisted:

1) **Demonstrate** how to fit helmet and safety glasses on an unconscious injured person wearing a rescue head support device (L3 – Skill)
2) **Demonstrate** how to fit a harness onto an unconscious injured person (L3 – Skill)
3) **Demonstrate** how to package an unconscious injured person on a rescue stretcher and on a spineboard. (L3 – Skill)
4) **Demonstrate** how to create an attachment point on a spineboard by attaching / choking an anchor sling through the handles of the foot and top of a spine board with a carabine attached (L3 – Skill)

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

1 exercise per Course Participant

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

ELEMENT 5.1 - PACKAGING THE INJURED PERSON

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 manual and the manufacturer's criteria or the participants own organisation

5.1.2 **Demonstrate** how to perform a pre-use inspection of the spineboard(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 carabiners
i. Metal parts
j. Attachment points
k. Back protection
l. Observe manufacturer's 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 spine board by attaching / choking an anchor sling through the handles at the foot and top of the spineboard with a carabiner attached

5.1.5 **Explain** how to package an unconscious injured person on a rescue stretcher and on a spineboard, adhering to the manufacturer's specifications

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

Each course participant shall:

5.1.8 Practice and **demonstrate** how to prepare, fit and check rescue head support and fit PPE helmet and safety glasses on an unconscious injured person

5.1.9 Practice and **demonstrate** how to, unaided, correctly and continuously perform the primary survey on an injured person who is wearing rescue head support

5.1.10 Practice and **demonstrate** how to fit a harness onto an unconscious injured person

5.1.11 Practice and **demonstrate** how to create an attachment point on a spine board by attaching / choking an anchor sling through the handles at the foot and top of the spineboard with a carabiner attached

5.1.12 Practice and **demonstrate** how to package an unconscious injured person on a rescue stretcher and on a spineboard, adhering to the manufacturer's specifications and ensuring a tight fit of restrain straps.

Note: If the spineboard and / or restrain strap manufacturer specifications allow, a crossing strap configuration packaging the injured person is preferred

Lesson 6 - LOWERING/RAISING RESCUE SYSTEM

25 min.

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

To successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to perform a pre-use inspection of a random pulley system and rescue device (L3 – Skill)
2) **Explain** the proper utilization of a pulley system (L2 – Knowledge)
3) **Explain** how to attach, rig and secure the system (L2 – Knowledge)
4) **Explain** requirements, applications and limitations of the system (L2 – Knowledge)
5) **Explain** the system's maximum raising distance possible (L2 – Knowledge)
6) **Explain** rigging setup options i.e. ways to combine rescue equipment and PPE lanyards (L2 – knowledge)

ELEMENT 6.1 - LOWERING/RAISING RESCUE SYSTEM

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 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, by following the principles of and covering:

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, carabiners and other hardware accessories following the same principles
j. Observe manufacturer's 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

Note: The above mentioned based on the manufacturer's specifications

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 accordance with manufacturers specifications, in a nacelle 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 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 in their own organisations on course completion requiring them to familiarise themselves with other rescue equipment products

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 Course 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).

To successfully complete this lesson of the module, Course Participants must be able to:

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
2) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios, relevant for various rescue scenarios
3) **Demonstrate** how to apply the concept of lifting angle, angle factor and deviation.
4) **Explain** how to control common risks of hazardous energies and common hazards of enclosed space areas in a WTG, when performing rescue operations
5) **Demonstrate** how 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 spineboard, lowering/raising rescue system (rescue device, pulley system or similar)
6) **Demonstrate** how to transition 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. 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 carabiner
7) **Demonstrate** how to fit a harness or improvised harness by the use of a rescue sling around the injured person's chest, and other relevant PPE (e.g. helmet, safety glasses) onto an injured person, in an enclosed space

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 extricating an injured person from an enclosed space *horizontally*.

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

8) **Demonstrate** how to package an injured person on a rescue stretcher and spineboard in a vertical or horizontal configuration to enable safe transportation, by doing regular checks, using rescue equipment such as rescue head support and avoiding head down configuration of the unconscious injured person.
9) **Demonstrate** how to manually transport an injured person on a rescue stretcher and on a spineboard - in a balanced way
10) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), when suspended
11) **Demonstrate** how to 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
12) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required
13) **Demonstrate** how to perform evacuation of an injured person from the nacelle to the base of the tower using personal flashlight (e.g. helmet light), if required due to poor lighting conditions
14) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy
15) **Demonstrate** how to 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
16) **Demonstrate** 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
17) Acknowledge the benefits of having a coordinator in a rescue team, and the responsibility that comes with it
18) Taking part in discussing which advanced rescue preparations, and emergency and communication procedures, apply in their own organisation.

Note: For **inside** evacuation, where possible, the course participants shall work in teams of two to four.

1 **inside** evacuation exercise per **course participant** from the nacelle to primary assembly area (either ground or transition piece).

Rescue device in an **active** setup.

Note: For **outside** evacuation, where possible, the course participants shall work in teams of two.

1 **outside** evacuation exercise per **team** from the nacelle to primary assembly area (either ground or transition piece).

Rescue device in a **passive** setup and using a tagline.

Note: During each exercise a course participant 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 TOWER

The instructor shall:

7.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

7.1.2 Introduce the specific exercise, including (to the extent needed):

a. Point out 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 to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

d. Highlight what 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/spineboard (i.e. harness front or back attachment point,

f. Highlight how to organize 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 Recapture the connected learning objectives/topics for this lesson in the evaluation (i.e. feedback to the course 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. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
e. Course Participant's risk mitigation during the exercise
f. Course participant's manual handling risk mitigation and application of further control measures

7.1.4 The Instructor shall guide and support the course participants with applying:

a. Manually operated lowering and raising systems.
b. Fall protection backup of injured person, if required

7.1.5 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

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

Course participants shall, in a team:

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 energy sources (mechanical, electrical, hydraulic, pressurized 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 **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

7.1.9 **Demonstrate** 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 spineboard)

7.1.10 **Demonstrate** how to manually transport an injured person (dummy) on a rescue stretcher or spineboard - in a balanced way - or by means of a tensioned line (zip line) when relevant

7.1.11 **Demonstrate** how to attach the rescue device to the injured person (dummy) in a safe and proper manner

7.1.12 **Demonstrate** how to utilize tagline(s) during one exercise, when performing outside evacuation

7.1.13 **Demonstrate** 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.

7.1.14 **Demonstrate** how to select and utilize certified and structural anchor points

7.1.15 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection

7.1.16 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system

7.1.17 **Demonstrate** how to apply rescue methods, techniques and clear and precise communication in performing safe ascending/descending rescue operations from a WTG

7.1.18 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

7.1.19 **Demonstrate** how to perform the rescue effort as a team member or team coordinator

7.1.20 **Demonstrate** 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)

7.1.21 **Demonstrate** 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), i.e. the rescuer controlling the descent located below the injured person, carrying the rope bag with him

7.1.22 **Demonstrate** 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:

a. 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) and,

b. Attaching the rescue device on the transition piece ensuring it is within reach and can be controlled without the risk of a fall from height and deviating the configuration over the transition piece crane boom (or similar) by the use of a pulley

7.1.23 **Demonstrate** 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 were 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 course 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 were first aid can be administered.

To successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to apply the techniques to successfully rescue the injured person from the enclosed space, in a controlled manner
2) **Explain** how to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in an enclosed space scenario
3) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, for relevant enclosed space scenarios
4) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation
5) **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
6) **Demonstrate** how to apply rescue methods and techniques in performing descending and ascending rescue operations, from a WTG, using a rescue stretcher and spineboard, lowering/raising rescue system (rescue device, pulley system or similar)
7) **Demonstrate** how 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

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 extricating an injured person from an enclosed space horizontally.

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

8) **Explain** how to assess and determine the suitable attachment point on the injured person and/or spineboard/rescue stretcher, i.e. harness front or back attachment point and in the top or bottom of the spineboard/rescue stretcher

9) **Demonstrate** how to 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 him out, constantly evaluating the rescue efforts

10) **Demonstrate** how to package an injured person on a rescue stretcher and spineboard in a vertical or horizontal configuration to enable safe transportation, by doing regular checks, using rescue equipment such as rescue head support and avoiding head down configuration of the unconscious injured person.

11) **Demonstrate** how to manually transport an injured person on a rescue stretcher or spineboard - in a balanced way

12) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), in a WTG, when suspended

13) **Demonstrate** how to 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

14) **Demonstrate** how to perform rescue operations, in a WTG, using the casualties personal fall protection on the injured person - as fall protection backup, if required.

15) **Demonstrate** how to perform rescue operations in a WTG enclosed space using personal flashlight (e.g. helmet light), if required due to poor lighting conditions

16) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy

17) **Demonstrate** how to 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

18) **Demonstrate** 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

19) **Demonstrate** 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)

20) Acknowledge the benefits of having a coordinator in a rescue team, and the responsibility that comes with it.

Note: Where possible the course participants shall work teams of two.

One course 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.

ELEMENT 8.1 - RESCUE FROM ENCLOSED SPACE - EXERCISES

The Instructor shall:

8.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

8.1.2 Introduce the specific exercise, including (to the extent needed):

a. Point out 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 optimize the rescue set up

c. To highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

d. To guide and support the Course Participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard

e. To highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)

f. To highlight how to organize the rescue team to the specific rescue operation scenario (who does what)

g. What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course participant's risk mitigation during the exercise.
e. Course participant's manual handling risk mitigation and application of further control measures

8.1.4 The Instructor shall guide and support the Course Participants with applying:

a. Manually operated lowering and raising systems.
b. Fall protection backup 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 course participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products

Course participants shall, in a team:

8.1.7 **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, pressurized 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

8.1.8 **Demonstrate** how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for a rescue scenario in a WTG

8.1.9 **Demonstrate** how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

8.1.10 **Demonstrate** 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

8.1.11 **Demonstrate** how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way

8.1.12 **Demonstrate** how to select and utilize certified and structural anchor points

8.1.13 **Demonstrate** How to apply the theory of Lifting angle, angle factor, deviation and edge protection

8.1.14 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system, if required

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

8.1.16 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

8.1.17 **Demonstrate** how to perform the rescue effort as a team member or team coordinator

8.1.18 Show acknowledgement of the added value of having a team coordinator

8.1.19 **Demonstrate** how to conduct a rescue operation in poor lighting conditions

8.1.20 **Demonstrate** how to transport the injured person to the escape hatch by means of a zip line (areal ropeway), to control the handling of injured person more efficiently and reduce manual handling

8.1.21 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 9 - 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 course participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

The Instructor shall:

9.1.1 Explain further control measures relevant for the specific training facilities and training to avoid injury during the training

9.1.2 Verify that the Course Participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions

9.1.3 Ensure that any hazardous energy sources which may affect the Course Participants during the practical training sessions are isolated and locked out and

that the status of the isolations has been communicated to the Course Participants

9.1.4 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.

9.1.5 Verify that each Course Participant who is working at height (either as a casualty or a rescuer) during the following practical exercises is always attached to a backup line prior to and at all times whilst working at height. GWO recommends that a SRL is used as a backup line.

Course participants shall:

9.1.6 Take part in the warm-up session of the major muscle groups and ankles, wrists and back

9.1.7 Perform a pre-use inspection of their Personal Fall Protection Equipment

9.1.8 Perform a 'buddy check' of another Course Participants personal fall protection equipment

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

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

Lesson 10 - RESCUE FROM CRAWL SPACE

200 min.

There are several locations on the turbine were 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 Course Participants to rescue an injured person from a crawl space to a location were first aid can be administered.

To successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to apply the techniques to successfully rescue the injured person from the crawl space, in a controlled manner. (L3 – Skill)
2) **Explain** how to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in a crawl space scenario. (L2 – Knowledge)
3) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, for relevant crawl space scenarios. (L3 – Skill)

4) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation. (L3 – Skill)

5) **Explain** how to identify and control common risks of hazardous energies and common hazards of crawl space areas in a WTG, when performing rescue operations. (L2 – Knowledge)

6) **Demonstrate** how 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. (L3 – Skill)

7) **Demonstrate** how 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. apply rescue head support, fit helmet, safety glasses etc.) onto an injured person, in a crawl space. (L3 – Skill)

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 extricating an injured person from an enclosed space horizontally.

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

8) **Explain** how to determine and **demonstrate** how to select the suitable attachment point on the injured person and/or spineboard/rescue stretcher, i.e. harness front or back attachment point and in the top or bottom of the spineboard/rescue stretcher. (L3 – Skill)

9) **Demonstrate** how to 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 him out, constantly evaluating the rescue efforts. (L3 – Skill)

10) **Demonstrate** how to perform rescue operations using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment. (L3 – Skill)

11) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)

12) **Demonstrate** 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. (L3 – Skill)

13) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

14) **Demonstrate** how to 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. (L3 – Skill)

15) **Demonstrate** 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. (L3 – Skill)

16) Acknowledge and **value** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it. (L3 – Attitude)

Note: Where possible the course participants shall work teams of two or four.

One course 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 10.1 - RESCUE FROM CRAWL SPACE - EXERCISES

The Instructor shall:

10.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

10.1.2 Introduce the specific exercise, including (to the extent needed):

a. Point out a team coordinator for the exercise, and introduce the tasks and responsibilities related to this function. Different rescue strategies, methods and techniques in order to optimise the rescue setup

b. To highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

c. To guide and support the Course Participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard

d. To highlight how to organize the rescue team to the specific rescue operation scenario (who does what)

e. What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course Participant's risk mitigation during the exercise
e. Course participant's manual handling risk mitigation and application of further control measures

10.1.4 The Instructor shall guide and support the Course Participants with applying:

a. Manually operated lowering and raising systems.
b. Fall protection backup of injured person, if required

10.1.5 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

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

Course participants shall, in a team:

10.1.7 **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, pressurized 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

10.1.8 **Demonstrate** how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

10.1.9 **Demonstrate** how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way

10.1.10 **Demonstrate** how to select and utilize certified and structural anchor points

10.1.11 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection.

10.1.12 **Demonstrate** 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

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

10.1.14 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

10.1.15 **Demonstrate** how to perform the rescue effort as a team member or team coordinator

10.1.16 Show acknowledgement of the added value of having a team coordinator

10.1.17 **Demonstrate** how to conduct a rescue operation in poor lighting conditions

10.1.18 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 11 - 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. 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 course 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.

To successfully complete this lesson of the module, participants shall be able to:

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, including a high awareness on the risk of the injured person getting stuck in the WTG (e.g. under a tower-tower sections). (L2 – Knowledge)

2) **Demonstrate** how to perform a pre-use inspection of a random power-driven lowering / raising rescue system. (L3 – Skill)

3) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios, relevant for various rescue scenarios. (L3 – Skill)

4) **Explain** and **demonstrate** the proper utilization of a specific power-driven lowering/raising rescue system, incl. 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. (L3 – Skill)

5) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation. (L3 – Skill)

6) **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. (L2 – Knowledge)

7) **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. (L2 – Knowledge)

8) **Demonstrate** how to apply 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 spineboard, raising rescue system (power driven rescue system). (L3 – Skill)

9) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), when suspended. (L3 – Skill)

10) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)

11) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

12) **Demonstrate** how to 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. (L3 – Skill)

13) **Demonstrate** how to apply clear communication and guidance to other emergency responders (e.g. helicopter crew or ambulance crew) including coordinating the handover of an injured person. (L3 – Skill)

14) Acknowledge and **value** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it. (L3 – Attitude)

15) **Demonstrate** how to utilize 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. (L3 – Skill)

16) **Demonstrate** how to utilize 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. (L3 – Skill)

Note: Where possible, the course participants shall work in teams of two.

There shall be a minimum of 3 exercises per team.

Note: Each **participant** shall perform 1 **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 Heli hoist platform.

Rescue device in an **active** setup.

Note: Each **team** shall perform 1 **outside** rescue up exercise from

the primary assembly area (transition piece), outside the tower, to the nacelle helicopter platform

Rescue device in a **passive** setup.

Note: During each exercise a course participant 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 11.1 - RESCUE UP - INTRODUCTION

The Instructor shall:

11.1.1 **Explain** the necessity and relevance of this module

11.1.2 **Explain** that the pre-use inspection of rescue equipment may be omitted only if it is permitted by the manufacturer's manual and the manufacturer's criteria or the course participants own organisations

11.1.3 **Demonstrate** how to perform a pre-use inspection of the rescue device driver, by following the principles of and covering:

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

11.1.4 **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 specifications allow – aiming for increased movability for the rescuer

11.1.5 **Discuss** with the course participants elements to consider when determining the rescue strategy, attending to 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

11.1.6 **Discuss** with the course participants requirements and procedures for helicopter rescue

11.1.7 Highlight the specific limitations of lifting distances of rescue devices, designed for lowering an injured person.

11.1.8 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

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

ELEMENT 11.2 - RESCUE UP, INSIDE AND OUTSIDE OF THE TOWER- PRACTICAL EXCERCISES.

The Instructor shall:

11.2.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

11.2.2 Introduce the specific exercise, including (to the extent needed):

a. Point out 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 recue device setup
c. Highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)
d. Highlight how to organize the rescue team to the specific rescue operation scenario (who does what)
e. What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course Participant's risk mitigation during the exercise
e. Course participant’s manual handling risk mitigation and application of further control measures

11.2.4 The Instructor shall guide and support the Course Participants with applying:

a. Power-driven raising rescue systems
b. Fall protection backup of injured person

11.2.5 **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

11.2.6 **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

11.2.7 **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 specifications allow

11.2.8 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

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

Course participants shall, in a team:

11.2.10 **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, pressurized 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 specifications allow)

11.2.11 **Explain** how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for a rescue up scenario

11.2.12 **Demonstrate** 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 him on a rescue stretcher or spineboard, respectively)

11.2.13 **Demonstrate** 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

11.2.14 **Demonstrate** how to select and utilize Certified and structural anchor points

11.2.15 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection.

11.2.16 **Demonstrate** how to rig and operate the rescue up system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilization of an injured person personal fall protection equipment backup system, if required

11.2.17 **Demonstrate** how to apply rescue methods, techniques and clear and precise communication in performing safe rescue up operations

11.2.18 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

11.2.19 **Demonstrate** how to perform the rescue effort as a team member or team coordinator.

11.2.20 **Demonstrate** how to perform a rescue up, of a rescue dummy, with the rescue device in a passive setup for rescue up outside of the tower

11.2.21 **Demonstrate** how to perform a rescue up, of a rescue dummy, with the rescue device in an active setup for rescue up inside of the tower or basement and safely apply rescuer fall protection using the vertical fall arrest system **or** the rescue device – if manufacturer's specifications allow

11.2.22 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 12 - EVALUATION

15 min.

The aim of this lesson is to enable the course 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 his/her way of work. Additionally, the aim is to give the course participants the opportunity to conduct an open-minded written and oral formative evaluation of the training.

To successfully complete this lesson of the module, course participants must:

1) Show commitment to avoid incidents requiring a rescue operation
2) Show commitment to act out this value by demonstrating a pro-active approach and role model behaviour
3) Participate in the formative evaluation of the module in a constructive manner

ELEMENT 12.1 - REFLECTION SESSION

The Instructor shall:

12.1.1 Give the course participants final feedback on the formal course participant performance assessment and inform them whether they have passed (failed course participants must be informed individually prior to the reflection session)

12.1.2 Help the course participant to do a summative self-evaluation, i.e. mentally overview and assort what is learned, identify key takeaways and bridge the gap between what is learned during the module and applying it in his/her way of work. This can be achieved e.g. by an individual reflection session, question session and/or class discussion

12.1.3 Re-present the overall aims and objectives of the course for the course participants' comparison on their learning outcome and meeting of their previously stated expectations of the course

12.1.4 Give an overall feedback and feed forward on the course participants' learning outcome

12.1.5 Encourage the course participants to examine and grow awareness of what specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualize and enhance learning transfer) and to discuss with colleagues advanced rescue methods and techniques under the local specific conditions identified after course completion

12.1.6 Motivate the course participants to avoid incidents requiring rescue efforts during daily work and demonstrating a pro-active approach and role model behavior.

ELEMENT 12.2 - FORMATIVE EVALUATION

Course participants shall:

12.2.1 Conduct an online or written formative evaluation of the module, as a minimum.

The Instructor shall:

12.2.2 Respond on relevant elements of any oral feedback from the Course Participants.

11 SINGLE RESCUER: HUB, SPINNER & INSIDE BLADE RESCUE (SR:HSIBR)

11.1 Aims and objectives of the Single Rescuer HSIBR Module

The aim of this module is to enable the course 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 Working at height.

Based on the course participants HSIBR Module qualifications, the single rescuer HSIBR Module shall ensure that course participants are able to;

1) Assess and determine single rescuer rescue strategy (relevant rescue method, technique, certified equipment and how to organize 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 spineboard, manually operated lowering/raising rescue system for limited distance rescue (rescue device, pulley system or similar), and other rescue equipment relevant to the Course Participant.

11.2 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.

11.3 Course Participant prerequisites for the Single Rescuer HSIBR Module

The single rescuer HSIBR module is an add on to the hub module, hence it is a prerequisite to have a valid HSIBR certificate. Valid GWO Working at heights, GWO First aid, and GWO Manual handling certificates are prerequisites for participation as well.

11.4 Duration of the Single Rescuer HSIBR Module

The total contact time for completing this module is estimated to be 4 hours and 20 minutes. This is based on the time estimate given in the module timetable.

The training provider must not exceed the times per day given in table 11-4 below.

The training provider must ensure that sufficient time is allowed for course participants with prior experience to share their experiences related to the module in a way that is constructive for the entire class.

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 11-4 - Maximum durations for training day

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

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

11.5 Trainer/Course Participant Ratio of the Single Rescuer HSIBR Module

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

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 Course Participant ratio
Single Rescuer HSIBR Module	Theory	1:12
	Practical	1:4

Table 11-5 - GWO Single rescuer HSIBR module instructor to Course Participant ratio

11.6 Equipment for the Single Rescuer HSIBR Module

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements as listed in table A3-3 in annex 3 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 course 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 course participant 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.

11.7 Timetable of the Single Rescuer HSIBR 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 total duration of practical elements is not reduced in length. Theoretical elements may be delivered during the practical exercises when feasible.

Lesson		Element		Approx, Duration
1	Introduction	1.1	Safety Instructions and Emergency Procedures Facilities Instructor & Course Participant Presentation Overall Aim & Objectives and Agenda Motivation On-Going Assessment	
			TOTAL	**15 min.**
2	Singular rescuer rescue strategy	2.1 2.1	Organisational strategy, in your own organisation, singular rescuer Evacuation strategy, singular rescuer	
			TOTAL	**30 min.**
3	Measures to prevent injury during training	3.1	Control measures and warm-up	
			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)	
			TOTAL	**90 min.**
6	Evaluation	6.1 6.2	Reflection Session Formative Evaluation	
			TOTAL	**15 min.**
			GRAND TOTAL	**260 min.**

Table 11-7 - GWO SR HSIBR Module timetable

11.8 Detailed description of the Single Rescuer HSIBR Module

Lesson 1 - INTRODUCTION

15 min.

The aim of this lesson is to introduce the course participants to the course, each other, the facilities and what is expected of them during the course.

To successfully complete this lesson of the module, course participants must be able to:

1) Explain the safety rules and emergency procedures of the training facilities
2) Locate emergency exits and equipment, and relevant training facilities
3) Recognize who the instructor and other Course Participants are
4) Describe the main aim and main learning objectives
5) Explain the on-going assessment according to Course Participants assessment form
6) State own expectations for the course.

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

The Instructor shall explain:

1.1.1 Safety instructions according to internal procedures

1.1.2 Emergency procedures and emergency exits in the areas where the Course Participants can be expected to be located during the course

ELEMENT 1.2 - FACILITIES

The Instructor shall give:

1.2.1 A general description of the on-site facilities (Administration, dining area, restrooms, etc.)

ELEMENT 1.3 - INSTRUCTOR & COURSE PARTICIPANT PRESENTATION

The Instructor shall:

1.3.1 Ensure that all Course Participants are registered with a personal Course Participant profile in WINDA and have provided their WINDA ID prior to completing the training course.

1.3.2 Give a short introduction, including their backgrounds as instructors

Course participants shall:

1.3.3 Give a short introduction, including their job function, onshore/offshore experience, time of employment in the wind industry, and expected primary geographic work location, etc.

1.3.4 Present his/her own expectations for the course

ELEMENT 1.4 - OVERALL AIM & OBJECTIVES AND AGENDA

The Instructor shall explain:

1.4.1 The overall aim & objectives and agenda of this ART Module

ELEMENT 1.5 - MOTIVATION

The Instructor shall explain:

1.5.1 Why advanced rescue preparedness and skills are relevant

1.5.2 The importance of personal involvement in the course

1.5.3 How the Course Participants will be challenged, and why

ELEMENT 1.6 - ON-GOING ASSESSMENT

The Instructor shall explain:

1.6.1 The reasons for the on-going assessment

1.6.2 The GWO Course Participant Assessment Form and its use

1.6.3 What is expected of the Course Participants

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.

To successfully complete this lesson of the module, course participants must be able to:

1) **Explain** focal areas of single rescuer Advanced Rescue operations most likely to have greater consequence compared to Advanced Rescue operations performed in teams (L2 – Knowledge)
2) Take part in discussing what specific rescue preparations, and emergency, communication and command procedures, apply in their own organization. (L2 – KNOwledge)

3) Recognize the limitations of the rescue preparations available, when deciding on the single rescuer rescue strategy, attending to a clear and preferred evacuation route for the injured person outside or inside the tower. (L2 – Knowledge)

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

The Instructor and course participants shall discuss:

2.1.1 What specific rescue preparations and emergency and communication procedures apply in their own organization, 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 (during this training) concerning what specific elements in their own WTG type/WTG environment might differ from the training scenario environment (to visualize and enhance learning transfer)

2.1.3 Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, Heli pad).

ELEMENT 2.2 - EVACUATION STRATEGY, SINGLE RESCUER

Course participants 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 organize 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 / utilize / layout 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, attending to a clear and preferred evacuation route and the limitations related to the singular rescue

2.2.7 **Demonstrate** how to establish means of escape

2.2.8 **Demonstrate** how to establish means of communication with incident/site command in own organization

2.2.9 **Explain** that a singleton 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** their 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 you are not able to successfully complete the rescue operation, and what to do in this situation

2.2.11 **Demonstrate** how to reduce manual handling to a minimum due to the risk of 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 course participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

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 course 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 course participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the course 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 Verify that each course participant who is working at height (either as a casualty or a rescuer) during the following practical exercises is always attached to a backup line prior to and at all times whilst working at height. GWO recommends that a SRL is used as a backup line.

Course Participants shall:

3.1.6 Take part in the warm-up session of the major muscle groups and ankles, wrists and back

3.1.7 Perform a pre-use inspection of their Personal Fall Protection Equipment

3.1.8 Perform a 'buddy check' of another course participants personal fall protection equipment

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

It is important that the course 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 were 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 course participants to successfully perform injured person rescue operations, in a WTG blade and out of the hub, as a single rescuer.

To successfully complete this lesson of the module, course participants must be able to:

1) Acknowledge 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. (L2 – Knowledge)
2) **Demonstrate** what equipment to rig/utilize/layout where, aiming to achieve a correct and efficient setup the first time and minimizing re-rigging during the rescue operation. (L3 – Skill)
3) **Demonstrate** how to ensure rigging setup can be operated as intended, by one person. (L3 – Skill)
4) **Demonstrate** where he should be located during the rescue operation and how he can move from one side of the IP to the other (if relevant). (L3 – Skill)
5) **Demonstrate** how to establish means of escape. (L3 – Skill)
6) **Demonstrate** means of communication with (simulated) incident/site command in own organization. (L3 – Skill)
7) Acknowledge limitations in own capacity – and **explain** how to cope with this and what to do in this type of situation. (L2 – Knowledge)
8) **Demonstrate** how to reduce manual handling to a minimum. (L3 – Skill)

9) **Demonstrate** how to perform the rescue operation using an injured person personal fall protection equipment backup system, if required (i.e. if the manually operated lowering/raising rescue system is not certified for person lifting). (L3 – Skill)

10) **Demonstrate** how to perform scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

11) **Demonstrate** 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. (L3 – Skill)

Note: One course 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)

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, including (to the extent needed):

4.1.3 Point out a single rescuer for the exercise, and introduce the task

4.1.4 Highlight that single rescuer is expected to apply the principals, methods and techniques from hub rescue operations in a team, and incorporate the mentioned single rescuer focal areas in his efforts

4.1.5 Guide and support the course participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard)

4.1.6 Highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)

4.1.7 Highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

4.1.8 What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback

b. Improvement proposals and alternative solutions

c. Course participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)

d. The importance of planning

e. Course participant's risk mitigation during the exercise.

f. Course participant's manual handling risk mitigation and application of further control measures

4.1.10 The Instructor shall guide and support the course participants with applying fall protection backup of injured person, if required

Each course participant shall:

4.1.11 **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, pressurized 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

4.1.12 **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

4.1.13 **Demonstrate** how to prepare the injured person for safe transportation (i.e. apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

4.1.14 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system, if required

4.1.15 **Demonstrate** how to apply rescue methods, techniques and clear communication in performing safe lowering/raising rescue operations from inside a WTG blade

4.1.16 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

4.1.17 **Demonstrate** how to perform a rescue operation, from a WTG blade, through the hub and e.g. out of the hub or into the nacelle

4.1.18 **Demonstrate** 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 to this lesson as well - but from inside the spinner.

Additionally, to successfully complete this lesson of the module, course participants must be able to:

1) Transport the injured person to the escape hatch by means of a zip line (areal ropeway), to control the handling of injured person more efficiently and reduce manual handling

Note: One course participant per exercise.

It is recommended that a rescue dummy is used for these exercises.

ELEMENT 5.1 - HUB RESCUE EXERCISE 3+4 (FROM SPINNER)

The Instructor shall conduct the elements mentioned in the elements of lesson 4 above which applies to this element as well - but related to the spinner

Additionally, the instructor shall:

5.1.1 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.)

5.1.2 **Explain** the concept of a tensioned line (zip line) in a nacelle, how to rig it and adhering hazards and risks

ELEMENT 5.2 - HUB RESCUE EXERCISE 3+4 (FROM SPINNER)

Course participants shall demonstrate and on request explain, how to conduct the elements mentioned in the lesson elements above (lesson 4) which applies to this element as well - but related to the spinner

Additionally, each course participant shall:

5.2.1 **Demonstrate** how to rig a tensioned line (zip line) in a nacelle and transport the injured person to the escape hatch

5.2.2 **Demonstrate** how to perform rescue operations using a headlamp (e.g. helmet light), if required due to poor lighting conditions.

Lesson 6 - EVALUATION

15 min.

The aim of this lesson is to enable the course 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 his/her way of work. Additionally, the aim is to give the course participants the opportunity to conduct an open-minded written and oral formative evaluation of the training.

To successfully complete this lesson of the module, course participants must:

1) Show commitment to avoid incidents requiring a rescue operation
2) Show commitment to act out this value by demonstrating a pro-active approach and role model behaviour
3) Participate in the formative evaluation of the module in a constructive manner.

ELEMENT 6.1 - REFLECTION SESSION

The Instructor shall:

6.1.1 Give the course participants final feedback on the formal course participant performance assessment and inform them whether they have passed (failed course participants must be informed individually prior to the reflection session)

6.1.2 Help the course participant to do a summative self-evaluation, i.e. mentally overview and assort what is learned, identify key takeaways and bridge the gap between what is learned during the module and applying it in his/her way of work. This can be achieved e.g. by an individual reflection session, question session and/or class discussion

6.1.3 Re-present the overall aims and objectives of the course for the course participants' comparison on their learning outcome and meeting of their previously stated expectations of the course

6.1.4 Give an overall feedback and feed forward on the course participants' learning outcome

6.1.5 Encourage the course participants to examine and grow awareness of what specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualize and enhance learning transfer) and to discuss with colleagues advanced rescue methods and techniques under the local specific conditions identified after course completion

6.1.6 Motivate the course participants to avoid incidents requiring rescue efforts during daily work and demonstrating a pro-active approach and role model behaviour.

ELEMENT 6.2 - FORMATIVE EVALUATION

Course participants shall:

6.2.1 Conduct an online or written formative evaluation of the module, as a minimum.

The Instructor shall:

6.2.2 Respond on relevant elements of any oral feedback from the Course Participants.

12 SINGLE RESCUER: NACELLE, TOWER & BASEMENT RESCUE (SR:NTBR)

12.1 Aims and objectives of the Single Rescuer NTBR Module

The aim of this module is to enable the course 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 Working at height.

Based on the course participants NTBR Module qualifications, the single rescuer NTBR Module shall ensure that course participants are able to;

1) Assess and determine single rescuer rescue strategy (relevant rescue method, technique, certified equipment and how to organize 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 spineboard, manually operated and power-driven lowering/raising rescue system (rescue device and pulley system or similar), and other rescue equipment relevant to the Course Participant.

12.2 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.

12.3 Course 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 certificate. Valid GWO Working at heights, GWO First aid, and GWO Manual handling certificates are prerequisites for participation as well.

12.4 Duration of the Single Rescuer NTBR Module

The total contact time for completing this module is estimated to be 4 hours and 20 minutes. This is based on the time estimate given in the module timetable.

The training provider must not exceed the times per day given in table 12-4 below.

The training provider must ensure that sufficient time is allowed for course participants with prior experience to share their experiences related to the module in a way that is constructive for the entire class.

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 12-4 - Maximum durations for training day

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

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

12.5 Trainer/Course Participant Ratio of the Single Rescuer NTBR Module

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

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 Course Participant ratio
Single Rescuer HSIBR	Theory	1:12
	Practical	1:4

Table 12-5 - GWO SR HSIBR Module instructor to course participant ratio

12.6 Equipment for the Single Rescuer NTBR Module

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements as listed in table A3-4 in annex 3 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 course 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 course participant 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.

12.7 Timetable of the Single Rescuer NTBR 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 the duration of practical elements is not reduced in length. Theoretical elements may be delivered during the practical exercises when feasible.

Lesson		Element		Approx. Duration
1	Introduction	1.1	Safety Instructions and Emergency Procedures	
		1.2	Facilities	
		1.3	Instructor & Course Participant Presentation	
		1.4	Overall Aim & Objectives and Agenda	
		1.5	Motivation	
		1.6	On-Going Assessment	
			TOTAL	**15 min.**
2	Emergency Response Plan in Your Own Organization	2.1	Emergency Response Plan in Your Own Organization	
		2.2	Evacuation Strategy	
			TOTAL	**30 min.**
3	Measures to prevent injury during training	3.1	Control measures and warm-up	
			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	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 and Outside of the Tower - Practical Exercises	
			TOTAL	**40 min.**
8	Evaluation	8.1	Reflection Session	
		8.2	Formative Evaluation	
			TOTAL	**15 min.**
			GRAND TOTAL	**260 min.**

Table 12-7 - GWO SR NTBR Module timetable

12.8 Detailed description of the Single Rescuer HSIBR Module

Lesson 1 - INTRODUCTION

15 min.

The aim of this lesson is to introduce the course participants to the course, each other, the facilities and what is expected of them during the course.

To successfully complete this lesson of the module, course participants must be able to:

1) Explain the safety rules and emergency procedures of the training facilities
2) Locate emergency exits and equipment, and relevant training facilities
3) Recognize who the instructor and other course participants are
4) Describe the main aim and main learning objectives
5) Explain the on-going assessment according to course participants assessment form
6) State own expectations for the course

ELEMENT 1.1 - SAFETY INSTRUCTIONS AND EMERGENCY PROCEDURES

The Instructor shall explain:

1.1.1 Safety instructions according to internal procedures

1.1.2 Emergency procedures and emergency exits in the areas where the course participants can be expected to be located during the course

ELEMENT 1.2 - FACILITIES

The Instructor shall give:

1.2.1 A general description of the on-site facilities (Administration, dining area, restrooms, etc.)

ELEMENT 1.3 - INSTRUCTOR & COURSE PARTICIPANT PRESENTATION

The Instructor shall:

1.3.1 Ensure that all Course Participants are registered with a personal course participant profile in WINDA and have provided their WINDA ID prior to completing the training course.

1.3.2 Give a short introduction, including their backgrounds as instructors

Course participants shall:

1.3.3 Give a short introduction, including their job function, onshore/offshore experience, time of employment in the wind industry, and expected primary geographic work location, etc.

1.3.4 Present his/her own expectations for the course

ELEMENT 1.4 - OVERALL AIM & OBJECTIVES AND AGENDA

The Instructor shall explain:

1.4.1 The overall aim & objectives and agenda of this ART Module, highlighting the rescue team coordinator functionality

ELEMENT 1.5 - MOTIVATION

The Instructor shall explain:

1.5.1 Why advanced rescue preparedness and skills are relevant

1.5.2 The importance of personal involvement in the course

1.5.3 How the course participants will be challenged, and why

ELEMENT 1.6 - ON-GOING ASSESSMENT

The Instructor shall explain:

1.6.1 The reasons for the on-going assessment

1.6.2 The GWO Course participant assessment form and its use

1.6.3 What is expected of the Course participants

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.

To successfully complete this lesson of the module, course participants must be able to:

1) **Explain** focal areas of single rescuer Advanced Rescue operations most likely to have greater consequence compared to Advanced Rescue operations performed in teams. (L2 – Knowledge)
2) Take part in discussing what specific rescue preparations, and emergency, communication and command procedures, apply in their own organization in order to support the singleton Rescue operation. (L2 – Knowledge)

3) **Explain** the limitations of the rescue preparations available, when deciding on the single rescuer rescue strategy, attending to a clear and preferred evacuation route for the injured person outside or inside the tower. (L2 – Knowledge)

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

The Instructor and course participants shall discuss:

2.1.1 What specific rescue preparations and emergency and communication procedures apply in their own organization, 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 visualize and enhance learning transfer)

2.1.8 Turbine design (e.g. layout, pathways, access ways, components, obstacles, hatches, Heli pad).

ELEMENT 2.2 - EVACUATION STRATEGY, SINGULAR RESCUER

Each course participant 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 organize 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 / utilize / layout 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, 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.

2.2.7 **Demonstrate** how to establish means of communication with incident/site command in own organization

2.2.8 Be aware that a singleton rescue operation could take more time, then a team rescue operation and the effect this could have on the medical condition of the IP.

2.2.9 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 you are not able to successfully complete the rescue operation, and what to do in this situation

2.2.10 **Demonstrate** how to reduce manual handling to a minimum due to the risk of 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 course participants are briefed in the control measures employed in the training area and to warm up prior to performing rescue exercises.

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 course 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 course participants during the practical training sessions are isolated and locked out and that the status of the isolations has been communicated to the course 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 Verify that each course participant who is working at height (either as a casualty or a rescuer) during the following practical exercises is always attached to a backup line prior to and at all times whilst working at height. GWO recommends that a SRL is used as a backup line.

Course participants shall:

3.1.6 Take part in the warm-up session of the major muscle groups and ankles, wrists and back

3.1.7 Perform a pre-use inspection of their personal fall protection equipment

3.1.8 Perform a 'buddy check' of another course participants personal fall protection equipment

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

It is important that the course 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 course 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.

To successfully complete this lesson of this module, course participants must be able to:

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. (L2 – Knowledge)
2) **Demonstrate** how 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 spineboard, lowering/raising rescue system (rescue device, pulley system or similar), as a single rescuer. (L3 – Skill)
3) **Demonstrate** how to package an injured person on a rescue stretcher and spineboard 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. (L3 – Skill)
4) **Demonstrate** how to manually transport an injured person on a rescue stretcher and on a spineboard - in a balanced way. (L3 – Skill)
5) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), when suspended. (L3 – Skill)

6) **Demonstrate** how to 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. (L3 – Skill)

7) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)

8) **Demonstrate** how to perform evacuation of an injured person from the nacelle to the base of the tower using personal flashlight (e.g. helmet light), if required due to poor lighting conditions. (L3 – Skill)

9) **Demonstrate** how to perform scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

10) **Demonstrate** 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. (L3 – Skill)

Note: One exercise for one course 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.

ELEMENT 4.1 - PRACTICAL EXERCISE EVACUATION INSIDE OF TOWER

The Instructor shall:

4.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

4.1.2 Introduce the specific exercise, including (to the extent needed):

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/spineboard

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/spineboard (i.e. harness front or back attachment point,

e. What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course Participant's risk mitigation during the exercise
e. Course participant's manual handling risk mitigation and application of further control measures

4.1.4 The Instructor shall guide and support the Course Participants with applying:

a. Fall protection backup of injured person, if required.

Each course participant shall:

4.1.5 **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, pressurized 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

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

4.1.7 **Demonstrate** 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 him on a rescue stretcher or spineboard)

4.1.8 **Demonstrate** how to manually transport an injured person (dummy) on a rescue stretcher or spineboard - in a balanced way - or by means of a zip line (areal ropeway) when relevant

4.1.9 **Demonstrate** how to attach the rescue device to the injured person (dummy) in a safe and proper manner

4.1.10 **Demonstrate** 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.

4.1.11 **Demonstrate** how to select and utilize Certified and structural anchor points

4.1.12 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection

4.1.13 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system

4.1.14 **Demonstrate** how to apply rescue methods, techniques and clear and precise communication in performing safe ascending/descending rescue operations from a WTG

4.1.15 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

4.1.16 **Demonstrate** 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). Thus, the rescuer controlling the descent should be located below the injured person

4.1.17 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 5 - RESCUE FROM ENCLOSED SPACE

50 min.

There are several locations in the nacelle were 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 Course 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 were first aid can be administered.

To successfully complete this lesson of the module, course participants must be able to:

1) **Demonstrate** how to apply the techniques to successfully rescue the injured person from the enclosed space, in a controlled manner. (L3 – Skill)

2) **Explain** how to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in an enclosed space scenario. (L2 – Knowledge)

3) **Demonstrate** how to apply rescue methods and techniques in performing descending and ascending rescue operations, from a WTG, using a rescue stretcher and spineboard, lowering/raising rescue system (rescue device, pulley system or similar). (L3 – Skill)

4) **Demonstrate** how 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. Apply

rescue head support, fit helmet, safety glasses etc.) onto an injured person, in an enclosed space. (L3 – Skill)

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 extricating an injured person from an enclosed space horizontally.

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

5) **Demonstrate** how to assess and determine the suitable attachment point on the injured person and/or spineboard/rescue stretcher, i.e. harness front or back attachment point and in the top or bottom of the spineboard/rescue stretcher
6) **Demonstrate** how to 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 him out, constantly evaluating the rescue efforts
7) **Demonstrate** how to package an injured person on a rescue stretcher and spineboard 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
8) **Demonstrate** how to manually transport an injured person on a rescue stretcher or spineboard - in a balanced way
9) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), in a WTG, when suspended
10) **Demonstrate** how to 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
11) **Demonstrate** how to perform rescue operations, in a WTG, using the casualties personal fall protection on the injured person - as fall protection backup, if required
12) **Demonstrate** how to perform rescue operations in a WTG enclosed space using personal flashlight (e.g. helmet light), if required due to poor lighting conditions
13) **Demonstrate** how to perform scene assessment and hazard identification, assessing and determining the rescue strategy
14) **Demonstrate** 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

15) **Demonstrate** how to transport an injured person horizontally over the length of the turbine, with the use of industry rescue equipment rigged as a tensioned line (zip line)

Note: One exercise for one course 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.

ELEMENT 5.1 - RESCUE FROM ENCLOSED SPACE - EXERCISES

The Instructor shall:

5.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

5.1.2 Introduce the specific exercise, including (to the extent needed):

5.1.3 Different rescue strategies, methods and techniques in order to optimize the rescue set up, e.g. refresh how to rig a zip line (areal ropeway) and/or methods/techniques to evacuate from transition piece to secondary assembly area (vessel)

5.1.4 Highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

5.1.5 Guide and support the Course Participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard

5.1.6 Highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)

5.1.7 Highlight what specific elements/course contents the instructor's assessment will include

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

a. Positive feedback

b. Improvement proposals and alternative solutions

c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)

d. Course Participant's risk mitigation during the exercise

e. Course participant's manual handling risk mitigation and application of further control measures

5.1.9 The Instructor shall guide and support the Course Participants with applying:

a. Manually operated lowering and raising systems.

b. Fall protection backup of injured person, if required

Each course participant shall:

5.1.10 **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, pressurized 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

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

5.1.12 **Demonstrate** how to prepare the injured person for safe transportation (i.e. Apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

5.1.13 **Demonstrate** 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

5.1.14 **Demonstrate** how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way

5.1.15 **Demonstrate** how to select and utilize Certified and structural anchor points

5.1.16 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection

5.1.17 **Demonstrate** 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 utilization of an injured person personal fall protection equipment backup system, if required

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

5.1.19 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

5.1.20 **Demonstrate** how to conduct a rescue operation in poor lighting conditions

5.1.21 **Demonstrate** how to transport the injured person to the escape hatch by means of a zip line (areal ropeway), to control the handling of injured person more efficiently and reduce manual handling

5.1.22 **Demonstrate** 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 were 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 Course Participants to rescue an injured person from a crawl space to a location were first aid can be administered, as a single rescuer.

To successfully complete this lesson of the Module, Course Participants must be able to:

1) **Demonstrate** how to apply the techniques to successfully rescue the injured person from the crawl space, in a controlled manner. (L3 – Skill)
2) **Demonstrate** how to assess and determine rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) in a crawl space scenario. (L3 – Skill)
3) **Demonstrate** how 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. (L3 – Skill)
4) **Demonstrate** how 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 a crawl space. (L3 – Skill)

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 extricating an injured person from an enclosed space horizontally.

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

5) **Demonstrate** how to assess and determine the suitable attachment point on the injured person and/or spineboard/rescue stretcher, i.e. harness front or back attachment point and in the top or bottom of the spineboard/rescue stretcher. (L3 – Skill)

6) **Demonstrate** how to 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 him out, constantly evaluating the rescue efforts. (L3 – Skill)

7) **Demonstrate** how to perform rescue operations using safe and suitable (certified or structural) anchor points, lifting angles, deviation, and edge protection for the rescue equipment. (L3 – Skill)

8) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)

9) **Demonstrate** how to prepare the injured person for safe transportation, by doing regular checks, using rescue equipment such as cervical collar and avoiding head down configuration of the unconscious injured person. (L3 – Skill)

10) **Demonstrate** how to perform scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

11) **Demonstrate** 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. (L3 – Skill)

Note: One exercise for one course 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.

ELEMENT 6.1 - RESCUE FROM CRAWL SPACE - EXERCISES

The Instructor shall:

6.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 2.6 Control measures to avoid injury during training

6.1.2 Introduce the specific exercise, including (to the extent needed):

6.1.3 Different rescue strategies, methods and techniques in order to optimize the rescue set up

6.1.4 To highlight the considerations to determine where in the WTG to package the injured person on a rescue stretcher/spineboard

6.1.5 To guide and support the Course Participants with exploring different rigging options of attaching the lowering/raising rescue system to the injured person or rescue stretcher/spineboard (i.e. harness front or back attachment point, or attachment point at the foot of the rescue stretcher/spineboard

6.1.6 What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course Participant's risk mitigation during the exercise
e. Course participant's manual handling risk mitigation and application of further control measures

6.1.8 The Instructor shall guide and support the Course Participants with applying:

a. Manually operated lowering and raising systems
b. Fall protection backup of injured person, if required

Each course participant shall:

6.1.9 **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, pressurized 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 WAH put into an advanced rescue context)
h. Slips and trips

6.1.10 **Demonstrate** how to prepare the injured person for safe transportation (i.e. Apply rescue head support, fit harness and other PPE, and package him on a rescue stretcher or spineboard)

6.1.11 **Demonstrate** how to apply proper manual handling techniques when transporting the injured person in a balanced and secure way

6.1.12 **Demonstrate** how to select and utilize certified and structural anchor points

6.1.13 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection

6.1.14 **Demonstrate** 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

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

6.1.16 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

6.1.17 **Demonstrate** how to conduct the rescue operation in poor lighting conditions

6.1.18 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

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 Course 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.

To successfully complete this lesson the course participants shall be able to:

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, including a high awareness on the risk of the injured person getting stuck in the WTG (e.g. under a tower-tower sections). (L2 – Knowledge)
2) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, relevant for various rescue scenarios. (L3 – Skill)
3) **Explain** and **demonstrate** the proper utilization of a specific power-driven lowering/raising rescue system, including: (L3 – Skill)
    a. how to properly attach, rig and secure the system,

b. requirements, applications, limitations,

c. means of tethering and

d. the maximum raising distance possible for the system and associated battery power source

4) **Explain** national and local 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. (L2 – Knowledge)

5) **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, as a singleton rescuer. (L2 – Knowledge)

6) **Demonstrate** how to apply 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 spineboard, raising rescue system (power driven rescue system). (L3 – Skill)

7) **Demonstrate** how to change directly from balancing an injured person from a horizontal position to a vertical configuration (and vice versa), when suspended. (L3 – Skill)

8) **Demonstrate** how to perform rescue operations, using the casualties personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)

9) **Demonstrate** how to perform scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)

10) **Demonstrate** how to apply clear communication and guidance to other emergency responders (e.g. helicopter crew or ambulance crew) including coordinating the handover of an injured person. (L3 – Skill)

11) **Demonstrate** how to utilize 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. (L3 – Skill)

Note: One inside rescue up exercise for one course 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

Note: Exercise includes: Rescue strategy planning, rescue efforts and Instructor-Led evaluation

ELEMENT 7.1 - RESCUE UP - INTRODUCTION

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 permitted by the manufacturer's manual and the manufacturer criteria or the course participants own organisation

7.1.3 **Demonstrate** how to perform a pre-use inspection of the power-driven lowering / raising rescue system required / chosen to deliver this module, by following the principles of and covering:

a. Markings and labels
b. Equipment is within the period of formal inspections
c. The product operating temperature range, in particular 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 manufacturer's use manual for specific or additional requirements

7.1.4 **Demonstrate** the method of rigging and operating the power-driven devices including relevant technical specifications, requirements, applications, limitations, means of tethering preventing drop and the maximum raising distance possible for the specific complete power-driven lowering/raising rescue system and ensuring sufficient battery power (fully charged)

7.1.5 Discuss with the Course Participants elements to consider when determining the rescue strategy, attending to 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 Course Participants the 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 course participants in their own organisations on course completion, requiring them to familiarise themselves with other rescue equipment products

ELEMENT 7.2 - RESCUE UP, INSIDE OF THE TOWER- PRACTICAL EXCERCISE.

The Instructor shall:

7.2.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to the section on Control measures to avoid injury during training

7.2.2 Introduce the specific exercise, including (to the extent needed):

7.2.3 Introduce relevant rescue strategy, method and technique, including active or passive recue device setup

7.2.4 Highlight what injured person configuration to apply (i.e. horizontal or vertical configuration)

7.2.5 Highlight how to organize the rescue team to the specific rescue operation scenario (who does what)

7.2.6 What specific elements/course contents the instructor's assessment will include

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

a. Positive feedback
b. Improvement proposals and alternative solutions
c. Course Participants' reflections on what specific elements in their own WTG environment/practice differ from the training scenario environment (to visualize and enhance learning transfer)
d. Course Participant's risk mitigation during the exercise
e. Course participant’s manual handling risk mitigation and application of further control measures

7.2.8 The Instructor shall guide and support the Course Participants with applying:

a. Power-driven raising rescue systems
b. Fall protection backup of injured person.

Each course participant shall:

7.2.9 **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, pressurized 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

7.2.10 **Demonstrate** how to assess and determine the most optimum rescue strategy (relevant rescue method, technique, certified equipment, and required personnel) for a rescue up scenario

7.2.11 **Demonstrate** how to prepare the injured person for safe transportation (i.e. fit cervical collar, harness and other PPE, and package him on a rescue stretcher or spineboard, respectively)

7.2.12 **Demonstrate** 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

7.2.13 **Demonstrate** how to select and utilize Certified and structural anchor points

7.2.14 **Demonstrate** how to apply the theory of Lifting angle, angle factor, deviation and edge protection.

7.2.15 **Demonstrate** how to rig and operate the rescue up system in a proper manner aiming to achieve a safe and efficient rigging setup, including the utilization of an injured person personal fall protection equipment backup system, if required

7.2.16 **Demonstrate** 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

7.2.17 **Demonstrate** how to perform regular checks of the injured person during the entire rescue operation

7.2.18 **Demonstrate** how to perform a rescue up, with the rescue device in an active setup for rescue up inside of the tower

7.2.19 **Demonstrate** how to reduce the risks associated with manual handling and apply further control measures where applicable

Lesson 8 - EVALUATION

15 min.

The aim of this lesson is to enable the Course 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 his/her way of work. Additionally, the aim is to give the Course Participants the opportunity to conduct an open-minded written and oral formative evaluation of the training.

To successfully complete this lesson of the Module, Course Participants must:

1) Show commitment to avoid incidents requiring a rescue operation
2) Show commitment to act out this value by demonstrating a pro-active approach and role model behaviour
3) Participate in the formative evaluation of the module in a constructive manner.

ELEMENT 8.1 - REFLECTION SESSION

The Instructor shall:

8.1.1 Give the Course Participants final feedback on the formal Course Participant performance assessment and inform them whether they have passed (failed Course Participants must be informed individually prior to the reflection session)

8.1.2 Help the Course Participant to do a summative self-evaluation, i.e. mentally overview and assort what is learned, identify key takeaways and bridge the gap between what is learned during the module and applying it in his/her way of work. This can be achieved e.g. by an individual reflection session, question session and/or class discussion

8.1.3 Re-present the overall aims and objectives of the course for the Course Participants' comparison on their learning outcome and meeting of their previously stated expectations of the course

8.1.4 Give an overall feedback and feed forward on the Course Participants' learning outcome

8.1.5 Encourage the Course Participants to examine and grow awareness of what specific elements in their own WTG type/WTG environment differ from the training scenario environment (to visualize and enhance learning transfer) and to discuss with colleagues advanced rescue methods and techniques under the local specific conditions identified after course completion

8.1.6 Motivate the Course Participants to avoid incidents requiring rescue efforts during daily work and demonstrating a pro-active approach and role model behavior.

ELEMENT 8.2 - FORMATIVE EVALUATION

Course Participants shall:

8.2.1 Conduct an online or written formative evaluation of the module, as a minimum.

The Instructor shall:

8.2.2 Respond on relevant elements of any oral feedback from the Course Participants.

13 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.

13.1 Duration of the Combined GWO ART Module

The total contact time for completing the combined ART module is estimated to be 20 hours and 30 minutes. This is based on the time estimate given in the module timetable.

The training provider must not exceed the times per day given in table 9-2 below.

The training provider must ensure that sufficient time is allowed for Course Participants with prior experience to share their experiences related to the module in a way that is constructive for the entire class.

	Maximum duration per day
Contact time	8 hours
Total training day	10 hours

Table 13-1 - Maximum durations for training day

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

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

13.2 Trainer/Course Participant Ratio of the Combined GWO ART Module

The ratio shown for theory sessions indicates the maximum number of Course Participants that can attend the course.

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 Course Participant ratio
Combined GWO ART module	Theory	1:12
	Practical	1:4

Table 13-2 - Combined GWO ART Instructor to Course Participant ratio

13.3 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 program. 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 Rescuer: Hub, Spinner and Inside Blade Rescue	SART-H
Single Rescuer: Nacelle, Tower and Basement Rescue	SART-N

Table 13-3 - GWO ART course codes

13.4 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 utilized for theoretical and/or practical course contents, where the Training Provider finds it provides most value to the Course Participants.

Lesson		**Element**		**Approx. Duration**
1	Introduction (Ref. modules 1 & 2: lesson 1)	1.1 1.2 1.3 1.4 1.5 1.6	Safety Instructions and Emergency Procedures Facilities Instructor & Course Participant Presentation Overall Aim & Objectives and Agenda Motivation On-Going Assessment	
			TOTAL	**15 min.**
2	Emergency Response Plan in Your Own Organization (Ref. modules 1 & 2: lesson 2)	2.1 2.1	Emergency Response Plan in Your Own Organization Evacuation Strategy	
			TOTAL	**30 min.**
3	Measures to prevent injury during training (day 1, 2 & 3)	3.1	Control measures and warm-up	

	(Ref. modules 1 & 2: lesson 3)			
			TOTAL	**60 min.**
4	Head support during rescue (Ref. modules 1 & 2: lesson 4)	4.1 4.2	Risks of using a Cervical Collar 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 6.2	Lowering/Raising Rescue System Rigging setup options – combining rescue equipment and PPE lanyards	
			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	**90 min.**
8	Hub Rescue Exercise 3 & 4 (From Spinner) (Ref. module 1: lesson 8)	8.1	Hub Rescue Exercise 3+4 (From Spinner)	
			TOTAL	**90 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 12.2	Rescue Up - Introduction Rescue Up, Inside and Outside of the Tower - Practical Exercises	
			TOTAL	**90 min.**
13	Single Rescuer (Ref. module 3 & 4: lesson 7)	13.1 13.2	Single Rescuer - Introduction Single Rescuer - Practical Exercises; - 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 13-4 - ART combined module timetable

ANNEX 1 - PARTICIPANT PERFORMANCE ASSESSEMENT FORM

Course Participant full name as in passport:						
Course Participant WINDA ID:						
Course module:						
Date of completion:						
Scenario Organisation	Violation of Assessment Measures			0-2 passed 3 failed	Instructor Remarks	
Aware of personal and group safety at all times						
Organises and utilises correct equipment for given scenario						
Organises individuals and groups as required						
Scenario Management						
Establishes and maintains control of the exercise scenario at all times						
Fully participates in the exercise scenario						
Follows instructions when required						
Demonstrates correct and safe Manual Handling in exercise scenario						
Knowledge and Understanding						
Applies subject knowledge correctly in given scenario						
Demonstrates understanding of subject						
Total Marks			0-9 Pass 10-27 Fail		PASS: ☐	FAIL: ☐
Instructor Name (in CAPITAL letters)						
Instructor Signature						
Training provider						

ANNEX 2 - MEDICAL SELF-ASSESSMENT FORM

Your personal health is your own responsibility. Your Training Provider shall not be held responsible for any illness whatsoever during or after the training. I hereby confirm that I have read and understood the listed risks and potentially life-threatening medical conditions and that I am physically and medically fit to participate in GWO Training.

I hereby confirm that there is no factor that will inhibit or affect my participation in GWO Training. I agree to follow all instructions from the appointed Instructor for the duration of the GWO Training. Should there be any doubt regarding my medical fitness, the training provider will stop the training and seek a physician's advice.

Name as in passport	
Course Participant WINDA ID	
Course module	
Signature and date	

The following conditions could pose a risk, when you participate in GWO training

- Asthma or other respiratory disorders
- Epilepsy, blackouts or other fits
- Angina or other heart complaints
- Vertigo or inner ear problems (difficulty with balance)
- Claustrophobia/Acrophobia (fear of enclosed area/height)
- Blood pressure disorder
- Diabetes
- Pacemaker or implanted defibrillator
- Arthritis, osteoarthritis or other muscular/ skeletal disorders affecting mobility
- Known allergies (E.g. bee, wasps or spider stings / bites)
- Recent surgery
- Any other medical condition or medication dependency that could affect climbing or physical impact of climbing

ANNEX 3 - EQUIPMENT LISTS

The following pages contain the lists of equipment required for delivering each of the modules contained within this training standard. Any equipment used by the training provider and Course Participants during the delivery of training under this standard must satisfy or exceed the requirements of the equipment standards for the time being in force in the country where the training is taking place.

Where training takes place in a country where there are no equipment standards for the equipment being used, then the equipment used by the training provider and the Course Participants during the delivery of training under this standard shall satisfy or exceed the requirements of the European (EN) standards.

Note: All equipment shall be maintained and where appropriate, inspected and tested in accordance with current national standards/legislation and manufacturers' recommendations.

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
2) Spineboard
    a. 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 spine board with a carabiner attached
3) Cervical collar for rescue purpose
    a. At least two different products:
        i. One rigid collar
        ii. One soft collar
4) Manually operated lowering/raising rescue systems for limited distance rescue
    a. Pulley system, with rope grab
        i. At least two different products
    b. Rescue device
        i. At least two different products – must have differences in design, functionality and operation
        ii. Must be compatible with a power driver for a rescue device
5) Power driver for a rescue device
6) Pulleys

7) Edge protector for rope
8) Tag line
9) Headlamp
10) Radios when applicable
11) Rescue dummy min. 50 kg/110 lbs.

GWO BST/BSTR Working at Heights related equipment:

1) Full body harness
    a. At least two different products
2) Work restraint lanyards
    a. At least two different products
3) Fixed length fall arrest lanyards with an energy absorber
    a. One flexible Y-type
    b. One fixed adjustable Y- or I-type
    c. Recommended, but not required: One fixed or flexible V-type
4) Helmets and safety glasses
5) Vertical fall arrest system
6) Self-Retractable Lifeline (SRL)
7) 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 in EN7795 type B, anchor devices)

8) Karabiner with mandatory automatic locking system
9) 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 fixed length 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 6.75 m (22.15’) for the rescue and evacuation exercises.

The recommended height is based upon the following formula,

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

Where,

RD	=	Required Fall Distance Clearance (minimum anchor point height)
LL	=	Length of Lanyard
DD	=	Deceleration Distance (fall distance)
HH	=	Height of Suspended Worker
C	=	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 2.00 m.

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

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

and,

$$RD = 2.00\ m + 1.75\ m + 2.00\ m + 1.00\ m,$$

therefore,

$$RD = 6.75\ m.$$

Therefore, the GWO recommends that the anchor points used during the evacuation exercises are placed a minimum of 6.75 m (22.15') 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 A3-1a.

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.

	Country Specific Equipment Standards (North America & Europe)			
Equipment	**Europe**	**North America**	**China**	**United Kingdom**
Rescue stretcher	EN 1865-1+A1 EN 1497	ANSI/OSHA class III harness standards		BS EN 1865-1+A1 BS EN 1497
Manually operated lowering/raising rescue systems for limited distance rescue				
Pulley system	EN 567			BS EN 567
Full Body Harness	EN 361 Or EN 813	ANSI / CSA Z259.10 ANSI / CSA Z359.3 ANSI /CSA Z359.11 OSHA 1926.28	GB 6095 GB/T 6096	BS EN 361 Or BS EN 813
Work Restraint Lanyards	EN 358	ANSI Z359.1-2 OSHA 1910.28 OSHA 1910.29 1926 Subpart M		BS EN 358
Fixed length Fall arrest lanyards	EN 355	ANSI / CSA Z259.2.5 ANSI / CSA Z259.11 ANSI /CSA Z359.3 OSHA 1910.28 OSHA 1910.29 1926 Subpart E	GB 24543	BS EN 355
Helmets	EN 397+A1	OSHA 1910.1333 OSHA 1926.28	GB 2811 GB/T 2812	BS EN 397+A1
Vertical fall arrest systems	EN 353-1+A1 EN 353-2 EN 1891 EN 892	ANSI / CSA Z259.2.5	GB 24542 GB/T 24537	BS EN 353-1+A1 BS EN 353-2 BS EN 1891 BS EN 892
SRL	EN 360	ANSI / CSA Z259.2.2 ANSI / CSA Z359.1-2 OSHA 1910.28 OSHA 1910.29 1926 Subpart M	GB 24544	BS EN 360
Anchor Points	EN 795	ANSI Z259.15 ANSI Z259.18 CSA Z259.15 CSA Z259.18	GB 30862	BS EN 795
Slings	EN 566		GB/T 30587 GB/T 20118	BS EN 566
Karabiners	EN 362		GB/T 23469	BS EN 362
Evacuation / Rescue devices	EN 341 EN 1496	ANSI / CSA Z259.2.3		BS EN 341 BS EN 1496
Vertical aluminium ladders	EN 131-2 EN 14122-4		GB/T17889.1 GB/T 17889.2	BS EN 131-2 BS EN 14122-4

Table A3-1a - Country specific equipment standards - ART Modules

ANNEX 4 - GUIDELINE FOR WARM-UP EXERCISES

Body part/major muscle group	Exercise	Duration/repetitions
Head	**Head rotations:** • Rotate your head clockwise and counter clockwise	10 repetitions (five each way)
Shoulders	**Shoulders rotation:** • Place your legs at shoulder-width • Feet straight and toes facing forward • Keep your arms straight at your sides • Perform both shoulders rotation clockwise and counter clockwise	10 repetitions
Arms	**Arm swings and big arm circles:** • Stand up straight with your feet shoulder-width apart • Rotate your arms forward making big circles and then switch rotating backwards.	10 times (clockwise) 10 times (counter clockwise) 10 times (in opposite directions)
Wrists	**Wrist rotation:** • Perform wrists rotation in both directions	10 repetitions (for each wrist)
Torso	**Torso swings:** • Stand with your legs straight • Place your feet at shoulder-width • Bend your torso forward 90 degrees • Raise both arms straight to the outside	15 repetitions (to each side)
Hips	**Hip rotation:** • Place your hands on your hips and keep your head straight • Perform extensive hips rotation	10 repetitions (clockwise) 10 repetitions (counter clockwise)
Thighs	**Squats:** • Stand with your legs straight • Place your feet at shoulder-width • Push your hips back and slowly bend your knees. • Keep your back straight and your eyes looking forward. • Raise yourself back up when your knees reach a 90-degree angle	15 repetitions
Ankle	**Ankle rotation:** • Place your feet slightly apart • Perform rotation for each foot clockwise and counter clockwise	10 repetitions (for each foot)
Back	**Back stretch:** • Open legs slightly and place hands on the hips • Turn to the right and left • Incline the back to the right and left • Move Back forward and backward	

Table A4 - Suggested warm-up exercises

ANNEX 5 - 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 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 of common wind turbine emergency rescue related hazards, included but not limited to:

1) Injured person getting stuck due to structure interference
2) Use of improper anchor point for injured person transportation
3) Ropes, slings and similar breaking due to sharp edges
4) Improper rescue method and technique
5) Physical shock, mental stress, exhaustion, fatigue due time-consuming rescue
6) Challenging weather conditions for rescue: wind speed, extreme temperatures and alike
7) Due to limited space difficulties to put harness and other rescue equipment onto an injured person and prepare the injured person for safe transportation
8) Collision of injured person and vessel when delivering the injured person down to the vessel, due to vessel moving up and down

9) Burns from contact HV-cables or hyperthermia during rescue operation
10) Improper PPE of rescuer and/or placing improper PPE onto injured person
11) Improper means of communication during rescue operation
12) Improper positioning of turbine parts
13) Movable parts of the wind turbine not locked properly
14) Etc.

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

1) An integrated emergency response plan
2) Sufficiently trained personnel
3) Dedicated advanced rescue equipment

3. SUFFICIENTLY TRAINED PERSONNEL

GWO recommends that decisions concerning the ratio of 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
2) Organizational limitations to ensure that the required AR trained personnel are available. Such as variations in the team's composition and size.
3) 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 amount 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 advices 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 spine board, suitable to manoeuvre within the turbine

2) Cervical collar
3) Manually operated lowering/raising rescue systems for limited distance rescue
4) Rescue device and/or pulley system with rope grab
5) 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
6) Pulleys
7) Edge protector for rope
8) Tag line of sufficient length
9) Flash light (helmet light)
10) 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 3.

ANNEX 6 - HEAD SUPPORT DURING RESCUE

1. PURPOSE

The purpose of this annex is to explain the risks associated with using a rigid or semi rigid cervical collar (cervical collar), the mitigation steps to minimise the risks, explain how the use of a cervical collar in a rescue setting is not considered routine and to present some alternative methods to support the head and manage the airway of an unconscious injured person during extrication 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 immobilization. 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.

Extrication 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 extrication 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 extrication 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 upmost importance.

Head support and airway maintenance can be achieved through manual in-line stabilization (MILS) where a rescuer actively supports the head with their hands, or through the use of a spine 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. Due limited space the use of a spine board with headblocks can be a hinderance or a complete obstruction to the extrication 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 spine 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. RISKS 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 extricating 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.