GLOBAL WIND ORGANISATION

TRAINING STANDARD

Advanced Rescue Training Refresher (ARTR)

(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
NTBRR	Nacelle, Tower and Basement Rescue Refresher
PPE	Personal Protective Equipment
SAR	Search and Rescue
SRL	Self-Retractable Lifeline
WAH	Working At Heights
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 (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	Areal 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 meaning 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 course participant to conduct pre-use inspection and to use other rescue equipment products compared to those taught during this Module – based on the manufacturer's user manual but without additional formal training. Consequently, a potential task is placed upon the course participant 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 ARTR 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 refresh the manual handling training as part of the ARTR course.

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

Table of contents

- Updated to reflect changes to the standard.

Terms and definitions

- Updated with additional items.

Change log

- Format and layout changed for ease of reading.

5.2 Aims and objectives

- Amended to include manual handling refresher.

5.6 Duration of ARTR 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

- Amended to require the instructor to be qualified to teach GWO manual handling.

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.

7.1 Taxonomy

- Explanation inserted after table 7-1.

8.3 Taxonomy

- Text and table 8-3 amended to include manual handling refresher.

Section 9 Hub, Spinner and inside Blade rescue module

- Moved from section 10 to align layout across GWO Standards.

Section 10 Nacelle, Tower and Basement rescue module

- Due to moving section 10, all subsections renumbered to 10.xx.

10.3 Course participants prerequisites for the NTBR rescue module

- inserted.

10.4 Duration of the NTBR 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 NTBR rescue module

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

10.7 NTBR rescue module timetable

- Times adjusted in line with module changes.

10.8 Detailed description of the NTBR rescue module

Lesson 1 – introduction

- Time reduce to 15 minutes.

Lesson 2 – Emergency response plan in your own organisation

- 2.1.1, 2.1.2 &2.1.6 layout changed for ease of reading.
- 2.2.1 layout changed for ease of reading.
- 2.2.8 inserted.
- 2.2.12 & 2.2.13 inserted.

Lesson 3 – Knowledge review

- Time increased to 75 minutes (due to addition of element 3.10)
- Learning objective 9 inserted.
- Phrase 'knowledge of' removed from all element titles.
- 3.1.4 & 3.1.5 inserted.
- 3.3.1, 3.3.2 & 3.2.3 reworded for clarification.
- Element 3.10 inserted.

Lesson 4 – Measures to prevent injury during training

- Name changed.
- Content and duration aligned with BST W@H.

Lesson 5 – Manual handling

- New lesson. Based on BST W@HR combined module.

Lesson 6 – Safe and correct use of rescue equipment from ladder

- Renumbered from lesson 5. To accommodate new lesson 5.
- Instructor notes moved to after learning objectives.
- 6.1.1 & 6.1.2 inserted.

Lesson 7 – Working at height – self evacuation

- Renumbered from lesson 6. To accommodate new lesson 5.
- Instructor notes moved to after the learning objectives.
- Learning objective 2 inserted.
- 7.1.4 & 7.1.5 inserted.

Lesson 8 – measures to prevent injury during training

- New lesson reflecting two-day training course.

Lesson 9 – Evacuation of an injured person …

- Renumbered from lesson 7. To accommodate new lesson 5 & 8.
- Instructor notes moved to after the learning objectives.
- Note inserted after learning objective 6.
- 9.1.3.e inserted.
- 9.1.5 & 9.1.6 inserted.
- 9.1.7 layout changed for ease of reading.
- 9.1.9 terminology changed form 'cervical collar' to rescue head support'
- 9.1.22 & 9.1.23 inserted.

Lesson 10 – Rescue from an enclosed space

- Renumbered from lesson 8. To accommodate new lesson 5 & 8.
- Instructor notes moved to after the learning objectives.

- Note inserted after learning objective 8.
- 10.1.3.e inserted.
- 10.1.5 & 10.1.6 inserted.
- 10.1.7 layout changed for ease of reading.
- 10.1.21 inserted.

Lesson 11 – Rescue from a crawl space

- Renumbered from lesson 9. To accommodate new lesson 5 & 8.
- Instructor notes moved to after the learning objectives.
- Note inserted after learning objective 9.
- 11.1.3.e inserted.
- 11.1.5 & 11.1.6 inserted.
- 11.1.7 layout changed for ease of reading.
- 11.1.18 inserted.

Lesson 12 – Rescue up

- Renumbered from lesson 10. To accommodate new lesson 5 & 8.
- Instructor notes moved to after the learning objectives.
- Learning objective 2 inserted.
- 12.1.2 & 12.1.3 inserted.
- 12.1.4 layout changed for ease of reading.
- 12.1.4.g inserted.
- 12.1.8 & 12.1.9 inserted.
- 12.2.3.e inserted.
- 12.2.5 to 12.2.9 inserted.
- 12.2.10 layout changed for ease of reading.
- 12.2.22 inserted.

Lesson 13 – Evaluation

- Renumbered from lesson 11. To accommodate new lesson 5 & 8.
- Time reduced to 15 minutes.

Annex 3 – Equipment list

- Updated in light of generic approach.
- Requirement for an anchor point height of 6.75 m changed to a recommendation. Based on changes to GWO WAH. References to a minimum height requirement of 6.75 m have been removed throughout the standard,

Annex 5 – Manual handling risk assessment

- Inserted.

Annex 6 – Head support during rescue

- Inserted

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.

The ART Standard was 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 the Nacelle, Tower & Basement Refresher incl. Working at Heights Refresher training that are recommended by the members of GWO.

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 Steering Committee.

5 General Requirement to GWO NTBRR Training

Upon completion of the Global Wind Organisation (GWO) NTBRR training Course participants will be able to access and rescue an injured person from the Nacelle, Tower and Basement section.

5.1 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.

5.2 Aims and objectives

The aim of the NTBRR module is to review and build on previously gained knowledge and skills from the ART Nacelle, Tower & Basement training as well as working at heights and manual handling training through theoretical and practical training. Hence, enable course participants to perform entry-type injured person rescue operations, in a WTG, using industry standard rescue equipment, rescue methods and techniques.

5.3 Conformity with other Training

The GWO NTBRR 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 NTBRR are met the Training Provider may choose to incorporate delivery of other similar certified training.

5.4 Legal requirements

The Training Provider shall identify whether national legislation sets additional requirements for NTBRR or prohibits delivery of certain elements.

If so, the Training Provider shall incorporate these identified requirements in the training.

5.5 Duration of NTBRR Module

The total contact time for completing the stand-alone modules in this advanced rescue refresher training standard is estimated to be ***14 hours***. This is based on the time estimates given in the module timetables and summarised in table 5-5 below.

The training provider must not exceed the times per day given in table 5-6 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 in a way that is constructive for the entire class.

Module	Duration
Nacelle, Tower and Basement Rescue Refresher (NTBRR)	14 Hours

Table 5-5 - Duration of the GWO ART NTBRR Module

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

Table 5-6 - 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).

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

5.6 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 practical elements are 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.

Note: If all refresher modules are delivered to the same course participants, the redundant elements shall be exchanged to other relevant exercises.

5.7 Validity period

The NTBRR Module 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 NTBRR 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 Period
Nacelle, Tower & Basement Rescue Refresher (NBTRR)	24 Months

Table 5-7 - GWO NBTRR Certificate validity period

5.8 Course participant prerequisites for the NTBRR

All personnel participating in NTBRR 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 NTBRR course.

Valid GWO ART - Nacelle, Tower & Basement, GWO 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 NTBRR training.

5.9 Physical demands

The NTBRR Module is 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 NTBRR Module

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 CRITERIA FOR TRAINING PROVIDERS OFFERING GWO TRAINING.

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 the modules, to enable them to maintain and update skills related to the 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 compared 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 the 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 for the "Rescue up" exercises, to simulate basement/tower rescue.
2) 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)
3) 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

4) Structural and certified anchor points.

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.

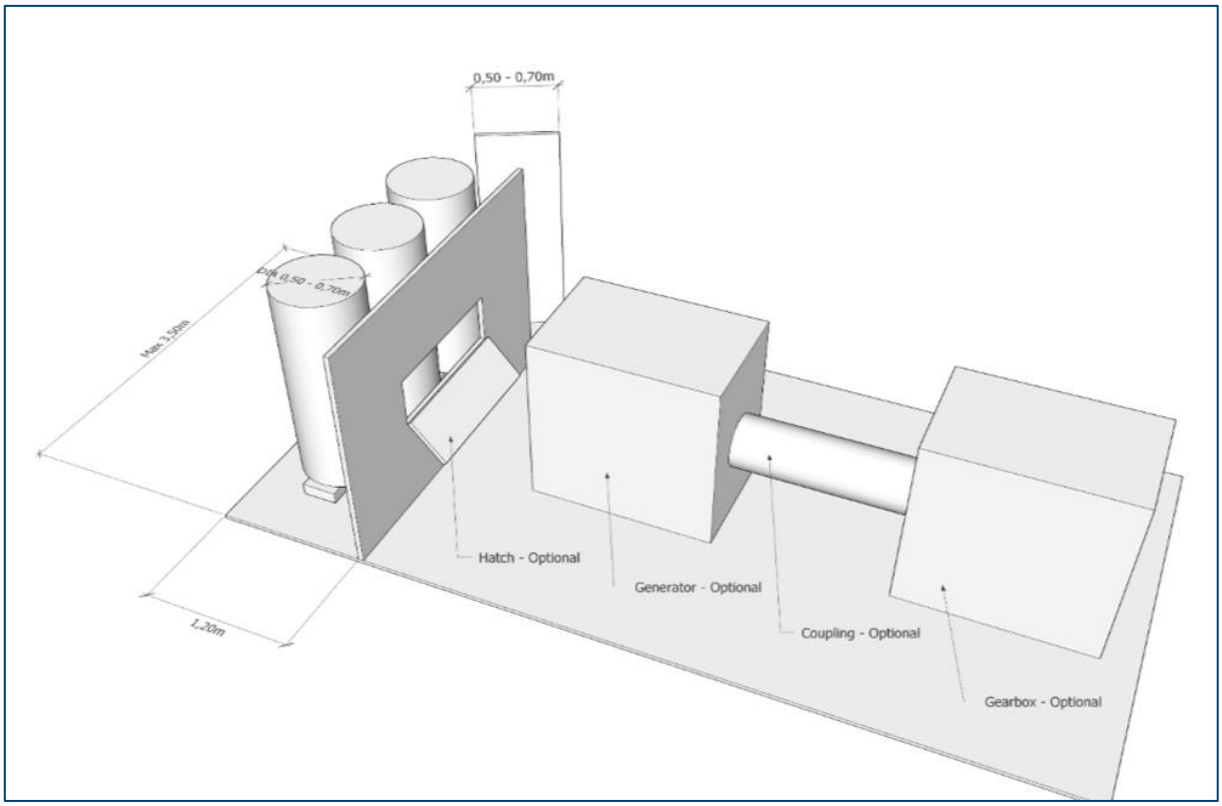


Figure 6-4 - Recommended dimensions for the Nacelle Mock-up

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, "training 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 safety equipment is applied to this Module aiming to avoid potential product specific additional training on completion of this Module, which may be required by the 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. guided type fall arresters), 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;
b. use the value for shock absorber elongation that is provided by the equipment manufacturer, and,
c. demonstrate that the equipment will prevent the person from coming into contact with the ground or structure directly below the anchor point, and,
d. 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,
e. the potential fall factor shall not exceed 0.5, and,
f. 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 NTBRR MODULE

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 Trainer keeps a course participant Assessment Form (or adaptation) for each course participant until the completion / evaluation of the NTBRR 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 NTBRR module, they shall attend a new NTBRR Module.

Training Provider 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. The training providers are required to upload the ART-NR, WAHR & MHR records separately to WINDA.

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
Nacelle, Tower & Basement Rescue Refresher	ART-NR
Working at Heights Refresher	WAHR
Manual handling refresher	MHR

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, SPINNER AND INSIDE BLADE REFRESHER

Delivery of the Hub Refresher module covers same content, duration, learning objectives as described in the initial Hub module standard.

The Hub module training can consist of first time Course participants and refresher Course participants in the same classroom. The training is designed to allow the more experienced Course participants to contribute more actively and share their knowledge with the refresher Course participants.

Note: If training is conducted with first time Course participants and refresher Course participants in the same classroom then first time Course participants shall receive an ART-H record in WINDA and refresher Course participants shall receive an ART-HR record in WINDA.

10 NACELLE, TOWER & BASEMENT RESCUE REFRESHER

10.1 Aims and objectives of NTBRR Module

The aim of this module is to review and build on previously gained knowledge and skills from the Nacelle, Tower & Basement module as well as the BST Working at Heights and manual handling modules 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.

The Nacelle, Tower and Basement Rescue Refresher module shall ensure that 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
20) Describe the legal requirements, and explain the risks posed by manual handling in a wind turbine
21) Safely and correctly move objects utilizing correct manual handling techniques

Course participants will show signs of:

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

10.2 Competencies of the NTBRR Module

1) Perform ascending and descending 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.

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

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

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

10.3 Course Participant prerequisites for the NTBR 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 training.

10.4 Duration of the NTBRR Module

The total contact time for completing this advanced rescue refresher training 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 9-3 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 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).

10.5 NTBRR Trainer/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	Instructor to Course participant Ratio
Nacelle, Tower & Basement Rescue Refresher	Theory	1:12
	Practical	1:4

Table 9-4 - GWO NTBRR Instructor to course participant ratio

10.6 Equipment for NTBRR Module

The equipment required for training as listed in Annex 3 must be available and must fulfil national legal requirements of the country where the training is taking place.

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 NTBRR Module Timetable

The order in which the elements of this NTBRR 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	Knowledge Review	3.1	Falls	
		3.2	Correct fitting of harness	

		3.3 3.4 3.5 3.6 3.7 3.8 3.9 3.10	Fall arrest lanyards Anchor points Fall arrest systems and fall prevention How to attach a guided type fall arrester Safe and correct use of a SRL Rescue and evacuation devices Inspection of PPE, rescue and evacuation devices Manual handling	
			TOTAL	**75 min.**
4	Measures to prevent injury during training	4.1	Control measures & warm-up	
			TOTAL	**20 min.**
5	Manual Handling	5.1	Manual handling Exercises	
			TOTAL	**30 min.**
6	Working at height - Rescue from Ladder	6.1	Safe and correct use of rescue equipment from ladder	
			TOTAL	**80 min.**
7	Working at height - Self-Evacuation	7.1	Safe and controlled self-evacuation	
			TOTAL	**35 min.**
8	Measures to prevent injury during training	8.1	Control measures & warm-up	
			TOTAL	**20 min.**
9	Evacuation of an injured person from the Nacelle to the Base of the Tower	9.1	Practical exercise Evacuation inside and outside of tower	
			TOTAL	**120 min.**
10	Rescue from Enclosed Space	10.1	Enclosed space rescue - Exercises	
			TOTAL	**110 min.**
11	Rescue from Crawl Space	11.1	Rescue from Crawl Space - Exercises	
			TOTAL	**200 min.**
12	Rescue Up	12.1 12.2	Rescue Up - Introduction Rescue up, inside and outside of the tower - Practical Exercises	
			TOTAL	**90 min.**
13	Evaluation	13.1 13.2	Reflection Session Formative Evaluation	
			TOTAL	**15 min.**
			GRAND TOTAL	**840 min.**

Table 9-6 - GWO NTBRR Module timetable

10.8 Detailed description of the Nacelle, Tower & Basement Refresher Module

The learning outcomes specified for the Nacelle, Tower & Basement Refresher 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 main aim, main 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 ORGANIZATION

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) Focus on 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 ORGANIZATION

The instructor and course participants 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 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 speeds, 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 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 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 avoid head down configuration of the unconscious injured person - preventing stomach content release.

2.2.13 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

2.2.14 **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 3 - KNOWLEDGE REVIEW

75 min.

The aim of this lesson is to reduce the risk of short-term and long term injuries when working at height in a wind turbine and during the practical elements of this course by refreshing the course participants knowledge of working at heights and manual handling.

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

1) **Demonstrate** how to perform pre-use inspections of personal fall protection equipment, rescue and evacuation devices. (L3 – Skill)

2) **Demonstrate** the correct use of personal fall protection equipment. (L3 – Skill)
3) **Demonstrate** how to attach a guided type fall arrester to the fall arrest system. (L3 – Skill)
4) **Demonstrate** how to correctly utilize a fall arrest lanyard, including attachment to the ladder system. (L3 – Skill)
5) **Demonstrate** how to use a work positioning lanyard in order to leave hands free for work. (L3 - Skill)
6) **Explain** how to select certified and suitable anchor points. (L2 – Knowledge)
7) **Explain** the different maximum angles that are allowed. (L2 – Knowledge)
8) **Demonstrate** the safe and correct use of SRL as a backup line. (L3 – Skill)
9) **Explain** how to reduce the risks associated with manual handling tasks. (L2 – Knowledge)

ELEMENT 3.1 - FALLS

The instructor shall:

3.1.1 Show examples of and **explain** fall indicators on equipment

3.1.2 **Explain** how different situations can influence the approach to the rescue, injuries / no injuries

3.1.3 **Explain** the risks posed by suspension trauma

3.1.4 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

3.1.5 **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

ELEMENT 3.2 - CORRECT FITTING OF A HARNESS

During the scenario-based training course participants shall:

3.2.1 **Demonstrate** how to carry out a pre-use inspection of a harness

3.2.2 **Demonstrate** how to correctly fit a harness

ELEMENT 3.3 - FALL ARREST SYSTEMS AND FALL PREVENTION

Course participants shall:

3.3.1 **Describe** the legal compliance of rail / wire vertical fall arrest systems

During the scenario-based training course participants shall:

3.3.2 **Demonstrate** how to use the work positioning lanyard

3.3.3 **Demonstrate** how to work with free hands, safely and securely

ELEMENT 3.4 - FALL ARREST LANYARDS

The instructor shall:

3.4.1 Show examples of and **Explain** the differences between a double and twin fall arrest lanyard

3.4.2 **Demonstrate** how to use double fall arrest lanyard

3.4.3 **Demonstrate** how to use twin fall arrest lanyard

During the scenario-based training course participants shall:

3.4.4 **Demonstrate** how to attach the fall arrest lanyard to the ladder system in a safe way

3.4.5 **Demonstrate** how to correctly attach fall arrest lanyards to their harness

ELEMENT 3.5 - ANCHOR POINTS

The instructor shall:

3.5.1 **Explain** the requirements of certified and structural anchor points

3.5.2 **Explain** how to identify suitable anchor points.

During the scenario-based training course participants shall:

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

ELEMENT 3.6 - ATTACHING A GUIDED TYPE FALL ARRESTER

The Instructor shall:

3.6.1 **Explain** the safe and correct use of an SRL for exercises (a) Different types of SRL systems that exist and how they are used, what length they come in, and difference between wire - straps

3.6.2 **Demonstrate** how to apply a SRL correctly to the harness, either to the attachment point (A - point) on the back or to the attachment point (A - point) in the front

3.6.3 **Explain** the different places an SRL is allowed to be secured

3.6.4 **Explain** the importance of using an SRL as a backup during exercises

3.6.5 **Demonstrate** how to conduct a pre-use inspection and see if an SRL is approved, possesses documentation and authorization date

Course participants shall:

3.6.6 **Describe** which regional legislation applies to their device

3.6.7 **Describe** the legal compliance of rail / wire vertical fall arrest systems

During the scenario-based training course participants shall:

3.6.8 **Demonstrate** correct choice and use of equipment

3.6.9 **Demonstrate** correct attachment to rail or wire

3.6.10 **Demonstrate** correct attachment to harness

ELEMENT 3.7 - SAFE AND CORRECT USE OF A SRL

During the scenario-based training course participants shall:

3.7.1 **Demonstrate** safe and correct use of a SRL

ELEMENT 3.8 - RESCUE AND EVACUATION DEVICES

Course participants shall explain:

3.8.1 **Explain** when and how to use rescue and evacuation devices

3.8.2 **Describe** which regional legislation applies to their devices

3.8.3 **Explain** the requirements for inspection/ certification (vacuum packed/ not vacuum packed)

ELEMENT 3.9 - INSPECTION OF PPE, RESCUE AND EVACUATION DEVICES

Course participants shall, with guidance from the training staff, if required:

3.9.1 **Describe** which regional legislation applies to their PPE

3.9.2 **Describe** formal inspection periods for certification of PPE in their region

3.9.3 **Explain** the requirements for inspection / certification

3.9.4 **Demonstrate** how to carry out a pre-use inspection of their PPE

3.9.5 **Demonstrate** how to carry out a pre-use inspection of rescue and evacuation devices

ELEMENT 3.10 - MANUAL HANDLING

The instructor shall:

3.10.1 Lead a discussion about manual handling, covering the following:

a. Consequences of long-term injuries arising from poor manual handling

b. Symptom awareness

c. Typical reporting methods for injuries

3.10.2 **Explain** spinal anatomy and posture

3.10.3 **Explain** and **demonstrate** how to plan manual handling tasks using the T.I.L.E Principle and a MAC tool (Manual handling Assessment Chart tool) - considering the load weight, maximum reaching distance and aggravating factors (refer to annex 4)

3.10.4 **Explain** and **demonstrate** risk Controls and manual handling Techniques with a focus on avoiding manual handling and using suitable handling aids

3.10.5 Inform the course participants that they will be observed and evaluated on applying manual handling theory and practical skills during the remaining part of the module

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 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The Instructor shall:

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

4.1.2 Verify that the course participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions

4.1.3 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

4.1.4 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.

4.1.5 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:

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

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

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

Lesson 5 - MANUAL HANDLING

30 min.

The aim of this lesson is to refresh the course participants knowledge and skills to be able to use the appropriate methods to control and reduce the risk of injuries.

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

1) **Demonstrate** how to safely and correctly move objects utilizing correct manual handling techniques (L3 – Skill)

ELEMENT 5.1 - MANUAL HANDLING PRACTICAL EXERCISES

Each course participant shall:

5.1.1 **Demonstrate** a hierarchical approach to controlling the risks associated with manual handling through the following exercises and subsequent rescue exercises:

a. Reducing the need for manual handling using handling aids where possible

b. Planning and execution of manual handling using the T.I.L.E. Principle and MAC tool - considering the load weight, maximum reaching distance and aggravating factors

5.1.2 **Demonstrate** the ability to apply further control measures where applicable:

a. PPE correct fit (e.g. correct sizes, boot laces tied)

b. Breaking up loads

c. Protecting pre-existing injuries

d. Adequate lighting

e. Good housekeeping

Lesson 5 Notes:

1) Each Course participant would benefit most if they participate in a practice scenario based on a wind turbine work environment.

2) Lifting various objects in the correct and proper manner. These can be of different shapes and sizes but shall not weigh more than 15 Kg.

3) In teams (2 or more persons if required according to local policy), perform a correct lift of a load that weighs no more than 30 Kg and is unwieldy, difficult to grasp, difficult to grip, with contents likely to move or shift (e.g. a rescue dummy)

4) The lesson elements concerned with manual handling should be practiced during subsequent exercises where the course participants are performing exercises for rescue and evacuation from height and at any other time where they are handling equipment or props for exercises.

5) Training staff shall, during remaining exercises, observe and provide immediate constructive feedback to the course participants focusing on the following areas:

a. Reducing manual handling using suitable handling aids where possible

b. Planning and execution of manual handling tasks using the T.I.L.E. Principle and MAC tool - considering the load weight, maximum reaching distance and aggravating factors

Lesson 6 - WORKING AT HEIGHT - RESCUE FROM LADDER

80 min.

The aim of this lesson is to ensure the course participants are competent in performing a rescue operation of an injured person on a ladder.

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

1) **Demonstrate** how to utilize their personal fall protection equipment in a safe and appropriate manner on a ladder. (L3 – Skill)
2) **Demonstrate** how to lower the injured person to the base of the ladder in a safe and controlled manner. (L3 – Skill)
3) **Demonstrate** consideration the potential of suspension trauma and take appropriate action. (L3 – Skill)

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

There shall be one exercise per course participant.

Note: it is recommended to use a live injured person for these exercises.

ELEMENT 6.1 - SAFE AND CORRECT USE OF RESCUE EQUIPMENT FROM LADDER

The instructor shall:

6.1.1 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

6.1.2 **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:

6.1.3 **Demonstrate** the ability to perform a safe and controlled rescue from a ladder

6.1.4 **Demonstrate** the ability to safely and correctly use rescue equipment

6.1.5 **Demonstrate** safe and correct use of personal fall protection equipment

6.1.6 **Demonstrate** the ability to select and safely use both certified and structural anchor points

6.1.7 **Demonstrate** the ability the take appropriate actions to avoid suspension trauma with the injured person

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

Lesson 7 - WORKING AT HEIGHT - SELF-EVACUATION

35 min.

The aim of this lesson is to ensure the course participants are competent to perform a self-evacuation from an emergency hatch.

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

1) **Demonstrate** how to perform a safe and controlled self-evacuation using standard wind industry evacuation equipment, from an emergency hatch. (L3 – Skill)
2) **Demonstrate** how to perform a safe and correct double evacuation with the evacuation or rescue device in an active mode setup including a connecting element between the device and the harness (L3 – Skill)

Note: 1 exercise per Course participant

ELEMENT 7.1 - SAFE AND CONTROLLED SELF EVACUATION

Each course participant shall:

7.1.1 **Demonstrate** as a group correct rigging and attachment of the evacuation device.

7.1.2 **Demonstrate** how to apply fall protection at any point when there is a risk from falling from height.

7.1.3 **Demonstrate** how to perform a passive mode setup self-rescue from an evacuation hatch

7.1.4 **Demonstrate** how to perform an active mode setup double evacuation from an evacuation hatch, applying a deflection/friction carabiner on the rescue device and using a fall restraint lanyard kept as short as possible as a connecting element between the rescue / evacuation device and the harness

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

Lesson 8 - MEASURES TO PREVENT INJURY DURING TRAINING

20 min.

The Instructor shall:

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

8.1.2 Verify that the course participants can explain the principles of operation of the PPE and equipment to be used during practical training sessions

8.1.3 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

8.1.4 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.

8.1.5 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:

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

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

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

Lesson 9 - EVACUATION OF AN INJURED PERSON FROM THE NACELLE TO THE BASE OF THE TOWER

120 min.

The aim of this lesson is for the course participants to be able to evacuate an injured person in a safe and secure manner to the base of the tower, by lowering the injured person on the inside of the tower.

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. (L2 – Knowledge)
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. (L3 – Skill)
3) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation. (L3 – Skill)
4) **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)
5) **Demonstrate** how to apply rescue methods and techniques in performing descending rescue operations, from a WTG, using a rescue stretcher and spineboard, lowering/raising rescue system (rescue device, pulley system or similar). (L3 – Skill)

6) **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. 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.

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 rescue head support and avoiding head down configuration of the unconscious injured person. (L3 – Skill)
8) **Demonstrate** how to manually transport an injured person on a rescue stretcher and on a spineboard - in a balanced way. (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, 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)
11) **Demonstrate** how to perform rescue operations, using the injured person's personal fall protection on the injured person - as fall protection backup, if required. (L3 – Skill)
12) **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)
13) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy and exercising clear communication. (L3 – Skill)
14) **Demonstrate** how to perform clear and precise communication in a stressful rescue operation with members of the rescue team as a team coordinator and as a team member. (L3 – Skill)
15) **Demonstrate** how to perform clear and precise communication to other emergency responders (e.g. vessel crew or ambulance crew) including coordinating the handover of an injured person. (L3 – Skill)
16) Acknowledge the benefits of having a coordinator in a rescue team, and the responsibility that comes with it. (L3 – Attitude)

17) Take part in discussing which advanced rescue preparations, and emergency and communication procedures, apply in their own organisation. (L2 – Knowledge)

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 9.1 - PRACTICAL EXERCISE EVACUATION INSIDE AND OUTSIDE OF TOWER

The Instructor shall:

9.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario

9.1.2 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

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

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

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. 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

9.1.4 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

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

9.1.6 **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:

9.1.7 **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

9.1.8 **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

9.1.9 **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)

9.1.10 **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

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

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

9.1.13 **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

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

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

9.1.16 **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

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

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

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

9.1.20 **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)

9.1.21 **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), carrying the rope bag with him

9.1.22 **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

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

Lesson 10 - 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, 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) **Explain** and **demonstrate** the identification and suitable selection of certified and structural anchor points, for relevant enclosed space scenarios. (L3 – Skill)
4) **Explain** and **demonstrate** the proper utilization of a specific lowering/raising rescue system, incl. how to properly attach, rig and secure the system, and requirements, applications, limitations and the maximum raising distance possible for the system. (L3 – Skill)
5) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation. (L3 – Skill)
6) **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)
7) **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)
8) **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. (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.

9) **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)
10) **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)
11) **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. (L3 – Skill)
12) **Demonstrate** how to manually transport an injured person on a rescue stretcher or spineboard - in a balanced way. (L3 – Skill)
13) **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. (L3 – Skill)
14) **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)
15) **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. (L3 – Skill)
16) **Demonstrate** how to perform rescue operations in a WTG enclosed space using a headlamp, if required due to poor lighting conditions. (L3 – Skill)
17) **Demonstrate** how to act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)
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. (L3 – Skill)
19) **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)

20) **Demonstrate** how to transport an injured person horizontally over the length of the turbine, with the use of industry rescue equipment rigged in a tensioned line (zip line). (L3 – Skill)

21) Acknowledge 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.

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 10.1 - RESCUE FROM ENCLOSED SPACE - EXERCISES

The Instructor shall:

10.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario

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

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

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

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 participants 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, 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

10.1.8 **Explain** 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

10.1.9 **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)

10.1.10 **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

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

10.1.12 **Explain** and **Demonstrate** how to select and utilize Certified and structural anchor points

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

10.1.14 **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

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

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

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

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

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

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

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

Lesson 11 - 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** the proper utilization of a specific lowering/raising rescue system, incl. how to properly attach, rig and secure the system, and requirements, applications, limitations and the maximum raising distance possible for the system. (L3 – Skill)
5) **Explain** and **demonstrate** how to apply the concept of lifting angle, angle factor and deviation. (L3 – Skill)
6) **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)
7) **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)
8) **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)
9) **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.

10) **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)
11) **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)

12) **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)

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

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

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. (L3 – Skill)

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. (L3 – Skill)

17) 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 11.1 - CRAWL SPACE RESCUE - EXERCISES

The Instructor shall:

11.1.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario.

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

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

11.1.3 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

11.1.4 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

11.1.5 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

11.1.6 **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:

11.1.7 **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

11.1.8 **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)

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

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

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

11.1.12 **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

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

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

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

11.1.16 Show acknowledgement of and **value** having a team coordinator

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

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

Lesson 12 - 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, 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) **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 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 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. (L3 – Skill)
10) **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)
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 act as the informal rescue team coordinator performing scene assessment and hazard identification, assessing and determining the rescue strategy. (L3 – Skill)
13) **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)
14) **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)
15) Acknowledge and **value** the benefits of having a coordinator in a rescue team, and the responsibility that comes with it. (L3 – Attitude)
16) **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
17) 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.

Note: Where possible, the delegates 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 delegate 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 12.1 - RESCUE UP - INTRODUCTION

The Instructor shall:

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

12.1.2 **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

12.1.3 **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. 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

12.1.4 **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

12.1.5 **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

12.1.6 **Discuss** with the Course participants requirements and procedures for helicopter rescue

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

12.1.8 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

12.1.9 **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 12.2 - RESCUE UP, INSIDE AND OUTSIDE OF THE TOWER - PRACTICAL EXCERCISES

The Instructor shall:

12.2.1 Highlight specific control measures to prevent injury during training relevant to this specific exercise scenario, according to section 1.6 Control measures to avoid injury during training

12.2.2 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

12.2.3 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

12.2.4 The Instructor shall guide and support the Course participants with applying:

a. Power-driven raising rescue systems

b. Fall protection backup of injured person.

12.2.5 **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

12.2.6 **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

12.2.7 **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

12.2.8 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

12.2.9 **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:

12.2.10 **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, 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

12.2.11 **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

12.2.12 **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)

12.2.13 **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

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

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

12.2.16 **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

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

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

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

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

12.2.21 **Demonstrate** how to perform a rescue up (dummy), with the rescue device in an active setup for rescue up inside of the tower/basement.

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

Lesson 13 - 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, 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 13.1 - REFLECTION SESSION

The Instructor shall:

13.1.1 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)

13.1.2 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

13.1.3 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

13.1.4 Give an overall feedback and feed forward on the Course participants' learning outcome

13.1.5 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

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

ELEMENT 13.2 - FORMATIVE EVALUATION

Course participants shall:

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

The Instructor shall:

13.2.2 Respond on relevant elements of any oral feedback from the Course participants.

ANNEX 1 - COURSE PARTICIPANT ASSESSEMENT FORM

Course participant full name as in passport:				
Course participant WINDA ID:				
Course module:				
Date of completion:				
		Violation of Assessment Measures	**0-2 passed 3 failed**	**Instructor Remarks**
Scenario Organisation				
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 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:

12) Full body harness
    a. At least two different products
13) Work restraint lanyards
    a. At least two different products
14) 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
15) Helmets and safety glasses
16) Vertical fall arrest system
17) Self-Retractable Lifeline (SRL)
18) 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)

19) Karabiner with mandatory automatic locking system
20) 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 - ARTR 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 A4-1 - Suggested warm-up exercises

ANNEX 5 - MANUAL HANDLING RISK ASSESSMENT

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

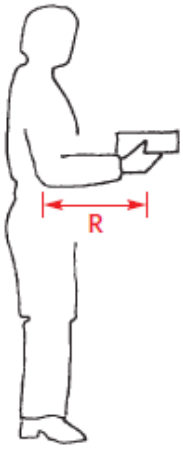
The baseline of assessing manual lifts is the load weight and the distance from the spine in the lower back (the reaching distance), respectively. The assessment chart below will assist you appraising manual handling.

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

Prior to delivering the Manual Handling Module, instructors should review local instructions and risks assessments for the tasks planned, including assessment of whether a given task should be solved by the Course participants by using a handling aid?

1. LOAD WEIGHT AND REACHING DISTANCE

The load weight compared to the reaching distance (R) indicates the gross strain on the lifting persons back.

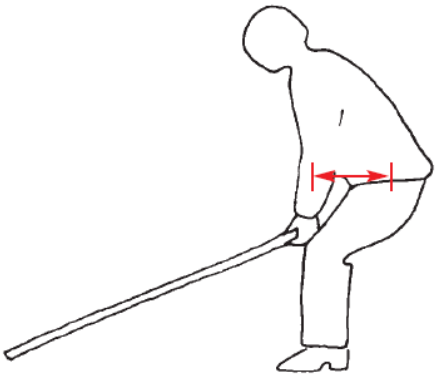


It must be taken into consideration when the person performing the lift is carrying only a part of the load, e.g. when the load is tipped onto one end and partly resting on the ground or when the lift is performed by more than one person.

The assessment chart below guides you to evaluate and determine whether the strain on the muscular- skeletal system is harmful to health and control measures must be taken.

The reaching distance is illustrated by (R) in the diagram to the left. The diagram represents (R) as the lateral distance between the center of gravity of the load and the lifting persons lower back (the spinal column of the lumbar curve). The center of gravity of the load is usually found right between the handle points of the load.

When the load is tipped and partly resting on the ground or when the lift is performed by more than one person, the reaching distance is measured from the lifting persons lower back (the spinal column of the lumbar curve) to a line between the handle points of the load.



When assessing manual handling, the *most excessive* reaching distance during the *entire operation* must be used in the assessment chart. The most excessive reaching distance is commonly found in the initial or ending part of the lifting operation (putting down the load).

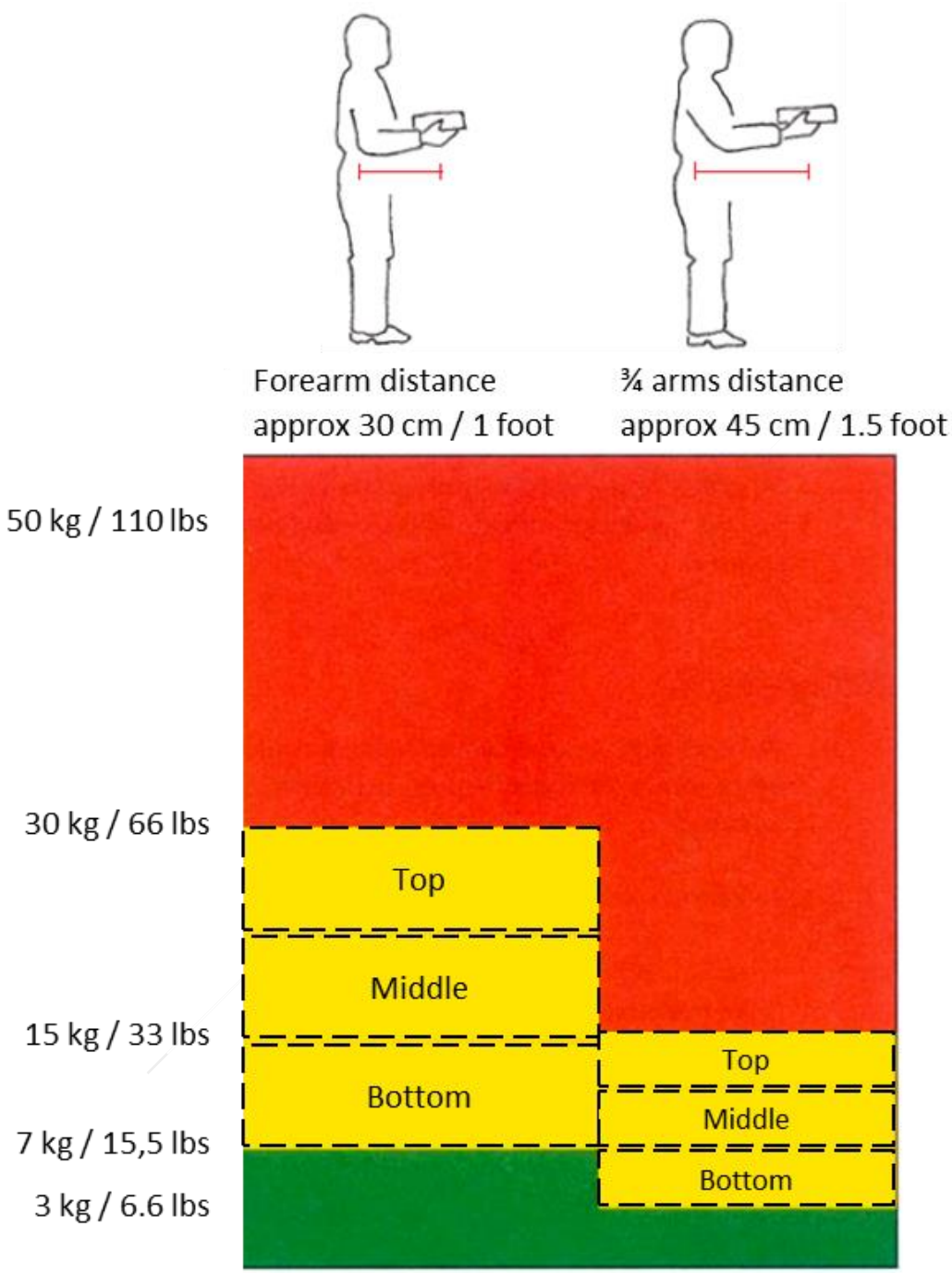
Two different reaching distances are indicated in the assessment chart:

1) Forearm distance (approx. 30 cm / 1 foot from the spinal column of the lumbar curve)
2) ¾ arms distance (approx. 45 cm / 1.5 foot from the spinal column of the lumbar curve)

Note: In most cases load lifting close to the body equals forearm distance. Shorter reaching distance (i.e. lifting closer to the spinal column than forearm distance) is thus only achievable when using personal moving equipment (moving straps for lifting or the like).

In the assessment chart, reaching distances above ¾ arm's distance is not included since they will most likely be harmful to health, and must be evaluated separately.

Manual handling assessment chart (MAC tool) – evaluating the load weight compared to the reaching distance



Red area: Lifting within the red area is without doubt harmful to health and must be avoided. To reduce the risk of injury control measures must be taken.

Yellow area: Lifting within the yellow area requires a detailed evaluation of the aggravating factors. They must be considered to evaluate to what extent they enhance the strain on the muscular- skeletal system resulting in manual handling which is harmful to health.

When lifting within the **top most** ⅓ part of the yellow area, manual handling is only accepted if it is performed under optimal conditions (i.e. the entire lifting operation is performed centered in front of the body, the lift is performed between mid-thigh and elbow height, the load is intended for manual handling, each lift is followed by a two-minute rest, the load is not carried, the foothold is stable, and the climate is appropriate).

Lifting within the **middle** ⅓ part of the yellow area, the amount and degree of aggravating factors determine whether the manual handling is harmful to health – and to what extent it is harmful.

Lifting within the **bottom** ⅓ part of the yellow area, it usually requires several aggravating factors for the manual handling to be harmful to health. In some cases, one single aggravating factor, e.g. the working posture, may cause lifting within the bottom ⅓ part of the yellow area to be harmful to health.

Green area: Lifting within the green area is usually not harmful to health based on the load weight and reaching distance.

There may be additional risk factors, which are individually harmful, causing the manual handling to be harmful to health, e.g. poor working postures, a high lifting frequency, or an excessive overall strain on the body.

2. AGGRAVATING FACTORS

The aggravating factors of the lifting operation must be considered which, individually and especially in combination, will enhance the strain on the muscular- skeletal system posing a risk of injury and manual handling harmful to health.

Examples of aggravating factors - categorized related to the four elements of the **T.I.L.E** principle:

1) Concerning the **Task**

No suitable handling aid available, stooping/bending, twisting, stooping/bending *and* twisting, lifting below knee height or above shoulder height, carrying, pushing, pulling or precise positioning of the load, sudden movement or stop, lifting for a longer period of time, high pace of work, inadequate rest or recovery periods, asymmetric or one handed lifting, team handling1, seated or kneeling position, or lack of planning.

2) Concerning the **Individual**

No warm-up, capability, previous and pre-existing injuries, unusual strength or height required for the activity, specialist knowledge or training required, uneven height of team handling individuals.

3) Concerning the **Load**

Unwieldy, difficult to grasp, difficult to grip, sharp edges, contents likely to move or shift, hot or cold.

4) Concerning the **Environment**

1 *Team handling is in general not a legitimate substitution for using handling aids.*

Transport route or floors uneven, slippery, unstable or with obstacles or steps, variations in floor levels, stairs, space constraints, draft, hot, cold or humid conditions, poor lighting, poor ventilation, rain, gusty winds, clothing or PPE that restricts movement, vibrating environment before manual handling.

5) Source of reference

This annex is based upon the legal requirements and guidelines of the Danish and UK EHS authorities and legislation on manual handling.

Note: Local legal requirements must always be adhered to when performing manual handling.

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.