	Temporary Personal Lift (TPL) for Wind Turbine Tower	File: AS_P_Temporary Personal Lift
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Referred documents:	Act Safe user's manual PPE manufacturer's instructions
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Revisions

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1.0 **SCOPE**

The scope of this document is to provide information on the installation and the use of a Temporary Personal Lift (TPL) for wind turbine tower, to reduce fatigue during daily climbs in the construction phase.

Restrictions: This system doesn't replace a permanent system and should only be considered during construction and maintenance phase, where no permanent climbing assistance system have been installed or is temporary out of use.

2.0 **STANDARDS, REQUIREMENTS & REFERENCES**

2.1 **Equipment standards**

2.1.1 EN norms

2.1.2 CE type approval

2.2 **Work standards**

2.2.1 Local Work at Height Regulation

2.2.2 Local Fall Arrest Regulation

2.3 **Tower and Ladder requirements**

The ladder inside the tower should be installed, tested and certified.
The certificate should mention where it is allowed to anchor a fall arrest system.

The upper and lower anchor points should provide a minimum breaking strength (MBS) of 15 kN.

3.0 **DEFINITIONS**

Definitions are equivalent to those used in the fall arrest manual, in Act Safe user's instruction, and in Work at Height regulations.

3.1 Fall Arrest

According to the definition in the OSHA documentation, a personal fall arrest system means a system used to **arrest** a technician in a fall from a working level. It consists of an anchor point, connectors, a full body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

The entire system must be capable of withstanding the impact forces involved in stopping or arresting the fall (maximum 600 daN).

The impact force on the system including technician shouldn't exceed 600 daN.

3.2 Temporary Personal Lift

The Temporary Personal Lift (TPL) is a system providing lifting capability for those who work in the wind turbines and are required to climb the internal ladder during construction or maintenance phase, and where no permanent climbing assistance system have been installed (or is temporary out of use).

The system provides full or part lifting capacity to the climber ascending the ladder, and is capable to lift or lower a free hanging load, up to 200 kg.

In that manner, the TPL can also be used for rescue purposes, to lift or lower a free hanging casualty.

The TPL is composed by a lifting system based on Act Safe ACC-2 RC Power Ascender and by an independant backup rope (only necessary if the ladder has no permanent fall arrest system - cable or rail).

4.0 SAFETY

All persons working to this procedure shall comply with the company policies and be aware of any local site rules pertaining to operation of equipment and personnel safety.

5.0 PERSONAL REQUIREMENTS

5.1 Minimum requirement

We recommend IRATA Level 1 training for all technicians, even if the use of TPL doesn't belong to IRATA syllabus.

Further information: www.irata.org

5.2 Additional training

- Fall arrest training for wind turbine
- Act Safe specific training

5.3 Rigging personal

Personal installing (rigging) the TPL with Power Ascender within this procedure should have received a proper instruction and training.

5.4 Supervision

Work should be done under supervision by competent person.

5.5 Team size

A minimum of 2 trained technicians on site is mandatory, one of them should be supervisor.

6.0 EQUIPMENT REQUIREMENTS

6.1 Personal fall arrest equipment

- 6.1.1 Work positioning harness EN 358 with EN 361 for fall arrest
- 6.1.2 Y-Lanyard with energy absorber conforming to EN 355
- 6.1.3 Adjustable positioning lanyard conforming to EN 358
- 6.1.4 Work at height certified helmet
- 6.1.5 Mobile fall arrest device for rope conforming to EN 353-2
- 6.1.6 Other PPE according to turbine manufacturer / owner

6.2 Rigging equipment

6.2.1 Upper anchor

- (x2) wire strops EN 795
- (x1) medium rigging plate
- (x3) steel karabiner with triple locking action
- (x4) steel karabiner with screw gate
- (x1) pulley EN 12278, MBS 40 kN
- (x1) TPL low stretch rope EN 1891A, 11mm length as described in section 7.1.1
- (x1) backup low stretch rope EN 1891A, 11mm length as described in section 7.1.2
- (x2) rope bag

6.2.2 Lower anchor

- (x2) wire strop EN 795
- (x1) medium rigging plate
- (x4) steel karabiner with triple locking action
- (xx) Power Ascender Act Safe ACC2 with remote control (one RC unit per technician)
- (x2) webbing sling 80cm

6.2.3 To connect the TPL rope ends

- (x1) big steel karabiner (Big Dan) with triple action locking
- (x1) Maillon Rapide 25 kN
- (x1) Snap Hook

See section 13.0 for product recommendations and check list.

6.3 Other equipment

- 6.3.1 Communication devices
- 6.3.2 Headlamp(s)

6.4 Additional recommendation

For easier handling, winch and backup ropes should be of **different colours**.

7.0 **RIGGING**

7.1 Setup of equipment – Bagging of ropes

7.1.1 Temporary Personal Lift rope

- Minimum rope length = 2x vertical distance between the upper and the lower anchor, plus additional 2 meters.
- For additional ease, the middle of the rope should be marked with appropriate marking tool.
- The rope should be bagged as a single rope (see left picture below).
- The bag remains at ground level, the technician connects the rope end to his harness equipment ring / loop, **on his right hand side**.

7.1.2 Backup rope

- Minimum backup rope length = 1x vertical distance between the upper and the lower anchor, plus additional 2 meters.
- The rope should be bagged as a single rope (see left picture below).
- The bag remains at ground level, the technician connects the rope end to his harness equipment ring / loop, **on his left hand side**.

7.1.3 The technician in charge of the upper rigging should ensure that he takes the necessary equipment described in section 6.2.1.



Single bagging

TPL rope end connected to right harness side while climbing.

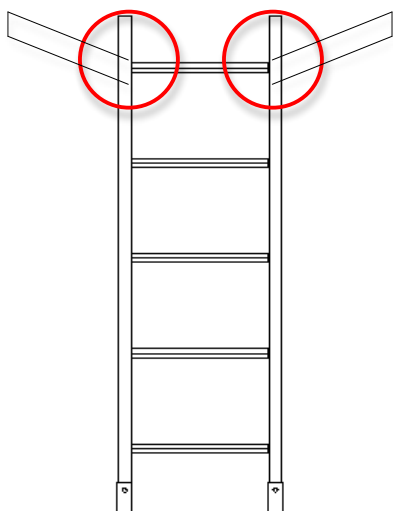
Backup rope end connected to left harness side while climbing.

7.2 Climbing the ladder with fall arrest lanyard



- Buddy check before climbing.
- If no permanent fall arrest system is available on the ladder, the technician should use his Y-fall arrest lanyard.

7.3 Selection of anchor points for the upper rigging



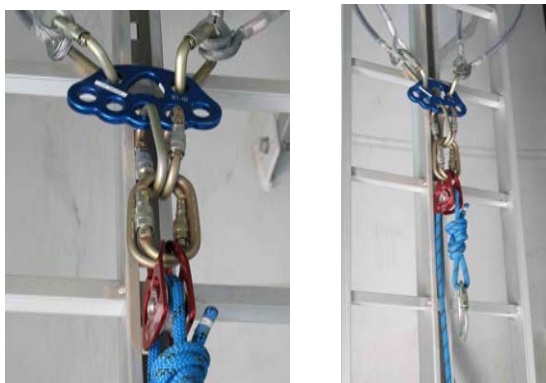
The anchors should be selected according to manufacturer's recommendations, but mostly vertical ladder section at rung and construction support (anchor) crossing are suitable anchors. In case of doubt, consult ladder manufacturer for further information (MBS, etc).

7.4 Rigging of upper rigging plate



- The upper rigging plate should be connected to 2 independent wire strops and karabiners.
- If using screw gate karabiners, ensure that the screws face downward.

7.5 Connecting the pulley and the Temporary Personal Lift rope to the rigging plate



After rigging, the pulley should be perpendicular to the rigging plate, and the rope end should face the technician.

- The Temporary Personal Lift rope is connected to the rigging plate over a pulley and 4 safety steel karabiners, as shown on the picture.
- The 4 karabiners to connect the pulley are necessary to give more rigidity and to avoid a twisting of the rope.
- Use holes No 2 and 3 (starting from right) to connect pulley's karabiners.

7.6 Connecting the backup rope to the rigging plate



With the system facing the technician, the pulley should be on the right side of the the rigging plate and the backup rope on the left side.

- The backup rope is connected (figure of eight knot at rope end) to the rigging plate over a safety steel karabiner, as shown on the picture.
- To avoid rope-over-rope friction, at least one rigging plate hole should be left empty between pulley and backup rope karabiners.

7.7 Final rigging check – Descent with mobile fall arrest device for rope

- After finishing the rigging, the technician should ensure that all karabiners are properly locked.
- If no permanent fall arrest system is available, the technician should use his mobile fall arrest device on the backup rope during the descent, rather than the Y-lanyard (more convenient and faster).

Connect TPL rope end to harness to pull down the rope through the pulley while climbing down the ladder.

7.8 Rigging of the lower rigging plate



- Same consideration as in sections 7.3 and 7.4 of the present document should be applied.

7.9 Connecting the Power Ascender to the lower rigging plate



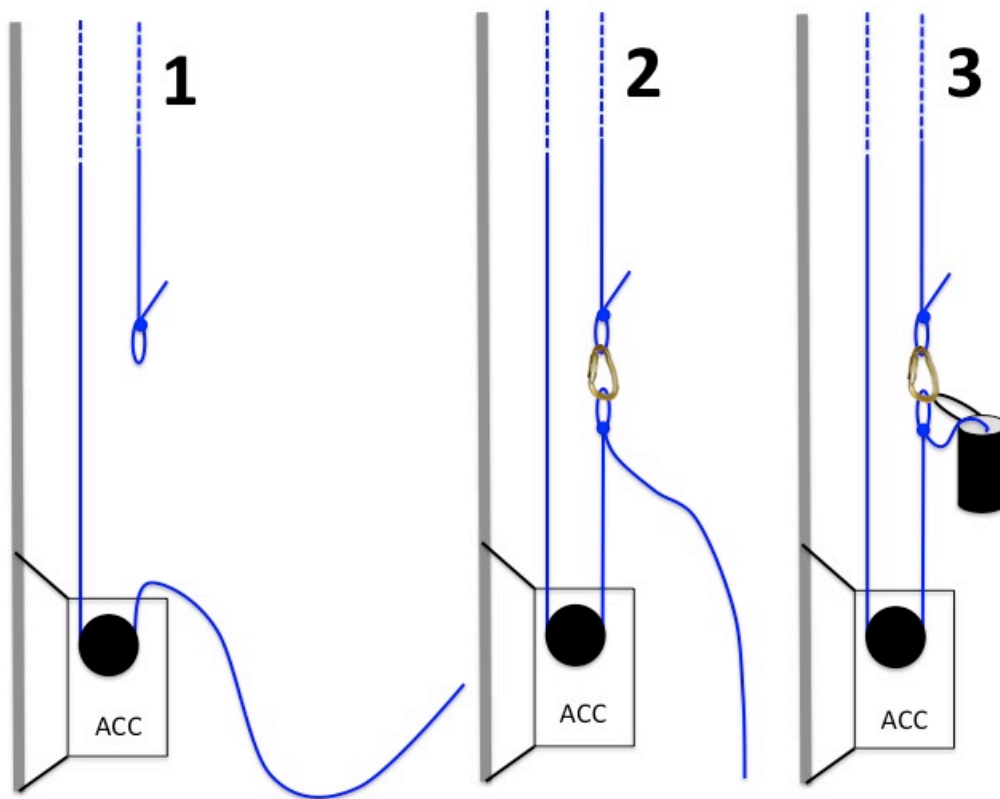
- The Power Ascender should be connected to the second free hole on the right side of the rigging plate, with accelerator bar facing the technician.

The accelerator bar shouldn't be in contact with the ladder.



- The 2 webbing slings are used to maintain the ACC in a vertical position while unloaded and should be connected as shown on the picture in the upper frame hole of the ACC.

7.10 Connecting TPL rope to the power ascender



- Once the Power Ascender has been connected to the rigging plate, introduce the rope in the ACC rope grab (figure 1), **free rope end on accelerator bar side**.

Rope tangle should absolutely be avoided.

- Tight a figure of eight knot on the remaining rope, and connect the two loops with the Big Dan karabiner (figure 2).
- The rest of unused rope is to be carefully bagged. The bag is connected to the Big Dan karabiner (figure 3) and will later move together with the technician.

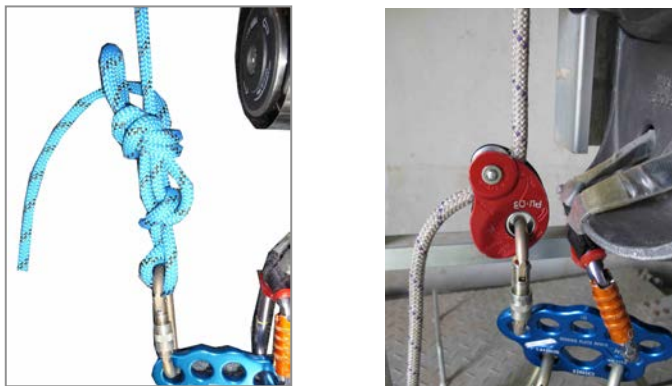
Once finished, the rope loop should have no slack.

7.11 Adding a connector for technician's central positioning D-ring



- The Maillon Rapide and the Snap hook are also connected to the Big Dan karabiner. The Snap Hook will later be connected to the lower positioning D-ring of technician's harness.

7.12 Tensioning backup line



- To avoid rope tangle and improve the mobility of the mobile fall arrest device, the backup rope should gently be tensioned.
- Tensioning system could be an Italian hitch (picture left), a self locking pulley (picture right) or a self locking descender.
- The unused rope should be bagged.

7.13 Functional and safety check

The system is now read to use, but should be tested before engaging technicians at height.

All technicians present on site should be aware of emergency and rescue scenarios and procedures.

8.0 **WORK INSTRUCTION**

The system is designed to be used by one person

8.1 All Remote Control senders should be tested one by one according to manufacturer's instructions.

8.2 Buddy check for technicians. Review of verbal communication and hand signs, especially following commands (in case of emergency or out of use RC sender):
STOP / UP / DOWN /SLOW

8.3 The first technician to climb connects the lower central D-ring of his harness to the snap hook of the TPL rope, and his mobile fall arrest device on the backup rope and to his harness sternal D-ring. He also connects his Remote Control unit of the Power Ascender to his harness.

8.4 **The active Remote Control sender has the priority**, the winch cannot be operated over the accelerator handle or another RC sender as long one the RC sender is active. If not operated, the active sender will automatically switch off after 5 seconds.

No personal should be exposed in the fall line of the climbing technician.

8.5 During climbing, a slack of rope on the unloaded winch rope will appear, this is normal considering the rope stretch.

8.6 The technician can adjust the climbing speed with his RC sender. Feet should remain on ladder rungs rather than be free hanging. This allows a better body balance and control.

8.7 Lifting operation should be stopped when the technician arrives around 5 meters from the top (pulley). He should then continue to climb without hanging in the rope. This measure is necessary to compensate the stretch of the rope (otherwise the knot would get stuck in the pulley after releasing technician's weight).

8.8 Once arrived to the top of the section, the technician should connect his Y-fall arrest lanyard to the ladder or the structure before disconnecting the snap hook from his harness, and the mobile fall arrest device from the rope.

8.9 When ropes are free, and the command has been given, the second technician can switch the Power Ascender (descent mode) to lower the snap hook, using the accelerator bar. He can also operate the ACC with his own Remote Control sender.

8.10 The operation can be repeated for the remaining technicians.

9.0 **EMERGENCY**

9.1 If the system runs out of battery

Should the Power Ascender run out of battery during the ascent, the technician should

- communicate information to ground staff, which can replace the used battery by a new one.
- disconnect the snap hook from his harness and climb the ladder without TPL or descent to change the battery (this could happen for the last climbing technician). **In any case** he should remain connected to the mobile fall arrest device of the backup rope (or permanent fall arrest system if available).

9.2 In case of no Remote Control signal

IN CASE OF NO REMOTE CONTROL SIGNAL

The technician should move the RC sender on side, showing down to ACC, this to avoid body interferences.

10.0 **DESCENT**

In most cases, the descent should be achieved without TPL.

11.0 **RESCUE PLAN**

- The system can be used to lower and /or to lift a person.
- As for individual climbing, the casualty should also be connected to the backup rope with a mobile fall arrest device (or permanent fall arrest system if available).
- In most situations, it would be preferable to have a technician accompanying the casualty. In this case, the valid technician would only be connected to the backup rope and would move independently from the TPL.

12.0 TEMPORARY PERSONAL LIFT EQUIPMENT CHECK LIST

	Qty	Description	Reference	✓
Personal PPE	1	Work positioning harness EN 358 with EN 361 for fall arrest		
	1	Y-Lanyard with energy absorber conforming to EN 355		
	1	Work at height certified helmet		
	1	Mobile fall arrest device for rope EN 353-2	ISC-RP500	
	1	ACC Remote Control sender	50-170-581	
	1	Headlamp	---	
	1	Communication device	---	
Upper anchor	2	Wire strops 1m EN 795	ISC-WS100	
	1	Medium rigging plate	ISC-RP310	
	3	Steel karabiner with safety locking system	ISC-KH200SS	
	4	Steel karabiner with screw gate	ISC-KH311SG	
	1	Pulley EN 12278, MBS 40 kN	ISC-RP060B	
	1	TPL low stretch rope EN 1891A 11mm LENGTH = TWICE VERTICAL DISTANCE + 2m		
	1	Backup low stretch rope EN 1891A 11mm LENGTH = VERTICAL DISTANCE + 2m		
Lower anchor	2	Rope bag, Large	50-130-162	
	2	Wire strops 1m EN 795	ISC-WS100	
	1	Medium rigging plate	ISC-RP310	
	4	Steel karabiner with safety locking system	ISC-KH200SS	
	1	Power Ascender Act Safe ACC-2	50-161-003	
	2	Spare battery for ACC-2	50-161-500	
To connect TPL rope ends	2	Webbing sling 80cm	PLSAC08	
	1	Steel karabiner Big Dan	ISC-KH455SS	
	1	Maillon Rapide 25 kN		
	1	Snap Hook	ISC-SH901	
	1	Tool bag, small	VC-TB10	

13. RIGGING EQUIPEMENT - OVERVIEW

13.1 UPPER ANCHOR



13.2 LOWER ANCHOR



13.3 CONNECTION TPL ROPE LOOP



14. RIGGING CHECK LIST

14.1 Pre-work

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Selection of equipment	6, 12, 13
<input type="checkbox"/>	Bagging TPL rope as a single rope	7.1.1
<input type="checkbox"/>	Bagging backup rope as a single rope	7.1.2
<input type="checkbox"/>	Connect the ropes on harness before climbing ladder Left = Backup rope / Right = TPL rope	7.1.1, 7.1.2
<input type="checkbox"/>	Rigging equipment for upper anchor connected to harness	7.1.3

14.2 Climbing the ladder

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Equipment check (buddy check)	7.2
<input type="checkbox"/>	Climbing ladder with Y-lanyard or permanent fall arrest system if available	7.2

14.3 Rigging upper anchor

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Selection of anchors and rigging 2 wire strops	7.3
<input type="checkbox"/>	Connecting rigging plate to wire strop karabiners	7.4
<input type="checkbox"/>	Rigging pulley + rope on right side of the rigging plate, holes No 2 and 3 from right	7.5
<input type="checkbox"/>	TPL rope through pulley, figure of 8 knot at rope end, rope end facing technician, and connected to harness	7.5
<input type="checkbox"/>	Rigging backup rope on left side of rigging plate, hole No 1 or 2 from left	7.6
<input type="checkbox"/>	Visual, tactile and functional check of rigging	7.7

14.4 Climbing down

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Climbing down with mobile fall arrest device for rope or permanent fall arrest system if available	7.7
<input type="checkbox"/>	Pulling down TPL rope through pulley while descending – Check for tangle	7.7

14.5 Rigging lower anchor

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Selection of anchors and rigging 2 wire strops	7.3
<input type="checkbox"/>	Connecting rigging plate to wire strop karabiners	7.8
<input type="checkbox"/>	Connect ACC to rigging plate, hole No 2 from right	7.9
<input type="checkbox"/>	Rigging webbing slings to maintain ACC in vertical position while unloaded	7.9

14.6 Building rope loop

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Check for TPL rope tangle	7.10
<input type="checkbox"/>	Insert long rope in ACC rope grab	7.10
<input type="checkbox"/>	Figure of 8 knot on rope, on rope grab exit side	7.10
<input type="checkbox"/>	Connect both loops to Big Dan karabiner	7.10
<input type="checkbox"/>	Bagging rest of unused rope	7.10
<input type="checkbox"/>	Connecting rope bag to Big Dan karabiner	7.10
<input type="checkbox"/>	Connect Maillon Rapide + Snap Hook to Big Dan karabiner	7.11

14.7 Backup rope

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Gently tension rope with descender, Italian hitch or self locking pulley	7.12
<input type="checkbox"/>	Bagging rest of unused rope	7.12

14.8 System check

✓	<i>Item</i>	<i>Section(s)</i>
<input type="checkbox"/>	Visual, tactile and functional check of the system	7.13

15.0 ACT SAFE ACC-2 CERTIFICATION



Declaration of EC conformity

In accordance with Machinery Directive 98/37/EC, appendix II A

ActSafe Systems AB
Säterigatan 29
SE-417 64 Gothenburg / Sweden

We hereby declare that the power ascender type ActSafe ACC for the lifting and lowering of loads and persons meets the fundamental requirements of the below stated EC directives:

EC Machinery Directive (MD) 2006/42/EC

Low Voltage Directive 2006/95/EC

Including the associated amendments.

Applied harmonized standards, in particular

**DIN EN 14492-1 Cranes - Power driven winches and hoists
Part 1: Power driven winches (02.2007)**

Applied national directives, in particular

**BGR 159 Hochziehbare Personenaufnahmemittel
(hoistable access equipment)**

The construction was inspected by

Fachausschuss Maschinenbau, Hebezeuge, Hütten- und Walzwerksanlagen
Prüf- und Zertifizierungsstelle im BG-PRÜFZERT
BG-Bescheinigung Nr. 08 006

(Committee of experts - mechanical engineering,
lifting gear, smelting works and rolling mills
Testing and certification body in BG-PRÜFZERT
BG-certification No. 08 006)

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16. DISCLAIMER

No Warranty

This procedure is not intended, in any way, to teach an individual how to assemble or to use the Temporary Personal Lift. It is only to be used as a reference source in conjunction with a training in the use of this system, conducted by a qualified instructor.

An ActSafe Power Ascender is not a safety device. It is specifically designed as a tool to assist in the ascending and descending of personnel and tools or materials and is always to be used in conjunction with a secondary safety device.

Act Safe Systems AB makes no guarantee that the ActSafe Power Ascender will increase the user's personal safety or free the user from possible serious injury or death or that the ActSafe Power Ascender operates as a lifesaving mechanism.

Act Safe, our partners and subsidiaries disclaim any liability or responsibility for damages, injuries or death resulting from the use or misuse of the system and equipment described in this procedure.

It is expressly understood and agreed by the user of this procedure, or any subsequent user, that Act Safe in no way be deemed or held liable or accountable for any liability or responsibility for damages, injuries or death resulting from the use of the described work method and equipment, and makes no warranty, either expressed or implied, statutory, by operation of law or otherwise, beyond that expressed herein.

Training and experience are required to lower the risk of serious bodily injury or death.

NEVER use the equipment described in this procedure unless you have read the user's manual and completed a "controlled program of instruction" in the use of this equipment. However, even with this requirement, Act Safe has no control over the use of this equipment and the person using this equipment assumes all risk of damage, injuries or death resulting from such use.

17. NOTES