Avanti Quick Reference

Volume 1
Introduction, Contacts, and Terms

R01 2019

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Introduction:

What is this?

This document is volume one of the Avanti Quick Reference Compendium. The compendium is designed to work as a quick reference for Avanti/Alimak personnel globally with respect to the wind area of the Alimak Group. This document is internal and not to be given to people outside of our organization.

Why do I want this?

Employees and customers of Avanti/Alimak want quick answers to their questions. The complete compendium is meant to fulfill that need by covering the most common topics regarding Avanti branded products. Previously all of this information was in a single volume. The purpose of breaking it up into more specialized smaller volumes is so they can be more easily updated.

The compendium is broken into 6 volumes by topic and product:

- Volume 1 – Introduction, Contacts, and Terms
- Volume 2 – Climb Assistance
- Volume 3 – Ladders and Fall Protection
- Volume 4 – Wind Turbine Elevators, Fences
- Volume 5 – Wind Turbine Internals
- Volume 6 – Standards, Specifications, and Permitting
- Volume 7 – Products new to Wind from Avanti

Can I, as an employee, improve this document?

Absolutely! This document is currently maintained by the USA Technical Support Engineer. Submit new content, notes, corrections, etc. to luke.metzinger@alimakgroup.com and they will be incorporated into these volumes in future revisions. Revisions will occur to volumes as updates accumulate.

This document lives here:

A digital copy of the compendium volumes will always be available on the Franklin, WI server here: S:\01 Sales\05 Sales Quick Reference Binder. This document will also be available upon request via a onedrive link requested from the contact listed above.

But I already have a Technical Support Contact?

These documents are not meant to replace Avanti's Technical Support Engineers. They are meant to supplement them and act as an at-your-fingertips reference. Fast reference = fast reply to customers = happier customers. Technical Support Engineers are happy to assist as applicable with customer conversation.

Revision Notes can be found on the last page of each volume.

Contacts:

Who is the Avanti Engineering Technical Support Staff?

Managed by:

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Acts as approval gate for work from below team members. Broad knowledge of all products.

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Specialized in Vestas ladders, SGRE support and tower integration of WTEs.

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Specializes in Goldwind and other predominantly Chinese customers.

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Specializes in North American Elevator code and GE related products.

Country: USA, Time zone: Central Standard Time (GMT-6)

Wind Industry Terms:

5.11: This is a slang term for A17.1 section 5.11 code. See definition below.

A17.1: This is elevator code written by ASME. It is basic elevator code adopted by most jurisdictions within the USA. This code was written with building elevators in mind not WTEs.

A17.1 section 5.11: This is elevator code written by ASME. This code is dealing directly with WTE designs and was(is) written directly for our industry. It is currently a section of A17.1 code which means a delay of adoption by jurisdictions.

A17.7: This is elevator code written by ASME. It is performance based code written as a guideline for elevator designs not conforming to A17.1. This is one of the two codes Avanti currently seeks to be in compliance with. AECO certification means compliance to this code.

A17.8: This is elevator code written by ASME. More specifically, 5.11 will eventually be its own standalone code called A17.8 instead of being a section under A17.1. Once 5.11 becomes A17.8 it will be easier for jurisdictions to adopt as it is standalone and only concerning WTEs.

AECO: AECO is an acronym for Accredited Elevator/Escalator Certification Organization. For Avanti's purposes an AECO is a third party company either UL or Liftinstituut that provides us with a certificate of compliance to ASME A17.7 elevator code.

AHJ: AHJ is an acronym for Authority Having Jurisdiction. An AHJ has knowledge of the regulatory code within his jurisdiction and is charged with regulating and proper licensing of elevators within his jurisdiction.

Anchor: For Avanti's purposes an anchor is a place within the wind turbine that a climber can tie off to in order to protect them from a fall. Reinforced ladder rungs as well as additional ladder mounted anchors act as anchor points for climbing technicians.

ASL: This is the fall protection device used in combination with our M508 hoist on our cable driven WTEs. It is a registered safety device designed and produced by Avanti.

ASME: ASME is an acronym for American Society of Mechanical Engineers. This is a USA body that writes the code for elevators within USA jurisdictions. Members and past members of this body include Avanti representatives Greg Kolodiej, Luke Metzinger, and Anthony Barnes.

Audible Warning Device: Commonly a buzzer or siren on a WTE that notifies technicians in and around the unit that it is moving. Not used for normal operation in Avanti WTE design as it would be annoying to users.

Beam: A beam refers to the supporting member of the suspension cables for cable driven WTEs. It must meet code specifications.

Blocstop: This is a trade name for a fall protection device that was available on our Tirak based WTEs. Now it is a slang term for the fall protection device found on our cable driven WTEs.

BOM: This is an acronym for Bill Of Materials. This is a list of parts/hardware/etc. involved in a manufactured product.

Bottom Stop: A bottom stop is an obstruction detection device that provides safety monitoring below the WTE.

Brake (centrifugal, overspeed): This refers to the brake built into the motors on our WTEs. If an overspeed condition occurs (IE the lift is moving too fast) the centrifugal brake expands and slows down the motor and therefore the WTE it drives. It should be noted that this brake is employed in an unpowered descent. For example, if the WTE or turbine loses power, a technician within the lift can manually deactivate the electromagnetic brake on the motor and descend. The centrifugal brake will govern the speed of descent of the WTE.

Brake (electromagnetic): By design WTE motors have a built in electromagnetic brake locking their rotor when no power is applied. This brake can be manually overridden in the case of the WTE or wind turbine losing power.

BU: BU is an acronym for Business Unit.

Cable Driven: This refers to a drive mechanism on a WTE that lifts the unit by driving a cable through it.

Cable, Drive: A drive cable is the cable that a cable driven hoist uses to provide motion for a lift. In Avanti designs this cable typically has a diameter of ~8.3mm.

Cable, Guide: A guide cable is(are) the cable(s) that a WTE uses as guides along its travel path up and down a wind turbine. In Avanti designs this cable typically has a diameter of ~12mm.

Cable, Safety: A Safety cable is the cable that is used in combination with a Fall Protection Device to stop a WTE from falling in the event of an emergency.

Cable, Trailing: This is a power cable that brings power from the base platform of a wind tower to the WTE. This cable hangs off the bottom of a lift and as the lift moves either coils into or uncoils from a bin below the base platform.

Cable, Traveling: This is a power cable that brings power from the middle of the tower to the WTE. This cable hangs from a junction box mid-tower in a large loop to the lift. It hangs freely and does not coil. It is considered a safer alternative to a trailing cable.

Centrifugal brake: This refers to a brake commonly applied by the hoist unit when the hoist reaches a certain speed (overspeed). This is used in a manual unpowered descent.

Climb Assistance: Climb Assistance refers to Avanti's Climb Assistance products. There are two revisions currently of note. CAVI is an older version no longer produced but very prevalent in the field today. CAVII is today's current version in production. See the Climb Assistance Section for details.

Climber: Climber refers to a technician within a WTE who is using the ladder to traverse up or down within a wind turbine.

Code: Code in Avanti's context refers to a set of rules that elevators must be in compliance with. Codes that may apply in the case of Avanti wind turbine elevators include ASME A17.1, ASME A17.7, ASME A17.1 section 5.11. See the permitting section of this document for more information.

Compliant (Compliance): This refers to Avanti products meeting or exceeding standards developed by third parties or required by our customers.

Disconnect: A disconnect is a device that can isolate power from a power source to a system or sub system. In Avanti USA a disconnect is required to isolate the WTE. Disconnects provided by Avanti are designed with lockout/tagout available for the convenience of service.

Deflector: This is a device designed by Avanti that attaches via magnets at tower flanges to prevent climbers from hitting their head on the flange as they climb. It uses a angled surface to deflect the climber toward the ladder.

Dolphin: This is an Avanti designed WTE. It is cable driven and wire guided. It uses the M508 hoist and a traveling cable design. Dolphin was designed for Vestas. It has design elements required and specified by Vestas. Our design is AECO certified.

Dolphin 350: This is an Avanti designed WTE. It is cable driven and wire guided. The primary difference between this and the Dolphin is load capability (3 person). This WTE is currently only developed for CE markets.

Egress: An egress is an exit. For example on a Pegasus WTE, there is a front door, an upper hatch, and a lower hatch. These are all means of egress from the WTE.

Electromagnetic Brake: This refers to a motor brake on the hoist that requires power to release. Our WTE always has this break applied unless power is applied to the hoist.

Emergency Descent: An emergency descent takes place when a WTE loses power. It relies on mechanical parts designed into a WTE to allow descent without power. It can also mean when a WTE is disabled up tower and a technician has to descend via the ladder.

Emergency Light: This refers to the light within a WTE. If the WTE or wind turbine loses power during operation, by code the light must stay lit for 30 minutes. This is to assist technicians in evacuation from the lift and/or tower.

Emergency Limit: If a WTE moves past its set limits, there is a secondary (emergency) limit in place to stop the WTE before it gets into a hazardous situation.

Emergency Stop: This is a button, pull cord, or other actuating device that works to cut power to machinery. It is used as a way for technicians within a lift to immediately stop the lift. This device is always in series within the electrical wiring of a device and should NEVER be bypassed.

ETT Cable: Specialized cable used in elevator traveling cable designs. It meets specifications of temperature extremes, flexibility, and fire resistance. It is round in shape. This is used in our Shark, Dolphin, SWP, and Octopus WTE designs where traveling cable is applied.

ETP: Specialized cable used in elevator traveling cable designs. It meets specifications of temperature extremes, flexibility, and fire resistance. It is flat in shape. This is used in our Pegasus WTE design.

Fall Protection Device (Lift): A fall protection device is a registered safety device that prevents a WTE from falling in the event of a mechanical failure.

Fall Protection Device (climb): A fall protection device is a device that prevents a climber from falling in the event of an emergency.

Fall Protection System (cable): A FPS that is cable based utilizes a cable from the top of the ladder to the bottom of the ladder within a wind turbine that a climber can secure their runner to thereby preventing a fall in case of an emergency. Avanti sometimes utilizes Tuf-tug's cable based FPS.

Fall Protection System (rail): A FPS that is rail based utilizes a rail mounted to the ladder from the top to the bottom of the wind turbine that a climber can secure their runner to thereby preventing a fall in case of an emergency. Avanti's FPS product is rail based and uses a rail mounted on the ladder.

Fence: A fence refers to a barrier within a wind turbine that prevents a technician from approaching a hole in platforms. It is employed to prevent a user from entering the WTE travel path and/or falling down the platform hole. A fence must be designed to meet OSHA standards.

Fishplate: A fishplate refers to a composite part used to join two pieces of ladder together end to end. It fits inside of the ladder stiles. These typically come in a set of 2 including hardware.

Flange: A wind turbine is made of sections that are stacked up during construction. Where these sections meet they are often bolted together. The protruded lips through which the bolts pass thru are the flange. The flange can be large enough to be an obstacle for a climber on the ladder.

Flange Stile Connector: A flange stile connector is used to connect two pieces of ladder together at each tower section. It has built in adjustment to account for tolerances between tower sections. This component is only used at tower section joints of ladders within a wind turbine. It is not to be confused with a stile connector.

Fuse: A Fuse is an electrical device that protects the devices downstream from it by preventing a specified level of current passing through it. If the specified current allowed by the fuse is exceeded, the fuse will need to be replaced prior to resuming normal operation.

Guard Locking System: This is a system relying on both mechanical and electrical contacts to insure a safe condition. This is applied to fences commonly on European designs. This is not utilized in the USA. The USA commonly uses trapped key instead.

Guide Wire: A slang term for a guide cable. See {Cable, Guide} in this glossary.

Harness: A harness is PPE worn by a technician that provides anchor points for a climber to tie off or hang equipment from them. A harness has ratings that should not be exceeded. A harness must be properly maintained and kept in good functioning condition.

Hazard: A hazard is a situation that can result in injury, death, or damage to a person or product. Avanti engineers design our products to avoid hazards.

Hoist: Hoist refers to the drive unit on an Avanti lift. It uses a drive mechanism to pull a cable through it. The cable makes a single loop through the drive unit on a wheel called a sheave. The hoist unit is attached to the lift at the "spine".

Interlock: An interlock is a series of devices that are interlinked in order to guarantee and define a certain order of operation. For example, in some wind tower designs a fence cannot be opened unless a WTE is present at that platform. This can be accomplished by both mechanical and electrical contactor means.

Internals: Internals refer to all items inside of a wind tower. Avanti provides options for platforms, WTEs, ladders, climb assistance, and fences.

Jurisdiction: A jurisdiction is a land area, be it a state, county, or country. In the Avanti context, we care about who is in charge (AHJ) and what code is applicable to our products.

Ladder (width): A Standard Avanti Ladder is 470mm outside dimensions on stiles. See the ladder section of this document for more information and available sizing.

Ladder guided: Ladder guided refers to when a WTE is guided along its travel path by a ladder. This makes the ladder within a wind turbine a critical part of the WTE design. Currently the only Avanti designs utilizing this are the Pegasus and the Octopus.

Licensed Elevator Mechanic: A licensed elevator mechanic is an individual(s) that is required on site for installation of a WTE in some jurisdictions. See the permitting section of this document for more information.

Lift: This is a slang term for a wind turbine elevator.

Limit: This refers to the extreme either top or bottom most position of a lift. This can also refer to the switches on a WTE that notify the controls of the WTE that it can no longer move further in that direction.

Lx: This is a unit of measurement for light. This is referenced in elevator code.

M508: This is the name of the Avanti designed and produced hoist used in our cable driven WTEs.

Nacelle: The Nacelle is the part of the wind turbine at the top where the blades come together. It houses the machine components necessary for electricity generation. Usually it houses a gearbox and a generator.

Obstruction Detection Device: An obstruction detection device is used on a WTE. It detect if something obstructs the travel path of the WTE. If activated it will stop the WTE from moving unless the obstruction is removed.

Octopus: This is an Avanti designed WTE. It is cable driven and ladder guided. It uses the M508 hoist and a traveling cable design. Our design is in the process of being AECO certified.

Omega Bracket: An Omega bracket is a bracket that fits around the stile of a ladder and then bolts to a support with two bolts. The center to center spacing of the bolts varies per who we are supplying the ladders and brackets to.

OSHA: OSHA is an acronym for Occupational Health and Safety Administration. This is a body of law designed to protect workers. OSHA is recognized at the federal level and can be adopted by states. Alternatively states and other jurisdictions can choose to provide equivalent organizations. An example of this would be MIOSH (Michigan's version of OSHA). Canada's equivalent to OSHA is CANOSH.

Overload: This refers to the overload in a WTE. This is a sensor that prevents operation of the WTE if it is loaded with too much weight.

PDM: This refers to the document and drawing management software that engineering began using in 2016. This software controls drawings, revisions, and provides automated services to support BoM generation resulting in more clear documentation between engineering and production staff.

Pegasus: This is an Avanti designed WTE. It is rack and pinion driven and ladder guided. It is the most unique Avanti WTE design and has many differing details from other Avanti WTE designs. The Pegasus was developed for Alstom and Acciona. It has design elements required and specified by Alstom and Acciona. This WTE has both CE market and AECO certified market models.

Pegasus XL: This is an Avanti designed WTE. It is rack and pinion driven and ladder guided. The primary difference between this and the Pegasus is load capacity (3 person). This WTE has both CE market and AECO certified market models.

Permit: A permit is a documented recognition by a jurisdiction that our product(s) is within the legal laws of that jurisdiction. A permit is sometimes required before we can install WTEs. See the permitting section of this binder for more information.

Platform: A platform in a wind turbine is a landing or elevated place where a technician can exit from the WTE or the climbing ladder to perform maintenance. WTEs and ladders pass through platforms on their way to the nacelle. Platforms are where fences are deployed to protect technicians from falling hazards.

PPE: This is an acronym for Personal Protective Equipment. Technicians utilize PPE to protect themselves from hazards.

Profile: See *Stile.*

Project: A project is an order, group of orders, or ongoing gathering of information leading to an order that will take a collective effort between engineering, sales, and production to come to a conclusion. It is the responsibility of the salesperson to determine when something is deemed a "project". There are several forms in regards to projects. Please see the forms section of this document.

PTC: PTC is an acronym for Production Tax Credit. This is USA federal regulation of funding for Wind Turbine projects. Status of the PTC often determines if the industry is in a low or a high producing state.

Pulley: In the Avanti world this refers to one of two things. A Climb Assistance pulley is the top most point in a tower that the rope passes through. It acts as the return for the rope. In an Avanti WTE pulley refers to the unit that guides and weighs down the traveling cable design. The travelling cable pulley is guided by the drive and safety ropes and therefore helps to contain and control the location of the traveling cable.

QEI: This is an acronym for Qualified Elevator Inspector. A QEI inspects a WTE installation for code compliance. They can be employed by their jurisdiction or employed by a third party company that is recognized by the AHJ of a jurisdiction.

Rack and Pinion: Rack and Pinion or R&P for short refers to a method of driving a WTE up and down a tower. It is currently only used on the Pegasus WTE. It consists of a set of gear teeth along one side of the ladder the full length of the tower and interfacing pinions that climb the gear teeth.

Rail: A rail refers to the rail used in a fall protection system on a ladder. It provides something the full length of the ladder that a climber can connect their runner to.

Repair Kit: A repair kit refers to either a ladder repair kit or a rail repair kit. A ladder repair kit is a short section of ladder with slots cut in the stiles on one end. This section of ladder can be inserted into an already fixed ladder without having to disassemble large portion of said ladder system. A rail repair kit is used to repair or replace damaged sections of fall protection rail. It is also employed at flanges within a tower to join one section of rail to the one above or below it in the next section.

Repel: Repelling is lowering oneself via a rope. Repelling within wind towers is only ever considered in emergency situations. It should never be employed in normal use of the Avanti Climb Assist, ladders, or WTEs.

Risk Assessment: During an AECO certification process sometimes Avanti products are not compliant with code. When this occurs we have to do a risk assessment. A risk assessment is a documented evaluation of a hazardous situation or situations resulting from not complying with code. It quantifies the risk and provides a way for Avanti engineers to determine what appropriate steps are necessary to eliminate a possible hazard.

Roller: A roller is a device that guides wire rope or textile rope in a desired location. Rollers are commonly used in our Climb Assistance designs. Wire rope rollers are used in our cable driven WTE designs.

Rope: Rope within the wind industry refers to several things. This can be a rope made of metal strands to either guide, drive, or provide safety on a cable driven WTE, or it can refer to a textile based rope used in Avanti's climb assistance system.

Rope Splice: A rope splice refers to splicing two ends of the same rope together in order to make one continuous rope. This is a term used in relation to our Climb Assistance product.

Rung: A rung refers to the horizontal parts of a ladder that climbers use their hands and feet on to ascend or descend the ladders. Rungs are mounted at equal spacing between ladder stiles.

Rung Reinforcement: Avanti rung reinforcement consist of a bolt or threaded rod that goes inside of a ladder rung and reinforces it to a level of strength such that it can be used as an anchor when tying off.

Runner: A runner is a safety device connected to a climber and a climbing ladder that prevents the climber from falling. Runners can work with a cable based fall protection system or a rail based fall protection system.

Section (Tower): A wind turbine is assembled by stacking sections of towers. Section refers to these individual sections. Tower sections can be concrete or steel depending upon tower design.

Sensor: A sensor is a device detecting a situation. This device can be in the form of a switch or a proximity detection device. Sensors of several types are common in WTE design.

SGRE: This is the new company formed by merging Siemens and Gamesa.

Shackle: A shackle is a device connecting two devices together. In Avanti's world this term is used in two places. A shackle is used on our runner linking our runner to our shock absorber. A shackle is also used connecting our drive, safety, and guide cables to the beam at the top of a wind turbine in a cable driven, wire guided WTE design. All shackles are rated to support certain loads.

Shark (L,M): The Shark is Avanti's most widely used WTE design. It is cable driven and wire guided. The Shark comes in 3 variants. The Shark M is a one person lift. It is no longer AECO certified. Our WTE for GE is based on this design. It uses a trailing cable. The Shark L is a two person lift. The Tirak version of the Shark L is no longer produced. It is AECO certified. The M508 version of the Shark L is currently in production. It is AECO certified. This lift was designed to be a generic design used in many wind tower designs.

Sheave: A sheave is a wheel around which a drive cable passes. The sheave is what drives the cable through the hoist.

Shock Absorber: This is a textile based apparatus placed in series with a runner and a climber. If the climber falls during ladder ascent or descent, the shock absorber helps to lessen the shock of the fall. The shock absorber used in the USA will deploy from a length of 6" to 4' during a fall helping to prevent a shock injury to a climber. A deployed shock absorber must be replaced.

Slack Line Detection System: A slack line detection system is present in new WTE designs for Avanti. It is employed on cable driven WTEs. If the drive cable goes slack the system stops the WTE from moving and notifies the user of the hazard. This potentially hazardous situation occurs if the WTE becomes suspended on an obstruction during descent and the hoist continues to drive cable through the sheave. With no tension on the drive cable, if the WTE dislodges from the obstruction it could potentially fall. The system prevents this by detecting the slackening of the cable. This is differentiated from a tail line detection system because it is implemented into the base design of our new WTEs.

Spine: Within an Avanti lift, this is the support structure that the hoist is connected to. It is designed and built to withstand the forces incurred by the driving unit, normal operation, and emergency operations of the lift.

Stile: A stile is the vertical portion of the ladder. Two stiles are connected by rungs.

Stile Connector: A stile connector is used to connect two ladder pieces end to end. It is used in conjunction with fishplates. A stile connector is used between all ladder joints in a tower ladder except at tower section connections. As stile connectors have no built-in adjustment they cannot account for tolerancing between tower sections. This is not to be confused with a flange stile connector used for this purpose.

Swagging: Where wire ropes or guide cables are suspended from the beam at the top of the tower, they are connected to the shackles via swagging. Swagging is the process of making a loop on the end of the wire and affixing it to itself with a permanently attached collar. This creates a tear-dropped shaped loop at the end of the rope. Internally this tear-drop is protected by a metal sheath.

SWP: This is an Avanti designed WTE. It is cable driven and wire guided. It uses the M508 hoist and a traveling cable design. It also uses the trailing cable design dependent upon space restrictions within a wind tower. The S refers to Siemens. This lift has many design elements implemented based on Siemens requirements and specifications. Our design is AECO certified.

SWP XL: This is an Avanti designed WTE. It is cable driven and wire guided. The primary difference between this design and the SWP is load capacity (3 person). This model is currently built only for the CE market.

TAB: This is an acronym used by engineering staff.

Tail Line Detection System: A tail line detection system is present in old WTE designs for Avanti. It is employed on cable driven WTEs. If the drive cable goes slack the system stops the WTE from moving and notifies the user of the hazard. This potentially hazardous situation occurs if the WTE becomes suspended on an obstruction during descent and the hoist continues to drive cable through the sheave. With no tension on the drive cable, if the WTE dislodges from the obstruction it could potentially fall. The system prevents this by detecting the slackening of the cable. This is differentiated from a slack line switch because it is an add-on to current systems.

Temporary Lighting: Temporary lighting refers to headlamps, flashlights, or portable light sources carried by technicians. It is used to perform maintenance and is used by technicians in the event of a loss of power negating all turbine lighting. It is mandatory for Avanti technicians to carry temporary lighting.

Tether: A tether is a temporary or permanent connection between two objects. An example of a temporary tether would be a link between a climbing technician and an anchor. An example of a permanent tether would be the connection between the key and the control unit in a trapped key system.

TFA: A TFA is a Technical Field Advisor employed from Avanti by our customers to guide their technicians in installation and integration of Avanti equipment.

Tied off: Tied off means that a climber is tethered to an anchor point within a wind turbine. This is done to prevent a falling hazard. A climber is considered 100% tied off when at least one tether is in place. Climbers above the base deck of a tower, using the ladder, or lift must be a minimum of 100% tied off AT ALL TIMES.

Top Stop: A top stop is an obstruction detection device that provides safety monitoring above the WTE.

Tirak (Griefzug): A Tirak refers to the drive hoist Avanti used to purchase for our lifts from the German company Griefzug. The Tirak was provided on all lifts in the USA prior to 2013. All lifts (with the exception of GE lifts) produced in and after 2013 are provided with an Avanti M508 Hoist.

Tower Internals: all parts inside a wind turbine; the term may also include the tower door and the stairs outside the turbine leading to the door.

Trapped Key System: A trapped key system is a design that requires a key to be engaged to use a WTE. It also requires that the same key be used to open fences at platforms. Removing the key from the WTE to open the fence prevents use of the WTE when the fence is open. This system is a mechanical safety measure designed to prevent a hazardous situation. The key is permanently tethered to the WTE with a length of cable long enough to reach the fence locks.

Tripod: Guide wires or cables are tensioned within a wind tower. At the base of the tower, usually below the bottom platform they are tensioned. Tension devices can be a tripod (3 legged) device with a threaded rod for tensioning or a spring type tensioning device.

TSSA: TSSA is an acronym for the Technical Standards and Safety Authority within some jurisdictions in Canada. In Ontario for example, in order to permit WTEs, the AHJ is the TSSA.

UL: UL is an acronym for Underwriter's Laboratory. They are a third party company that in the past has acted as an AECO body for us.

Variance: Jurisdictions and AHJs have code that our products must comply to. A variance is a process by which we state non-compliance to said code and demonstrate why the code is not applicable to our product or how we are equivalently safe in our design. A variance can also be a request for more time within a jurisdiction to become compliant to jurisdictional code.

Visual Warning Device: In an Avanti WTE this is a blink light used to alert technicians in and around the unit that it is moving or in operation.

Wire Fix: A Wire fix is a device mounted at intervals in a tower along the travel path of a WTE. It acts as an interface and additional guide for the guide wires/cables. It works in cooperation with the Wire Guides on the WTE.

Wire Guide: A wire guide is a device mounted to a WTE that engages the guide wires to guide the travel of the WTE along its travel path.

Wire Guided: A wire guided WTE utilizes tensioned wires to act as travel path guides for the moving WTE. The wires are utilized the full length of travel. Another name for this is cable guided.

Work Cage: This is a slang term for the passenger portion of a wind turbine elevator.

WTE: WTE is an acronym for Wind Turbine Elevator. Avanti builds WTEs that are cable driven, rack and pinion driven, ladder guided, and wire guided.

Revision Notes:

- Q4 2019: First revision created, split off from single volume R06

AVANTI