

# Creating a Safe and Efficient Work Environment for the Wind Power Industry

**Presenter:** Mr. Kent Pedersen, GM, AVANTI Wind Systems Inc.  
Mr. Dilip Khatri, PhD, SE, Khatri International Inc.

**AWEA, San Diego, CA, January 12, 2011**





## Company Profile

- **AVANTI** - a global company
- **MISSION:** “Safe work in wind turbines”
- **AVANTI** was established 1885 and today 100% dedicated to the Wind Industry
- **AVANTI** is the market leader worldwide of products for safe work in Wind Turbines with sales and production activities throughout the world.
- **AVANTI** has developed a complete range of products and service that includes:
  - Work Cages / Service Lifts,
  - Climb Assistance,
  - Ladders w. Fall Protection Equipment,
  - Rest & Tower Platforms as well as Anchor Points,
  - Safety training programs,
  - Rescue Equipment,
  - Annual service for all AVANTI products,
- **AVANTI** has supplied more than 12,000 service lifts globally

- **Wind turbine towers are getting higher !**
- **Most towers today are prepared for 80 meter HH**
  - **100 meter towers are now being produced**
  - **+120 meter tower are now in design phase**
- **The demand for safety of the employees working in the wind turbines increases.**
- **Workers are under pressure to increase / maintain WTG availability and maximize performance.**





## Wind Tower Structures Aluminum Ladders

*The Tower Ladder* is the conventional main egress method in a Wind Turbine tower.

*The Tower Ladder* must comply with ANSI 14.3 with an ANSI / CSA approved fall protection system.

Climbing *The Tower Ladder* requires that “YOU” are fit for duty.

Climbing the *The Tower Ladder* requires that “YOU” wear and use the proper PPE / fall protection system.

How far have “YOU” climbed today?



**A Climb Assistance** is a motorized lifting device that relieves the climber during the climbing ascent / descend on a vertical ladder.

- Think “Instant Weight Loss of 90 lbs”.
- Works by an endless rope leading / assisting the user both up and down the ladder in the WTG tower.
- Profitable investment both in turbines of average height and older turbines without service lift system.
- Easily retrofitted in existing towers.
- Works best for towers less than 80 meters.
- Ensure co-habitation between Climb Assistance and Fall Protection System.



## Wind Tower Structures - Work Cages / Service Lifts

- A **Work Cage / Service lift** is a lifting device that can be used for both personnel as well as material.
- A **Work Cage / Service lift** is safety equipment and requires user training.
- A **Work Cage / Service lift** requires a State permit or release of permit before operations that include stamped PE engineering drawings.
- A **Work Cage / Service lift** is safety equipment and requires annual inspection / preventative maintenance.
- A **Work Cage / Service lift** can be supplied from most WTG manufacturers as a Standard Feature or as an Optional Feature by request.





- **ICC Writes building codes for the US**
- **ICC Building Codes (IBC) are adopted in all US states**
- **ICC have developed AC 394 – Acceptance criteria for structural capacity of work cages for wind turbine towers.**
  
- **ASME 17.1 is the governing elevator code and adopted by many AHJ's through out the country.**
- **ASME 17.1.5.11 is a new code being developed specifically for Elevators for Wind Turbines.**
  
- **ARC 6852B Div 875 is State specific for Iowa**



**OSHA REQUIREMENTS**

**1926.552(A)(1)**

THE EMPLOYER SHALL COMPLY WITH THE MANUFACTURER'S SPECIFICATIONS AND LIMITATIONS APPLICABLE TO THE OPERATION OF ALL HOISTS. WHERE MANUFACTURER'S SPECIFICATIONS ARE NOT AVAILABLE, THE LIMITATIONS ASSIGNED TO THE EQUIPMENT SHALL BE BASED ON THE DETERMINATIONS OF A PROFESSIONAL ENGINEER COMPETENT IN THE FIELD.

**1926.552(A)(2)**

RATED LOAD CAPACITIES, RECOMMENDED OPERATING SPEEDS, AND SPECIAL HAZARD WARNINGS OR INSTRUCTIONS SHALL BE POSTED ON CARS AND PLATFORMS.

**1926.552(A)(3)**

WIRE ROPE SHALL BE REMOVED FROM SERVICE WHEN ANY OF THE FOLLOWING CONDITIONS EXISTS:

**1926.552(A)(3)(i)**

IN HOISTING ROPES, SIX RANDOMLY DISTRIBUTED BROKEN WIRES IN ONE ROPE LAY OR THREE BROKEN WIRES IN ONE STRAND IN ONE ROPE LAY;

**1926.552(A)(3)(ii)**

ABRASION, SCRUBBING, FLATTENING, OR PEENING, CAUSING LOSS OF MORE THAN ONE-THIRD OF THE ORIGINAL DIAMETER OF THE OUTSIDE WIRES;

**1926.552(A)(3)(iii)**

EVIDENCE OF ANY HEAT DAMAGE RESULTING FROM A TORCH OR ANY DAMAGE CAUSED BY CONTACT WITH ELECTRICAL WIRES;

**1926.552(A)(3)(iv)**

REDUCTION FROM NOMINAL DIAMETER OF MORE THAN THREE SIXTY-FOURTHS INCH FOR DIAMETERS UP TO AND INCLUDING THREE-FOURTHS INCH; ONE-SIXTEENTH INCH FOR DIAMETERS SEVEN-EIGHTHS TO 1 1/8 INCHES; AND THREE THIRTY-SECONDS INCH FOR DIAMETERS 1 1/4 TO 1 1/2 INCHES.



**72.12(3)** The owner of a wind tower lift installed after May 28, 2008, shall register the wind tower lift with the labor commissioner prior to its installation. A wind tower lift installed after May 28, 2008, shall pass an installation inspection by the labor commissioner's inspectors prior to its being placed into operation. The wind tower lift shall receive a periodic inspection by the labor commissioner's inspectors annually thereafter.

**72.12(4)** Registration pursuant to this rule requires submission of the following information to the labor commissioner:

- a. The unique identifier of the wind tower.
- b. The name of the wind tower owner and contact information for the owner's representative.
- c. The name of the wind tower lift manufacturer and contact information for the manufacturer's representative.
- d. The location of the wind farm.
- e. The blueprints and design documents that are certified by a professional engineer duly licensed in the state of Iowa and that bear the professional engineer's P.E. stamp for the lifts.
- f. The manufacturer's complete test procedures, inspection checklists, operating manual, service manual, and related documents as determined necessary by the labor commissioner.

Describes in details the requirements for initial and annual inspection.

**72.12(9)** Wind tower lifts shall pass an inspection covering the following criteria:

- a. Ascending speed, descending speed, and emergency descending speed shall not exceed the manufacturer's recommendations.
- b. Stop switch, interior lighting, cage entry door, door contact, operating controls and remote operating controls shall operate according to manufacturer's recommendations.
- c. Interior floor and cage framework shall appear to be structurally sound.
- d. Enclosure signage recommended by the manufacturer shall be in place.
- e. Manufacturer's data plate shall be visible.
- f. Hoisting mechanism shall appear to be structurally sound and intact from inside and outside the car.
- g. Guide shoes shall appear to be structurally sound and undamaged.
- h. Suspended power cords and strain relief devices shall reveal no visible damage.
- i. Upper and lower normal and final limits shall operate according to the manufacturer's recommendations.
- j. Overspeed device shall successfully pass a full-load test.
- k. Overload device shall successfully pass an overload test according to the manufacturer's recommendations.
- l. Wire rope, safety rope, and guide rope shall show no evidence of wear.



## How often are they used? Work Cage / Service Lift

- **A survey was conducted end of 2010 and we found:**
  - **Total of 9 Wind Farms located in IL, IA, PA, TX, NH, MO**
  - **Included 485 service lift installations in 80 meter towers.**
  - **Year to date “operation hours” was 1 – 3 years.**
  - **Average number of round trips per lift, per tower per year = 123**
  - **Total number of round trips for all lifts installed on all 9 wind farms over 1 - 3 years:**

**48,104**



## **Safety Plan / Conclusions / Take Away**

**Work Cage / Service Lift / Climb Assistance**

**The Wind Farm Safety Plan should consider / include the following:**

- **Are ALL safety products in the WTG approved by Local, Federal & State notified bodies for their intended purposes ?**
- **Will the Climb Assistance counteract the fall protection system? Can you prove it ?**
- **How can “You” reduce current and future long terms injuries due repetitive climbing, through usage / implementation of Climb Assistance / Work Cages ?**
- **What is the importance / cost saving of employee retention of both young and older wind technicians ?**
- **Is the annual Inspection / preventative maintenance of PPE as well as Work Cages / Service Lifts, actually being performed and recorded ?**
- **Could the General Liability and Worker Comp. insurance rates be lowered, due to a safer and more efficient work environment ?**



**Thank you!**

**For more information, Please contact:**

**Presenter / Author:**

**Kent Pedersen  
General Manager  
AVANTI Wind Systems Inc.  
5150 Towne Drive  
New Berlin, WI 53151  
P: 262 641 9101  
M: 414 238 1071  
E: [kp@avanti-online.com](mailto:kp@avanti-online.com)  
W: [www.avanti-online.com](http://www.avanti-online.com)**

**Co-Author:**

**Dilip Khatri, PhD, SE  
Khatri International Inc.  
3579 E. Foothill Blvd., # 736  
Pasadena, CA 91107  
P: 626 475 7660  
E: [DKHATRI@aol.com](mailto:DKHATRI@aol.com)  
W: <http://www.khatrinternational.com>**