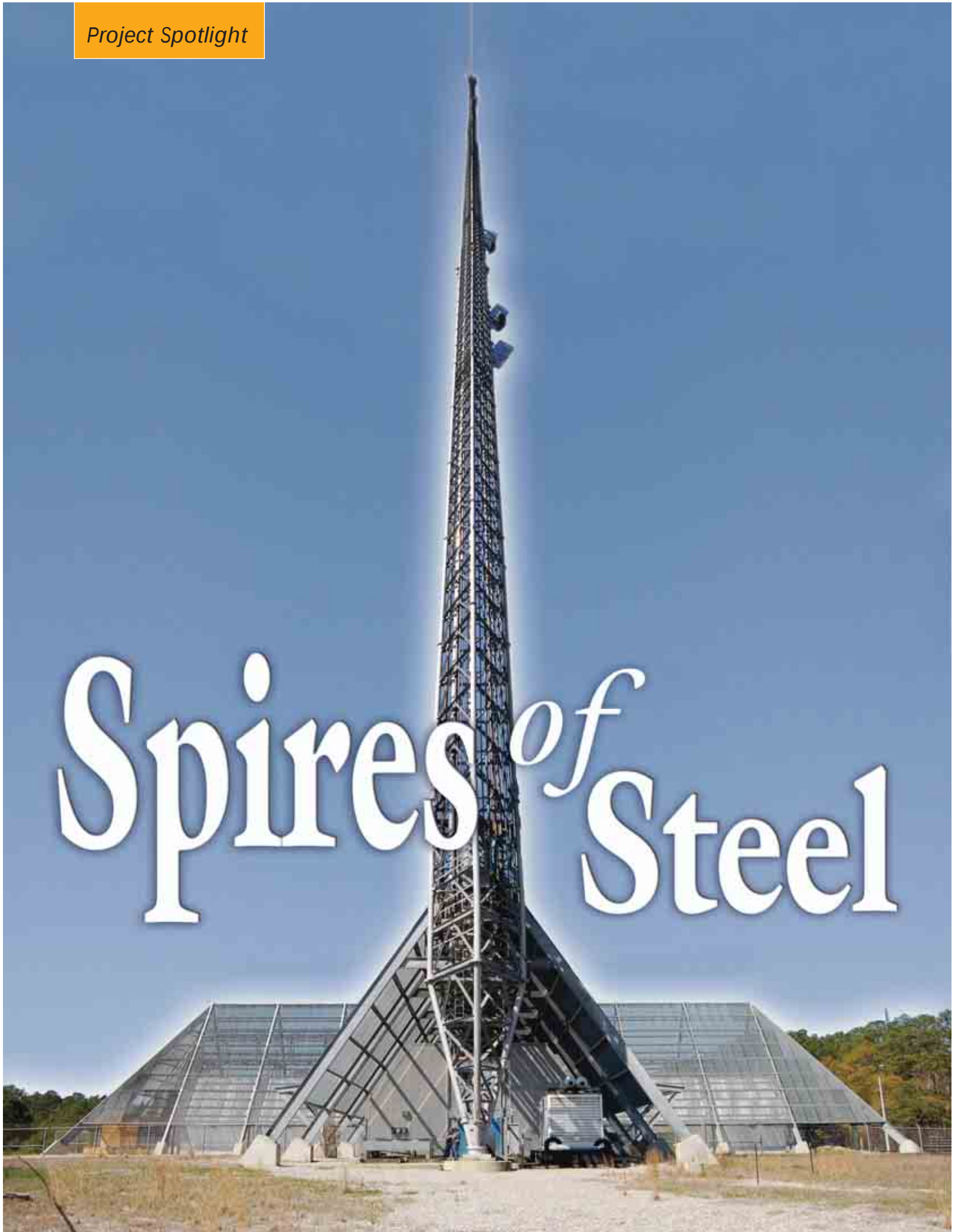


Project Spotlight

Spires of Steel





by Robert S. Caporale, MSc

Anyone who has strolled along the sidewalks of a major city has walked among some of the largest manmade structures on earth. Massive high-rise buildings in excess of 40 stories are quite common in major cities on every continent. The list of the tallest buildings in the world is currently led by Taipei 101 (ELEVATOR WORLD, September 2005) in Taipei, Taiwan, which stands at 509 meters in height. This is followed by the two Petronas Towers (ELEVATOR WORLD, March 1997) in Kuala Lumpur, which are each 452 meters tall. Next is the Sears Tower in Chicago at 442 meters in height, followed by the Jin Mao Tower in Shanghai, which rises to 421 meters.

These buildings also contain the world's fastest and highest-rising elevator systems in public service. Although these buildings are currently listed as the tallest, it won't be too long before all of them are eclipsed by the recently announced Burj Al Alam in Dubai and the Fordham Spire (ELEVATOR WORLD, October 2005) in Chicago.

From afar, awestruck observers cannot help but wonder how these structures could have been raised so far above the urban landscape. It is clear that the elevator systems in these buildings are what make them viable. In addition, these modern-day electromechanical systems are seen as wondrous products.

Skyscrapers are contemporary phenomena that have become an integral part of the daily lives for many, and most people feel that these are the tallest structures in the world. However, as significant as these projects and their elevator systems are, they only rise to about two thirds of the height of the world's tallest structures. To date, none have risen to anywhere near the astounding heights that have been reached by the much-less-obvious (but no less spectacular) steel TV broadcasting and radio communication towers that have become common sights along the highways and byways of many nations.

Above:

- Looking down inside of tower from above

Left (top to bottom):

- Looking up at the elevator parked at its bottom terminal landing 50 feet above ground level
- The base of the WRAL-TV Tower in Raleigh, North Carolina

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Spires

of Steel

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All anyone needs to do is take a drive along any U.S. Interstate, and before long one of the many steel towers will be seen poking above the horizon and up into the clouds. And as anyone who has ever gotten close enough to gaze up at one of these towers from near its base will attest, the view from below is dazzling. As the slender steel structure disappears into the sky, numerous large-diameter steel-wire cables are seen angling down from the tower to the ground, where they are embedded into massive concrete foundations placed hundreds of yards away from the tower's base. These 2-to-3-inch-diameter steel-wire cables hold the towers in place, and are an integral part of their design and construction. You can't help but wonder not only how these structures could have been built, but also how the equipment that is mounted on them is accessed and by whom. Someone needs to get to the numerous antennae, wire ways and broadcasting equipment that are mounted along the tower and at its very peak, which in some cases can be as high as 2,000 feet above ground level.

A visit to the Richland Towers website indicates that this company has built numerous broadcast towers throughout the U.S. Among those listed are four that are over 1,700 feet in height, including one that stands 1,972 feet tall and another in Sacramento, California that rises to an astounding height of 2,000 feet. To build anything that tall requires a great degree of engineering and construction skill, and to maintain it and the equipment that is mounted thereon requires not only a tremendous amount of courage, but equal parts of strength and stamina as well. Richland Towers is one of many companies that design, build and maintain these titanic structures. An examination of the membership list posted on the National Association of Tower Erectors website uncovers a list of numerous other construction companies and broadcasting-equipment suppliers that are involved in this industry.

In addition to being involved in the construction of these towers, brave individuals known in the trade as "riggers" also routinely scale these structures to inspect the towers, as well as to install, adjust and maintain the antennae and other equipment that is installed on them. Some of these towers are provided with elevators, but most of this work is relegated to individuals who must scale these huge structures on a regular basis.

Riggers climb these structures to gain access to the equipment that is located many hundreds (and in some cases thousands) of feet above ground level. The destination of these workers is routinely more than 1,500 feet in the air, and for them to be able to climb hand over hand to such heights, they must be in great physical and mental condition. After hours of strenuous, nonstop climbing,



Opposite page (top to bottom):

- A geared hoist machine installed at ground level
- A stationary counterweight and deflector-sheave assembly. The hoist machine is beneath a galvanized-steel cover to the left of the counterweight.

Inset (below):

- Those daring young men at the top of the tower; these guys are 2,000 feet above the ground and working at the base of a broadcasting antenna. Can you believe it?



they must then be able to perform maintenance and repair work before climbing down. It might take as much as half a day to scale one of these towers, and in this amount of time, weather conditions can change dramatically from when the climb began. These workers must be prepared to not only put in a strenuous day of climbing up and down a 2,000-foot-high tower; they must also be prepared to do this in all weather conditions. It is a remarkable expectation, and those who rise to the challenge are truly remarkable individuals.

Although all of the riggers must be prepared to scale these towers on occasion, they might come across one that is provided with an elevator to assist with this work. It has been estimated that about 250 of the approximately 3,000 broadcast towers that are located in the U.S. are provided with elevators. Although this still leaves a lot of climbing to be done, in some cases the maintenance crews are fortunate enough to be assigned to a tower that is provided with an elevator that they can take all the way to the top. While this makes the riggers' job a bit easier to some degree, it creates an extreme challenge for the elevator industry.

Specialists at Marshall Elevator Co. in Pittsburgh; Hontz Elevator Co. of Orlando (which was recently purchased by Schindler Elevator Co.); and Park Manufacturing Co., Inc. in Gastonia, North Carolina are among the businesses that install and routinely maintain broadcast-tower elevators that rise thousands of feet in the air. In North Carolina, state inspectors examine them on a routine basis. Chief Elevator Inspector Jonathan Brooks, Deputy Elevator Inspector Tom Chambers and Inspector Wesley Tart of the State of North Carolina, as well as Elevator Consulting Engineer Buddy Godwin, have all been involved in this inspection work. On these projects, the elevator hoist machines, counterweights and controllers are positioned at or just above ground level. However, the hoist ropes, car equipment, limit switches and overhead sheaves can only be inspected by riding to the top of the tower in a slow-moving and quite-confined elevator car provided with a collapsible car gate. It is a long and tedious ride that may take as long as 20 minutes in one direction, and requires a good deal of courage and confidence in the equipment you are inspecting. However, someone has to do this important work, and the people who install, maintain and inspect broadcast-tower elevators are among the individuals who have been higher than most of us would ever think of going without wings or at least a parachute.

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At right (top to bottom):

- Controller mounted at ground level (open)
- Controller mounted at ground level (closed)
- Car enclosure





Marshall Elevator Co.

Established in 1818, Marshall is the oldest elevator company in the U.S. Now in its 188th year of operation, the company is one of western Pennsylvania's premier family-owned-and-operated manufacturers. Marshall carries conventional- and holeless-oil-draulic elevators, geared and gearless traction elevators, wheel-chair lifts, portable lifts, and rescue devices for the home. It also offers a line of moving walkways and escalators for indoor/out-door use and high-volume applications.

Since 1953, Marshall Elevator has been manufacturing elevators for tall towers throughout the world. The ability to transport personnel and equipment with the speed, safety and ease necessary to service and repair operations on equipment mounted on tall towers is critical to keeping broadcast towers operational and profitable. Marshall has two types of standard elevator cars – for either triangular or square towers.



Park Manufacturing Co., Inc.

Park Manufacturing is a licensed elevator company that has been in business since 1898. It is also the oldest independent elevator company in the southeastern U.S. Since its founding, the company has installed over 6,487 elevators and accessibility lifts in over 20 states.

Park Manufacturing President Ken Sumney stated, "Our main objectives are safety, quality and customer satisfaction. Our 108 years of experience have helped us achieve these goals. The work we do is extremely dangerous and technical, but our rates are competitive with other elevator companies." Park Manufacturing has an office in Greenville, South Carolina, and their main office is in Gastonia, North Carolina. Their mechanics are on call 24 hours a day, seven days a week.

Since 1954, Park Manufacturing has built elevator hoisting machines and equipment for tall tower elevators. The company has supplied these for TV and radio towers in most of the U.S., and has qualified personnel and sufficient manufacturing capability for this operation.



Opposite page (clockwise from upper left):

- Hoist machine
- Car at bottom landing
- Hoist ropes at back of car
- Car safety

This page (clockwise from upper left):

- Car enclosure
- Geared machine
- A broadcast tower in Baldwin County, Alabama
- Car safety





WRAL-TV Tower

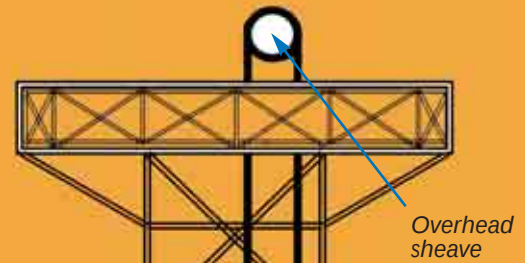
Raleigh, North Carolina

Tower Specifications

Pinnacle height:
1,999 feet
Weight of tower:
723 tons
Weight of guys:
258 tons
Broadcasting range:
88 miles

Elevator Specifications

Capacity:
700 pounds (two persons)
Speed:
75 fpm
Control:
Two-speed AC,
continuous-pressure
push button control
Machine:
Geared
Roping:
Two 5/8-inch-diameter
galvanized-steel wire
ropes, roped 1:1 to the
car and 2:1 to a stationary
counterweight mounted
at ground level



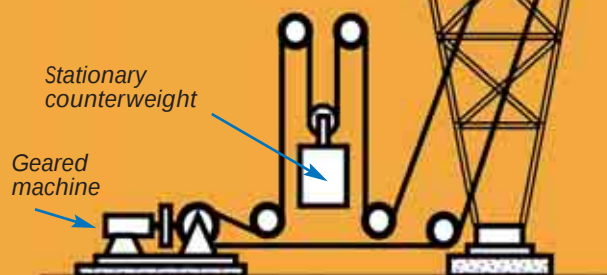
Car



Deflector sheave

Stationary counterweight

Geared machine



Opposite page (top to bottom):

- Broadcast-station equipment enclosure at base of tower
- Lower deflector sheave
- Base of broadcast tower, with counterweight frame at left

This page (clockwise from upper right):

- Overhead sheaves atop tower
- Hoist ropes passing by rear of car enclosure
- View of the countryside from near the top of a 2,000-foot-high tower
- Roller guides
- Overhead sheaves atop tower



Continued

We've been told (and the accompanying photos bear out) that the views from the top of one of these structures are magnificent, but riding that high above the ground in an elevator that is installed in a 2,000-foot-high opened steel tower is white-knuckle work that takes a good deal of strength and courage to complete. Kudos are in order to those who work on these magnificent "spires of steel," without which we would not be able to enjoy the radio and TV broadcasts and wireless communication upon which we have come to depend.

Tower Elevator Systems, Inc. (TESI) also provides rack-and-pinion elevators in TV-broadcasting towers. The TESI tower elevator uses a hard-wired control and communication system, and will be the subject of a follow-up story in a future issue of *ELEVATOR WORLD*.

Special thanks to Jonathan Brooks for photos taken in the tower, and to Marshall Elevator for equipment photos.