

# **INVESTIGATION OF THE MARCH 25, 2014 FAILURE OF GIN POLE RIGGING, AND COLLAPSE OF CELLULAR TOWERS AT BLAINE, KS.**

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U.S. Department of Labor  
Occupational Safety and Health Administration  
Directorate of Construction

August 2014



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BLAINE, KS.**

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## **Background**

On March 25, 2014, two communication towers owned by Union Pacific Railroad (Railroad) collapsed in Blaine, KS, killing two workers. The project consisted of dismantling an older communication tower with all its appurtenances (e.g., antennas, dishes, coaxial cables, etc.). The older tower was located next to a recently constructed tower. At the time of the incident, a gin pole was being raised on the older tower to lower a 10 ft. diameter dish when the rigging of the gin pole suddenly failed causing the 60 ft. tall gin pole to plummet down, resulting in the collapse of both the towers. One employee was situated approximately 20 ft. below the top on the older 250 ft. high tower and was engaged in disconnecting the 10 ft. diameter dish and another employee was on the same tower approximately 80 ft. from the top. One worker died at the scene and the other was pronounced dead at the hospital. There were two additional employees at the site who were not injured.

The crew dismantling the tower had been on the site for about two weeks. The victims were employees of Wireless Horizon of St. Peters, MO, subcontractor for the Sabre Communication Corporation.

The Occupational Safety and Health Administration's (OSHA) Regional Administrator, Region VII, requested the Directorate of Construction (DOC), OSHA National Office in Washington, DC to provide technical assistance in a causal determination, and to render engineering assistance to the Wichita, KS, OSHA Area Office in its investigation. A structural engineer from the DOC arrived at the site on March 28, 2014 to inspect the incident site, and observe the failures. As a result of the collapse of the two towers, the guy wires got embedded in the ground, and the fallen towers were twisted and crumpled. The gin pole was stuck in the ground and was standing almost vertical. Pieces of the fallen equipment were examined at the site. Materials and equipment relevant to the investigation as evidence were identified. Photos were taken at the incident site.

The following is our report.

## **The project**

Union Pacific Railroad Company (Railroad) at 1400 Douglas St., Omaha, NE 68179, decided to upgrade the antennas and other appurtenances of two of their existing towers, built in the 1960s, located at New Cambria, KS and Blaine, KS. Both towers were similar. The Railroad retained two consultants, FDH Engineering Inc. (FDH) of Raleigh, NC, and Towercraft Engineering, P.C. of Alliance, NE to evaluate the Blain and New Cambria towers, respectively. The purpose of the evaluation was to determine whether the older towers were structurally adequate to support the proposed new antennas and related appurtenances in accord with the current industry standards. FDH performed the structural analysis for the Blaine tower in December 2008 (FDH Project Number 08-09184E S1) and concluded that the existing tower could not support the new proposed loads to meet the requirements of TIA/EIA-222-F industry standards.

Towercraft Engineering (Project No. 7536) reached a similar conclusion in regard to the New Cambria tower stating that the existing tower with the new loads could not meet the requirements of ANSI/TIA 222-G. The Railroad, therefore, decided to replace both the existing towers at New Cambria and Blaine with new towers. A Contract was signed on September 26, 2013 between the Railroad and Sabre Communication Corporation of 2101 Murray St., Sioux City, IA 51111 (Sabre) to furnish all labor, equipment, and material to supply and install one (1) 250' guyed tower at Blaine, KS and one (1) 270' guyed tower at New Cambria, KS. Sabre's scope of work included removal of the two (2) existing 250' guyed towers and associated anchors at Blaine and New Cambria.

Sabre in turn retained Wireless Horizon, Inc. , of 7870 Mexico Road, St. Peters, MO 63376 (Horizon) to construct new towers at the two locations including foundations and fences, and to transfer necessary equipment to the new towers. Sabre was also to remove the existing towers at both the locations. Horizon installed the new towers at both the locations and then proceeded to remove the older towers, see figure 1.

The incident occurred at the Blaine site during the removal phase. The details given below pertain to the Blaine site.

Horizon was in the process of dismantling the existing tower as a part of their contract. But before the actual tower could be demolished section by section, Horizon had to remove the existing dish antennas from the tower. The existing tower had four (4) 10 ft. diameter dish antenna marked EW63, located at elevations of approximately 60 ft., 90 ft., 210 ft. and 240 ft. There were smaller antennas too. The three (3) 10 ft. diameter dishes were successfully removed and then they were in the process of removing the fourth dish for which Horizon decided to use a gin pole which was required anyway to remove the tower sections during dismantling of the tower.



Figure 1 – Existing and New Tower at Blaine, KS

### **Existing (Old) Tower Details at Blaine, KS**

FCC# 1046569

Site ID by Railroad: Blaine (91639)

The tower was a four (4) sided guyed tower with tower face of 20". At the base, tower face was tapered to 9". The tower was about 50 years old, built in the 1960s.

Legs: Steel Angles 2"x2"x8/32" – painted orange and white.



Diagonals: Steel Angles 1½"x1½"x 6/32"    Horizontals: Steel Angles 1½"x1½"x 6/32"

Location: Northwest corner of Highway 16 and Rock Creek Road approximately 1.5 miles southwest of Blaine, Kansas, see figure 2.

The site coordinates for the tower center: N 39° 28' 47.8", W 96° 25' 36.9".

Figures 3 to 5 show the tower before the collapse, and figures 6 and 7 show the tower lying on the ground after the collapse. Existing tower elevation drawing and existing loads are shown in figures 8 and 9.

Guy wire details: Radius: inners 95 ft. and outers 185 ft.

Guy wire elevations	size	radius
50 ft.	3/8"	95'
100 ft.	3/8"	95'
150 ft.	3/8"	185'
200 ft.	3/8"	185'
240 ft.	½"	185'



Figure 2 – Site location - from Google maps



Figure 3 – Existing Tower – photo before collapse



Figure 4 – Existing Tower – photo before collapse



Figure 5 – Existing Tower – photo before collapse



Figure 6 – Existing Tower on the field after collapse



Figure 7 – The dish that was being removed

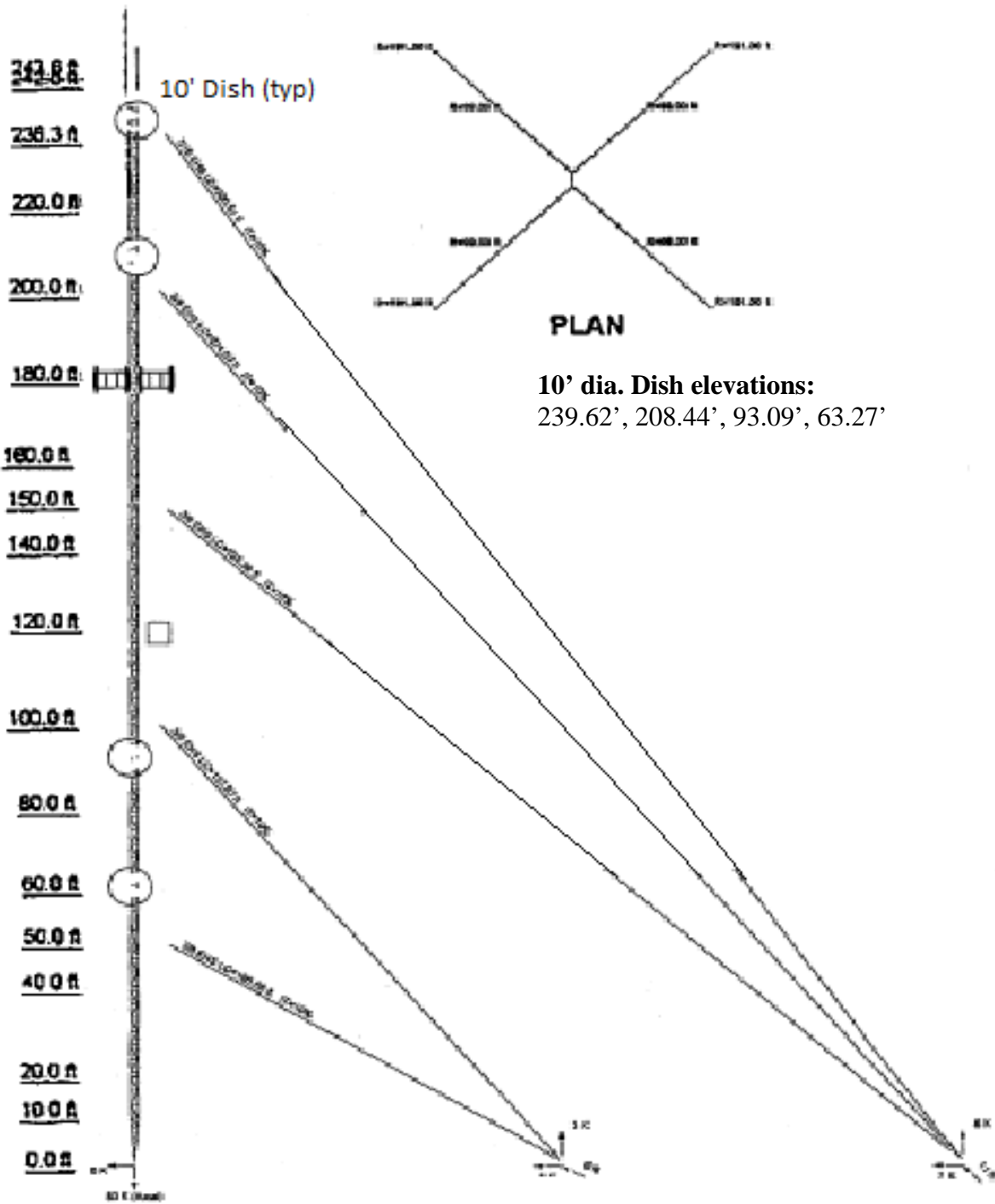
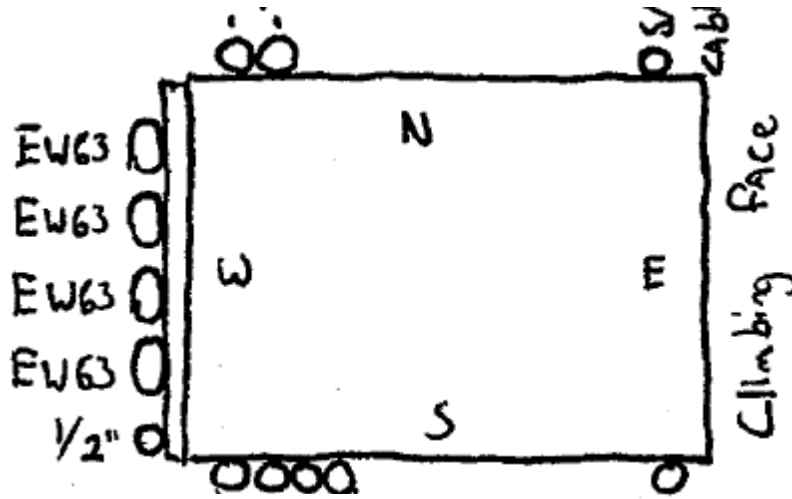


Figure 8 – Existing tower drawing (FDH Structural Analysis, FDH Project 08-09184E S1)



EW63 – 10 ft. dia. Dish  
 Step angles on climbing face

Existing Loading:

Antenna	Elevation (ft.)	Coax and Lines (in)	Coax Number	Mount Type	Description
1-2	246.3 <sup>2</sup>	(4) 7/8	4,5,11,12	(2) 12" Standoffs	(1) 10'x3" Omni (1) 18'x2" Dipole
3-4	239.62 <sup>2</sup>	(1) 7/8 (1) EW63	1,8	(1) 2'-4"x2.5" Pipe Mount (1) 6'x4.5" Pipe Mount	(1) 2'-2"x14"x11" Panel (1) Andrew 34741-4 Dish
5	224.9	(1) 7/8	3	(1) 2'-4"x2.5" Pipe Mount	(1) 2'-2"x14"x11" Panel
6	222 <sup>2</sup>	(1) 7/8	6	Direct Mount	(1) Sinclair 210C
7	208.44	(1) EW63	7	(1) 6'x4.5" Pipe Mount	(1) Andrew 34741-4 Dish
8	93.09	(1) EW63	9	(1) 6'x4.5" Pipe Mount	(1) Andrew 34741-4 Dish
9	63.27	(1) EW63	10	(1) 6'x4.5" Pipe Mount	(1) Andrew 34741-4 Dish
10	12	(1) 1/2	2	(1) 8.5" Standoff	(1) Laird Tech 39358

1 See Figure 1 for coax location.

2 Omni and Dipole mounting elevations listed to the antenna's base elevation.

Figure 9 –Antenna and feed line loads on the existing tower (from FDH Structural Analysis)

### New Tower

For the new tower, Sabre Model 3600SRWD 250 ft. high guyed tower was selected and installed. The new tower was 3-legged, triangular in shape, each face being approximately 36" wide. The legs were 2" diameter, see figures 10 to 17. The tower was designed in accord with ANSI/TIA-222-G, Structure Class II, Exposure Category C, and Topographic Category 1. At the time of the incident, the tower was already completed and was in operation.





Figure 10 –New and existing tower



Figure 11 –Photo taken before collapse



Figure 12 – Photo taken before collapse



Figure 13 –Photo taken before collapse



Figure 14 –New Tower after collapse



Figure 15 –New Tower after collapse

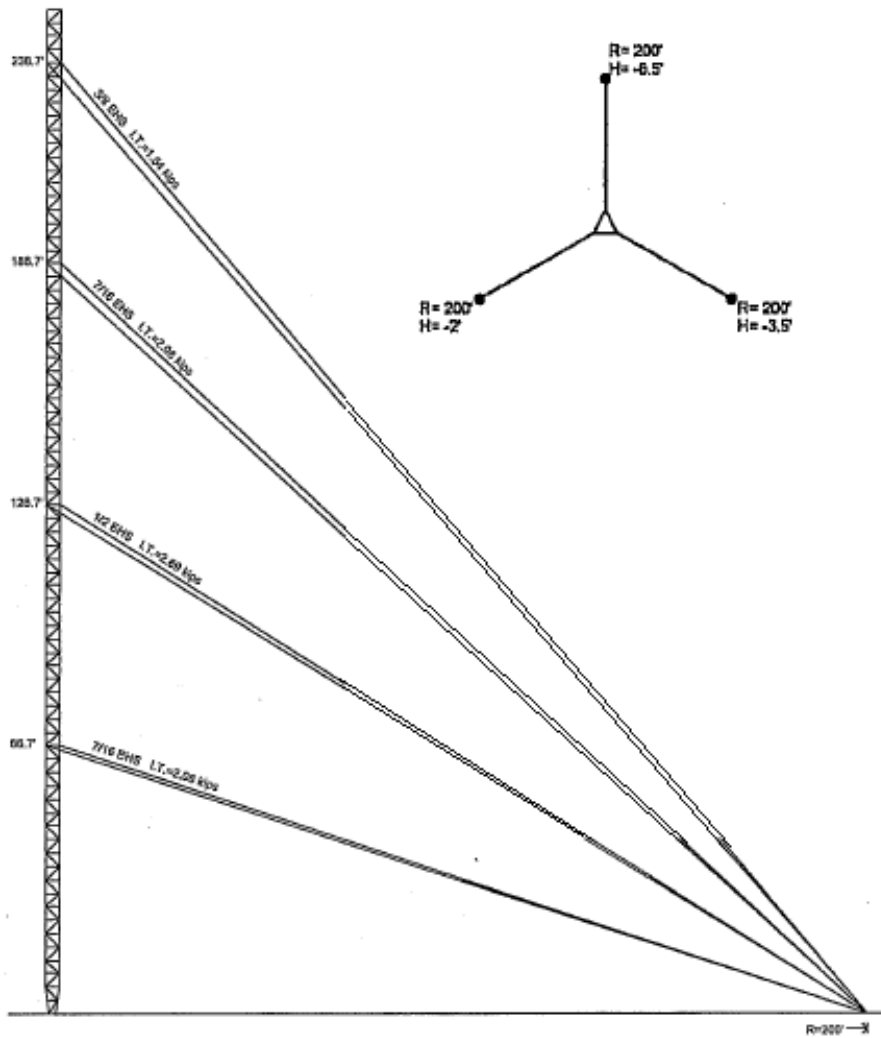


Figure 16 – New tower elevation drawing (from Sabre Industries)

### Designed Appurtenance Loading

Elev	Description	Tx-Line
250.5	(1) SD212	
250	3ft Sidearm	
250		(2) LDF5-50A
248.08	(1) DB808 Whip Antenna	
247	3ft Sidearm	
247		(1) LDF5-50A
240	Flush Mount	
240	(1) OGB8-900 Whip Antenna	(1) LDF5-50A
238	Face Dish Mount	
238	(1) 10' Solid Dish w/ Radome	(2) EW63
228.5	(1) SD212	
228	Flush Mount	
228	3ft Sidearm	
228	(1) OGB8-900 Whip Antenna	(1) LDF5-50A
228		(2) LDF5-50A
208	Face Dish Mount	
208	(1) 10' Solid Dish w/ Radome	(2) EW63
180	Face Dish Mount	
180	(1) 8' Solid Dish w/ Radome	(2) EW63
150	3T-Boom(R) - 12ft Face - 3ft Standoff	
150	(12) RRU 24" X 13" X 7"s	(0) "
150	(12) 6' x 1' x 6in Panel Antennas	(24) 1 5/8"
138	Face Dish Mount	
138	(1) 8' Solid Dish w/ Radome	(2) EW63
108	Face Dish Mount	
108	(1) 8' Solid Dish w/ Radome	(2) EW63
94	Face Dish Mount	
94	(1) 10' Solid Dish w/ Radome	(2) EW63
62	Face Dish Mount	
62	(1) 10' Solid Dish w/ Radome	(2) EW63

Figure 17 – New tower loading (from Sabre Industries)

### The Demolition

Wireless Horizon was using a crane to remove the dishes up to a height of 120 ft. There were four dishes 10 ft. in diameter to be removed. Two of the dishes at elevations of 60 ft. and 90 ft. were removed with the help of a crane. The dish at elevation of 210 ft. was removed by rigging the top block to the tower and then lowering the dish to the ground after being rigged by the winch operator. For the dish at 240 ft. a gin pole was being used. On the day of the incident, the

crew was trying to disconnect the 10 ft. diameter dish located at an elevation of 240 ft. to be removed later by the gin pole, see figure 18. The crew consisted of four employees; a foreman, a winch operator and two workers on the tower. The task for the day was to jump and install the gin pole on the tower, lower the remaining dish and then begin dismantling the old tower section by section with the assistance of the gin pole.

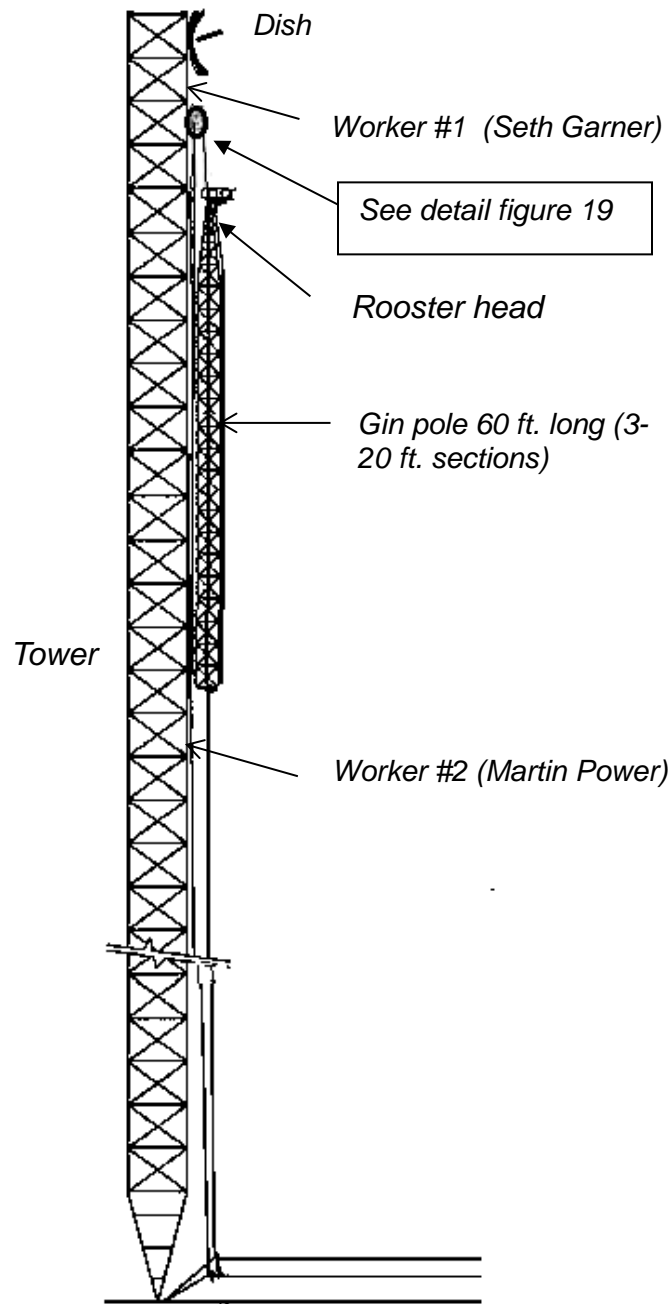


Figure 18 – Rigging elevation at the time of the incident



### Rigging details

Horizon was using a 12” triangular gin pole 60 ft. long comprised of three sections, 20 ft. each. The top block of the jump line was rigged to a single tower leg as shown in figure 19. The legs of the tower consisted of steel angles 2x2x1/4. The sling which was wrapped around the tower leg and connected to the top block for jumping the gin pole was a 6x19 IWRC 3/8” diameter wire rope, 3 ft. in length. The ratings marked on the sling tag were 1.2, 0.92 and 2.5 tons for vertical, choker, and basket configurations, respectively, see figure 19. The top block had a stamp of McKissick, Tulsa, OK with a rating of 4 tons, see figure 20. The jump and load lines were 3/8” and 7/16” diameter wire ropes, respectively. The gin pole from the site is shown in figures 22 and 23. The load chart provided by Horizon indicated LeBlanc as the manufacturer. The winch was Braden Model PD10D, see figures 24 and 25.

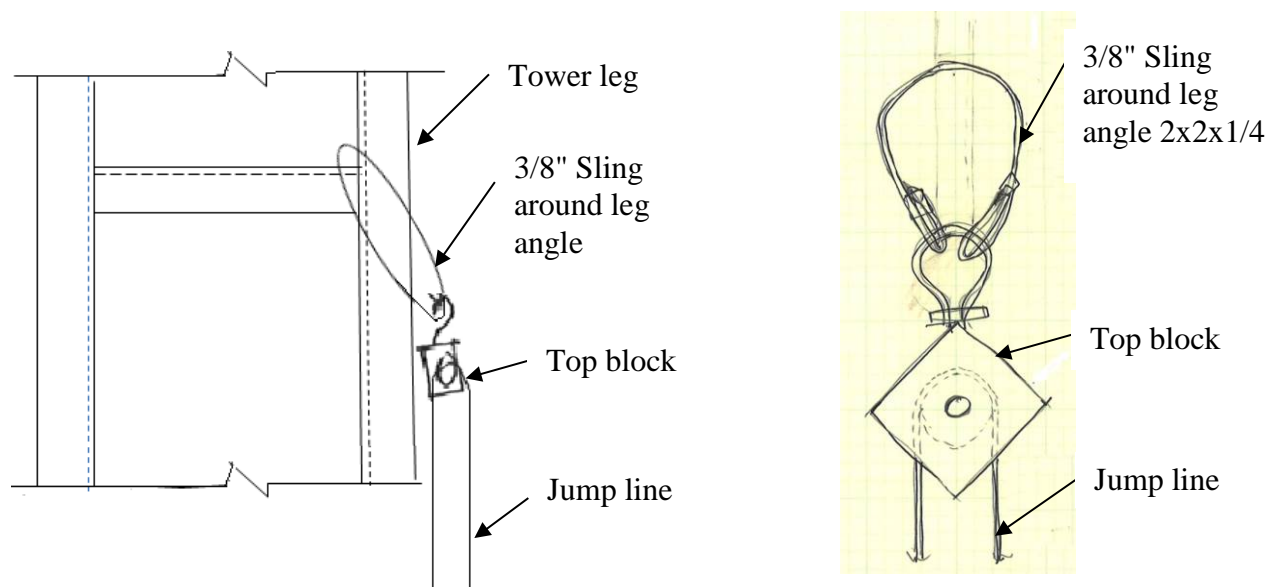


Figure 19 – Hand drawn rigging details



Figure 20 – Slings



Figure 21 – Top block



Figure 22 – Gin pole



Figure 23 – Gin pole



Figure 24 – Winch Truck



Figure 25 – Winch Truck

## **The Incident**

The incident occurred on March 25, 2014 at around 9:30 a.m. The crew that worked on the construction of the new tower and demolition of the existing tower is discussed below. As mentioned earlier, the new tower was already completed. Hence, the discussion that follows pertains to the old tower only.

The involvement of Sabre Towers in the project was limited to the design and manufacturing of the new tower, and did not cover any aspect of actual erection and construction. Jeff DeGroot of Sabre visited the site on January 7-10, 2014, the only site visit from Sabre before the incident. R.J. McLaughlin, the Construction Project Manager of Sabre who signed the contract with Horizon, never visited the site. Demolition of the old tower was entirely left to Horizon.

### **Horizon:**

Rick Heister, the President signed the contract with Sabre Towers for construction of the new tower and demolition of the old tower. Troy Heister, the Safety Manager, trained the crews and inspected the equipment off-site. Jason Cooper, the Project Manager of Horizon had worked with the company for the last 5 years. He lined up all the vendors, delivered equipment and material to the job site (including concrete pumps), and managed the concrete work. He did not supervise the tower construction or demolition.

The demolition of the old tower was left to the four-member crew that was performing the demolition of the tower entirely on their own. One of the crew members, Robert Gene Linzoin, the foreman (site supervisor), had more than 20 years of experience, but the other three had less than a year of tower construction experience. The four-man crew had been on site for about two weeks.

1. Linzoin had been working for Horizon since 2000. He managed the demolition entirely. He conducted the safety meeting and planned each day's activity. Linzoin stated that he was standing behind the trailer looking up at the tower when the incident happened. Linzoin further said that he heard a snap and then saw the gin pole plummeting down. Linzoin recently came back from surgery, and probably was on medication. He was a vice president of Horizon.
2. Damion Michael Ripple was the winch truck operator at the site. He was certified as an authorized Climber/Rescuer in July 2013. He had only one year of tower experience.

Ripple stated that he was operating the winch to jump the gin pole to where it needed to be to take down the dish. He said that Seth and Martin were instructed to signal him to control the movement of the gin pole by extending their arms. Ripple said that they never flagged him. Ripple said that he thought the chokers broke. He said he saw the pole start to go (fall) and then everything went crazy. He said that at that point he jumped off the truck and ran towards Garner and Powers who were on the tower.

3. Seth T. Garner a climber from St. Peters, MO, was hired on October 11, 2013, and had only 5 months of tower industry experience. At the time of the incident, he was near the top of the tower near the dish to ensure the smooth movement of the gin pole without any interference from the dish. When the tower collapsed, he fell to the ground with the tower and was killed.
4. Martin J. Power, another climber, was hired on January 27, 2014, had been with the company for only two months. At the time of the incident, Martin was on the tower below the gin pole. He fell to the ground with the tower and was killed at the site.

#### Removal of dish and the collapse

The crew had already unbolted the stiffener arm of the top-most dish and rotated to clear the gin pole. At the time of the incident, the gin pole was being jumped. There was no load on the jump line other than the weight of the gin pole, wire rope and the top block. . The two workers on the tower were monitoring the movement of the gin pole to raise it to a level to facilitate the removal of the dish. Around 9:30 a.m., suddenly there was a popping sound and the gin pole came crashing down along with the tower. When the tower collapsed, it took down the new tower that was just next to it, resulting in a pile of twisted metal laying on the ground, see figures 26 to figures 32. The workers on the tower were equipped with personal fall arrest protection.

Two days after the incident, on March 28, the gin pole (see figures 33 and 34), the sling and top block assembly, the winch spool, the bottom portion of the existing tower and the top portion (40 ft.) of the existing tower were identified as evidence for the forensic investigation. The 3 ft.-long 3/8" sling, wrapped around the leg of the tower was found damaged and broken, see figures 35 and 36, and OSHA took custody of the sling and block assembly. The sling and block assembly



were sent to OSHA's Salt Lake City Laboratory (SLTC) for non-destructive microscopic examination.



Figure 26 – Collapse photo



Figure 27 – Collapse photo



Figure 28 – Collapse photo



Figure 29 – Collapse photo



Figure 30 – Collapse photo





Figure 31 – Collapse photo



Figure 32 – Collapse photo



Figure 33 – Gin Pole



Figure 34 – Gin Pole with Rooster Head

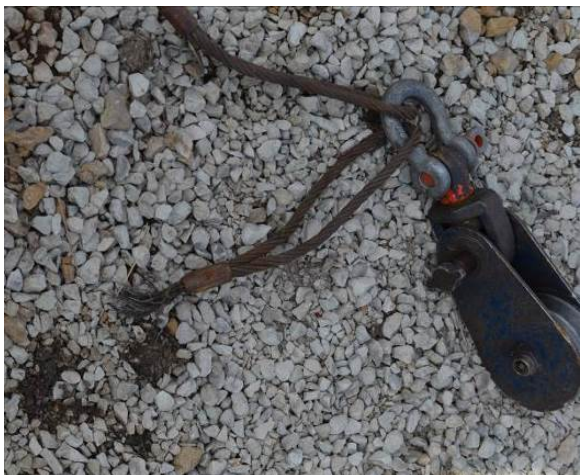


Figure 35 – Broken sling with top block



Figure 36 – Top block

### **Load on the sling and the gin pole block**

At the time of the incident, the gin pole was being jumped. The gin pole was not loaded except for its own weight. The total weight of the gin pole assembly with rooster head and headache ball is estimated to have been approximately 1,800 pounds. Adding the weight of the wire ropes, hook and the block, the total weight is estimated to have been below 2,000 pounds (1 ton).

The top block was subjected to a load of 2 tons. The McKissick top block had a working load rating stamp of 4 tons. The ultimate load capacity from the catalog for the block was 16 tons. The block, therefore, had adequate capacity. The sling was subjected to a tensile load of one ton and it had a breaking capacity of 6.56 tons. The sling was, therefore, properly sized.

Thus the load was not the cause of the failure of the sling wire rope.

### **Examination of Collapsed Structure**

The top portion of the tower, gin pole and top block rigging assembly were identified as evidence at the site. The tower components and gin pole were stored in a secured storage facility by Horizon, and the top block assembly was taken by the OSHA area office for non-destructive testing by OSHA's Salt Lake City Technical Center (SLTC). The broken sling and the top block were sent to OSHA's Salt Lake City laboratory for microscopic examination.

The top portion of the tower was closely examined to identify the rigging location of the sling. There were clear marks of sharp cuts on the steel angles of the tower leg below the torque arm consistent with marks that would be made by wire rope abrasion, see figures 37 to 40.

The gin pole and rooster head were inspected for identification marks. During an inspection in the storage facility, no identification marks on the gin pole or on the rooster head were observed.



Figure 37 - Top block rigging location



Figure 38 - Top block rigging location



Figure 39 - Top block rigging location



Figure 40 - Top block and broken sling

### Microscopic Examination of the Broken Sling

The Salt Lake Technical Center Materials Failure Team was asked to examine the 3-foot sling to determine the mode of failure. The photos of the top block rigging location were supplied by the compliance officer to SLTC. The primary findings from the report are discussed below. Figures 41 to 52 are from the SLTC report.

A microscope examination of the sling revealed deformations on failed wire rope ends, which is evidence that the sling was unprotected due to abrasive actions that crushed and gouged the wires



in the rope. Figures 41 and 42 show the wire rope ends at the point of separation on the sling that was wrapped around the tower leg.



Figure 41 - Failure next to swage on the wire rope sling.



Figure 42 - Failed wire rope sling.

The wire ends were examined using a Keyence Microscope at magnifications from 20-200X. There was some yellow paint-like substance on both the outer surface of the wire rope away from the failure point (figures 43 and 44) and on the fractured ends (figures 45 and 46).

This yellow substance was also on the tag (figure 47). The yellow substance did not have the appearance of having been recently applied. The Yellow paint-like substance observed in the valleys of the wire rope suggested that it was applied prior to the accident. *Paint on fractured wire rope ends suggests that some wires in the strand were damaged prior to the accident. There is evidence of pitting corrosion on the wire rope sling (figure 48).*



Figure 43 - Yellow paint-like substance on wire rope away from the fracture surface



Figure 44 - Yellow paint-like substance laying in the valleys of the wire rope



Figure 45 - Paint on fractured wire rope ends



Figure 46 - Close-up of Yellow substance on fractured surface



Figure 47: Yellow paint like substance on tag



Figure 48: Rust/yellow substance on top of damaged wires

The damage on the 7x7 inner core wire ends was evidence of the scraping, gouging and abrasion that was responsible for the failure of the sling, see figures 49 to 51. Some of the inner core wires were hooked on the end, indicating that they were pulled around a sharp corner, see figure 52.





Figure 49 - Inner core wire ends showing evidence of scraping, gouging and abrasion



Figure 50 - Evidence of gouging, abrasion and crushing on the failed ends



Figure 51 - Gouging and crushing damage on the wire ends at the point of failure



Figure 52- Hooked ends are indicative of being pulled around a sharp corner

The SLTC laboratory report concluded that:

- *The evidence suggests that the rope was damaged prior to the incident.*
- *The failure of the rope was attributed to abrasion, crushing, gouging of the wires that can occur when wire ropes are not protected from sharp corners and edges during use.*

## **Discussion**

Horizon performed poorly in managing and executing the project. From the very beginning, there were lapses, shortcomings and lack of compliance with the industry standards. The management of the entire site was left to the discretion of the foreman. The training in rigging of the two employees (killed in the incident) and of a winch operator is highly suspect. Horizon's project manager never visited the site during the construction and demolition, and did not provide any guidance. A litany of mistakes and misjudgments occurred. The primary shortcoming was the lack of understanding of the rigging procedure whereby the sling supporting the jump line block was supported around the tower leg which consisted of steel angle shapes. The wire rope of the sling was not protected against abrasion, crushing and gouging, and it eventually broke, killing the two workers on the tower.

The following are among the errors committed by Horizon:

1. When the contract for dismantling the existing tower was awarded to Horizon, the Railroad did not provide any drawings, schematics, or sketches of the tower to be demolished to Horizon, nor did Horizon ask the Railroad for any of these items. The drawings or schematics would have been necessary to plan the procedures to demolish the tower. If the drawings were not available, field measurements should have been taken by Horizon to obtain the necessary information.
2. Horizon failed to ask the Railroad for reports of any inspections of the old tower performed by the Railroad or by any other entity in the past. Horizon also did not inspect the tower to determine its structural integrity before it sent two employees up the tower to demolish the dishes and then the tower. An inspection would have revealed if there were any deficient structural members, broken welds, compromised guy wires, or loose anchor and guy fasteners. It was very imprudent to risk the lives of these employees without having any detailed inspection report on the old tower.
3. There is no record that Horizon had ever computed the weight of each section of the tower which they intended to demolish section by section using the gin pole. The weight of the tower was important information to determine the selection of the gin pole, the jump line

block and the wire rope slings. Reliance on a cursory look at the tower was very inappropriate.

4. The industry standard ANSI/TIA-1019-A-2012, section 2.2 requires that a written rigging plan be prepared before implementing construction classified as Class II, III and IV. No such plan was prepared.

**2.2. Rigging Plans**

All construction shall be classified in accordance with Table 2-1 based on the scope of the proposed construction work.

Proposed activities shall be outlined in a written rigging plan prior to implementation of Class II, III and IV construction.

The minimum level of responsibility for establishing a rigging plan is specified in Table 2-1.

5. The industry standard for construction work on a cell tower is Telecommunication Industry Association (TIA) 1019-A-2012 which is also adopted by the American National Standard Institute (ANSI). ANSI/TIA-1019-A-2012 was applicable to the site for dismantling the existing tower. Under the construction classifications of the above standard, this project falls under Class IV; see the construction classification table below, which requires a “qualified person with qualified engineer” as the “minimum level of responsibility”. The responsibility at the site was not shared with an engineer. This was a violation of the industry standard.

ANSI/TIA-1019-A

**Table 2-1: Construction Classifications**

<b>Class</b>	<b>Description</b>	<b>Minimum Level of Responsibility</b>
I	The scope of work does not affect the integrity of the structure and the proposed rigging loads are minor in comparison to the strength of the structure, but not exceeding rigging forces greater than 650 lbs.	Competent Rigger
II	The scope of work involves the removal or the addition of appurtenances, mounts, platforms, etc. that involve minor rigging loads in comparison to the strength of the structure, but not exceeding rigging forces greater than 1,000 lbs.	Competent Rigger
III	Rigging plans that involve work outside the scope of Class I, II or IV construction.	Qualified Person
IV	The scope of work involves custom or infrequent construction methods, removal of structural members or unique appurtenances, special engineered lifts, and unique situations.	Qualified Person with Qualified Engineer

6. ANSI/TIA-1019-A section 6.2.6 requires that the gin pole and rooster head be provided with identification marks which would correspond to the load chart. ANSI/TIA-1019-A-2012 states:

**6.2.6. Identification**

Marking for gin poles shall be properly referenced to the load chart intended for their use. Identification for a gin pole shall be as follows:

- a) Each gin pole assembly and associated rooster head shall be permanently marked or otherwise clearly referenced for identification to its load chart.
- b) The gin pole installation documents shall identify sections requiring a specific installation sequence and the sections shall be appropriately marked.

A 12" triangular gin pole and a rooster head shipped to the site did not contain any identification marks on them. This amounted to non-compliance with the industry standard, ANSI/TIA-1019-A-2012.

7. The industry standard, ANSI/TIA 1019-A section 3.5, requires that a load chart prepared for a specific gin pole be provided. ANSI/TIA-1019-A-2012 states:

**3.5. Load Charts**

A Standard Load Chart shall be developed in accordance with Section 5 for all vertical or near vertical gin poles intended to be used for construction. The purpose of a Standard Load Chart is to establish safe lifted loads for a specific gin pole based on strength and deflection limitations. Standard Load Charts shall, as a minimum, provide the information shown in the template provided in Figure 3-5.

No such load chart was available at the site. Horizon's contention that there were other load charts available at the site in the safety manual that did correspond to the gin pole being used indicates a lack of understanding of the standard, and has little merit. A load chart for a 12" triangular gin pole ID No. 451211-1 was provided to OSHA, post-incident, by Horizon, see figure 57, which was in Horizon's office, but the employees at the site were not aware of this load chart. There were three problems with this load chart. First, this load chart was not valid as it did not indicate the overall length of the gin pole for which this load chart had been prepared. Second, the employees could not have verified if this load chart applied to the gin pole in use due to the lack of identification marks on the gin pole. Third, the load chart was prepared for a certain type of rooster head which was different from the rooster head in use at the site. In fact, the load chart cautions that "*if the rooster head is not as shown, contact engineering for load capacity*". In the gin pole inspection report, see figure 58, the model number is shown as 45-813, different from the ID number shown in figure 57.

8. Horizon failed to take notice of the fact that the structural members of the existing tower consisted of steel angles (legs, diagonals and struts) instead of round shapes. Steel angles have sharp edges whereas round pipe shapes provide smooth surfaces. The wire rope sling supporting the gin pole top block was wrapped around one of the tower legs consisting of steel angles without providing any protection against abrasion, cuts and gouging. The 3/8" wire rope sling that was subjected to tensile forces was wedged into the 90-degree corner of the leg and the horizontal strut angle, subjecting it to cuts and bruises, see figures 53 to 56 below. The SLTC's microscopic examination indicated: *The failure of the rope is attributed to abrasion, crushing, gouging of the wires that can occur when wire ropes are not protected from sharp corners and edges during use.*

The sling wire rope manufacturer's catalog states:

- *Slings shall be protected from being damaged by sharp corners, sharp edges, protrusions, or abrasive surfaces.*
- *Slings shall not be dragged on the floor or over abrasive surfaces.*



Figure 53 – Cuts and bruises from abrasion of wire rope



Figure 54 – Cuts and bruises from abrasion of wire rope



Figure 55 – cuts and bruises from abrasion of wire rope



Figure 56 – Cuts and bruises from abrasion of wire rope

9. The standard practice of the industry to support the gin pole block is to provide two slings, one at each tower leg with a shackle at the center of the face of the tower to hang the block. Horizon deviated from the standard practice.
10. There is no record available to indicate that the sling wire rope was inspected at the beginning of each workday. ANSI/TIA-1019-A-2012 section 3.4.5 states:

**3.4.5. Inspections for Rigging Equipment**

**Rigging equipment (i.e. cables, slings, shackles, hooks, etc.) shall be inspected daily or before each use when not used daily. Defective equipment shall be immediately removed from service.**

A close examination of the failed wire rope indicates that the failure of the wire rope most likely occurred with strands breaking gradually over a period of time, rather than all strands failing all at the same time. The SLTC's microscopic examination indicated: *The evidence suggests the rope was damaged prior to the accident.*



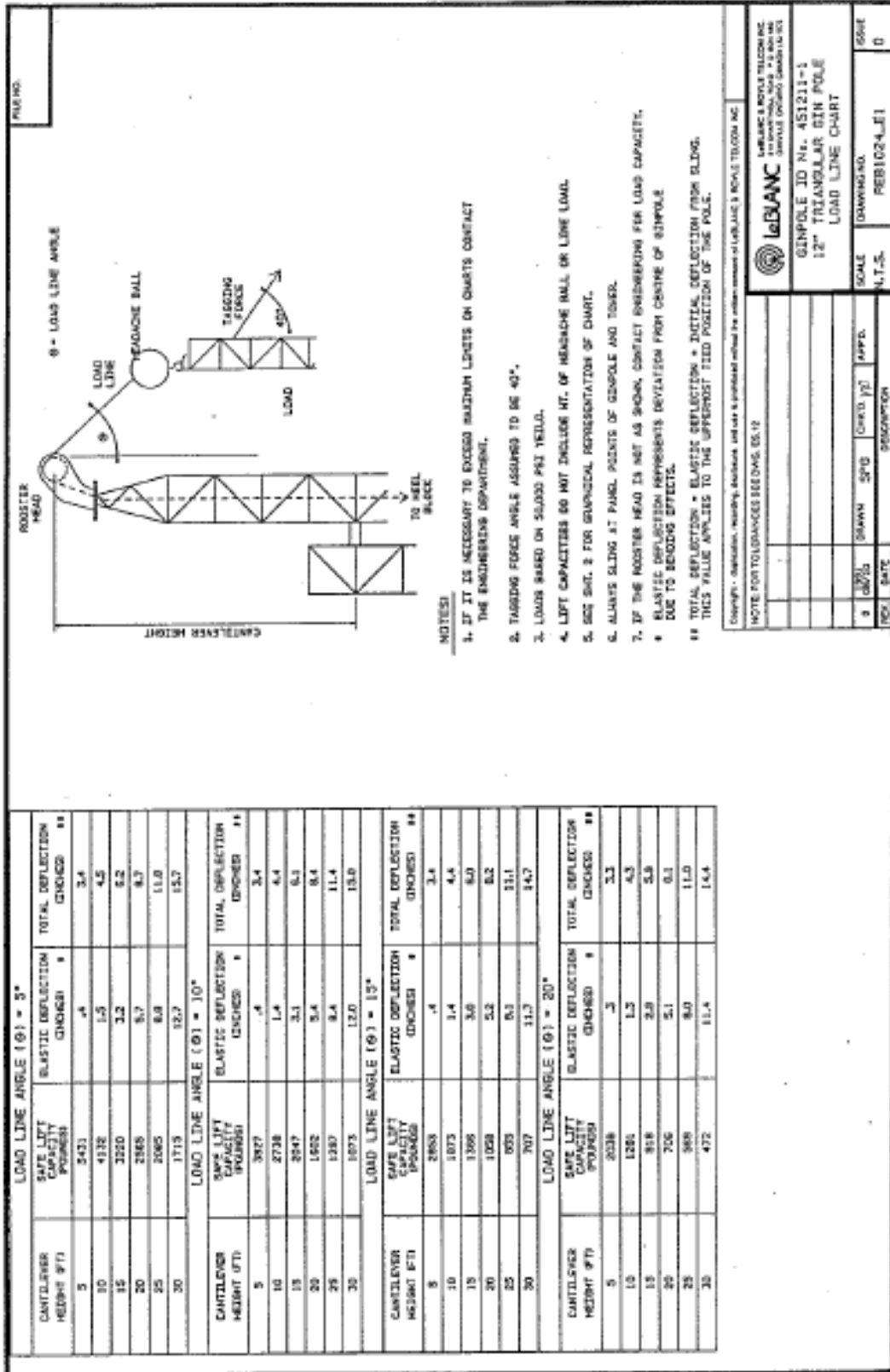


Figure 57 – Gin pole load chart provided by Horizon



7870 Mexico Road  
St. Peters, MO (636)397-1341 St. Peters, MO 63376

### Gin Pole Inspection

Date: 7-16-13 Winch Truck Number: N/A IN STORAGE  
 Model Number: 45-813 Length: 12" x 60'

**General**

	YES	NO	N/A
Does the pole have an Identification Number?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is Number visible and easily identified?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the sections numbered or Marked for assembly sequence?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the legs numbered or marked for assembly rotation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Structural Condition:**

Is the overall assembly straight within a tolerance of 1/500?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the legs free of bends or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the diagonals free of bends or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the horizontals free of bends or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the welds free of cracks or signs of physical damage??	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Rooster Head**

Are the plates free of bends or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the main bearing rotate freely and smoothly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do all sheeves rotate freely and smoothly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are all bearings well greased	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are all bolts in good working condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Attachments**

Are the bottom attachemnt lugs free of bends, cracks or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the top (jump) attachemnt lugs free of bends, cracks or signs of physical damage?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Comments:**

THE LIGHT DUTY POLE HAS VERY MINOR "X" BRACING  
BENDING ON ONE FACE AT THE BOTTOM 5' LEVEL OF THE  
POLE. WELL WITHIN THE 1/500 OF VARIANCE OVER THE  
TOTAL LENGTH OF THE POLE.

Inspector: TROY HEISLER  
Chris J. Hark

Date: 7-16-13

Figure 58 – Gin pole inspection by Horizon

## Conclusions

1. The cause of the collapse of the tower was the failure of the rigging of the gin pole block as the wire rope sling, which was unprotected and wrapped around a tower leg failed, due to abrasion and cutting against the sharp edges of the tower leg. The failure of the rope is attributed to abrasion, crushing or gouging of the wires that can occur when wire ropes are not protected from sharp corners and edges during use.
2. Wireless Horizon used a 12" triangular gin pole and a rooster head at the site that did not contain any identification marks on them. This amounted to non-compliance with the industry standards, ANSI/TIA-1019-A-2012.
3. The industry standard, ANSI/TIA-1019-A-2012, requires that a load chart prepared for the specific gin pole in use be provided. No such load chart was available at the site. Wireless Horizon's contention that there were other load charts available at the site in the safety manual has little merit.
4. The microscopic examination of the sling suggests that the rope was damaged prior to the incident. The sling wire rope was not inspected at the beginning of each workday. Microscopic examination of the failed wire rope indicates that the failure of the wire rope occurred with strands breaking gradually over a period of time, rather than all strands failing at the same time.
5. Wireless Horizon did not inspect the tower to determine its structural integrity before deciding to send two employees up the tower to demolish the dishes and then the tower. There is no record that Horizon had ever computed the weight of each section of the tower which they intended to demolish section-by-section using the gin pole.
6. Wireless Horizon performed poorly in managing and executing the project. The entire site management was left to the discretion of the foreman, two workers with no experience (who were killed in the incident) and a winch operator. ANSI/TIA-1019-A-2012 requires that the minimum responsibility be provided by a "qualified person with qualified engineer". Wireless Horizon violated the industry standard.
7. ANSI/TIA-1019-A-2012 requires that a written rigging plan be prepared prior to "*implementation of Class II, III and IV construction*". No such plan was prepared.