

Figure 1 - Power Transmission Lines in Vicinity of Accident Site. Approximate Location of Basket marked with red X.

Each set of transmission lines consisted of three individually bundled conductor (of two conductors each) lines (named A, B, and C) along with a fourth ground wire, arranged vertically on one side of each tower. For T510, the wires were arranged Ground, A, B, and C from top to bottom, while T511 was arranged Ground C, B, A from top to bottom. (See Figure 2).

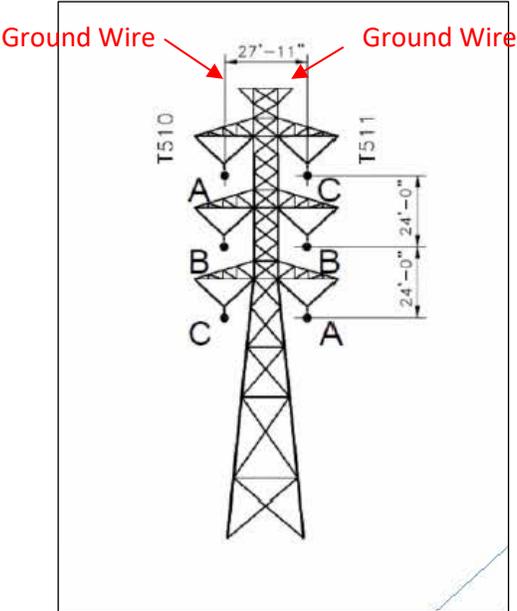


Figure 2 - Arrangement of Lines on Towers near Accident Site.

The lines were strung along towers that were a total of approximately 140-150 feet in height, depending on the tower. According to LCRA, at tower 127, the bottom conductor was approximately 75 feet off the ground, but, at the approximate point of balloon impact, the lowest conductor was approximately 58' above the ground, and the top (ground) line approximately 137' feet above the ground, due to conductor sag between towers. See Figure 3.

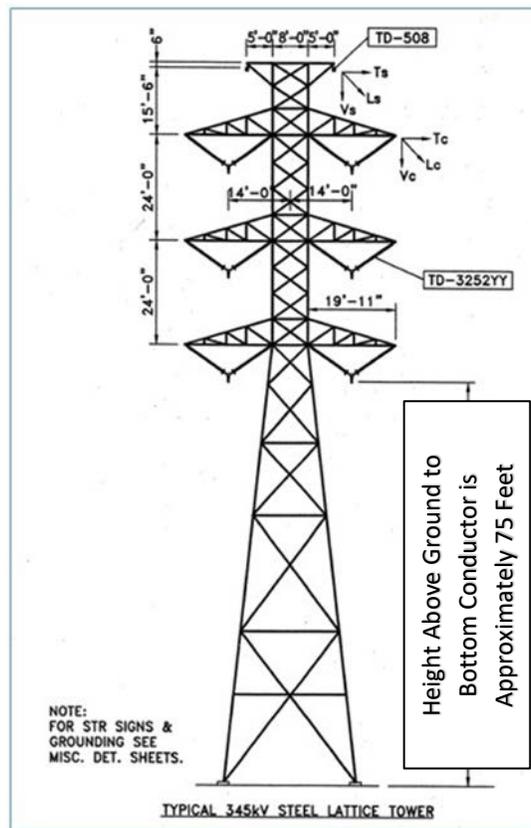


Figure 3 – Representative Dimensions of Towers near Accident Site

LCRA Towers 127 and 128 were constructed of a steel lattice.

2.0 Transmission Line Circuit Breakers

2.1 Description of Circuit Breakers

At Towers 127 and 128, LCRA transmission line T510 runs between substations Zorn and Hutto, while transmission line T511 runs between the Gilleland Creek and Clear Springs substations. Each substation is equipped with circuit breakers. According to LCRA, the circuit breakers are numbered as follows:

Transmission Line 510

- a. Hutto Circuit Breakers: 10365 and 10370¹
- b. Zorn Circuit Breakers: 22400 and 22410

Transmission Line 511

- c. Gilleland Creek Circuit Breakers: 22230 and 22240
- d. Clear Springs Circuit Breakers: 18040 and 18030

Circuit breaker trip information (time and which breaker) was recorded by LCRA system.

2.2 Information Related to Circuit Breakers

After the accident, LCRA provided circuit breaker trip information to the NTSB. According to LCRA, the first circuit breakers opened occurred on the 511 lines (south lines) and later the circuit breakers associated with the north lines (510) opened. Based on the timing of the recorded circuit breaker opening, the balloon first impacted the 511 lines: T511 tripped at 07:42:21 Local Time via Clear Spring substation circuit breakers 18030 and 18040, and Gilleland Creek substation circuit breakers 22230 and 22240. Line T510 opened at 07:42:42 Local Time of Zorn substation circuit breakers 22400 and 22410. See Figure 4.

07/30/2016 07:42:41.679	ZORN	CB 22400	42147	Trip
07/30/2016 07:42:41.679	ZORN	CB 22410	42150	Trip
07/30/2016 07:42:21.493	GILLCR	CB 22230	49282	Trip
07/30/2016 07:42:21.366	GILLCR	CB 22230	49282	Closed
07/30/2016 07:42:20.744	GILLCR	CB 22240	49280	Trip
07/30/2016 07:42:20.744	GILLCR	CB 22230	49282	Trip
07/30/2016 07:42:20.737	CLEASP	CB 18040	34449	Trip
07/30/2016 07:42:20.737	CLEASP	CB 18030	34449	Trip

Figure 4- Image provided by LCRA regarding Circuit Breaker Opening Information

LCRA indicated that, based on the circuit breaker trip information, the circuit breaker trip information for the T511 indicated was the result of a phase C to ground fault, or connection of transmission line C (top line) with the ground line.

The T510 circuit breaker trip, according to LCRA, at 07:42:42 was a phase to phase to ground fault (A-B-G), indicative of a connection between lines A, B, and the ground line.

3.0 Damage to Transmission Lines and Tower Structure

According to LCRA, none of the transmission lines were severed. However, an LCRA inspection of the area did note the following damage:

- a. Abrasions/light pitting on the transmission lines.
- b. Bend on the elbow for the ground/static line on Line 511 at Tower 127. See

¹ The Hutto circuit breakers are owned by Oncor Electric Delivery Company.

Figure 5.
c. Reconstituted metal on lines.



Figure 5 - Bent elbow on Tower Structure 127 (circled). Transmission T511 lines are on left side of tower, Transmission T510 lines are on right side of tower.

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