



Otis Elevator Company
949 Oak Creek Drive
Lombard, IL 60148

Jan. 31, 2019

Mr. Stephen Hearn
Hearn Company Inc.
875 N. Michigan Ave., suite 4100
Chicago, IL 60611

RE: 875 N. Michigan Avenue, Chicago, IL

Dear Mr. Hearn:

Please see below the Summary of Findings Report for 875 N. Michigan Avenue, Chicago, IL.

Overview

On Nov. 16, 2018, one of seven, steel cable hoist ropes that help to raise and lower elevator #2 at 875 N. Michigan Avenue malfunctioned, while the elevator cab was at or near the 20th floor. The elevator's safety systems immediately engaged, lowering the car gradually to a controlled and safe stop between the 11th and 12th floors.

Otis immediately dispatched a team, including its onsite mechanic, to assist the Chicago Fire Department with releasing the passengers. Because the safety systems worked effectively as designed, the six passengers who were in the elevator were safe throughout the gradual lowering of the elevator and no one was injured.

Promptly after the event, a team of Otis national engineering specialists initiated a comprehensive examination of the rope that malfunctioned and a proactive maintenance audit of all the building's 29 commercial passenger and freight elevators. The maintenance audit confirmed that all 29 commercial passenger and freight elevators are in good condition. The audit also reconfirmed that all safety tests and inspections were up to date and all required maintenance measures had been performed prior to the Nov. 16 event.

As a result of this comprehensive evaluation, Otis has concluded elevator #2 was never out of control or unsafe. The examination confirms the car descended safely the entire ride, including the nine floors it traveled after the rope broke at or near the 20th floor, until it came to a controlled and safe stop between the 11th/12th floors. Additionally, the elevator's backup safety brake never engaged, indicating the elevator never traveled at an unsafe speed.

All of the elevators in 875 N. Michigan Avenue are equipped with multiple, automatic safety systems. These systems worked properly on elevator #2 when the rope malfunction occurred by decelerating and lowering the car to a controlled and safe stop.

Timeline of events

1. On Nov. 16, elevator #2 was descending from the 95th floor when one of its seven hoist ropes became entangled around the drive and secondary sheave and broke while the elevator cab was at or near the 20th floor.

2. When the rope broke, the energy released by the falling rope was detected by the over-speed switch, which is how this safety feature is designed to operate.
3. The over-speed switch worked as designed to decelerate and gradually lower the elevator, bringing it to a controlled and safe stop between the 11th and 12th floors.
4. Because the elevator came to a controlled stop in an express zone, the Chicago Fire Department had to cut through the hoistway wall to remove the passengers. Express zones occur in supertall buildings like 875 N. Michigan Avenue, where an elevator or group of elevators does not stop at every floor.
5. All six passengers that were on the elevator when the event occurred were safely removed by the City of Chicago Fire Department with assistance from Otis. Because the safety systems worked effectively as designed, the six passengers in the elevator were safe throughout the gradual lowering of the elevator and no one was injured.
6. The broken hoist rope on elevator #2 was replaced, as is Otis standard operating procedure. As a proactive measure, the other six ropes that did not break were replaced as well.
7. Otis completed the repair of elevator #2 on Nov. 30. That same day, elevator #2 was inspected and certified for safe operation by the City of Chicago and restored to service.

Rope Examination

- Once the repair on elevator #2 was completed, Otis immediately began a separate and thorough examination of the rope involved in the incident with a team of five engineers from Otis world headquarters engineering group, who were supported by Otis associates from our Chicago operation.
- Using recovered samples from the event, Otis rope experts analyzed the rope and its break.
- Our experts determined the rope displayed tensile shearing with the ends showing a cup and cone break pattern, which is consistent with a break from a one-time event. The analysis also found no visible wire breaks; light to moderate lubrication; no exterior rouge present; and crown wear was minimal. In fact, there was no indication the rope that malfunctioned needed repair or replacement prior to the Nov. 16 event. The ropes were last replaced in 2015, as part of our normal maintenance schedule.
- With the exception of the parted or damaged region of the rope, the ropes were found in good condition.
- The examination also confirmed that elevator #2's safety systems worked correctly when the rope broke by decelerating and lowering the elevator to a controlled and safe stop.

Maintenance Audit

- All the building's 29 commercial elevators, including elevator #2, were also inspected as part of a proactive maintenance audit by Otis and were found in good repair.
- The audit confirmed that all 29 of the commercial passenger and freight elevators' safety tests and inspections were up to date and all required maintenance measures had been performed leading up to the Nov. 16 event.
- All operating aspects of elevator #2 and the building's other 28 commercial passenger and freight elevators have been studied and found to be safe.

Elevator Safety Systems

The elevators in 875 N. Michigan Avenue are equipped with multiple, automatic safety systems and redundancies. These safety systems worked as designed when the Nov. 16 event occurred. These multiple safety systems helped to bring the elevator to a controlled and safe stop and led to the safe removal of the passengers.

The following safety features are among those found on a passenger elevator, including the elevators at 875 N. Michigan Avenue:

- **Safety brake/over-speed switch:** When the rope broke, the energy released by the falling rope was detected by the over-speed switch, which is how this safety feature is designed to operate. The elevator then decelerated before coming to a controlled and safe stop from the machine brake.
- **Governor/backup safety brake:** The backup brake is part of the safety system of the elevator which automatically engages when it reaches an unusually high speed that cannot be controlled by the over-speed switch. The elevator's backup safety brake at 875 N. Michigan Avenue never engaged. The fact that it did not engage indicates the elevator never traveled at an unsafe speed.
- **Ropes:** The high-rise elevators in the building are each equipped with seven, steel cable hoist ropes. Each rope can support the weight of the entire elevator system on its own, in the event of a rope break event.
 - Six out of the seven ropes remained intact during the event at 875 N. Michigan Avenue.
 - The single rope break did not increase the risk of injury; in fact, the rope break did trigger the automatic safety system to gradually lower the elevator, which is how the elevator is designed to operate.

Conclusion:

A team of Otis engineering specialists completed a comprehensive examination of the event at 875 N. Michigan Avenue and concluded that elevator #2 was never out of control or unsafe. The safety systems operated as designed to decelerate and lower elevator #2, bringing it to a controlled and safe stop between the 11th and 12th floors. There are seven steel cable hoist ropes on every elevator in the building, each of which can support the full weight of the car. The other six hoist ropes functioned appropriately.

After careful inspection and repair by Otis, elevator #2 was certified by the City of Chicago as safe for operation and returned to service on Nov. 30.

Otis has also completed a proactive, comprehensive maintenance audit of all 29 commercial passenger and freight elevators in the building, including elevator #2. This review confirmed the building's commercial passenger and freight elevators are well-maintained, in good working condition and safe for operation.

Respectfully,

OTIS ELEVATOR COMPANY



Kyle Franzen
Regional General Manager

CC: Holly Connors – General Manager, Otis
Jorie Balogh – Sales Manager, Otis