IUEC SAFETY ALERT

NONCIRCULAR ELASTOMERIC-COATED STEEL SUSPENSION MEMBERS

RESIDUAL STRENGTH & REPLACEMENT CRITERIA

Description of Safety Alert

Suspension Type : Noncircular Elastomeric-Coated Steel Suspension Members
[Coated Steel Belts (CSBs) for Elevator Systems]

- Multiple reports of elevators with CSBs meeting their replacement criterion yet still in operation
  - Catastrophic failure of CSBs with elevator in operation for the riding public
  - Catastrophic failure of CSBs during testing
  - Elevators in operation with CSBs displaying excessive wear
  - Elevators operating with damaged load carrying cords
  - Elevators operating with excessive runs on trip counting devices

- CSB suspension has been operating in North America for approximately 20 years
- Many CSB suspension systems have met or surpassed their life expectancy
- It is critical that CSB suspension systems be maintained in strict conformance with Code requirements, Maintenance Control Programs and Replacement Criteria

Retirement Criterion of CSBs
- Residual Strength – reached 60% or less of remaining strength
- Damage – load carrying cords damaged by an exterior source
- Wear – red rouging, exposed cords, strands break through coating

Life Expectancy of CSBs
- Approximately 15 years depending on CSB manufacturer
- 3 million trips or less depending on OEM Maintenance Control Program

Note: The requirements for Noncircular Elastomeric-Coated Steel Suspension Members are found in ASME A17.1-2019/CSA B44:19

Noncircular Elastomeric-Coated Steel Suspension Members

Suspension Member Residual Strength – Replacement of Suspension

Suspension Member Residual Strength

All elevators using CSBs must have a residual strength detection device. This device must operate before any of the CSBs reach 60% of their remaining breaking force.

This device, when actuated, will stop the car at the next available landing and prevent the car from operating other than on hoistway access or inspection modes.

The device must remain actuated until it is manually reset.

The requirements for Suspension Member Residual Strength can be found in ASME A17.1-2019/CSA B44:19 2.20.8.3

Replacement of Suspension

Elevator suspension means (ropes, CSB's, compensation and governor) must be replaced when they no longer conform to code requirements.

A17.1 and A17.6 detail the requirements for their replacement.

The requirements for the replacement of suspension means can be found in ASME A17.1-2019/CSA B44:19 8.6.3.2

The requirements for the replacement criterion of CSBs can be found in ASME A17.6-2022, Section 3.7

Noncircular Elastomeric-Coated Steel Suspension Members

Replacement Criteria

Replacement Due to Wear

CSB's must be replaced when distinct signs of wear occur. Some indicators include:

- Worn elastomeric coating exposing inner cords
- Steel strands protruding through the coating
- Evidence of red rouging

The requirement for Replacement Due to Wear can be found in ASME A17.6-2022 section 3.7.2

Replacement Due to Damage

CSBs must be replaced when the load carrying cords have been damaged. This may occur when the load carrying cords have been exposed to damage from an exterior source. Damage to the coating itself may not require replacement as long as the load carrying cords have not been damaged.

The requirement for Replacement Due to Damage can be found in ASME A17.6-2022 section 3.7.3

Replacement Due to Residual Strength

CSB's must be replaced when their residual strength criterion has been met. The CSBs must be replaced before the remaining strength has been reduced to 60% of the rated breaking force.

The requirement for Replacement Due to Residual Strength can be found in ASME A17.6-2022 section 3.7.4
Also see ASME A17.1/CSA B44, requirement 2.20.8.3.

Noncircular Elastomeric-Coated Steel Suspension Members

Maintenance & Testing Requirements

Maintenance Requirements

Elevator systems are required to have a Maintenance Control Program (MCP)

The MCP must specify the requirements to maintain the equipment and specify examinations, testing, cleaning, etc.

Where a defective part has been identified directly affecting the safety of the operation the elevator, it must be taken out of service.

No person shall at any time make any safety device inoperative or ineffective on which the safety of the user is dependent.

The requirements for MCP's, identifying defective parts, and making safety devices ineffective can be found in ASME A17.1-2019/CSA B44:19 section 8.6.1.2.1, 8.6.1.2.3 and 8.6.1.6.1.

Testing Requirements

Residual strength detection devices and broken suspension member devices must be tested on an annual basis. The tests must simulate the devices detection of each condition.

The requirements for broken suspension members and residual strength detection devices can be found in ASME A17.1-2019/CSA B44:19 section 8.6.4.19.13

Recommendations & Lessons Learned

- Always follow the company safety policy
- Always follow the Maintenance Control Program
- Always conform to the requirements of ASME A17.1/CSA B44 adopted by the Authority Having Jurisdiction
- When CSBs have reached their Residual Strength Criterion, remove the elevator from service until the CSB's have been replaced
- When CSBs have reached their Replacement Criterion, remove the elevator from service until the CSB's have been replaced
- Never reset trip counters without replacing CSBs, thus rendering a safety device ineffective
- Never disable or defeat residual strength detection devices, thus rendering a safety device ineffective
- Never allow an elevator to operate using CSBs without a residual strength detection device functioning properly