

Senior Living chair elevator gear failure

Case background:

An elderly person while using the chair elevator had rapid decent and it caused injury. The chair elevator stopped functioning.

Investigation:

Determine the root cause for the elevator failure.

Results:

The elevator assembly was given for further investigation. The elevator had a crank shaft mounted to a gear bow which in-turn using a rack and pinion type assembly moved the chair up and down the staircase.

Opening the gear box, it was found that the carburized steel gear was completely eroded of all its teeth while the bronze gear was intact.

The gear assembly was inside an aluminum case which contained the transmission oil.

Investigation of the bronze gear found a fine coating of ceramic over entire tooth. The composition of the fine remains was investigated.

Further investigation of the manufacturing assembly of the gear box revealed that the aluminum gear box went through

a wheelabrator process to remove sharp edges from the casting and trimming operations. The wheelabrator process uses smooth ceramic rock to abrade the sharp edges.

Conclusion:

A ceramic stone remained inside the aluminum shroud post edge trimming. During subsequent assembly of the gear box and fill of the gear box with oil the ceramic broke and coated the bronze gear evenly causing a very hard surface which was harder than the carburized steel gear (Rc 64).