Department of Consumer and Employment Protection
Government of Western Australia

Resources Safety

Mines Safety
Significant Incident Report No. 150

Failure of escape ladderway in underground rise

Incident

During a routine inspection, segments of a 100 m long underground ladder were found in a twisted and broken pile at the bottom of an escape ladder rise to surface. About 45 m of ladder were found at the base of the rise.

The ladder was constructed of galvanised tubular steel sections and manufactured in a modular system for ease of installation from the top of the vertical rise using a crane.

As is quite common in the area, the rise was subject to localised inflows of hypersaline water.

The ladder had been installed only four years prior to its failure. There was no substantive corrosion on the modular sections recovered from the bottom of the rise.

Immediate causes and contributing factors

- A significant amount of salt build up was apparent from the material at the bottom of the rise. This would have added to the total load suspended from the ladder mountings.
- The apparent failure may have been associated with breather holes in the ladder sections, which are required for cooling and moisture removal during the hot dip galvanising process.
- There were also failures alongside welds located for mounting and pinning brackets.
- There appeared to be some internal corrosion, under the galvanised coating, in the vicinity of the breather holes on one section of the ladder. This might well have been the initial cause of the failure.
- The ladder modules have three main structural elements (standard side-by-side step-over ladder arrangement). Internal corrosion in one structural element could cause the load on the ladder to exceed the load carrying capacity of the adjacent components.

Comments and preventative action

- An in-depth inspection should be carried out of all escape ladderways to check for and monitor internal and external corrosion. Care should be exercised during the examination process in case it causes traumatic failure of a ladderway component weakened by corrosion, as in this case.
- Extraneous material such as salt loading and loose rocks should by systematically removed.
- Joints, welds and breather holes should be carefully examined for signs of impending failure.
- Design and load carrying capacity from engineering calculations should be available at the mine.

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- Intermediate support brackets, plates, bolts and cross members should be carefully checked during regular inspections.
- Regular thickness testing should be conducted on the ladderway structure.
- Every third ladder module should have a bracket against the wall. The bracket should be fixed to the wall with an M20 hot dipped galvanised chemical anchor bolt. Retro-fitted brackets to existing ladderways should have appropriate steel protective treatment.
- The bottom of every ladderway should have two brackets against the floor. The brackets should also be fixed to the floor with M20 hot dipped galvanised chemical anchors. The brackets should also be concreted in with a substantial concrete block. Retro-fitted brackets to existing ladderways should have appropriate steel protective treatment.
- Every galvanising breather hole should be totally sealed with an appropriate plastic plug. The engineering drawings for new ladderways should specify that the galvanisers supply and fit appropriate plastic plugs that totally seal the breather holes.

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