

FAILURE OF A GALVANISED GRADE 80 CHAIN SLING

INCIDENT

A galvanised grade 80 chain sling with a catalogue safe working load (SWL) of 11.5 tonnes (corresponding to a minimum breaking strength of 46.0 tonnes) failed catastrophically through the crown areas of one link when subjected to a load of about 4.5 tonnes. The chain sling which failed was one of four parallel chain slings attached to a purpose-built lifting beam. The failure of the one sling caused the adjacent sling to fail and this resulted in the suspended load falling to the ground when the other two lifting points on the load tore away. This incident had potential for serious injury.

CAUSE

A metallurgical examination of the failed link and other links in the chain sling revealed extensive prior cracking in the link which failed and that the link had a zinc coating of 20 micron depth. Similar cracking was found in the other links examined and this indicated that the cracks could have been initiated during the original heat treatment of the chain. Furthermore the cracks propagated after the manufacturing and testing phases and this propagation may have been caused by the processes associated with the galvanising of the chain.

COMMENTS AND PREVENTATIVE ACTION

Galvanised grade 80 chains are normally used in corrosive environments where unprotected chains could deteriorate rapidly. There are three methods used for galvanising chains:

- (i) Mechanical process
- (ii) Hot-dipping process
- (iii) Electroplating process

In all the three methods the chain surfaces must be cleaned thoroughly before the galvanising process. The cleaning process in both the hot dipping and electroplating galvanising usually involves acidic solutions and if this process is not properly controlled then the cleaning agents can promote crack propagation after the galvanising is completed and the chain surfaces are prestressed during the necessary proof-loading of each chain.

Manufacturers of chains normally indicate the method used to galvanise the chain supplied on the test certificates issued with each chain.

In order to avoid a recurrence of this type of incident the following steps are recommended:

- (i) All galvanised grade 80 chains should be thoroughly examined for cracks. One positive method which can be used is the magnetic particle method with a phosphorescent dye under an ultra-violet light. This should also apply to ungalvanised chains which have been used in corrosive environments.

Where cracks are found details of these cracks should be referred to the supplier or manufacturer of the chain before any further use.

- (ii) Galvanised grade 80 chains are intended for corrosive environment use. Account should be taken of the intended use in procurement. Before using these chains checks should be made of the method used in the galvanising process, and any derating of the chain on the relevant test certificates, to avoid overloading. For example, hot-dip galvanised chains are normally derated by 20% and this is stated on their test certificates.

J M Torlach
STATE MINING ENGINEER

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