



White Paper

## **Service Problems with Steel Bins**

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During the past ten year period from 1970 to 1980 there have been eleven partial or complete failures of coal storage bins at locations on the surface and underground in N.S.W. coal mines. A number of these failures have resulted in loss of life to workmen. Several factors have emerged from investigations of these failures which have either individually or collectively been the cause of the failure. This paper attempts to identify these factors by reference to relevant details of the failed structures.

The absence of a suitable design code or code of practice covering the design, construction and maintenance of elevated bulk solid storage containers, has led to standards being adopted which were not satisfactory.

It is therefore vitally important that a suitable design code be prepared or additional requirements inserted in existing structural codes to cater for the peculiar operating conditions within bulk solid storage containers.

The design of elevated bulk solid storage containers has been traditionally carried out using techniques adopted for other classes of structures.

When in use, a bulk solid storage container will require more maintenance than other classes of structure because of wear, corrosion and fatigue.

The N.S.W. coal mining industry has for many years been able to cope with these problems by adopting designs which were robust and had adequate margins of safety (heavily framed structures with - usually timber - lagging for containment of the bulk solid).

Economic pressures have led to the introduction of lighter, more cost efficient structures in which the container also forms part of the support structure.

The prediction of loadings imposed on the structure during filling and emptying of the container have quite often been in error, due to a lack of understanding of the flow properties of the bulk solid and the effect of bin geometry on the flow patterns produced.

During the period between September, 1970 and April, 1981 there have been eleven partial or complete failures of bulk storage containers in N.S.W. coal mines that have been investigated by the Department of Mineral Resources.

Three of these failures resulted in fatal injuries to workmen engaged in driving vehicles used to unload the containers or servicing machinery installed under the container.