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**DEPARTMENT OF MINERAL AND  
PETROLEUM RESOURCES**

WESTERN AUSTRALIA

Mining Operations Division  
Department of Mineral and  
Petroleum Resources  
Mineral House, 100 Plain Street  
EAST PERTH WA 6004  
Phone: +61 + 9222-3092  
Fax: +61 + 9325-2280  
Email: mod@dme.wa.gov.au  
www.dme.wa.gov.au

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**SAFETY BULLETIN NO: 65**

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**DESIGN AND OPERATION OF DREDGES ON PONDS**

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**RECENT INCIDENT**

In September 2001 a 5.5 metre long dredge capsized whilst operating on a tailings pond at a gold mine. Fortunately the operator avoided serious injuries by escaping through a missing cabin window panel while the vessel was upturned and swimming to the bank.

An investigation into the incident revealed the following disturbing problems.

1. Under normal operating conditions the minimum freeboard on the dredge was approximately 100mm. With the cutter driven into the bottom of the pond the aft end of the dredge deck was submerged. Freeboards in the order of 230 mm would normally be considered a minimum under normal operating conditions. **Dredge decks should not become submerged under any circumstances.**
2. There were significant cracks in the deck around each handrail stanchion on the port side. This was probably caused by handrail impacts during transport between dredging sites. These cracks allowed water ingress when the deck was submerged. Decks and hulls should be checked regularly for cracks and holes.
3. Hull compartment inspection deck covers were not watertight which also allowed water ingress when the deck was submerged. All covers over hatches in the deck should be sealed with continuous excess marine sealant to ensure watertightness.
4. Holes had been cut in the bottom of each hull compartment bulkhead which allowed water to flow from one end of the pontoon to the other. All hull compartment bulkheads should be watertight to isolate water flow should water ingress occur in any individual compartment.
5. The dredge did not have any hull sounding tubes which allow periodic checks to be carried out for water ingress. Each hull compartment should have a sounding tube extending to near the bottom of the compartment so the compartments can be sounded daily for water ingress. Dredges should also have an adequate capacity pump with a non-collapsible suction pipe long enough to reach the bottom of any hull compartment, so that when water ingress is detected the water can be quickly and efficiently removed from the hull before buoyancy of the dredge is seriously affected. This dredge had a small capacity pump which could not have dealt with the progressive ingress of water.



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6. The hulls were filled with buoyancy material. The starboard hull was filled with injected polyurethane and the port hull was filled with polystyrene blocks. With polystyrene blocks it is not possible to completely fill the available space in the hull and in this case the port hull was able to be flooded to about 20% of the total hull space, enough to cause the dredge to capsize. The use of polyurethane or polystyrene in hull compartments does not ensure buoyancy of dredges. It is recommended that these materials are not used because the materials deteriorate over time, becoming porous and water absorptive and they do not allow for regular inspection of the hull compartment surfaces.
7. The dredge cabin did not have a designed emergency egress. Cabins should have an emergency egress system in the event of a dredge capsize, such as a push-out window or a trap-door in the floor.
8. The dredge design itself was not submitted to the State Mining Engineer. Instead, the operation of the dredge was subject to an exemption, which relied on a type approval for use from another State. Regulation 14.4(2), of the Mines Safety and Inspection Regulations 1995, which lists the components of a dredge design submission, includes the report of a qualified naval architect confirming buoyancy under all operating conditions.

This dredge was supplied and operated by a hire company and had operated at several other minesites for short durations, also without formal design approval. Principal employers and managers of mines must ensure that the use of any dredge has been approved by the State Mining Engineer before operation at a mine and be particularly diligent when hiring dredges for short durations.

## CONCLUSIONS AND RECOMMENDATIONS

Recent inspections of other dredges on minesites indicate that some of the range of problems noted above are present in several dredges. **The most common issues are insufficient freeboard, decks not watertight, soundings for water ingress not carried out daily, no emergency egress in the cabin and no approval for use from the State Mining Engineer.**

Should the freeboard of a dredge appear to be insufficient, then a naval architect should be engaged to evaluate and rectify the buoyancy. In the case of the incident cited above, the naval architect's report has recommended that this type of dredge be fitted with extra hull compartments to increase the buoyancy by approximately 50%.

Dredge operators must ensure that dredge decks do not become submerged under any operating conditions, particularly when sludge builds up on the cutterhead and when the cutter is driven into the bottom of the pond or into a working face during mining operations with the dredge.

M J Knee  
STATE MINING ENGINEER

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