Mining & Quarrying
OCCUPATIONAL HEALTH & SAFETY COMMITTEE

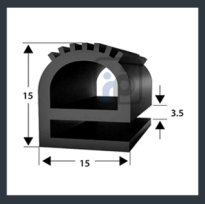
MAQOHSC Safety Snapshot

Machinery operator cabins - minimising RCS dust intrusion

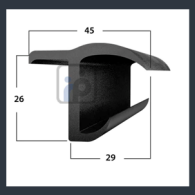
Testing has shown that the installation of new door gaskets and plugging and sealing cracks and holes in the shell of the enclosure have a major impact on increasing the cabin pressurisation

(CMEIG, 2021)

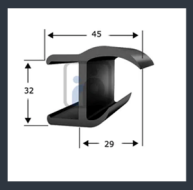
Door seal profiles



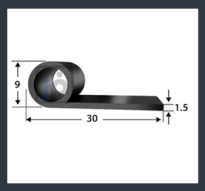
E Seal



J Seal



H Seal



P Seal
(PAR Australia)

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Enclosed cabins are an engineering control that can provide a safe, comfortable, and healthy work environment for equipment operators. Various levels of filtration can be incorporated into the HVAC system to improve the quality of the air inside the cab by removing airborne pollutants such as dusts and diesel particulates. (Min Eng. 2016 February)

Keep doors and windows closed

To achieve and maintain enclosure pressurization, doors and windows must be closed at all times, except while the operator is entering or exiting the enclosure. Studies have shown a nine-fold increase in respirable dust concentrations inside the cabin when the door was open, compared to that when the door was closed, despite no visible dust cloud. (NIOSH, 2012)

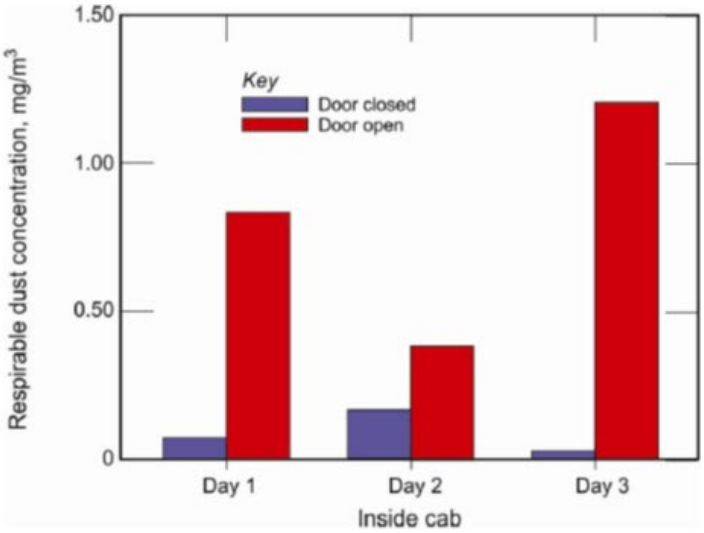

Figure 9.4. Respirable dust concentrations inside enclosed cab for three days of testing with cab door closed and open.

NIOSH 2012

Avoiding HVAC discharge vents at the floor level of the cabin

The floor heater can be a fundamental problem because the floor is the dirtiest part of the cab from the operator bringing dirt in on their work boots. Then as the operator moves his or her feet around, dust is created, which is then blown throughout the cab by the fan on the floor heater.

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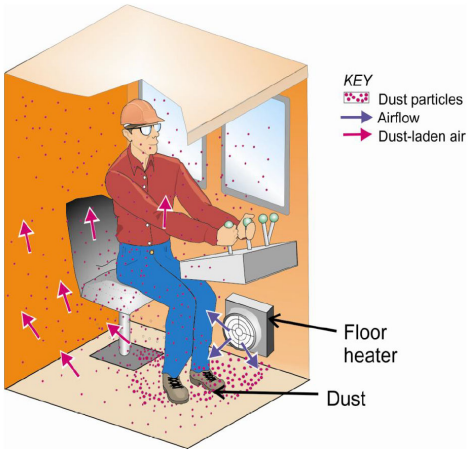

NIOSH (Dust Control Handbook) 2012

Keep cabins clean

It is critical that the inside of an enclosed operator cabin or crusher control room be kept clean to minimise the workers exposure to respirable dust. Use a M-rated portable battery powered vacuum or an industrial H-class 240v vacuum (available with up to 10m hose length).

Seat covers and cloth seats should be avoided as they retain and re-distribute dust every time the operator sits down. Often dust buildup on the floor is re-distributed by the operators' work boots.

Locate HVAC air inlets well away from high dust generating areas of machinery

It is recommended to place the enclosure's air inlet strategically away from dust sources to reduce dust loading of the filter cartridge. This can usually be accomplished by locating the outside air intake inlet at higher levels away from the ground and on the opposite side of the cabin or control room from dust sources.

Ease of filter change

It defeats the purpose of a good system if when filters need to be changed they are very difficult to access. For the operator or maintenance workers to want to take the time to perform the task they should be accessible. The easier a filter is to change; the less contamination should occur to the worker performing the task and to the work area.

M-class battery powered vacuums

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(Freudenberg)

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Pre-cleaner

It is recommended that the outside air filtration system use a pre-cleaning and final-filtering arrangement. The pre-cleaning should be performed to remove oversized dust particles and to increase the life cycle and the filtering capacity of the final intake filter.

Filtration design

The cabin HVAC system needs to be composed of both an effective outside intake air and a recirculation fan and filter; laboratory experiments showed a 10-fold increase in protection factors as compared to no recirculation filter (NIOSH, 2012). The recirculation filter has shown to significantly decrease the decay time needed for the cabin dust concentrations to go down and stabilize after the cabin door was closed (NIOSH, 2008 report).

Filtration efficiency

Higher filtration typically involves trade-offs in terms of restricting airflow, cost/complexity as well as the need for frequent replacement, which may not be practical in in an earthmoving equipment working environment. A high efficiency recirculation filter is not critical, as long as a filter within reasonable filter efficiency range (70– 95 percent) is used and maintained.

Filter mechanism	ISO 23875	QLD RS20
HVAC filter element	Filter minimum E11 or ISO 15E (95%)	H13 HEPA or ISO 35H (99.95%)
Recirculation element in cabin	Filter minimum E11 or ISO 15E	H13 HEPA

Automatic cabin pressurisation, including carbon dioxide (CO_2) monitoring with alarm functions.

It is essential for the cabin atmosphere to have sufficient oxygen. As the operator breaths there could be a build-up of their exhaled carbon dioxide if enough fresh air is not entering the cabin. An all-in-one monitoring unit for cabin pressure and CO_2 to alert the machine operator is recommended and included in ISO 23875 specifications.