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ACN 053 135 318

REF.: Z:\Projects\2007\2007.0106 L104 Dust Control.docx

Date: 18 September 2009

TOWN OF PORT HEDLAND

P.O. Box 41
PORT HEDLAND WA 6721

Attention Mr. T. Sargeant

Dear Sir,

PROJECT: PROPOSED "WEST END" DEVELOPMENTS – PORT HEDLAND

RE: COMMENT ON PROPOSED MEASURES TO REDUCE DUST IMPACT

In accordance with your instructions we have assessed the dust ingress minimisation guidelines provided including further suggestion as applicable.

The following commentary has been prepared with the intent to provide our assessment considering the effectiveness and practicability of the suggested dust minimisation options presented.

1. HERMETICALLY SEALED / POSITIVELY PRESSURISED BUILDINGS

- High levels of building sealing and/or positive pressurisation must be considered in conjunction with other dust ingress modes such as location of ventilation openings and filtration systems
- The effectiveness of the building sealing may be difficult to control for the life of the building due to tenant/owner modifications and maintenance regime. Detailed inspection and maintenance must be performed on a regular basis to ensure sealing components are effective.
- Due to the low occurrence of cracks or fissures expected in new or recently constructed buildings this is not considered a significant source of duct ingress.

We also note that BCA Vol 1 Clause J3.6 (also Volume 2 – cl 3.12.3.5) already requires a high level of construction to minimise air leakage from air-conditioned residential buildings.

- Further investigation should be performed to quantify the prevalence of dust ingress through cracks and fissures in existing buildings. In our opinion this mode of dust ingress is a low contributor to the overall level of dust ingress.
- It is also expected that costs may be excessive for little improvement in dust ingress.

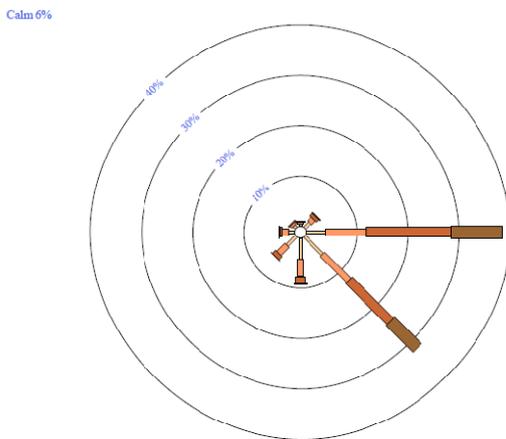
2. WINDOW AND DOOR ORIENTATION

- As the mode of dust ingress is similar for all openings in the building envelope, we have considered "Window Orientation" and "Door Orientation" simultaneously.
- The location and protection of openings is vital to reduce the ingress of dust into the space.

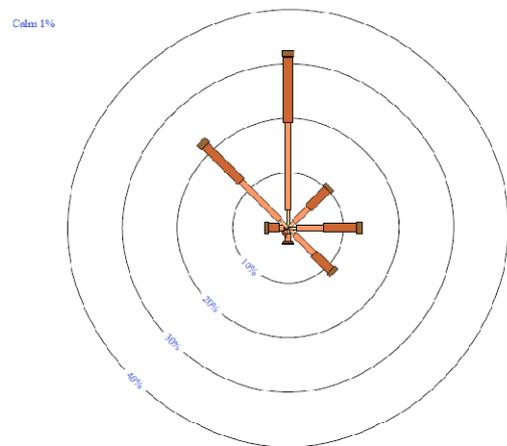
2. WINDOW AND DOOR ORIENTATION (cont.)

- Openings should be limited to walls on the leeward side of the prevailing winds in Port Hedland. We have assessed wind rose data for the area, and as such recommend not to include operable openings on Northern or Eastern facades.

The prevailing winds in the Northern Dry Season (May to September) indicate the vast majority of the time the wind comes from East-South-Easterly in the morning swinging around to North-Nor-Westerly in the afternoon.



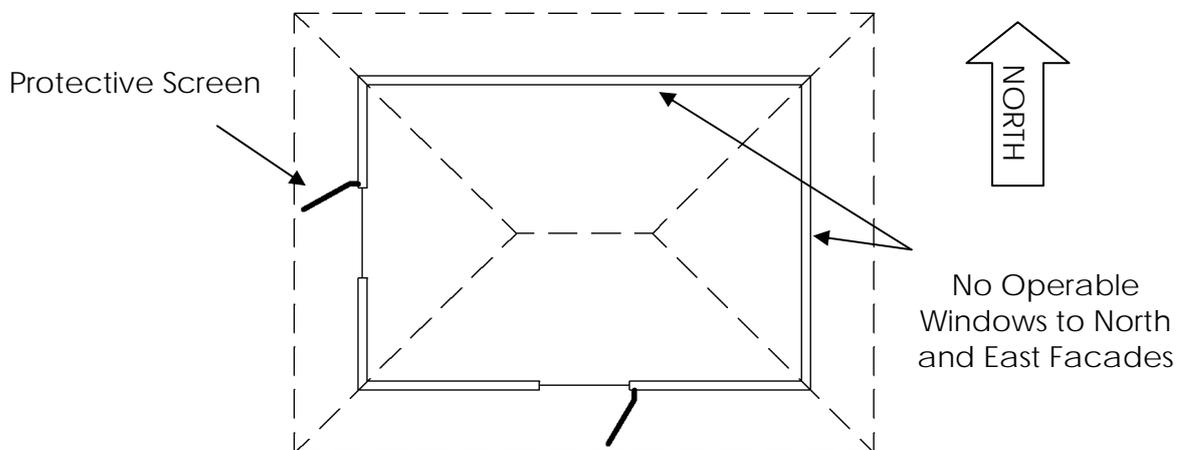
Wind Rose - Dry Season – 9am



Wind Rose - Dry Season – 3pm

- Protective screens or louvers should be implemented to reduce the direct impact of winds onto the windows. Windows on the west facades should be protected on the left hand side of the opening, windows on the south facade should be protected on the right hand side of the opening.

These screens should be the full height of the windows and designed such that wind may be directed away from the window whilst still maintaining vision out of the window.



Window and Deflection Screen Locations

2. WINDOW AND DOOR ORIENTATION (cont.)

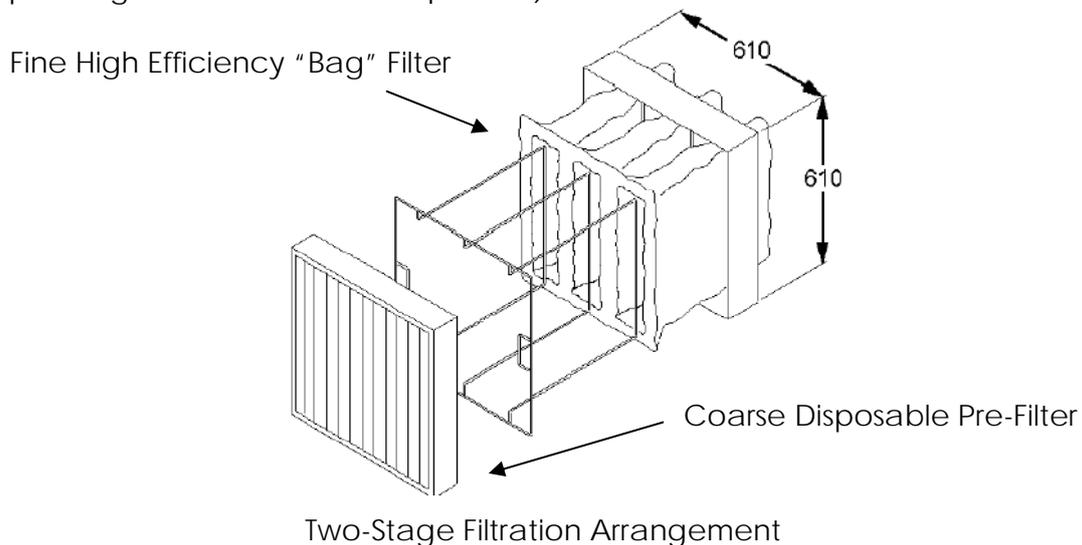
- The use of eaves to roofs of buildings can be effective to create a building boundary layer that may reduce the direct air-flow into the building. Orienting buildings such that wind-tunnelling effects of prevailing winds amplifying wind velocity should be avoided.
- Protective screens and porticos in front of the main building entrance may be of assistance to reduce the direct impact of wind onto the opening.

3. FILTERED AIR-CONDITIONING

- Air-filtration systems associated with air-conditioning equipment actively remove dust from the air. There is an ongoing requirement for maintenance, cleaning and replacement of the media to ensure adequate performance.
- Whilst the only "active" dust reduction strategy mentioned, it also carries with it the highest on-going cost for maintenance and replacement. Filtration medium must be checked and cleaned on a monthly basis and replaced annually.
- Selection of suitable filtration type and media may also be subject to a trial as the rate at which the dust builds up in the media is directly proportional to the hours of use of the air-conditioning system.
- The following filtration systems have been considered;
 - Disposable Media – includes a cardboard frame and is designed to be replaced when showing signs of clogging. It is not washable and has a shorter life-span to washable media, however cost less and are more reliable where maintenance practices may fall short. Due to their cost and convenience, these are considered to be the most effective filtration system.
 - Washable Media – usually consists of filter media supported by a metal frame and is designed to be washed when dirty. Washable filters progressively lose efficiency when washed and as such can become ineffective without the occupants knowledge.
 - Active Electrostatic – consisting of an array of alternately charged plates, electrostatic filters attract dust particles to the plates, removing them from the air-stream. Electrostatic filters can be "self-cleaning" however require a continuous power-source and specialist routine maintenance. This option is considered expensive in comparison to other filtration methods.
 - Cyclonic Filtration – is a process in which the air is accelerated in a circular chamber to remove the airborne particles via centrifugal force. Whilst effective and relatively maintenance free, these units are significantly noisier than other options due to the high fan power requirements. This option is considered expensive in comparison to other filtration methods.
- Consideration should be given to a system of "cheap" coarse disposable filtration upstream from effective fine washable media filtration. This system can serve multiple purposes by using inefficient filtration to protect fine filtration media from the effect of high duct environments.
- The location of fresh air intakes should be selected to ensure openings are oriented downwards, on the leeward side of the dwelling and sized to ensure low velocities are experienced and minimum dust pickup from the surrounding.

4. RECOMMENDATION AND DISCUSSION

- Filtration of incoming air into buildings is the only “active” mode of dust removal from air streams incoming into the dwelling. For this reason it is our opinion that it is the most reliable and effective “dust minimisation strategy” if designed intelligently.
- Filtration systems should be designed as “two stage” arrangements utilising coarse disposable pre-filtration (suggest G3 or G4 rated), cleaned regularly, and a fine filter (suggest F4 rated) to efficiently remove particulate matter from the air.
- We have estimated the cost of this filtration arrangement to be relatively in-expensive in the order of \$400 for supply and installation, with annual filtration media costs expected to be approximately \$150, plus maintenance personnel cost as required.
- The pre-filtration media should be cleaned monthly, by vacuuming or “banging” out as much dust as possible, with the fine filtration replaced annually (or sooner depending on actual dust level present).



- To further reduce dust ingress into dwellings, via openings, careful design of window and door locations should be carried out to restrict their locations to Western and Southern building facades only.
- Deflection screens to the northern and eastern edges of windows should also be considered to reduce the direct path of dust laden wind into the opening.

We trust the information provided meets your approval.

Please do not hesitate to contact our office if you have any queries.

Yours faithfully,

C.A. & M.J. LOMMERS PTY LTD

M.D. Lommers

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