Ventilation and Jet fans in Car Parks

Presented by: Kerry Dumicich
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Introduction

• Introduction to Jet fans.
• How to meet the BCA Performance requirements for Jet fans.
• Summary of FRNSW “Guideline for Impulse fans in car parks”.
Introduction to Jet fans.

- The use of Jet fans to move and to mix the air within an entire space
- Pollutants are efficiently diluted throughout the entire volume of space
- Fresh air is introduced and exhaust air removed for closed car parks via natural or mechanical means
- No ductwork network for supply & exhaust air
How Does An Impulse/Induction System Work?
Examples of Impulse/Induction fan Installations
Linear Flow

Exhaust Air

Supply Air
Assisted System
• These CFD plots are at maximum speed.
Ramped control of speed (i.e. with variable speed control)

Variable speed control involves controlling the speed of the fans proportionally to pollutant levels in a car park. The EcoVent control system will control a VSD using a 0-10 Vdc analogue signal. This system of speed control is more energy efficient as it provides more precise control of the fan speed against pollution levels.
BCA Compliance Requirements

• Single Jet fans serving dead spots can be DtS as per AS1668.2 2012 and AS1668.1 2015.

• Most jet fan projects are therefore an alternative solution to the BCA from a fire, smoke and ventilation perspective.
An automatic fire suppression system must be installed to the degree necessary to control the development and spread of fire appropriate to –

- The size of the fire compartment; and
- The function or use of the building; and
- The fire hazard; and
- The height of the building.
A mechanical air-handling system installed in a building must control

- the circulation of objectionable odours; and
- the accumulation of harmful contamination by micro-organisms, pathogens and toxins.
NCC 2016

EP2.2 (a)

• In the event of a fire in a building the conditions in any evacuation route must be maintained for the period of time occupants take to evacuate the part of the building so that:
  – the temperature will not endanger human life: and
  – the level of visibility will enable the evacuation route to be determined; and
  – the level of toxicity will not endanger human life
EP2.2 (b)

- The period of time occupants take to evacuate referred to in (a) must be appropriate to:
  - The number, mobility and other characteristics of the occupants; and
  - The function or use of the building; and
  - The travel distance and other characteristics of the building; and
  - The fire load; and
  - The potential fire intensity; and
  - The fire hazard; and
  - Any active fire safety systems installed in the building; and
  - Fire brigade intervention
I trust the above is of assistance. Should you have any questions please don’t hesitate to contact the QFES Fire Engineering Unit on 07 3635 1989.

Yours sincerely

Peter Shillington  
Acting Chief Superintendent/Director  
Community Safety Capability Branch  
Queensland Fire and Emergency Services

Dear Mr Dunicich,

Thank you for your letter of 25 May 2015 concerning the installation of jet fans in car parks.

Under Queensland legislation Queensland Fire and Emergency Services (QFES) is a referral (advice) agency for most fire-related Alternative Solutions, including those involving the installation of jet fans in car parks. In this role QFES provides fire safety advice to the relevant building certifier, the certifier being the ‘Assessment Manager’ and therefore the party responsible for the formal approval of any performance-based Alternative Solution.

As a referral (advice) agency for Alternative Solutions, QFES advocates the use of the process set out in the International Fire Engineering Guidelines (IFEG), including the development of a Fire Engineering Brief (FEB) and early consultation with relevant stakeholders, including QFES. Further information on this process is set out in our ‘Guide to the Referral of Alternative Solutions’, a copy of which is attached for your information.

In your letter you asked whether Queensland Fire and Emergency Services (QFES) considers the Fire and Rescue New South Wales (FRNSW) “Fire Safety Guideline – Guideline for impulse fans in car parks” to be a reasonable process for the development of Alternative Solutions for the installation of jet fans in car parks.

It is important to note that Queensland and New South Wales operate under different building legislation frameworks; hence the FRNSW guideline is not directly applicable in Queensland. However, in terms of general process and technical content I would advise that the QFES position is generally aligned with the majority of the FRNSW guideline, including the recommendation that the FEB process be followed, as set out in the IFEG.

I would emphasise that early stage consultation through the FEB process greatly assists all stakeholders to achieve a mutually acceptable outcome that adequately addresses occupant life safety and the facilitation of fire brigade intervention. Therefore, it is strongly recommended that our QFES Building Approval Officers (BAOs) be consulted early in the design stage, when they can provide stakeholders with detailed fire safety advice, taking into account all relevant considerations, including the applicable legislative and operational requirements, as well as the design proposals for the specific building under consideration.
FRNSW Guidelines

- Jetvents are an alternative solution unless serving dead spots.
- Fire Engineering Brief/Report must be done.
The provision of a detection system to quickly shut down the impulse fan system and the correct positioning of the impulse fans within the car park may assist in addressing these items of consideration.

The following key items need to be considered as part of the Alternative Solution:

1. Performance requirement EP1.4 must be assessed to demonstrate that the sprinkler design and performance is not adversely affected.

2. Performance requirement EP2.2 must be assessed to demonstrate that conditions within the car park are not adversely affected.

The provision of a detection system to quickly shut down the impulse fan system and the correct positioning of the impulse fans within the car park may assist in addressing these items of consideration. Examples of detection systems that may be utilised include:

- beam detectors
- aspirating smoke detectors
- duct probe detectors.
Design Requirements

5.1 Design requirements

The following details the minimum requirements that need to be addressed in the design:

1. The impulse fans should be located in driveways and access ways, and not above car parking spaces or other areas where there are stagnant fire loads.

2. The impulse fans should be located between rows of sprinklers and it should be demonstrated that the air jet from the impulse fans does not impinge upon any sprinkler heads.

3. The impulse fans are to shut down upon detection of fire within the car park, including activation of any sprinkler system. However, in addition, an appropriate means of shutting down the impulse fan system via the provision of a suitable detection system is also to be provided. This detection system should only shut down the impulse fan system and not activate the occupant warning system or fire brigade notification unless it is appropriate to use within a car park environment and would not cause spurious alarms.
Design Requirements

(4) Manual control of the impulse fans should also be provided for fire-fighters at the Fire Fan Control Panel (FFCP) so that the impulse fans can be used during fire brigade intervention if required.

(5) The shutdown operation of the impulse fans by the proposed detection system should be tested during the commissioning tests prior to occupancy. The test procedures should be in accordance with the relevant Australian Standards for the applicable detection system.

(6) Sprinklers, where required, must be installed as per the BCA and AS 2118.1:1999.
Analysis Required

• Show that the difference in sprinkler activation times between jet fan at its design speed and off is negligible.

• Show that the conditions within the car park are not adversely affected by the operation of the impulse fans.
  – Demonstrate tenability is maintained for the period of time occupant take to evacuate, or
  – Show conditions within the car park are at least equivalent to a Deemed-to-Satisfy solution.
Analysis Required

• Analysis to be undertaken using CFD modelling.
• Two scenarios to be modelled for every car park.
Non-sprinklered car parks

• Should be discussed during the Fire Engineering Brief.
Smoke Detectors.
Questions?

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