Part B
Guidelines

Section 7

Crowd management

Guideline 18: Crowd dynamics

Although a venue may be fully compliant with building codes and regulations, significant problems may still occur.

A basic understanding of crowd dynamics will allow you to set up your venue and operational plans to substantially reduce the risk of a serious incident.

Failure to appreciate the appropriate crowd dynamics may result in a serious incident at some stage.

Background

- Crowd dynamics refers to the behaviour of crowds and issues that may cause unrest or a crush to occur. Crowd dynamics can be very complex.
- Crowd dynamics will vary according to the overall behaviour of the crowd; and perceived risks.
- Most crowd experiences are good, and many people enjoy being in a crowded environment.
- Crowds consist of individuals that react differently in certain situations.
- Individuals cannot observe the whole crowd, which means if anything goes wrong there will be various individual responses rather than a unified crowd response.
- Individuals in a crowd are inclined to take short cuts. This often leads to intended flow patterns being disrupted.
- People may have a negative reaction to being in crowded spaces. For example:
  - anxiety
  - stress
  - dehydration
  - a general feeling of being uncomfortable and frustrated.
- Prolonged crushes can lead to broken bones, difficulty breathing, and even death. Most deaths in crush incidents are attributed to compressive asphyxia which occurs when the individual's chest cavity is compressed by the crowd on all sides, and the individual can no longer breathe, due to the pressure on the chest cavity.
- A crowd may **react** to a perceived threat and respond by fleeing the danger (flight response). Dangers do not have to be real, just perceived.
- A craze occurs when there is a competitive rush to obtain a valued objective such as front position at a concert, or giveaway from a promotion or entertainer.

Example: The Who concert tragedy

(https://web.archive.org/web/20021020125144/http://www.crowdsafe.com/taskrpt/)

On December 3, 1979, eleven concert ticketholders in a crowd of approximately 8,000 to 10,000 still waiting to enter the venue, were crushed to death and scores were injured trying to enter a sold-out rock concert by The Who in Cincinnati, Ohio, USA. Dozens were injured.

The main viewing options inside the Coliseum were festival seating (unreserved seats) or general admission (standing room). That is why thousands of loyal The Who fans came to the concert hours early to stand in the chilly wintry evening.

The lack of allocated seating or areas forced competition among fans. The situation was made worse by, among other things, an absence of communication between event managers, security and the waiting crowd, a lack of crowd management of any kind, including queuing, and, a refusal by those in charge to respond to a call by police to open enough entrance doors to relieve the distressed crowd.

When the main entrance doors finally opened close to the time The Who were to take the stage, many eyewitnesses claimed that only one or 2 main entrance doors, from among a broad bank of doors, were opened to handle the massive crowd. Fans near the front watched in horror as these doors were opened, then shut, then opened, then shut yet again, and so on. When the doors did open, ticketholders pressed forward. When the doors were shut, people were smashed against each other and the building by the thousands of fans behind them who did not know the main entrance had closed again. Deadly crowd surges and rippling human waves of pressure knocked people down and rendered them helplessly trapped and fighting for breath and and unable to escape.

Guidelines

Crowd flows

- For high pedestrian flows it is important to maximise flows by ensuring that there are no obstructions and limiting changes in direction.

- As crowd density increases, walking speed slows dramatically.
- Normal walking speed is estimated at 1.5 metres per second.
- At densities of 4 people per square metres, speeds are less than 0.5 metres per second.
- At densities of more than 6 people per square metre, people often lose control and fall or are lifted off the ground.
- Crowds can only move as fast as the slowest person.

- Densities should be monitored and regulated to reasonable limits. For further information contact Public.Events@health.wa.gov.au
- Flow rates and crowd dynamics must be considered when designing entries, exits and pedestrian routes within the venue.
- Visual and audible communications such as PA and video screen messages are recommended to communicate with patrons to assist with crowd control. This allows crowds to be informed about delays which will help to reduce frustration, aggression and panic.
- Implement strategies to avoid traffic flow disruption due to:
  - obstructed travel paths
  - closed gates or doors
  - crowds stopping to view something of interest
  - a queue to an attraction or concession
  - disruption caused by crowd behaviour.

- Crowds have no collective intelligence.
- Crowds react to individual perceptions / motivation.
- Visual or audible messages are valuable tools to obtain desired crowd responses.
- Crowds become agitated and restless if they cannot progress after approximately 6 minutes.

Be aware of flow-on effects of modified crowd flows or modified behaviour.

Guideline 19: Crowd control and security

Crowd controllers have a unique role and can proactively prevent problems rather than just reacting to them. Early use of mediation and non-aggressive patron management strategies can play a huge role in preventing incidents and promoting a positive atmosphere.

Background

- The ultimate responsibility to ensure patron safety rests with the event manager or organisation that is responsible for the public building application. For permanent facilities this is usually the venue or site manager. Local government is responsible for ensuring that crowd control plans are adequate.
- The difference in roles between security officers and crowd controllers is often misunderstood. The table below outlines the purpose of each role.

Crowd controller

A crowd controller is a person who performs one of the following functions:

- Controls or monitors behaviour.
- Screens people seeking entry.
- Removes people for behavioural reasons.

Ticket collectors

Ticket collectors do not have to be licensed crowd controllers.

Security

The term security refers to the process and officers involved in ensuring the security of people, equipment or property.

Spruiker/usher

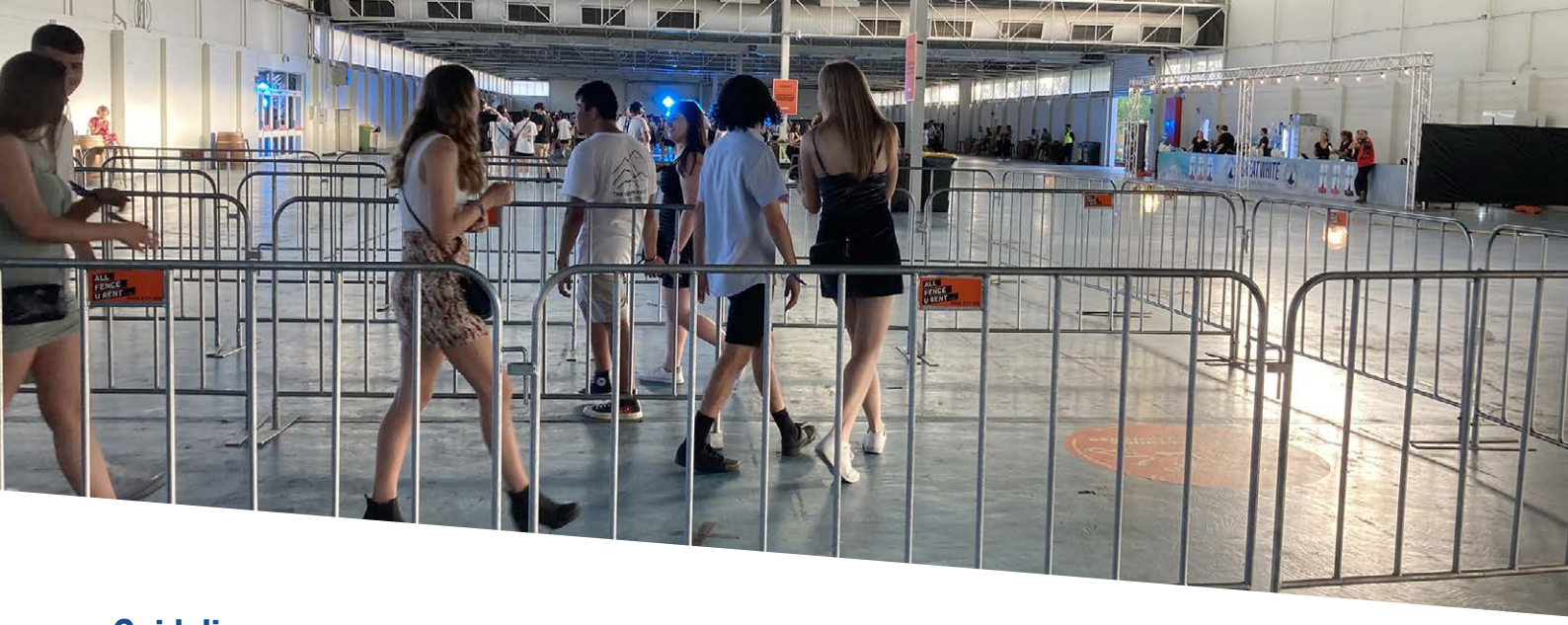
A spruiker can clearly deliver directional advice to crowds, e.g. to the correct gate or seating area. They do not have to be licensed crowd controllers.

Security officer

A security officer is defined as a person who watches, guards or protects any property. Officers may be dual licensed as crowd controllers, but when determining requirements, the 2 responsibilities must be clearly separated.

Why is crowd control required?

- To prevent, as far as practicable, personal injury due to crushing, overcrowding and unruly behaviour.
- To enable injured or distressed patrons to be identified and moved to safety.
- To prevent overloading of structures for spectator use. This includes seating stands, advertising hoardings, stages, lighting and sound mixing towers.
- To prevent overcrowding.



Guidelines

- Every large scale event should have a crowd management plan.
- Clear communication mechanisms between staff should be established.
- The crowd management plan must identify:
  - Anticipated crowd demographics (age range, etc).
  - A clear mandate to prevent problems and use non-aggressive patron management techniques where possible.
  - Probable areas of concern and response to prevent problems.
  - Numbers and deployment of crowd controllers.
  - Numbers and deployment of security officers.
  - Start and finish times.
  - Rostering for relief and meal breaks.
- Higher risk licensed events should employ a ratio of at least 2 crowd controllers for the first 100 patrons and then 1 crowd controller for each additional 100 patrons or part thereof.
- For events deemed to be lower risk by the relevant authority, the numbers are normally reduced to 1 controller/200 patrons. The ratio method should only be used as a guide for low risk events.
- Locations where crowd control is required include:
  - venue entrances
  - exits
  - concession areas
  - bars and service outlets
  - stages
  - aisles
  - front of house crowd barriers.
- Where an exit point also serves as an entry there must be at least 2 controllers.
- Controllers should be on site at least one hour before the venue is opened.
- Crowd controllers should be briefed and operate to the pre-arranged crowd control plan.
- Standing orders and procedures should be developed for each event.
- There must be enough controllers to allow relief for meal breaks and sickness etc.

- Every crowd controller must:
  - have a distinctive uniform
  - be able to be easily identified. Unique identification must be formally issued at each event so that controllers can be easily identified
  - have a torch if the event is held at night and the controller is required to direct patrons
  - have communication equipment that is effective under the conditions anticipated at the event
  - have ear protection if noise will be excessive
  - have any other equipment required by Worksafe WA.
- Where events are likely to involve alcohol and other drug use, crowd controllers should have enough training to enable them to identify at-risk patrons, provide support and refer to medical services.

Electronic dance music festival crowd management

Experience indicates that dance/rave party crowds are not usually aggressive, and hysteria or crushing is not common. The most common problem is dehydration and excessive use of alcohol or illicit drugs.

- Crowd controllers should receive a briefing on emergency first aid for illicit drug-related medical incidents. This will assist if a patron 'drops' whilst a crowd controller is attending until first aid support arrives.
- Distressed or intoxicated patrons should be escorted to first aid for medical assessment, rather than simply ejecting them.

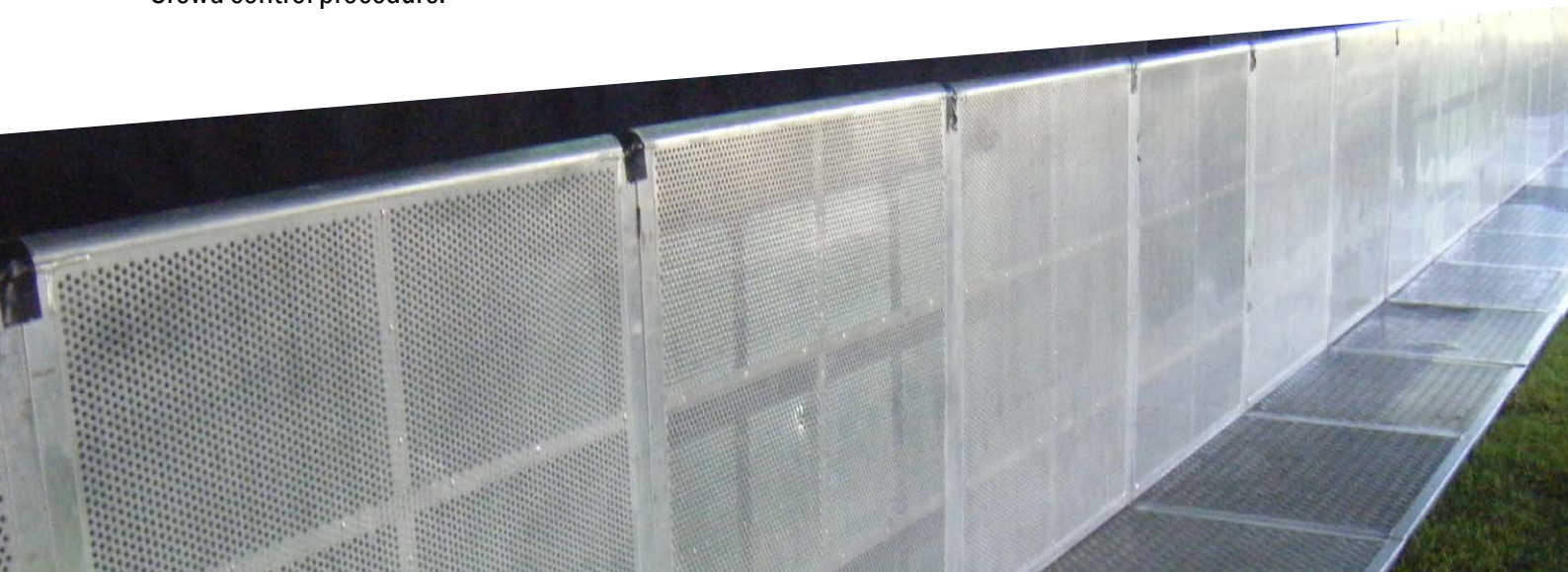
Concert crowd management

For large events the following is recommended:

- at peak times there must be at least one controller per metre of stage, including the side extensions of the main stage. Crowd controllers must act to prevent patrons climbing onto the stage, remove injured patrons and monitor activities to ensure that crowd behaviour remains acceptable
- stage barriers of suitable design must be provided (refer to section on stage barriers)
- egress from the audience area should be provided at either end of the stage barrier
- patrons must be prohibited from accessing the stage unless arrangements were made with the event manager and security prior to the event.

Support tools

- Checklist of crowd control duties and planning tool.
- Crowd control procedure.



Guideline 20: Crowd management requirements

Definitions

Mosh pit – The audience area in front of the stage.

Stage barrier – Also known as a crowd barrier: a barrier placed in front of the stage to prevent patrons accessing the stage. Barriers must be able to withstand high pressures and be equipped with a raised area to enable crowd controllers to be higher than the crowd. Mojo barriers are recognised and accepted throughout the world as being suitable mosh pit barriers.

Pit – The area between the stage and crowd barrier. The area occupied by the stage crowd controllers.

Background

- Concerts and events where people crush to view entertainment are inherently dangerous. Most members of the public are unaware of the significant dangers.
- It is imperative that event and venue managers establish safety policies to minimise the risks to allow events to be as safe as possible and comply with recognised best practise.
  - Mosh pits are high risk areas because:
    - crowd surfing is dangerous and common.
    - crushing occurs.
    - people have been killed and many more have been permanently disabled due to activities in these areas.
    - the size of the crowd is not always a key factor as serious injuries have occurred at relatively small events, some with less than 500 people.
    - people who are frail or have small frames should not enter mosh pits.
  - Barriers at concerts serve several different purposes. These include:
    - physical security
    - preventing the audience from accessing stages and restricted areas
    - relieving and preventing the build-up of crowd pressures. E.g. Properly constructed stage barriers enable distressed patrons to be reached and helped with ease
- There are 2 categories of crowd collapse:
  - Collapse of a patron.
  - Multiple patrons collapsing through moshing, being caught in swirls, or other pressures within the crowd.

'**Swirls**' – is the name given to the practice of patrons moving with the music until the movement becomes circular. In the circular motion, patrons have been known to collapse as they move and step backwards.

Guidelines

- A crowd management plan should be implemented at all higher risk events. Failure to implement a safety policy may result in serious financial consequences in the event of a subsequent injury and claim from an injured patron.
- It is imperative that prior to an event, 'Show Stop' procedures are developed to enable events to be stopped in a timely manner. This is an extremely important process that is often not considered.

There are various types of barriers in the entertainment industry. The most common type is a free standing demountable 'A' frame barrier (e.g. 'Mojo' Barrier) which normally has a 1 metre tread plate at the front and a small raised platform at the rear. The individual barriers are bolted or pinned together to form a single extended barrier across the stage.

Front of stage barrier

Stage barriers should be considered for most concerts. They are particularly important if significant crowd pressure is expected. See the tools section for design considerations for stage barriers.

Barriers potentially subjected to heavy pressure must always have provision to extract patrons in distress.

Multiple stage barrier

- In prime standing viewing areas at stages extreme pressures occur. Strategies are required to manage these extreme pressures.
- Common strategies include creating smaller areas that allow crowd capacity to be controlled and restricted to a manageable size.
- Various models have been implemented. A common option is a 'D' barrier. These barriers normally extend in a curve from the stage extremities through to the mixing facilities and roughly form a 'D'.
- For more extreme situations smaller pods may be required. The preferred option should be one that has been derived from experience gained from previous experiences of the performances, there is a considerable variation but generally crowd reactions for the same performers is consistent.
- Crowd pressure is critical and must be monitored throughout events.
- At events where people may be of relatively small stature, density ratios may be considered which allow less than 0.5 square metres per person.
- These areas may require Chief Health Officer approval because local government does not have discretion to approve densities permitting less than 0.5 square metres per person.

Health legislation dictates viewing densities. Local government has discretion to approve densities to 0.5m^2 per person. The Chief Health Officer has discretion to approve increased capacities (i.e. less than 0.5m^2 per person).

Area capacity is assessed as the area that can be occupied by the audience. For entertainment events patrons invariably move towards the stage so the area in front of the stage becomes denser than what was approved, but the overall density of the area remains compliant.

The pit

- This is the area between the stage and the front of stage barrier, this should be designed to assist crowd controllers, first aiders and paramedics.
- There should be no less than a 1.5 metre clear space between the stage front and the crowd barrier.
- The 'pit' should have a non-slip surface.
- An elevated platform inside the barrier should be provided to help crowd controllers extract people from the crowd and oversee the audience to identify anyone in distress.
- Entrances or exits from the pit must be unobstructed and at least 1.1-metre-wide to allow individuals in distress to be removed.
- Arrangements for photographers and media to work in the pit area should be agreed to prior to the event, with the event manager who needs to be satisfied that their activity will not interfere with the work of crowd controllers or first aid staff.

Note

A concert held 'in the round' with a standing audience requires special arrangements for a pit area. The provision of an unobstructed escape corridor enables members of the audience taken over the barrier to be led away from the pit. However, care needs to be taken to avoid creating a point where people can be trapped between the escape corridor and the barrier.

Rock concert safety

The below specific requirements for rock concerts and seated audiences have been extracted from the current regulations i.e. the Building Code of Australia and the Health (Public Buildings) Regulations 1992. Fully seated venues are safer than those with standing viewing. For unseated configurations, crowd pressures, collapses, and inappropriate behaviour such as crowd surfing and stage diving and circle dancing are major concerns.

Seated audiences

- For seated audiences, the seats must be set out in accordance with the Building Code of Australia and the Health (Public Buildings) Regulations 1992. The basic requirements are set out below.

Aisles

- Aisles are required on both sides of every row of seats that is more than 10 seats.
- There shall be no more than 42 seats between aisles.
- Steps within aisles must:
  - be the full width of the aisle, minimum aisle width 1 metre
  - be uniform in size (both the riser and going)
  - going shall be between 280 mm and 355 mm
  - risers shall be between 115 mm and 190 mm.

Clearance between rows

The clearance between rows of seats shall be:

- 300 mm if the distance to an aisle is less than 3.5 metres or 8 seats
- 500 mm if the distance to an aisle is more than 3.5 metres
- the minimum width of a seat or seating space is 450 mm
- seats should be fixed to the floor or fastened in groups of no less than 4 and the groups should also be fastened together
- where cross aisles occur, they must lead directly to an exit route
- dead Ends should be avoided.

Keeping the pit clear

- It is essential that the pit area is always kept clear of rubbish, obstructions and patrons.
- When patrons are in the pit, they are at risk from other patrons and crowd controllers falling on them. They must be removed from the pit immediately.
- Patrons are not permitted to take photos or dance in the pit and must be kept moving as they will not be aware of hazards and can hinder crowd control and security operations.

Job rotation

- To reduce crowd controller fatigue, pit personnel must be rotated.
- A job rotation procedure should be in place to rotate personnel from their position in the front row to a position in the back row.
- It should be noted that due to the difference in performing acts and associated crowd behaviour, the demands on crowd controllers will vary throughout the event. Therefore, rest periods must coincide with demand.

Support tools

- A concert safety policy.
- How to deal with patrons in distress.
- Design considerations for the front of stage barrier.

Guideline 21: Entry and exits

Background

- Disasters and crowd crushes may occur when obstructions occur at entries and exits. They can occur on ingress or egress but also partial ingress and egress.

Guidelines

- It is important that pedestrian flows and processing on entry are clearly identified and that there are no cross flows or competing queues.
- For dual direction routes, lanes of 2.5 m in each direction are recognised as the optimum width to allow streaming flows.

Optimum width to allow for streaming flows

Queuing studies have revealed that the most efficient queuing are single queues serving multiple points of service like those used at airports.

Egress from an event

- For buildings, refer to the Building Code of Australia Section D 1.6. Note that these requirements may be varied by alternative fire engineering or building performance solutions.
- For outdoor areas, the code is not appropriate and exit locations and sizes must be calculated to allow evacuations within reasonable times.

Support tools

- Entry and exits.

References

- Crowd Management Strategies 2002, *The Who Concert Tragedy Task Force Report*. Retrieved June 11, 2008, from The Who Concert Disaster
- Building Code of Australia
- *Health (Public Buildings) Regulations 1992*.