Front of Stage Barrier Systems
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Introduction

This paper considers the safety of mass crowds in front of a stage at an open-air concert event. During the period 1974 - 2003 forty-one people died in thirteen separate incidents in front of a concert stage in countries thousands of miles apart. Each of these fatal incidents was reported by the media to have been somehow caused by irrational crowd behaviour. The probability that all thirteen incidents were caused by the crowd is however in my view extremely unlikely. My presentation therefore draws on the lessons learned from experience to argue that better understanding of front of stage barrier system (FOSBS) design is needed in order to better control crowd dynamics and cultural behaviour.

Influences on crowd behaviour

Irrational crowd behaviour at concert events arguably has its roots in the campaign by press agent George Evans in the forties who appears to have drawn on traditionalist crowd theory to launch the career of Frank Sinatra. It has been alleged by some researchers that Evans paid young women to scream `Frankie` during the singers live radio performances (see Kureishi and Savage 1995 and Kelly 1998), the objective being to create a mass hypnosis situation by peer pressure. The degree of success achieved by this marketing strategy can be seen by research by Bruce Blivin (1995), who describes how one hundred and fifty police officers failed to control 10,000 young women trying to get into a Sinatra concert at the 3,500 capacity Paramount Theatre, New York, in 1944.

Throughout the fifties and sixties the strategies used by Evans were widely copied, most notably by Colonel Tom Parker to launch the career of Elvis Presley and Brian Epstein for the Beatles. Both these campaigns focused on artiste image to create hysteria among female fans. When Andrew Oldham launched the Rolling Stones however there was a dramatic change in crowd behaviour, particularly on the Stones 1965 tour, which became notorious for stage invasions and disorder by predominantly male audiences.

FOSB Development

I first witnessed irrational crowd behaviour when I joined the Beatles security team in 1964. In 1965 I also worked for the Rolling Stones during a tour that experienced stage invasion nightly. Clearly stage invasions were dangerous and could not be allowed to continue. At first the answer was believed to be to move these concerts into theatres that had a front of stage orchestra pit that would act as a moat which would deter would be stage invaders. This strategy proved to be flawed however when determined people attempting to climb theatre stages fell into pits that were often very deep. A move to station security teams in front of the pit proved to be counterproductive as it resulted in eyeball to eyeball confrontation between the public and security staff. When concerts moved back into dance halls an attempt was made to construct a front of stage barrier from equipment flight cases but this was doomed to fail. A brief period of constructing barriers from scaffold and board then followed but the situation only improved when the

Dutch Company, MOJO, introduced the de-mountable FOSBS. From this point on it was possible to change the concept of a pit team from that of a security function to deter stage invasions to that of crowd safety rescue. At this point concert events moved outdoors in order to attract mass crowds.

In the UK, the first warning that there could be serious problems with a mass crowd in front of a stage at an open air event came with a David Cassidy concert at the White City Stadium, London in 1974. At this event there was a crowd crush that involved over 500 people, thirty were taken to hospital and sadly, 15yr old Bernadette Wheelan died. This incident was the catalyst for the first pop code, the *GLC Code of Practice for Pop Concerts*. The document recommended that FOSBS should be curved rather than parallel in order to cope with dynamic crowd surge activity. For this system to be effective however it required emergency exits both sides of the stage to deal with any dynamic crowd urge (see fig1).

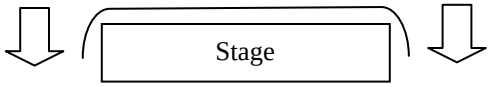

Fig1 Curved barrier showing emergency exits

The curved, or D system, did work at concerts where it provided a better audience viewing area but it was not possible to fit in the required emergency exits at all venues. The 1988 Donington Monsters of Rock event was one such venue that could not provide these exits, consequently a single parallel primary barrier was installed. Two young men died and thirty people injured in a tragic incident at this event but it was caused by a lateral crowd surge therefore a curved barrier with exits is unlikely to have prevented the tragedy. The fatal incident was triggered by *Thrash Metal* crowd activity. Subsequently this accident brought about a revised pop code and a further change in FOSBS design when the Center Thrust, or T barrier system (see fig2) was introduced by promoters MCP to control lateral surge activity. The danger with the T barrier however was that it created trapping points. An additional problem was that it had to be manufactured off site in a factory. It was also expensive in terms of construction and security staff to man it. The advantages were that it restricted lateral surges and allowed the pit team to get 60m deep into the crowd.

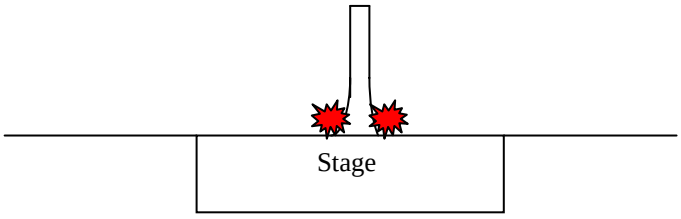

Fig 2 Thrust or T system  *indicates trapping points*

The practical problems involved with the T system caused rock band AC/DC to experiment with a pod system to improve crowd safety 1991 at a concert in Salt Lake City. The pod system involved placing large concrete fixtures within the crowd to brake up density (see fig 3). Unfortunately however the system failed because crowd members close to one of these objects got caught up in a crowd spin that eventually collapsed and three people died. Sadly a rescue team could not reach the victims in time and there were claims that there was a delay in stopping the show (a common feature in concert crowd disasters). Clearly the pod system theory was flawed and it was abandoned.

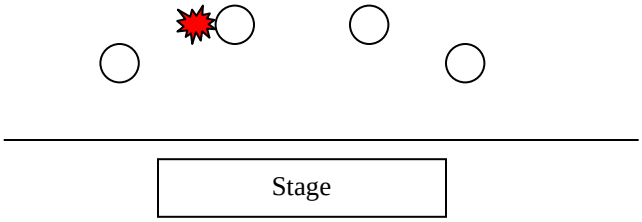

Fig 3 Pod system

My own research at this time indicated that approximately 5% of a Heavy Metal crowd were responsible for producing 75% of the energy release. I therefore preferred a double barrier system in which 5% of the crowd were allowed into a controlled area in front of a stage while 95% enjoyed themselves in a more relaxed area further back (see fig 4).

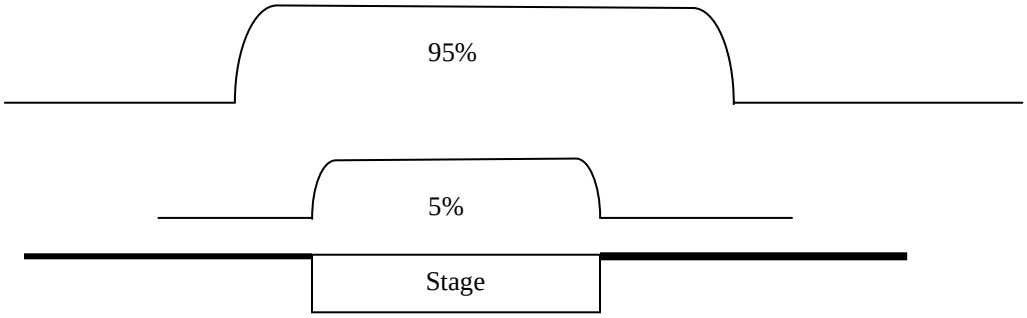

Fig 4 Double barrier system

The double barrier system worked well for crowds of 50/60.000 people but when Oasis wanted to play to 120,000 people at Knebworth in 1996 the promoter (MCP, now a part of the Clear Channel group) introduced a triple D barrier system (see fig 5).

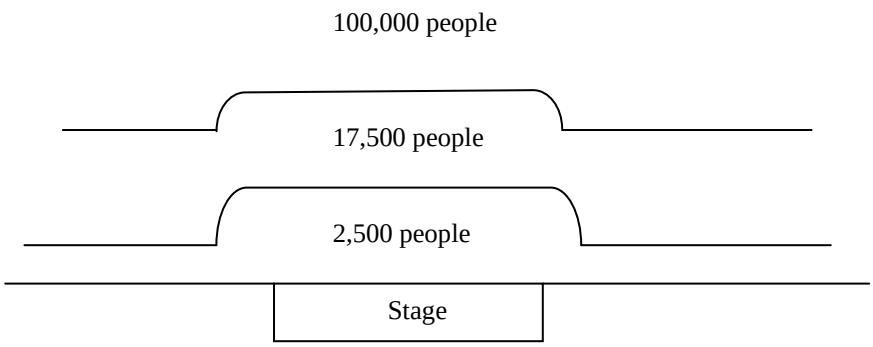

Fig 5

The emergence of *Nu Metal* and subsequent irrational youth cultural behaviour introduced problems that existing FOSBS failed to cope with. The Danish Roskilde Festival had run for over thirty years prior to the year 2000 event. The main (Orange) stage relied on a Primary FOSBS and a series of permanent crush barriers (see fig 6), the system worked well and was considered safe for crowds of 40-50,000 people. At the 2000 event however nine people died in front of the main stage in the second worse ever-fatal accident at a concert event.

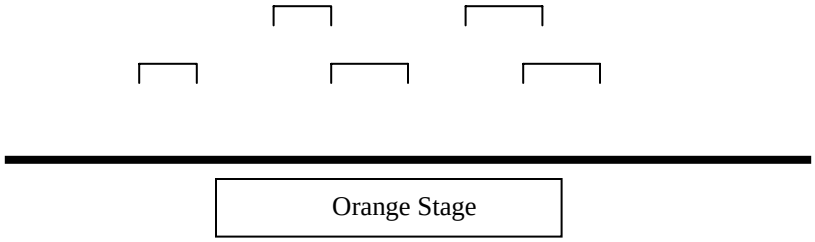

Fig 6 The old Orange Stage at Roskilde system with crush barriers installed in front of the primary barrier.

Once again communications necessary to stop the show appear to have failed. Clearly it was time for a drastic rethink of FOSBS design in order to cope with worrying cultural activity. I was invited to Denmark by promoter Leif Skov to assist the Roskilde Festival organisers to design a new system. The system subsequently designed by Henrik Bono Nielsen introduced a system of *four* controlled pens based on the 5% theory. Each pen holding 500 people, a total of 2,000. The rear of the pen area was controlled by a single curved barrier behind which the majority of the crowd stood (see fig 7).

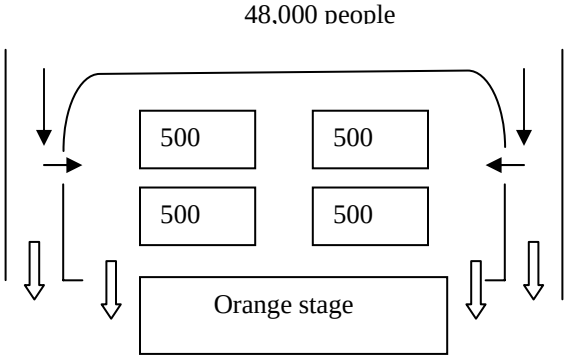

Fig 7 Outline of the new Roskilde system indicating ingress access and emergency exits

Lessons learned

The current Roskilde system appears to work very well but performers continually demand bigger crowd attendances i.e. 125,000 people for Robbie Williams at Knebworth and 500,000 people for the Rolling Stones at Toronto in 2003, therefore there is no room for complacency with regard to FOSBS design. My observations have led me to form the opinion that a mass crowd gathering of long duration will inevitably cause large sections

of the crowd to sit or lay down. The further back from the stage people are the more inclined they are to sit down. The majority of the crowd has come to see the headline act and they realise that they have a long wait. Sitting down at the rear of the crowd they can pay casual attention to support acts on screens. An added factor is that there will be considerable crowd migration i.e. to use facilities or visit food and drink concessions, where density is calculated at 0.5m^2 movement through a crowd is difficult, it can also be difficult to figure out the location of facilities and concessions. In these circumstances individuals can begin to feel unsure or even afraid for their personal safety even when an event has complied in all respects with current guidance.

The above problems have led me to believe that FOSBS design to cope with crowds in excess of 50,000 people requires a re-think. In my opinion there are at least five key factors that determine FOSBS design for mass crowds:

1) Crowd capacity/density

A realistic approach to establishing capacity and density.

2) Sight lines to point of focus

The point of focus at a mass crowd event for the majority of people is likely to be a screen not the stage, therefore conditions must be assessed by area not the overall arena.

3) Ground conditions

Assessment of capacity should include incline, drainage and grass/hard standing factors

4) Possible cultural behaviour

An accurate assessment of potential cultural behaviour, the influence of the performer and its impact on the crowd generally.

5) Medical and security team needs

The often-urgent requirement for rescue teams to reach, triage and extract casualties safely within a mass crowd.

Conclusions

My experience of working with mass crowds has lead me to conclude that arena design for events of this type should be considered in terms of zones. Each zone being colour coded, or numbered, and assessed independently on the five principals outlined above. A sliding scale could then be used for calculation of each zone. For example; a Red zone (close to the stage) could be calculated at 0.5m^2 while a Blue zone (at the center) would allow more space and at the rear of the crowd, or Green zone, capacity would be calculated at a minimum of 1m^2 per person.

Each zone would be served by its own ingress, egress and emergency evacuation systems and self-contained in terms of facilities, welfare and concessions. Admission tickets should state clearly the zone that you will be located in which in turn indicates that a particular zone is either close to the stage or the fact that you are likely to view the event on a screen. Finally, a trained crowd manager would manage each zone, with authority to direct medical and security teams as necessary within their particular zone.

End

Ref used:

Bliven B.:1995: *1944 The Voice and the Kids p 10*: in Faber Book of Pop ed Kureish H. & Savage J.: Faber and Faber

Kelly K 1998: Newspaper article: *Sinatra the Man*: Daily Mail 19.5.98. p 32-34.

Kureish H. & Savage J.1995: *`Groovy Fantastic Scenes` p5:* Faber Book of Pop: ed Kureish H. & Savage J.: Faber and Faber

Mick Upton

Mick Upton has acted as a crowd management consultant at senior level for many events. Just some of these include all Monsters of Rock at Donington, Live Aid, the Moscow Peace Festival, the V.E. Commemoration Hyde Park 1995 and Royal Ascot. He has also served on UK government sponsored Lead Bodies set up to introduce NVQ qualifications for events, door supervisors and VIP protection. He was the founder, and until Jan 2000, the Chairman of ShowSec International Limited. Since 1992 until the present Mick has been a regular guest lecturer on crowd safety issues at the Home Office (now the Cabinet Office) Emergency Planning College, Easingwold.

In response to their request, he has submitted study papers to Mr (now Lord) Greville Janner MP (European Security Standards), Mr. Bruce George MP (Standards in the British Security Industry) and the International Security Conference (Security Training Standards). He has also acted as a consultant to Bramshill Police Staff College and devised and delivered training for the U.K. police service, local authorities and foreign agencies. He has also acted as consultant to UK official published guidance on concert event crowd management.

For his services to the entertainment security industry he is the recipient of a Silver award from the Event Services Association, unprecedented four times winner of the Live Gold Award for crowd management planning, and the recipient of a Police award for designing and delivering training for the police service. In January 2002 Mick retired from active crowd management planning. At this time he was presented with; a Lifetime Achievement Award by the Event Services Association, a Lifetime Contribution to Concert Safety Standards by Total Production Magazine and a certificate from Mojo Barrier designers acknowledging his outstanding achievements in the field of Crowd Management.

Although he is now retired, Mick is currently involved in a partnership with the University of Buckinghamshire to design, develop and deliver a qualification for crowd safety management.