

1. SCOPE

Free TV Australia Operational Practice 51 is a guideline for the minimum requirements for industry standard live television coverage of staged events at indoor and outdoor venues. It provides an indication of infrastructure for an outside broadcast production using contemporary production techniques, which meet commercial television presentation formats.

This Operational Practice has been developed by the Free TV Australia Project Group - Outside Broadcasts, its intention being to maximise television and radio production potential and productivity at all indoor venues and avoidance of costly omissions at planning and construction stages. TVOB coverage of indoor entertainment events is a progressive and ever expanding production, limited only by a producer's imagination, and can include red carpet outdoor scenes and aerial coverage as well as the increasing use of video inserts and lighting and computer effects into both the venue and the "to air" program. These developments have increased the venue space and infrastructure installation requirements for TV operations.

No single organisation has the copyright on producing indoor entertainment events, and any venue within Australia has the potential to have an outside broadcast live from that venue. Indoor entertainment programs are all venue and program specific, however, they are generally going to include wireless microphones, wireless cameras, large screens and an on-stage focus.

This Operational Practice covers type and placement of cameras, video and audio equipment, power and OB compound requirements. Also included are the important requirements of RF spectrum management and safety issues related to such things as cable placement and venue security.

2. TYPICAL CAMERA REQUIREMENTS

2.1 Type and Number of Cameras

The number of cameras may typically vary between 10 and 30 dependant on the venue and program requirements.

The typical configuration of an indoor venue where a specific stage is the main focus may have:

- Cameras covering external scenes, arrivals etc 2 - 8
- Cameras in the venue 6 - 16
- Other cameras including aerials, POV, etc 2 – 6

2.2 Camera Positions

Camera positions for entertainment productions are venue and program specific but can include:

- Portable cameras inc. RF cameras
- "Steadicam" units
- Camera cranes (mobile and stationary)

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- Studio style camera pedestals
 - Point-of-view (POV) cameras
 - Rail (floor) Cameras
 - Overhead cameras-tracks or wires

Note: Any special constructions for rail, tracking and wire cameras, are to comply with relevant building codes, structural engineering codes and are to be erected by suitably qualified and licensed persons and must comply with relevant WHS regulations.

See Clause 12: Safety.

2.3 Portable Cabled Cameras

Portable cabled cameras are used in areas where space is an issue such as Red Carpet overviews, entry and exit points at a venue and on-stage during entertainment telecasts.

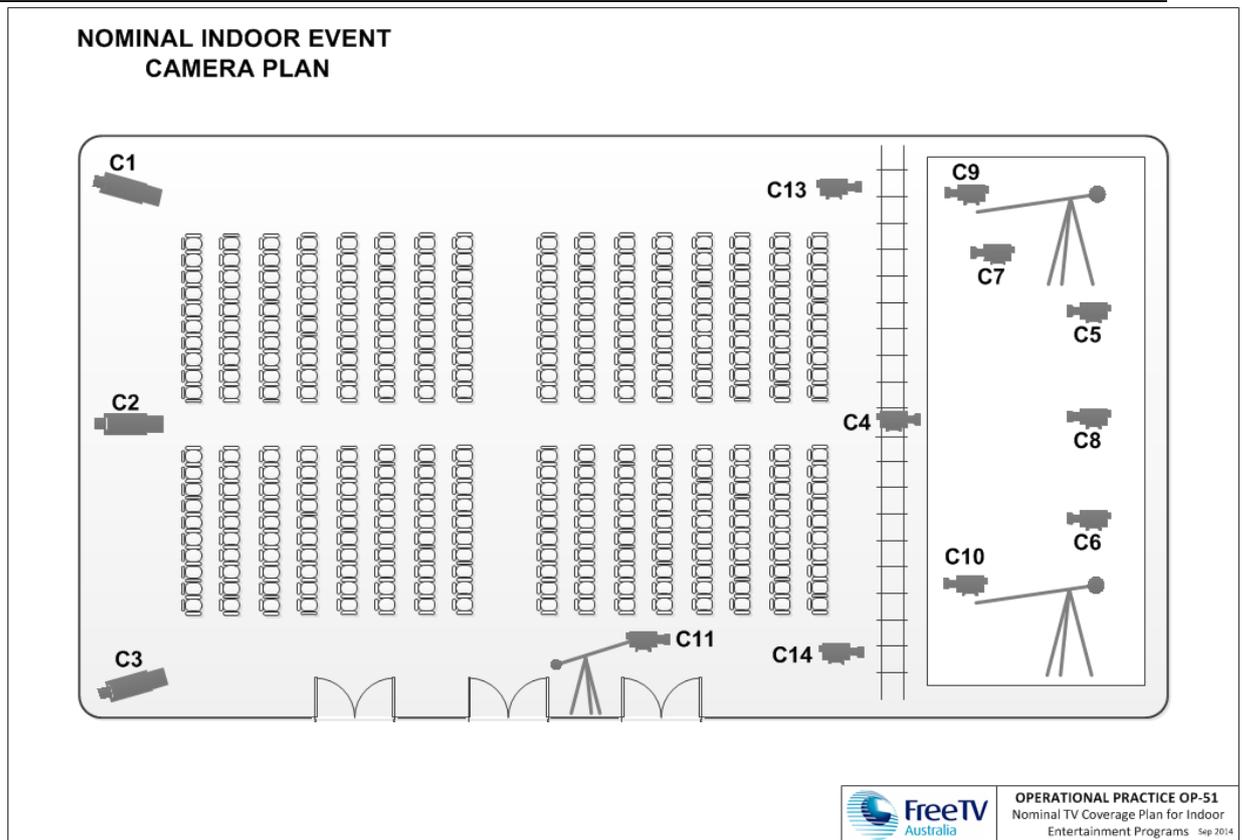
2.4 Portable Wireless (RF) Cameras

RF cameras are primarily used as mobile handheld units enabling the cameraperson to move about more freely than would be possible with a cabled camera. These cameras are fitted with low powered microwave transmitters with omni directional transmit antennas to nearby receive locations.

Radio frequency management is a major consideration in planning, see Clause 5: Radio Frequency (RF) Spectrum management.

2.5 Typical Camera Placement

This is venue and program specific, but could be configured as shown in diagram:



Nominal TV Coverage Plan for Indoor Entertainment Programs

The above camera positions could be used in an indoor entertainment venue coverage but final camera placement will always be at the prerogative of the program producer and director.

3. LIGHTING

Refer to Free TV Australia OP 31: Lighting Requirements for Television for details.

3.1 General

Stage lighting design for entertainment events involves multiple special effects, specialised lighting equipment, and theatrical lighting changes. The TVOB production needs to encompass the stage designer's concept but is required to operate within the photometric limits of the TV camera equipment. The illumination parameters necessary for HD TV need to be met as the base lighting level.

"White balance" needs to be established for all cameras and set as a reference. Colour matching of cameras may follow. Consultation between stage and TV Lighting Directors is essential during planning phases of the production to best meet the needs of both the stage and TV productions.

Whilst satisfactory picture quality can be achieved at the minimum lighting levels specified in OP 31, restrictions are placed on full usage of tele zoom lenses.

3.2 Venue Lights

Venue lighting is to be operational at “work light” level during the rigging stage of the outside broadcast.

Full production lighting levels are required for camera line up from approximately one hour preceding any scheduled camera rehearsal.

Lighting is to be maintained at production levels following the close of the telecast until post event interviews, recaps etc. are completed.

Venue lighting is to be operated at “work light” level until the “bump out” is completed. “Work light” levels are to comply with relevant WH&S regulations. See Clause 12: Safety.

4 AUDIO

4.1 General

Audio is a major component of the TVOB production of entertainment events. The TV audio mix needs to be independent of the “Front of House (FOH)” stage mix which feeds the venue sound reinforcement system. It is important that the FOH and TVOB audio systems share a common mains power technical earth point to minimise “hum-loop” buzz problems. This is ideally achieved by powering the FOH audio system ex the TVOB mains supply.

4.2 Wireless Microphones

Wireless microphones are extensively used for on stage performers and by TV and radio hosts and interviewers at entertainment venues. Wireless microphone frequency co-ordination is required on a venue by venue basis to avoid interference with stage microphones, TV operations, radio broadcasters, venue officials, public address announcers, and other legitimate users of wireless microphone equipment.

5. RADIO FREQUENCY (RF) SPECTRUM MANAGEMENT

Extensive use of the RF spectrum is necessary for comprehensive TVOB cover of major TV OB operations and events.

Allocation of frequency bands is generally as follows:

- 2.0 & 2.2 GHz microwave bands: Portable wireless cameras,
Specialty POV cameras

For specific information on use and coordination of ENG / TOB in the 2 and 2.2GHz bands refer to:

OP63 Spectrum usage for ENG and TVOB Operations in the Brisbane / Gold Coast / Sunshine Coast Area

OP64 Spectrum usage for ENG and TVOB Operations in the Sydney / Canberra / Newcastle / Illawarra Area

OP65 Spectrum usage for ENG and TVOB Operations in the Melbourne Area

OP66 Spectrum usage for ENG and TVOB Operations in the Adelaide Area

OP67 Spectrum usage for ENG and TVOB Operations in the Hobart Area

OP68 Spectrum usage for ENG and TVOB Operations in the Darwin Area

OP69 Spectrum usage for ENG and TVOB Operations in the Rural and Remote Areas

- 7 / 8 GHz microwave band Medium haul point to point back haul links
- 13 GHz microwave band Short haul point to point back haul and local interconnect links
- 470 – 520 MHz UHF band Duplex Radio Telephone (RT) voice, telemetry and data communications
- 520—694,1790—1800MHz band Wireless microphone operations
- Aggregate RF systems requirements can be in the order of 12 x 2.0 & 2.5GHz channels, 4 to 6 of 7 & 8 GHz channels, 4 to 6 of 13 GHz channels, 10 x UHF duplex RT frequencies and upwards of 50-60 wireless microphone frequencies.

RF spectrum usage is strictly controlled, and specific channel allocations are generally licensed to individual commercial entities. It is essential that a rigid frequency management procedure be implemented on a venue by venue basis to ensure non interference between services involved in the on stage event and the TVOB operation, and for other licensed users (ENG etc) operating in near proximity to the entertainment venue.

Frequency allocation and usage regulations are becoming increasingly rigid and restricted. To this end it would be advantageous to consider making an enclosed venue electronically shielded from areas outside, by incorporating materials and/or design techniques during construction that would reduce or minimise RF interference. Such infrastructure would need to be considered and implemented during the design stages of any new venue or those undergoing redevelopment.

Wireless microphone frequency management is the prerogative of the event promoter and venue management, but TVOB operators need to be fully involved in channel allocations from the early planning stages of the project. In the case of long running entertainment events when television production may only be for one performance it is generally accepted that TV radio mic requirements will not impact on the already established "event" frequencies.

Major events involving multiple operators of RF services require overall co-ordination to be under statutory authority control of use / misuse of RF spectrum assets.

6 UNALLOCATED SEATING aka “SEAT KILLS”

Unallocated seating or “seat kills” are inevitable, but wherever possible, positioning of cameras and other production facilities such as lighting control and FOH audio control, should be planned to reduce audience obstruction as much as possible. When cameras are to be located in seating areas, the seats should be removed for camera placement and the area made level for safety and operational reasons.

“Seat kill” requirements are to be determined by the TV director, event promoter and venue management during the planning stages of the program.

7. BACKSTAGE AND ARRIVAL AREAS

7.1 Change Area

An area back of stage is required for off camera preparations including make-up, wardrobe etc. The change area should have access to kitchen facilities, and male and female toilet facilities. Adequate space needs to be provided to cater for the production requirements.

7.2 Guest Arrivals Area

It is common practice to include televised coverage of guest arrivals for major indoor entertainment events. A suitable area at the main entrance to the building should allow for safe entry of guests and VIP whilst still allowing good spectator and media view. Provision should also be made in this area to house a smaller OB production facility/OB van, should this be required.

7.3 Dressing Rooms

All single and group dressing rooms should be equipped with suitable vision and audio monitoring systems that are fed via the venue reticulation system which has a minimum of one input dedicated to the TV production. (see Clause 10.1) The ability to “cut” audio to all or selected rooms should be designed into any system.

8. OUTSIDE BROADCAST COMPOUND

8.1 General

A level hardstand area for outside broadcast control units (OB vans) parking is required, should be situated as close as possible to the camera platform/ TV commentary box area. This area (OB compound) should be securely fenced so as to provide security for television equipment, personnel, operations and the safety of the public. This is particularly important on large scale television operations where facilities are setup for many days, weeks and there is the need for only accredited personnel to have access to the compound.

Major outside broadcast vehicles are semi trailer units built to Australian road transport regulations. Venue vehicle access and load bearing capacity needs to comply with maximum vehicle dimension and weight specifications. Typical requirements are 22.0 metres combined trailer and prime mover length, maximum height of 4.3 metres, and 8.5 tonne per axle loading.

Access to and egress from the OB compound needs to cater for the turning circle and overhead clearance requirements of maximum dimension articulated vehicles. Special attention to overhead obstructions and the van underbodies is necessary where ramps or uneven road surfaces are involved.

Typical hardstand area is in the order of 500 square metres either 25 metres x 20 metres or 50 metres x 10 metres, rectangular. This area would cater for up to two OB facilitators with more space required should the event have a number of Australian or International unilateral broadcasters.

The hardstand area is required to be level to accommodate OB vans with expanding sides, with any slope for drainage being kept to a minimum.

Provision is to be made to site a satellite uplink vehicle within the compound, adjacent to the compound or within the venue area with suitable cable/fibre connectivity and local 32A 3 phase power outlets x 3 as a minimum. Clear line of sight to the North-East sky for the majority of Australian broadcasters and to the western sky for a number of international broadcasters is a location requirement.

Should the OB compound be situated within an enclosed space (underground or under a grandstand for instance) adequate ventilation is to be provided so as to comply with relevant safe work practice regulations as outlined by each State's regulatory body Code of Practice. Air conditioning units on OB vans and portable sheds give off a considerable amount of heat which needs to be removed from the area and this along with any exhaust fumes from generators and vehicles (buses, delivery vehicles, fork lift trucks etc), needs to be taken into account when designing ventilation systems.

8.2 Personnel Amenities

Adequate personnel services need to be provided in the OB compound.

These amenities should include:

- Toilet facilities, separate male and female facilities
- Sewer or self contained connection, town water connection
- Lighting for personnel movement
- Drainage contours such as to minimise "ponding" during heavy rainfalls
- Food preparation area and catering area
- First Aid facility
- Regular cleaning and rubbish removal services

9. POWER

9.1 Typical Requirements

Typical power requirement is for 250 Ampere per phase three phase supply adjacent to the outside broadcast vehicles hardstand area. Power should be available via powerlock connectors with OB facilitators providing their own distribution equipment as required.

Three phase 32 Ampere rated interconnect cables (5 pin connectors) are to be installed between the OB Compound and Front of House audio system, and between the OB Compound and back-stage for extension of OB van power to key event and TV operational areas

9.2 Heavy Neutral Currents

The high level of use of switch mode power supplies in TVOB technical equipment has resulted in high neutral current drain in three phase mains supplies. High current neutral connections should be specified for mains power installations planned for TVOB compounds.

9.3 Circuit Breakers and Safety

Where mains power supplies are protected by residual current devices (RCDs) trip current of the source RCD should be adjustable, to be set to a higher trip current level than the main OB van circuit breaker, such that the OB van main circuit breaker serves as the prime safety switch for the TVOB operation

Power reticulation ex the OB van to operational areas is to be RCD protected in accordance with Work Safety requirements.

TVOB mains supplies are to be separately protected from other electrical supplies servicing the entertainment venue. See clause 4.1 re FOH power.

9.4 Local and Standby Emergency Generators

Generator hardstand should be incorporated in the OB compound and should be adjacent to the mains power connect point.

Sourcing of generators is a TVOB responsibility. Generators are to be silenced to EPA requirements and are to be sited to obviate exhaust fume exposure to TVOB staff and patrons.

Where generator hardstand cannot be within the OB van compound interconnect cabling specified to full electrical load (250 Amps / phase, three phase) is required to be installed between the generator site and the OB Compound.

10. AUDIO/VIDEO CONNECTIVITY

10.1 Venue Audio / Video (A/V) Connections

The connect panel for venue A/V services should be located in the OB compound, co-sited with any TVOB cable terminations and Telco services.

TV signals emanating from the OB van will be HDSDI with embedded audio (minimum stereo audio) supplied on BNC connectors. The venue A/V service provider would need to provide equipment for reticulation to any in house monitors.

10.2 Telecommunications services connections.

An area within the compound is required for the location of various circuit provider's equipment and services, (fibre interfaces, PSTN, data etc.) This area to have local power as required by the service providers and adequate space for their equipment. Modern equipment has seen the need for small air conditioning plants being used on the equipment housings so facility for water runoff needs to be considered.

10.2.1 Microwave Link Platform

A 2.0 m x 2.0 m platform is typically required for TVOB backhaul microwave link installation.

The platform is to be sited to allow clear line of sight radio transmission to the TV studios or to a suitable intermediate relay site.

Any structures need to comply with relevant WHS regulations.

11. CABLING

11.1 General

Simple access is required for cabling from the outside broadcast vehicle hardstand to the stage and all camera areas.

TV cable installations are site specific and need to be planned on an individual basis, but provision needs to be made for cable routes which provide ease of access, do not compromise venue aesthetics and do not present risk to workers or public.

Cable routes within the venue should allow for obstacle free installation and removal of cables.

Wherever possible, ground level cable paths clear of public traffic areas are preferred.

Where cables need to be routed below ground level open cable troughs with easily removable and replaceable cover plates are the preferred option.

Where cables need to be routed above traffic area open cable trays with cantilever mounting from below allow for simple cable runs with "lift in" installation possible.

Cable conduits are not recommended for temporary cable installs, but where there is no other option conduits should be a minimum 150mm diameter with draw wire installed. A minimum

of 3x conduits should be available in order to separate signal cables from power cables, and to allow for (inevitable) future expansion.

11.2 Permanent Cable Install

Cable routes in major complexes may be such as to preclude temporary cable installs. In such cases permanent installations become the only option.

A nominal cable list is included in this OP, but it should be recognised that TV production techniques change, particularly with equipment innovations, and that cable installations are subjected to continuing upgrades. It should be noted that specific installations need to be negotiated between the TV rights holders and venue management.

For multi-purpose venues, the total installation should encompass the highest common requirements of all possible event cabling.

Provision needs to be made for replacement and upgrade of such installations.

Preference is for cantilevered cable trays exclusive to TV cabling. Where conduits are the only option, 150mm diameter is minimum spec, and multiple conduits should be available to all operations areas with provision for upgrade and expansion.

12. CABLE INSTALLATIONS AT INDOOR ENTERTAINMENT VENUES

Current television production equipment is becoming increasingly reliant on the use of fibre optic cables for the acquisition and distribution of camera, audio and communications signals which is therefore seeing many existing stadia being left with outdated cable installations. Any existing tri-axial camera cable and co-axial video cable within venues that may still be used for instance, to distribute video signals to venue distribution points should be of such a specification that it will deliver uncompressed High Definition (HD SDI) video over the installed length of cable. Existing shielded audio cable is often of some use.

The following cable listings are typical of requirements for indoor entertainment venues but intended only for guideline reference. Cable types and cable technical specifications alter with advances in technology so cable schedules need to be updated prior to planning any permanent installation.

Permanent cable installations should be planned in consultation with venue management and TV Rights holders, with emphasis on specifications for cables, connectors and locations of outlets.

Fibre optic camera cables are: - SMPTE 311M specification cable terminated in SMPTE 304M specification connectors. They are commonly referred to as --"SMPTE camera cables"

Due to the varied nature of possible indoor entertainment events a multipurpose cabling approached is considered the most practical.

The installation of wall box patch points around the building and surrounds allows for the most versatile building coverage.

Each wall box should contain as a minimum:

- 6 x SMPTE 311M camera cables SMPTE 304M connectors
- 1 x 12 pair single mode fibre optic cable terminated with LC connectors.
- 5x digital coaxial video
- 8 x XLR audio (minimum 24 to FOH)
- 2 x CAT 6 cables

These points should be located:

- either side of the usual main stage area (See Clause 9.1)
- at the position usually used for FOH lighting/audio (see Clause 9.1)
- on the upper most level for high/speciality cameras
- in the backstage/dressing room area
- at the exterior of the building in the area that would be used for arrivals
- at other strategically logical locations on multiple levels

13. SAFETY

All personnel working on TVOBs are to be familiar with and to comply with relevant WH&S regulations.

A site specific risk assessment is to be undertaken by venue management and TVOB operations management during planning stages of the event.

TVOB personnel are to be inducted as to venue and TVOB safety requirements prior to commencement of duties.

Scaffolding, camera tracks, aerial cabling and other constructions are to be installed by suitably licensed persons.

Camera cranes, scissor lifts, fork lifts and other mobile work platforms are to be operated by licensed persons.

Electrical installations are to be undertaken by licensed persons, and tested and tagged in compliance with statutory regulations.

Temporary TV cable installations are to comply with site hazard reduction policies.

As safety regulations can vary subject to individual state government regulations, applicable requirements need to be determined on a site by site basis.
