

## **1. SCOPE**

Free TV Australia Operational Practice 37 is a guideline to the minimum requirements for industry standard coverage of swimming competition. It outlines infrastructure requirements for a television outside broadcast production using contemporary production techniques, which will meet current broadcast television presentation requirements as well as catering for future developments. The following description of facilities is based on those for an outside broadcast by one facilitator, with mention being made to events that may see multinational coverages involving numerous OB facilitators being present.

This Operational Practice has been developed by the Free TV Australia Project Group - Outside Broadcast its intention being to maximise television and radio production potential and productivity at swimming venues and the avoidance of costly omissions at planning and construction stages.

TV coverage of swimming events has been, and is still expanding. The use of ultra slo-mo, super slo-mo, wireless, underwater and other specialty cameras, computer generated graphics, "second screen" applications and the requirement to interface these in an on site hosting environment along with the associated audio facilities, requires certain space and infrastructure installation requirements.

## **2. TYPICAL COVERAGE**

### **2.1 Cameras**

The configuration of a typical venue will be:

Cameras covering the pool	16
Network Host cameras	2+

### **2.2 Camera positions**

#### **2.2.1 Camera 1 Start / Finish**

Hard camera on scaffold, located in line with the start/finish line of the pool at the top of the grandstand, nominal height of 15 metres above the pool, and 15 metres back from the pool edge so as to have an unobstructed view of all swimming lanes in use.

#### **2.2.2 Camera 2 Start / Finish Slo-Mo**

Super Slow Motion camera on scaffold located in line with the start/finish line of the pool at a lower level of the grandstand, at a nominal height of 3 metres above the pool and 4 metres back from the pool edge. Mid tight shots / iso record finish.

#### **2.2.3 Camera 3 50 metre turn**

Hard camera on scaffold located in line with the 50 metre turn (50m race start) at the top of the grandstand, nominal height of 15 metres above the pool, 15 metres back from the pool edge so as to have an unobstructed view of all swimming lanes in use.

**2.2.4 Camera 4 tracking camera**

Located on the edge of the pool deck, (main camera side) track is laid parallel for the entire length.

A "piggy back" camera mounting may be employed to provide simultaneous tight and wide camera angles across the pool.

**2.2.5 Camera 5 portable (RF) camera, pool deck**

Portable camera working the pool deck for close up coverage. Wide angle lens typical.

**2.2.6 Camera 6 portable (RF) camera, pool deck**

Portable camera working the pool deck for close up coverage.

**2.2.7 Camera 7 underwater camera**

Waterproof remote controlled mini- cam submerged at start end of pool.

**2.2.8 Camera 8 underwater camera.**

Waterproof remote controlled mini-cam submerged at 50 metre turn.

**2.2.9 Camera 9 underwater tracking camera**

Waterproof remote controlled camera submerged below Lane 5, and tracking the full length of the pool.

**2.2.10 Camera 10 overhead tracking camera**

This is a camera system which provides a down looking remote controlled tracking camera above the pool, tracking the full length of the pool. Such camera systems require preinstallation of track supports and track and typically require free access to the pool area in the days/nights leading up to the event. Installation and operation of overhead tracking camera systems will be a special requirement for major events and will be negotiated between TV broadcasters and venue managements in the lead up to the telecasts. Space for operator required pool side or close to it in order to be able to see the actual camera moving.

**2.2.11 Camera 11 50 metre turn Slo- Mo**

A super slow motion camera on scaffold or platform in line with Lane 4/5 located behind the 50 metre turn, typically at a height of 5 metres above the pool level and 10 metres back from the pool (subject to architectural aspects) The camera is used for close-up slow motion replays and a large lens is typical.

**2.2.12 Camera 12 Crane camera, pool deck**

A cabled portable camera mounted on a jib arm or similar lightweight camera crane with jib length in the order of 15 metres. The crane base is located on the pool deck behind or adjacent to the start/finish, and out of the competition traffic area. The jib length allows for camera angles above the warm up area, starting blocks and dais.

**2.2.13 Camera 13 Marshalling area**

A cabled portable camera (with tripod option) located in the marshalling area for cover of pre-race activity.

**2.2.14 Camera 14 Flash Interview**

A cabled portable camera located at the competitors exit from the pool area for post race interviews of competitors and officials.

**2.2.15 Camera 15 Waterproof camera**

Waterproof remote controlled mini cam at a starting block.

**2.2.16 Camera 16 Waterproof camera**

Waterproof remote controlled mini cam at a starting block (typically 5).

**2.2.17 Camera 17 / 18>> Host cameras**

Cabled portable cameras at the on-camera host position for program presentation.

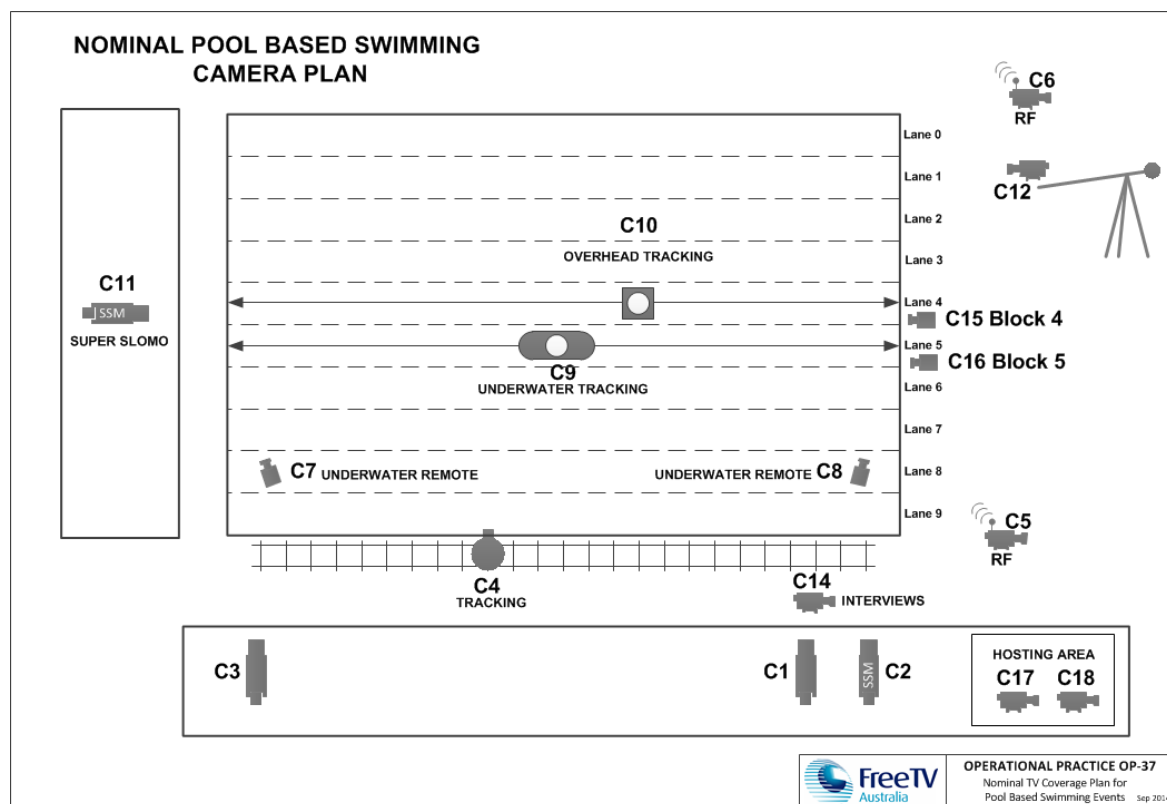
**AND/OR**

A POV style remote controlled camera mounted in the commentary area and typically positioned for cover of the commentary team.

**2.2.19 Final camera placement**

The above camera positions are typical of swim meet coverage, but final camera placement will always be at the prerogative of the programme producer and director. Camera numbering above is indicative, and individual directors will nominate camera numbers for compatibility with their individual camera switching technique.

### 2.3 Nominal camera positions



**Nominal TV Coverage Plan for Pool Based Swimming Events**

### 2.4 Commentary/hosting areas

The main commentary area should be positioned above the start/finish line of the pool, usually just above or below the camera platform so as to have an unobstructed view of all swimming lanes in use as well as the swimmers preparation and introduction areas behind the starting blocks. The commentary area may be accommodated in a formal commentary box or more commonly at aquatics venues on a purpose constructed scaffold platform complying with current WHS regulations and codes of practice.

The dimensions of the commentary area should be in the order of 4 metres wide by 4 metres deep. The configuration should be such as to accommodate four commentators and statistician at a commentary desk along the frontage of the area. In the case of an enclosed commentary box the front wall should consist of sliding glass windows that allow the option of open access to the pool or acoustic isolation.

#### 2.4.1 Host Position / Studio

A host presentation area is required to accommodate on-camera hostings and interviews. Area required is typically 4 metres x 4 metres and can be located adjacent to the commentary area or a suitable area within the venue as negotiated between venue management and television production personnel. Provision needs to be made for installation of lighting bars in the hosting area for support of TV lighting fixtures. Positioning of lighting bars is to be determined during consultation between venue management and TV technical staff.

Where commentary area and/or host area are enclosed spaces, the area needs to be air conditioned with capacity to cope with a nominal 10 person heat load plus studio lighting load. Evaporator fans need to be low noise units (Not to exceed NR 35) with local control for optional shut down during studio on air segments.

#### **2.4.2 Poolside commentary and interview position**

Provision is to be made for a poolside area where interviews, hostings and "colour" commentator operations can take place without impacting on competitors and the running of the event.

Personnel, additional to commentators in this area are producer, floor manager, cameraman and assistant, and audio assistant.

Space provision also needs to be made for equipment such as wireless microphone bases and presentation/on screen monitors.

#### **2.5 Wireless microphones**

Wireless microphones are extensively used for umpire calls and TV / radio interviewers. Wireless microphone frequency co-ordination is required on a venue by venue basis to avoid interference with TV operations, radio broadcasters, umpires and linesmen, ground announcers, entertainment, and other legitimate users of wireless microphone equipment.

##### **2.5.1 Radio Frequency (RF) spectrum management**

Reference should be made to FREE TV AUSTRALIA OP 27: *Operation of wireless microphones in Australia for matters concerning radio microphones.*

Extensive use of the RF spectrum is necessary for comprehensive TVOB cover of swimming events.

Allocation of frequency bands is generally as follows:

- 2 and 2.2GHz microwave bands: Portable wireless cameras  
RF cameras  
Specialty POV cameras  
Camera helicopter down links in 2GHz band  
ONLY

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

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- 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 band Duplex Radio Telephone (RT) voice, telemetry and data communications
  - 520- 694, 1790-1800 MHz band Wireless microphone operations
  - Aggregate RF systems requirements can be in the order of 8 of 2.0 & 2.5 GHz channels, 2 to 4 of 7 & 8 GHz channels, 2 to 3 of 13 GHz channels, 10 x UHF duplex RT frequencies and up to 30 to 40 x wireless microphone frequencies for major events.

RF spectrum usage is strictly controlled, and specific channel allocations are generally licensed to individual commercial entities. Temporary use of multiple frequencies as is required for operations on the major event scale require frequency co-ordination with established license holders and special licensing for the complete RF requirements for the period of the event.

It is essential that a rigid frequency management procedure be implemented on a venue by venue basis to ensure no interference between services within the precinct involved in TVOB origination, including authorised unilateral operators, and for other licensed users (ENG etc.) operating in near proximity to the OB precinct.

Wireless microphone frequency management is the prerogative of the event promoter and venue management, along with TVOB operators who all need to be fully involved in channel allocations from the early planning stage of a project.

Microwave and UHF frequencies are licensed but may be subject to frequency sharing arrangements. Co-ordination between users, including news services not directly involved in the event telecast, but licensed to operate in proximity of the event precinct is an essential pre-requisite for event RF spectrum planning. Major events involving multiple operators of RF services require overall coordination to be under statutory authority control of use / misuse of RF spectrum assets.

### **3. Outside Broadcast compound**

#### **3.1 General**

A level hardstand area for outside broadcast control units (OB vans) parking is required, it 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, TV 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 is necessary where ramps or uneven road surfaces are involved along with adequate clearance on the underside of the OB vans

Generator hardstand should be incorporated in the OB compound (see below).

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 co-sited with it, should the event have a number of Australian and overseas 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 eastern 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.

### **3.2 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
- Clearly marked emergency egress routes

## **4. POWER**

### **4.1 Typical requirements**

Typical power requirement is for 250 Amps per phase three phase (415 Volt) supply adjacent to the outside broadcast vehicles hardstand area. Power should be available via

powerlock connectors with OB facilitators providing their own distribution boxes as required. If supply becomes inadequate due to the number of facilitators being on site, generators will be used to supplement the local power, however major venues likely to be hosting major international events should specify 400 Amps per phase in construction and rebuilding planning

3 x 15A single phase outlets should be provided adjacent to the connectors for overnight use.

#### **4.2 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.

#### **4.3 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.

TVOB mains supplies are to be separately protected from other electrical supplies servicing the rest of the venue.

Power reticulation ex the OB van to operational areas is to be RCD protected in accordance with current local work safety requirements.

#### **4.4 Local and standby 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.

For indoor/undercover OB compounds provision needs to be made to extract exhaust fumes. If this is not possible, interconnect cabling specified to full electrical load is required to be installed between the generator site and the OB compound.

Three phase 32 Ampere rated interconnect cables (5 pin connectors) are to be installed between the OB compound, commentary box and/or studio area, and the outer pool deck area for extension of OB van power to main operational areas.

### **5. VENUE AUDIO / VIDEO (A/V), TIMING and TELCO CONNECTIVITY**

#### **5.1 Venue Audio / Video (A/V) Connections**

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



TV signals emanating from the OB unit will be HDSDI with embedded audio (minimum stereo audio) supplied on BNC connectors.

Event judges, scrutineers, timing officials should be provided with HD monitoring, with suitable cabling infrastructure supplied to their location.

Interface connectors for off-air TV distribution, venue A/V distribution, Pay-TV cable and venue phone should be available at the connect panel.

## **5.2 Official timing**

Provision needs to be made at the A/V panel for connection of video, data and communications services between the OB van and the official time-keeper.

## **5.3 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.

## **6. CABLING**

### **6.1 General**

Simple access is required for cabling from the outside broadcast vehicle hardstand to the main camera platform, roof camera platform, main commentary box, unilateral commentary box, studio/on camera position and field, pre/post match presentation area, media press conference area/s.

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.

As a general rule, day cabling allows for full cable install within a 20 man hour rig time, and de-rig within 12 man hours.

Where this cannot be achieved due to either stadium access problems or to the scale of the OB operation, installation of "season cabling" is a preferred option.

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 areas, open cable trays with cantilever mounting from below allowing for simple cable runs with "lift in" installation without the need for mechanical aids— ladders, scaffolds, elevated work platform/scissor lifts.

Cable conduits are not recommended for temporary cable installs, but where there is no other option conduits should be a minimum 150mm diameter and curves/bends no greater than 30 degrees 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.

## **6.2 Permanent cable install**

Cable routes in major stadium complexes may be such as to preclude both DAY and SEASON cable installs.

In such cases permanent installations become the only option.

It should be recognised that TV production techniques change, particularly with equipment innovations, and that cable installations are subjected to continuing upgrades.

Implementation of HDTV equipment sees an increased demand for fibre optic camera cables, precision digital video coaxial cable, and multi way fibre optic cables for utility use.

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.

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

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

Preference is for cantilevered cable trays exclusive to TV cabling. Conduits – if provided – should be free of turns no less than 120 degrees from any change of direction. Where conduits are the only option, 150mm diameter is the minimum specification, and multiple conduits should be available to all operations areas with provision for upgrade and expansion.

## **8. BACKHAUL**

### **8.1 General**

TVOB transmission to studio base can be via telecommunications circuits, satellite uplink or local microwave radio transmission.

The telecommunications access point should be adjacent to the OB compound.

Space provision for a satellite uplink vehicle with clear view to North-East sky is required within or adjacent to the OB compound.

### **8.2 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.

A microwave platform may also be required within the stadium for mounting of RF camera microwave receivers and/or antennae.

Any structures need to comply with relevant WHS regulations.

## **9. LIGHTING**

(Reference should be made to FREE TV AUSTRALIA OP 31: *Lighting Requirements for Television.*)

NOTE - It should be noted that lighting requirements should take into consideration glare off the water surface towards main cameras.

A brief summary of lighting standards is as follows:-

### **9.1 International standard for TV venues**

Lighting level ( $E_v$ ) toward main cameras:	1400 lux (average)
Lighting level toward other directions:	1000 lux
Lighting level toward USM / SSM cameras:	1800 lux within defined zones- slo mo replay zones (SRZ)
Colour temperature (TK):	4000K to 6500K, but within 500K at individual venues: preferred value 5600K.
Colouring rendering index $R_a$ :	$\geq 90$
Maximum GR for main TV cameras:	<40
50 Hz mains flicker:	minimise flicker by cross aiming and spreading floodlights equally over the three phases: $\leq 10\%$ flicker for $\leq 600$ fps $\leq 3\%$ flicker for $\leq 1,000$ fps.

### **9.2 Professional standard**

$E_v$ toward main cameras:	1000 lux (average)
$E_v$ toward other directions:	800 lux
Colour temperature:	4000 K to 6500 K, but within 500K at individual venues.
Colour rendering index $R_a$	Minimum requirement $R_a$ 85, $R_a > 90$ preferred
Maximum GR for main TV cameras:	<40
50 Hz mains flicker:	minimise flicker by cross aiming and spreading floodlights equally over the three phases

Note: Whilst satisfactory picture quality can be achieved at the minimum lighting levels stated, restrictions are placed on full usage of zoom lenses and focusing becomes quite difficult for camera operators on BCU (big close up) camera angles. Super Slo-mo cameras cannot perform satisfactorily below Professional standard lighting.

## **10. SAFETY**

All personnel working on TVOBs are to be familiar with and to comply with relevant OH&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.

Special precautions are essential to ensure electrical safety and trip hazard safety in the pool deck and other wet areas. Power reticulation from the OB van to operational areas and to the pool deck to pool deck area (underwater tracking camera, tracking dolly etc) is to be RCD protected. Single phase distribution circuits are to be individually RCD protected. TV cables are to be run out of traffic areas, flown above floor level where appropriate and "Gaffer" taped in situ. Mini cameras are to be low voltage operated. Wireless cameras are to be used where appropriate on the pool deck proper.

During planning stages of new aquatic centre developments, voids below pool deck level with cable ways to the dais / starting block area and cable entry via purpose built cable hatches can be planned to minimize cable trip hazards in the pool deck area.

## **11. CABLE INSTALLATIONS AT SWIMMING COMPETITION VENUES**

Implementation of HDTV equipment is impacting on cable installation with increased demand for Fibre optic camera cables, precision digital video coaxial cable, and (multi way) fibre optic cables for utility use.

Co-axial video cable is to be specified for end to end delivery of uncompressed digital video over the installed length of cable.

The following cable listings are typical of requirements for swimming competition telecasts 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.

**Outside broadcast compound to main camera platform**

4 x SMPTE 311M camera cables SMPTE 304M connectors

1 x 6 pair single mode fibre optic cable terminated with LC connectors.

2 x digital coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

1x single phase power

**Outside broadcast compound to overhead tracking camera control area**

1 x 6 pair single mode fibre optic cable terminated with LC connectors.

4 x digital coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

1 x single phase power interconnect cable

2 x Cat 6 cables

**Outside broadcast compound to pool deck (start area)**

4 x SMPTE 311M camera cables SMPTE 304M connectors

8 x digital coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

2 x 6 pair single mode fibre optic cable terminated with LC connectors.

1x 12 way audio multi-mic cables

1 x 20 pair Telco (Audio & data)

1 x single phase power interconnect cable--RCD protected

4 x Cat 6 cables

**Outside broadcast compound to behind start**

2 x SMPTE 311M camera cables SMPTE 304M connectors

2 x 6 pair single mode fibre optic cable terminated with LC connectors.

8 x digital coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

**Outside broadcast compound to behind 50 metres**

2 x SMPTE 311M camera cables SMPTE 304M connectors

2 x 6 pair single mode fibre optic cable terminated with LC connectors.

**Outside Broadcast Compound to pool deck tracking camera operations**

4 x SMPTE 311M camera cables SMPTE 304M connectors

8 x digital coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

2 x 6 pair single mode fibre optic cable terminated with LC connectors.

1x 12 way audio multi-mic cables

1 x 20 pair Telco (audio & data)

2 x single phase power interconnect cable

6 x CAT 6 cables

#### **Outside broadcast compound to TV commentary / host area**

2 x SMPTE 311M camera cables SMPTE 304M connectors

2 x 12 pair single mode fibre optic cable terminated with LC connectors.

6 x coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

1 x 12 way audio multi-mic cable

1 x 20 pair Telco (Audio)

6 x CAT 6 cables

1 x 32 Amp three phase 5 pin power cable

#### **Outside broadcast compound to A/V**

Off Air TV reticulation

Venue A/V reticulation

Venue comms

2 x Cat 6 cables for possible interface to venue IT services

Other services to be specified by venue A/V service provider

#### **Outside broadcast compound to time keepers facility**

6 x coaxial video, specified so that it will deliver HD uncompressed video signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

2 x 6 pair single mode fibre optic cable terminated with LC connectors.

1 x 20 pair Telco (audio & data)

1 x single phase power

#### **Outside broadcast compound to RF camera receive location**

4 x SMPTE 311M camera cables SMPTE 304M connectors

1 x 12 pair single mode fibre optic cable terminated with LC connectors.

6 x coaxial video, specified so that it will deliver HD uncompressed signals (may be downgraded due to length, to SD uncompressed signals, depending on required use).

6 x CAT 6 cables

1x Single phase power (to connect to OB Van)

**Outside Broadcast Compound to Backhaul microwave platform**

2 x Microwave equipment specification triax.

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