

Sydney Opera House

# Concert Hall

Technical and Production Information



March 2016



## Concert Hall Technical and Production Information March 2016

[sydneyoperahouse.com](http://sydneyoperahouse.com)

### Street Address:

Sydney Opera House  
Bennelong Point  
2 Macquarie St  
Sydney NSW 2000  
Australia

### Mailing Address:

Sydney Opera House  
GPO Box 4274  
Sydney NSW 2001  
Australia

### Venue Bookings:

Venue & Event Sales  
T +61 2 9250 7393  
[venues@sydneyoperahouse.com](mailto:venues@sydneyoperahouse.com)

Architectural photographs by Jack Atley and Jeremy Piper

*The information contained in this document is given in good faith and is believed to be correct. All measurements are approximate and should be checked on site. While every effort is made to fulfil production requirements from in-house stock, no guarantee is made that the equipment listed will be available for a particular event. Availability is subject to the requirements of the other Opera House venues.*

© Sydney Opera House

# Contents

---

<b>Introduction</b>	<b>5</b>
<b>Concert Hall</b>	<b>6</b>
Seating	7
<b>Access &amp; Loading</b>	<b>8</b>
Accessibility	8
Public Transport	9
Complimentary Shuttle Bus	9
Parking	10
Vehicle Access	10
Load-in Area	12
Height Restrictions	12
Stage Access	13
Maximum Loads	14
Risk Management	14
<b>Venue specifications</b>	<b>15</b>
Stage Dimensions	15
Stage Floor	16
Care of Building Surfaces	16
Stage Plans	16
<b>Staging</b>	<b>21</b>
Stage Machinery	21
Staging Equipment	23
<b>Keyboard Instruments</b>	<b>24</b>
Pianos	24
Grand Organ	24
<b>Stage Lighting</b>	<b>26</b>
Control	26
Fixed Concert Lighting	27
Additional Lighting Equipment	27
Effects	29

<b>Sound &amp; Audio Visual</b>	<b>30</b>
Acoustics .....	30
Loudspeaker System.....	30
Dolby Lake Controller.....	32
Control Positions .....	32
Additional Equipment .....	33
Video Replay, Switching and Patching .....	35
Projection .....	35
Video Monitors .....	35
<b>Recording &amp; Broadcast</b>	<b>36</b>
Commercial Audio Recording .....	36
Video Recording.....	36
Outside Broadcast.....	37
Signal Transport.....	37
<b>Communications</b>	<b>38</b>
Stage Manager's Desk.....	38
Show Relay .....	38
Headset Communications .....	38
<b>Backstage Facilities</b>	<b>39</b>
Dressing Rooms.....	39
Rehearsal Rooms.....	39
Wardrobe and Laundry Facilities .....	39
Visiting Management Office .....	39
Wi-Fi .....	39
<b>Staff &amp; Artists</b>	<b>40</b>
Sydney Opera House Staff .....	40
Green Room.....	40
Access and Other Conditions.....	40



# Introduction

---

*Welcome to Sydney Opera House.*

Sydney Opera House is a major performing arts venue, staging over 2,400 events a year. There are seven performance venues, ranging in capacity from 200 to 6000. We offer daily guided tours and our catered functions, bars, restaurants and retail outlets offer some of Sydney's best experiences and spectacular harbour views.

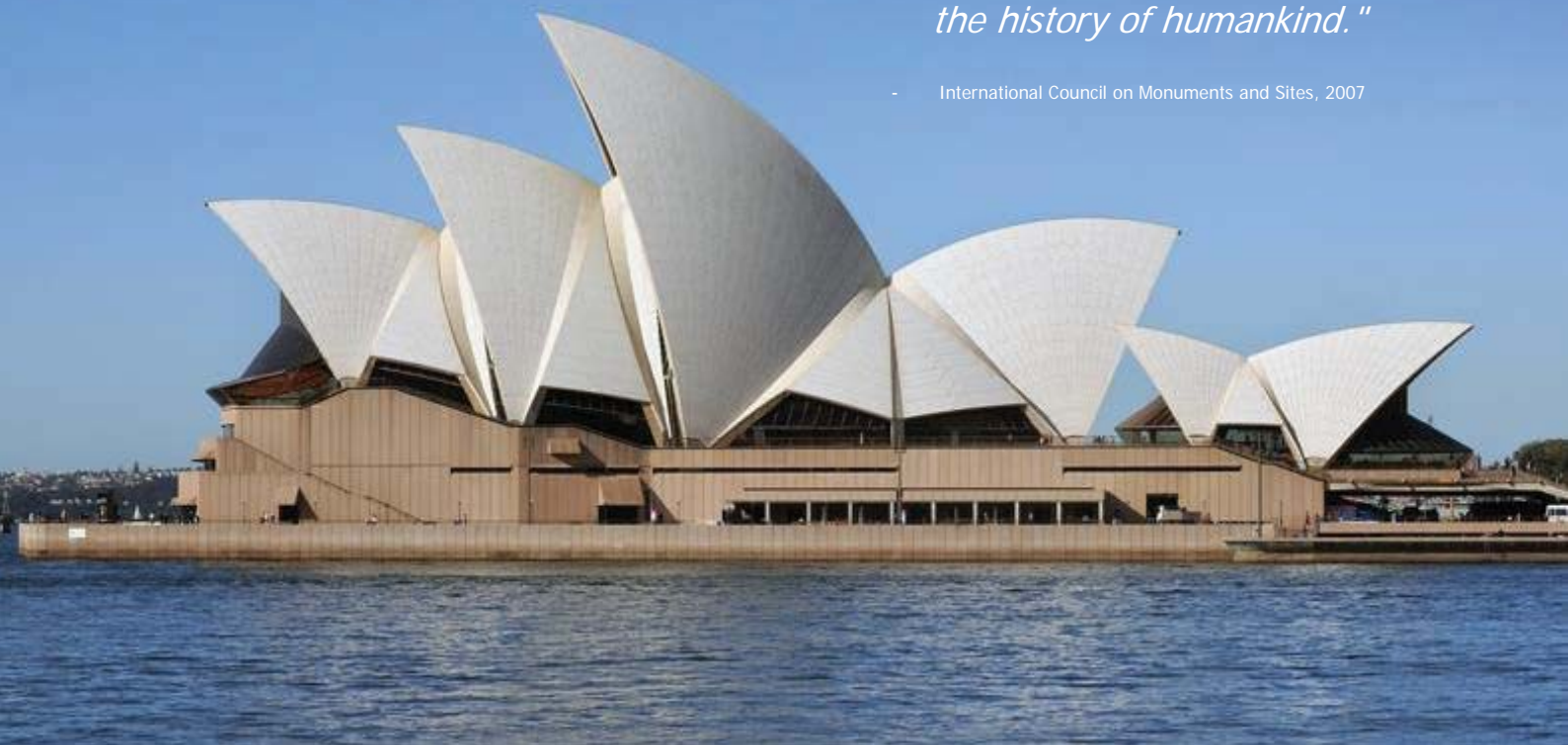
One of Australia's premier tourist destinations, and a treasured local and global landmark, we welcome more than 8 million visitors a year to our site. Millions more connect with the Opera House from all over the world through our live-streamed events and social media.

A State, National and World Heritage listed *masterpiece of human creative genius*, the Opera House is unlike any other performing arts centre in the world. As the custodians of Jørn Utzon's extraordinary masterpiece, we carry legal obligations to protect the site. These affect how we plan and stage events, and place high expectations on how we perform.

Every event is carefully managed so that it is integrated with other performances and presented to the highest standards. Our experienced Event Operations team will work with you to plan every aspect of your event and ensure its success. We look forward to helping you create an unforgettable event, and trust you will enjoy your experience with us at the House.

*"Sydney Opera House stands by itself as one of the indisputable masterpieces of human creativity, not only in the 20th century but in the history of humankind."*

- International Council on Monuments and Sites, 2007



# Concert Hall

---

With its warmth and cathedral-like ambience, the Concert Hall is the most majestic, prestigious and architecturally significant space inside the Opera House. It is the largest of our interior venues, with an audience capacity of up to 2679 in the round.

The Concert Hall delivers outstanding performance experiences derived from its high vaulted ceiling and timber panelling of white birch and brush box. The stage area consists of a plain-walled platform, accessed via a double door on each side. There is no wing space.

Home of the Sydney Symphony Orchestra, the Concert Hall is heavily used by symphony orchestras, chamber orchestras, solo classical performers and choral groups, for which its acoustics are particularly suited. The hall is also regularly used for contemporary music concerts, jazz, variety shows, dance, films, seminars and conferences requiring amplification. More than 300 performances are staged in the Concert Hall every year.

The walls, stage and auditorium floor are made of Australian brush box timber. The seats consist of a shell of Australian white birch timber veneer, upholstered in magenta wool. The ceiling is also lined with white birch timber veneer. Above the stage is what is believed to be the world's largest mechanical action grand organ, itself a distinctive architectural feature of the hall. A set of 21 acrylic rings hangs above the stage to provide a basic acoustic foldback to the stage.

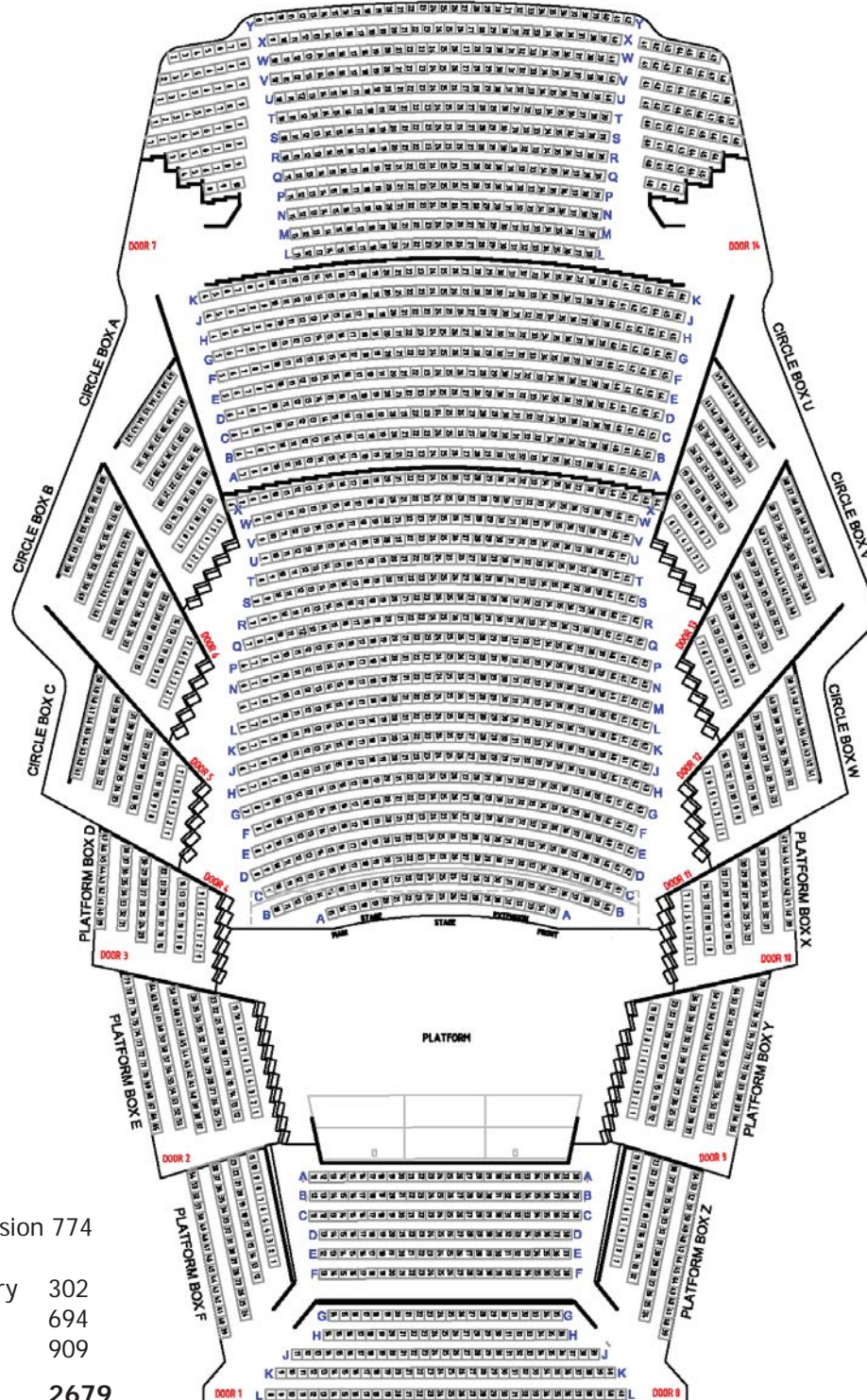
The Concert Hall foyers completely encircle the hall, offering unsurpassed views across Sydney Harbour and the Harbour Bridge to the north and west, and the city skyline to the south.





## Seating

The maximum seating in the Concert Hall is 2679, arena style in-the-round, with continental seating in the stalls and dress circle. When the optional stage extension is used, the front three rows of seats in the Stalls are removed and the maximum seating is 2593. The capacity in front of the stage is approximately 2100. There are 14 doors from the foyers into the auditorium.



Stalls without Stage Extension	774
<i>(689 with extension)</i>	
Choir Stalls & Organ Gallery	302
Total Boxes	694
Circle & Upper Circle	909
<b>Total</b>	<b>2679</b>

# Access & Loading

---

## Accessibility

The Concert Hall auditorium is wheelchair accessible as far as the front of the Stalls. There is space for up to four wheelchairs, two each side of the auditorium. All other parts of the hall are accessible only via stairs.

There is a public elevator, which provides access between the Lower Concourse, the Ground floor in the Western Foyer, and the Box Office Foyer on Level 1. From there, an escalator connects to the Concert Hall South Foyer on Level 2.

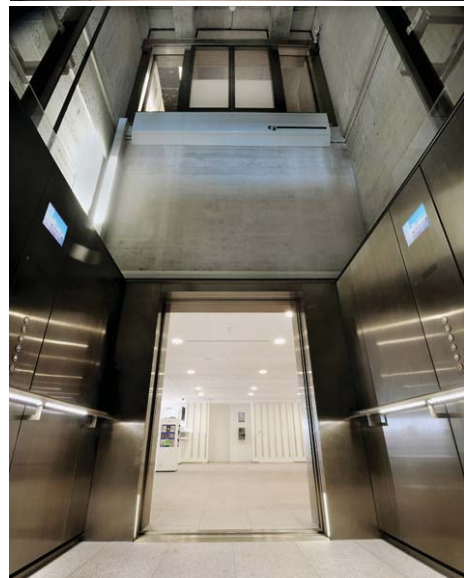
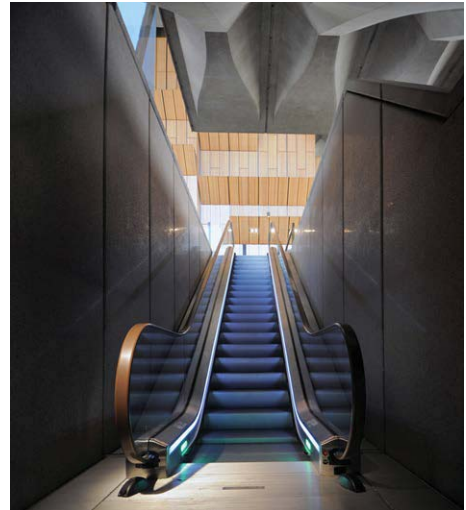
Our staff at the Information Desk in the Box Office Foyer can assist patrons using a wheelchair and their companions to access an elevator from the Box Office Foyer level to the Concert Hall South Foyer.

Wheelchair access can be arranged to the Bar level of the Concert Hall North Foyer. This does require travel through back-of-house areas, so please see our staff for assistance. This can be done either through Stage Door on the Ground floor, or through the Green Room via the Box Office Foyer Information Desk on Level 1.

The other levels of the Concert Hall North Foyer are accessible only by stairs.

Wheelchair access to the Concert Hall stage is through Stage Door on the ground level, via the goods lift to the ante room behind the stage, then a 1:8 ramp onto the stage.

Please discuss any accessibility needs with your Account Manager in advance so that the appropriate arrangements can be made for your event.



## Assisted Hearing System

An FM radio transmitter operates within the Concert Hall on a dedicated frequency. Please see our Front-of-House staff in the foyers for assistance and to arrange a receiver.

A loop system also operates in selected seats in the Concert Hall. Patrons are advised to turn their hearing aid to the **T** switch to pick up the program.



## Public Transport

Circular Quay is a five to ten minute walk from the Opera House. Buses, trains and ferries are all available at Circular Quay. To ensure your event's public transport needs can be met and for further information, please contact:

**Transport Info line:** 131 500

**TTY:** 1800 637 500

<http://www.transportnsw.info>

**Sydney Buses**

<http://www.sydneybuses.info>

**Sydney Trains**

<http://www.sydneytrains.info>

**Sydney Ferries**

[www.sydneyferries.info](http://www.sydneyferries.info)

## Complimentary Shuttle Bus

Intended primarily for elderly and less mobile customers, a complimentary shuttle service operates between Circular Quay and the Opera House at certain times. The service is linked to performances in our larger theatres, including the Concert Hall. Please check with your Account Manager to confirm the operating times during your event.

Seating is limited and available on a first come, first served basis. The bus runs between Circular Quay near bus Stand E (under the Cahill Expressway overpass) and the Opera House Vehicle Concourse.

There is no bus service for any theatres on Sunday evenings.



## Indicative Shuttle Bus Schedule

### Before performances:

Bus starts 75 minutes before matinee and evening performances and runs continuously for 1 hour.

### After performances:

Bus starts 10 minutes after the performance finishes and runs continuously for 45 minutes.

## Parking

The Sydney Opera House Car Park adjacent to the Opera House is operated by Wilson Parking, phone 1800-PARKING. It is not owned or managed by the Opera House. However we do have a special arrangement for a reduced daily rate for performers and staff. Parking ticket validation can be done at a machine located just inside Stage Door. There is no provision for parking on the Opera House site.

### Accessible Parking

There are 11 accessible parking spaces on Level 1 and 12 spaces on Level 6 of the Wilson's Sydney Opera House Car Park for holders of RMS Mobility Parking Scheme permits. Car spaces on Level 6 also have direct wheelchair access to lifts.

## Vehicle Access

### Loading Dock

Vehicle access for scenery, equipment and other deliveries to the Opera House is via the Loading Dock, and is by arrangement only. The loading dock is a mixed work zone; including vehicles, pedestrians, plant and machinery used by all the theatres and other Opera House site operations.

Deliveries must be booked in advance. It is vital that they arrive on schedule to assist us in managing the requirements of all the Opera House's logistical needs.

The Loading Dock has a height restriction of 4.3m and cannot accommodate B-double articulated vehicles. Other access will need to be arranged for these larger vehicles. Bicycles are not permitted in the Loading Dock.

All staff and drivers requiring access to the Loading Dock will need to complete a safety induction. Opera House procedures and the directions of our staff must be followed.

Vehicles are not to be left unattended in the dock and no parking is available. For security reasons, vehicles that have not been pre-booked will be denied access to the site.

For more information please refer to the *Loading Dock Operations Booklet* (available on request). Please discuss all of your vehicle access needs with the Production Manager for your event.

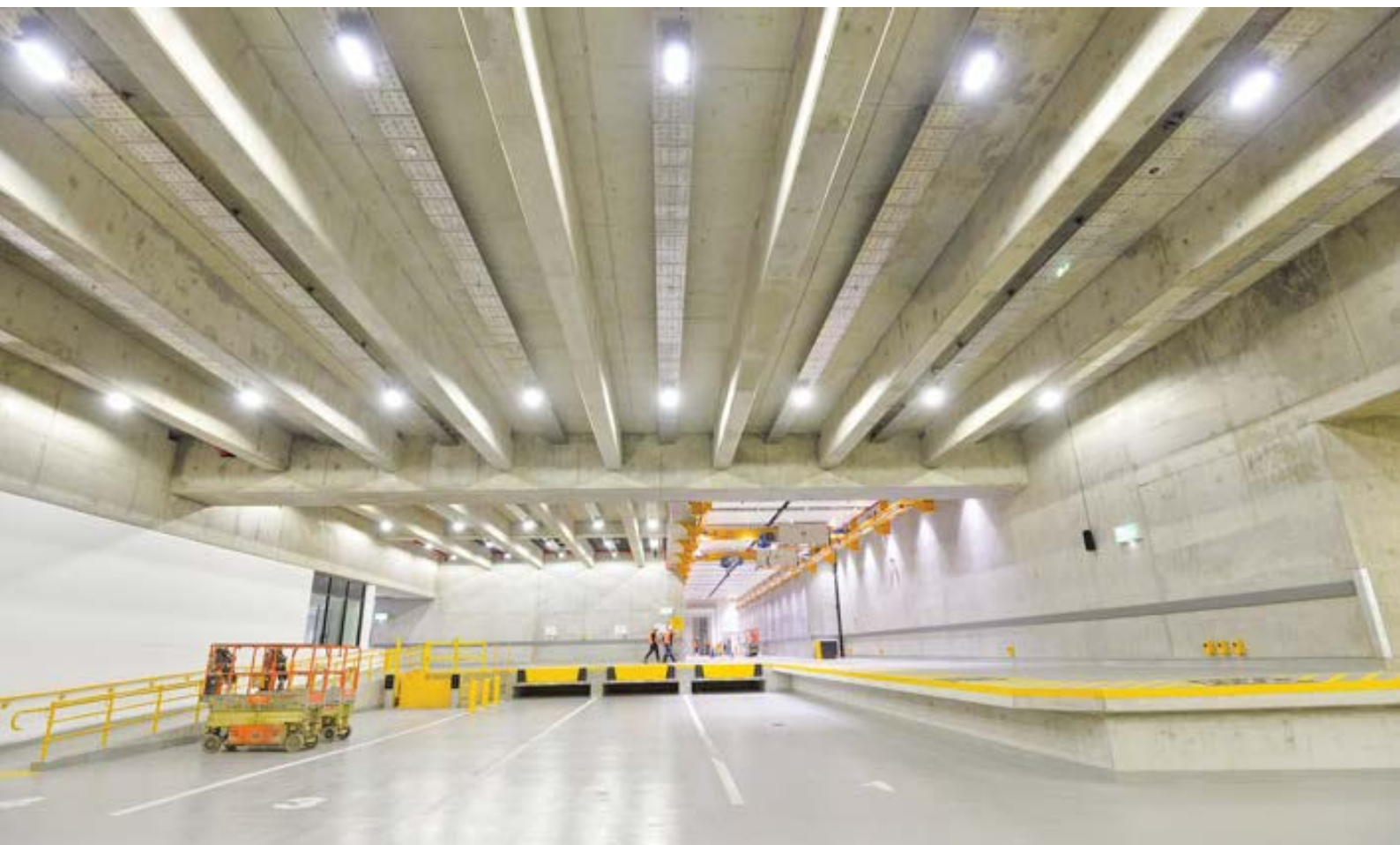
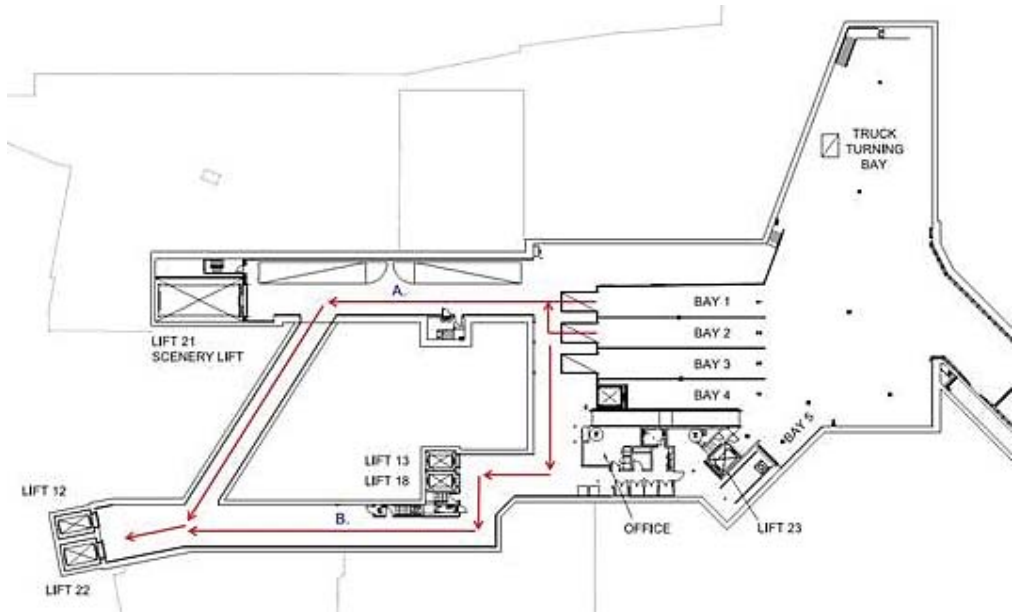
## Transport Schedule

In order for us to manage deliveries across all the Opera House venues, we require that a Transport Schedule for deliveries to and from your event is provided at least one week in advance. The Transport Schedule should include the type and height of each vehicle, registration number and contact details of the driver.

All vehicles requesting access to the Opera House must stop at the security checkpoint at the main gate house.

***The Loading Dock handles all deliveries to the Opera House.***

***Deliveries to the Concert Hall are transported from the truck bays to lifts 12 and 22.***





## Load-in Area

The Concert Hall is located on the second floor (level +42') of the Opera House. Our theatre staff will assist you to unload equipment and transport it to the Concert Hall.

Two goods lifts stop at the Loading Dock, Central Passage, the Orchestra Assembly Room one level below the stage, and at the Concert Hall Ante Room directly behind the stage. From the Ante Room, there is a short 1:8 grade ramp up to the stage.

Goods lifts:

<b>Internal car dimensions</b>	<b>Lift 22</b>	<b>Lift 12</b>
Height	2.40m	2.40m
Width	2.00m	1.70m
Depth	3.35m	3.35m
<b>Clear door opening</b>		
Height	2.20m	2.20m
Width	1.80m	1.60m
<b>Load capacity</b>		
Maximum capacity	1800kg	1800kg
Point load	1080kg	1080kg
<b>Other</b>		
Speed	1.0m/s	1.0m/s
Doors	3 panel side opening	3 panel side opening

Larger items need to be carried up 72 stairs, either from the Forecourt via the Monumental Steps, or from the Vehicle Concourse via the Box Office Foyer and Concert Hall South Foyer. Access from the Podium to the South Foyer, and into the hall from the South Foyer is via standard double doors, through the auditorium via Door 11.

Safety is of the highest priority and in order to ensure the safety of all people using Central Passage, we require that pedestrians remain within the marked paths. Anyone working in the Central Passage area is required to wear high visibility vests and protective footwear.

## Height Restrictions

Transport contractors must check to ensure that load heights do not exceed the maximum:

Height of Concourse	3.6m <i>safe clearance</i>
Central Passage South Door	3.5m high x 4.5m wide <i>safe clearance</i>
Central Passage North Door	4.4m high x 4.5m wide <i>safe clearance</i>
Loading Dock	4.3m high <i>safe clearance</i>
Concert Hall Goods Lift	1.98m high x 1.88m wide x 3.70m long
Stage Entrance Doors	Prompt Side (Stage Left) 1.9m high x 1.55m wide Opposite Prompt (Stage Right) 1.9m high x 2.18m wide Opposite Prompt top of ramp 1.90 high x 1.79m wide
Stalls Door 11	2.00m high x 1.50m wide <i>very restricted access</i>

## Stage Access

The stage floor level is approximately 500mm higher than the Ante Room level. On the Opposite Prompt (Stage Right) side, there is a ramp graded at 1:8 and on the Prompt Side (Stage Left) there are four steps up to the stage.

On each side of the stage, there are two double doors to be negotiated. These measure:

### Opposite Prompt (Stage Right)

#### Ante Room door at top of ramp

Height	1.90m
Width	1.80m

#### Stage entrance door

Height	1.975m
Width	2.380m

### Prompt Side (Stage Left)

#### Ante Room door at base of steps

Height	2.00m
Width	1.65m

#### Stage entrance door

Height	1.975m
Width	1.70m

*Rodriguez, October 2014*



## Maximum Loads

Central Passage Floor	9 tonne axle load <i>no overtaking or passing</i> 6 tonne axle load <i>passing allowed</i>
Western Broadwalk	27.5 tonne over 3 axles <i>limited areas only</i> 23.5 tonne on 2 axles
Northern Broadwalk	27.5 tonne over 3 axles <i>limited areas only</i> 23.5 tonne on 2 axles

## Risk Management

We require a comprehensive risk assessment to be completed during pre-production for all shows and events. The Risk Assessment needs to consider the risks associated with your specific event. It should be delivered to your Opera House Production Manager at least seven days before the event. Our staff can assist you with this process. General considerations:

- Equipment may be subject to safety checks by Opera House staff
- All mains-connected electrical equipment requires a current compliance test tag from a suitably licensed person
- Overhead equipment (including lighting and scenery) must be rigged by a qualified rigger, using appropriately certified equipment
- Lighting equipment rigged overhead must be secured with a safety chain or similar
- Scenery and large props must be of a fire retardant fabric or treated with a fire retardant. A certificate of such treatment must be produced on request
- Polystyrene, plastic and other such materials that cannot be treated with fire retardant are not permitted
- Approved drapes must be of a fire retardant fabric or treated with an approved fire retardant and with an appropriate label attached to the drape
- Compressed air may only be used by suitably trained operators



Neil Finn in concert, March 2014



# Venue specifications

---

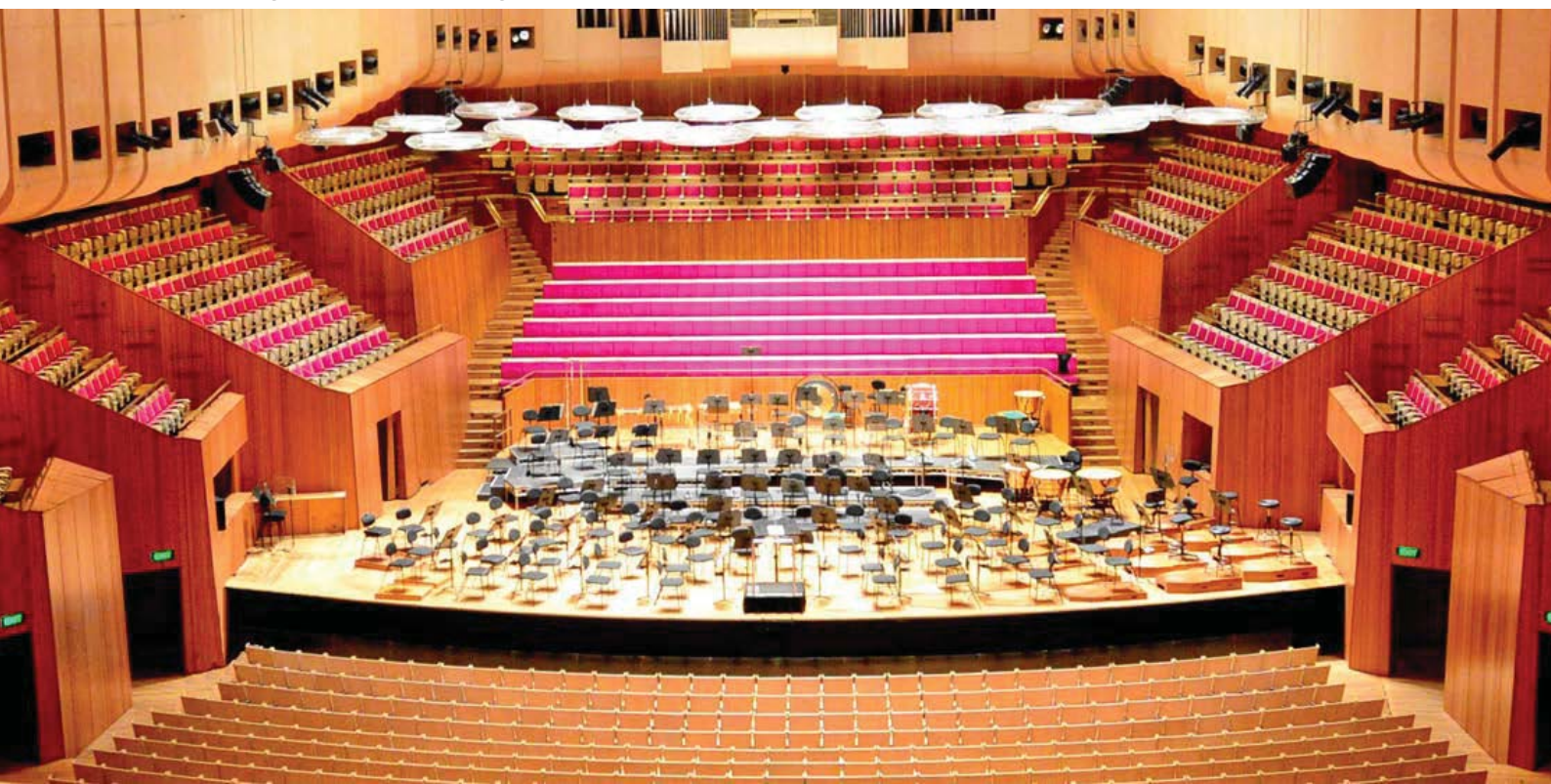
## Stage Dimensions

The Concert Hall stage dimensions are:

Width	downstage	20.52m ( <i>18.46m without stair fillers</i> )
	setting line	17.10m
	foot of upstage stairs	14.98m
Depth	centre line	11.51m
	sides	10.87m
Extended Depth	centre line	13.75m
Ceiling Height	maximum (shape varies)	22m <i>centre stage</i>
Stage Height	above auditorium floor	1.30m
Upstage Wall	height	1.60m <i>from stage floor</i>
Throw	followspot	36m <i>to downstage edge</i>
	rear stalls to stage	21m
	rear circle to stage	44m

Dimensions are approximate. Critical measurements should be confirmed on site. The setting line (*zero line*) of the stage is drawn between the downstage corners of the main side walls.

***Concert Hall stage platform, with stage extension***





## Stage Floor

Surface	satin matte clear polyurethane on brush box
Stage Rake	0 degrees (flat)
Upstage Wall	satin matte clear polyurethane on brush box
Box Fronts	satin matte clear polyurethane on brush box
Material	hardwood brush box flooring
Maximum Loading	7.5kPa (750 kg/m <sup>2</sup> ) – distributed 4.5kN (450kg) - concentrated

## Care of Building Surfaces

The Opera House is a World Heritage listed property. The Concert Hall is of exceptional heritage significance, and the polyurethane coated brush box timber of the floor and walls is unlike the timber used on stages in many other theatres. The rare white birch laminate timber used in the seats and ceiling must also be protected from damage.

No holes or permanent marks of any kind (including cello or double bass spikes) may be made on any timber surface in the Concert Hall. Equipment and scenery may be weighted, clamped or hung on approved rigging points, but may not be anchored into the timber. The use of gaffer tape is to be minimised, and any stage mark-up must be done using removable "spike tape" only, which is available from the Stage Manager.

## Stage Plans

A basic stage plan is available at [sydneyoperahouse.com](http://sydneyoperahouse.com)

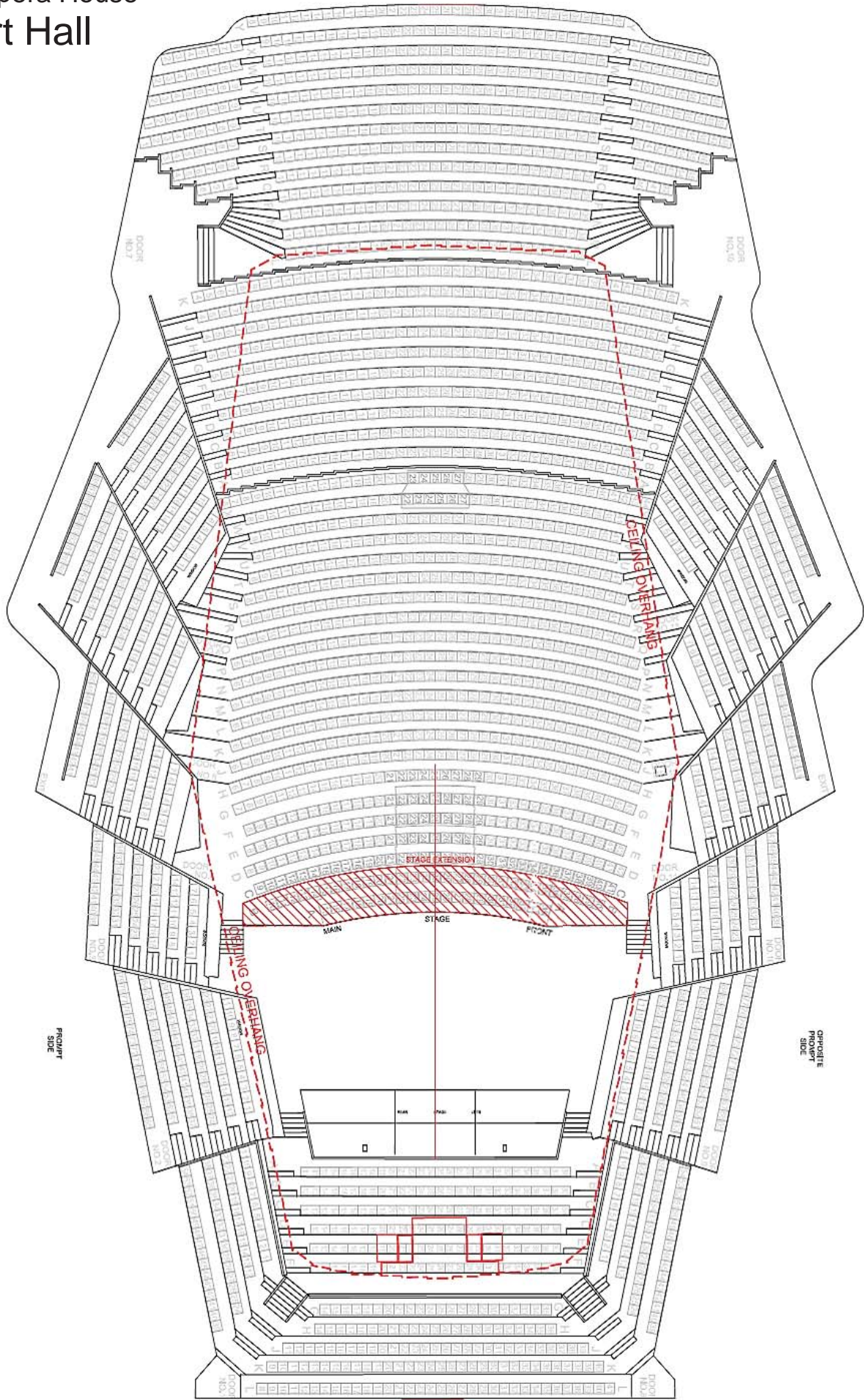
CAD plans to scale can be requested through Event Operations, please email [techspec@sydneyoperahouse.com](mailto:techspec@sydneyoperahouse.com) or contact your Production Manager.





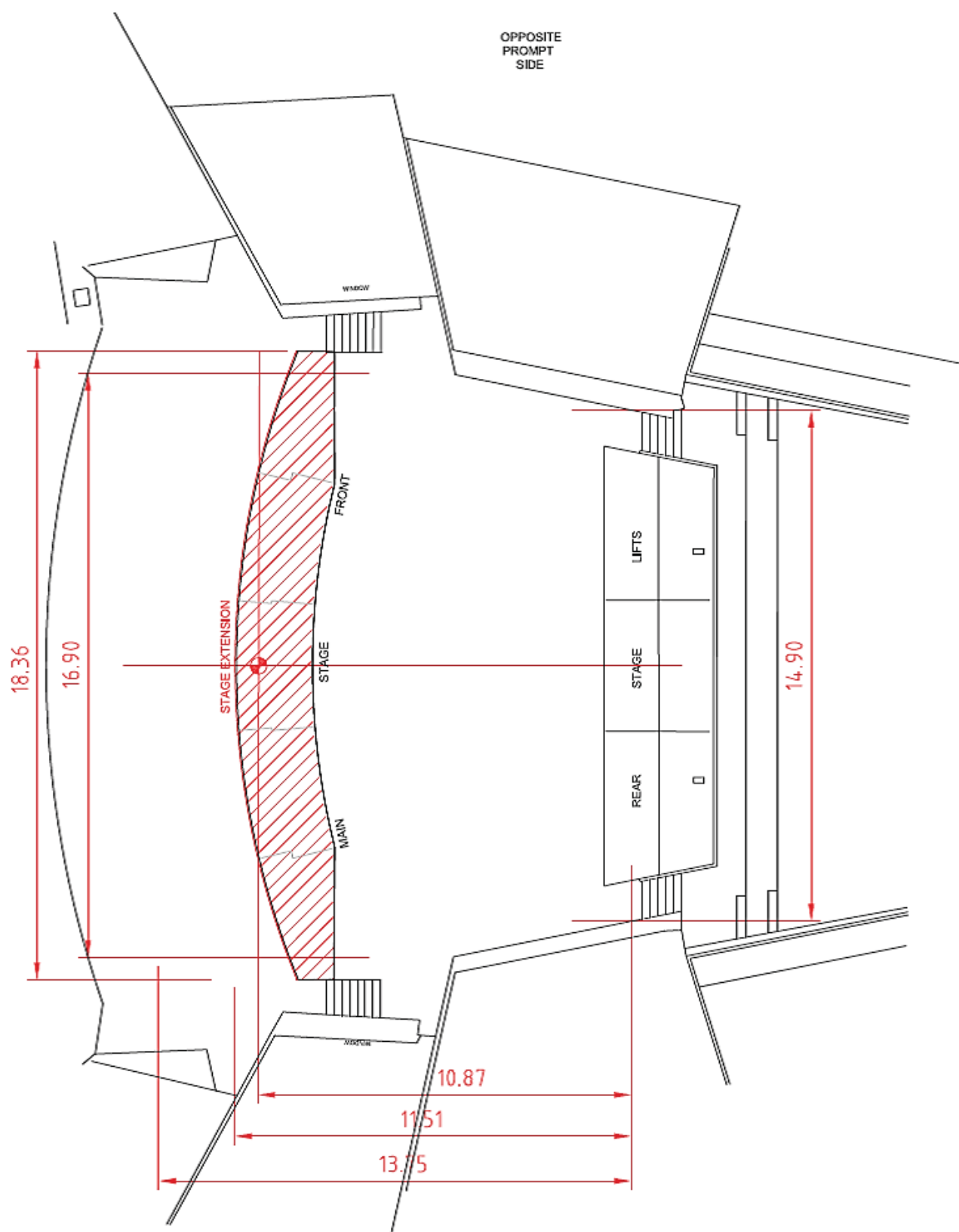
Sydney Opera House  
Concert Hall

PLAN VIEW



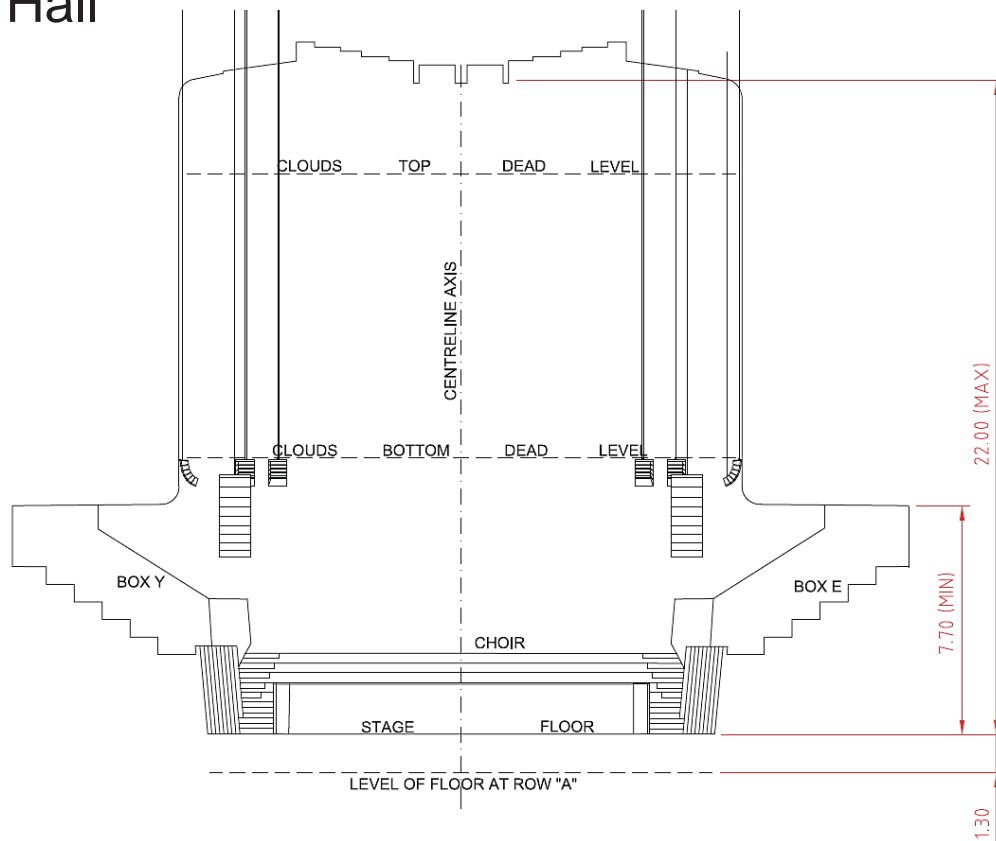


# Sydney Opera House Concert Hall

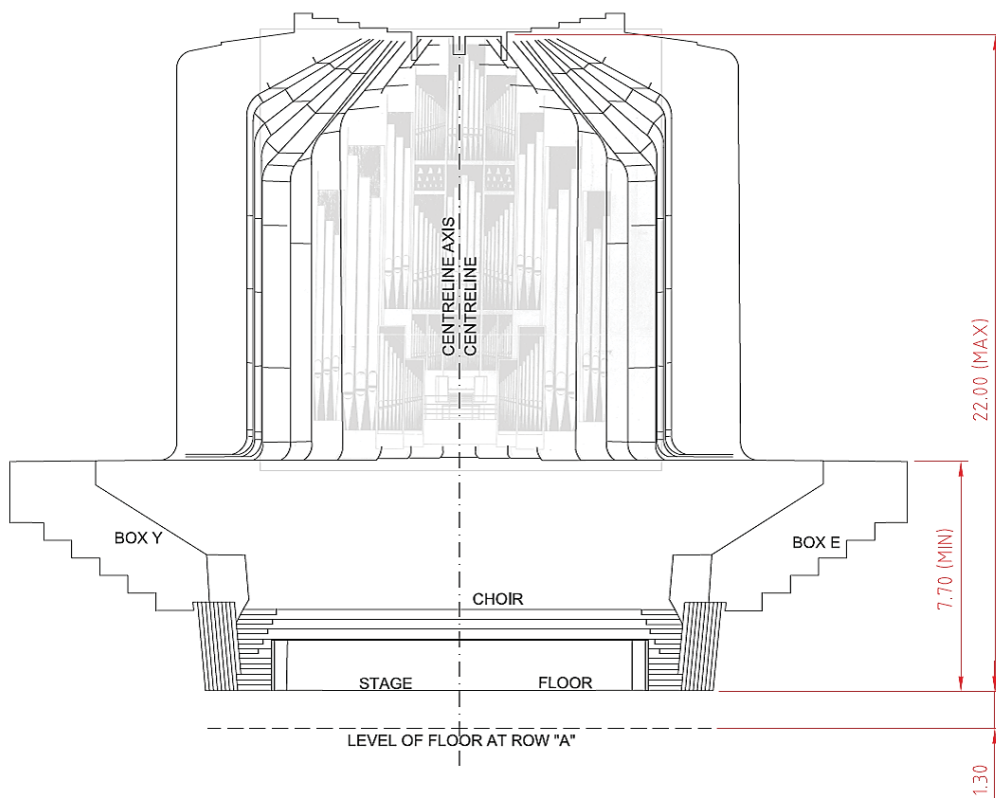


## STAGE DIMENSIONS

# Sydney Opera House Concert Hall



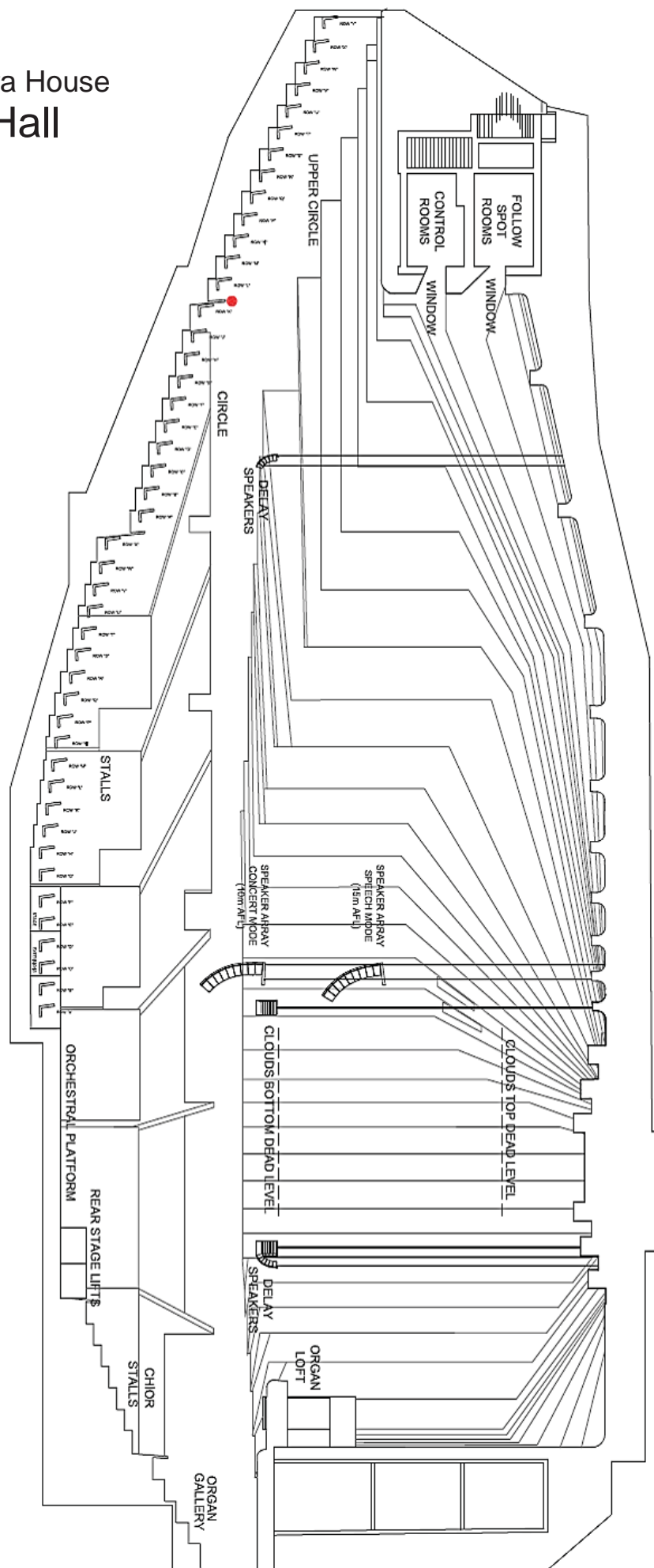
EAST-WEST SECTION



ORGAN ELEVATION

# Sydney Opera House Concert Hall

## NORTH-SOUTH SECTION





# Staging

---

## Stage Machinery

### Control System

The control system for all winches and platforms is operated by soft-touch control interface panels. These are located at stage level as well as a variety of flexible control point locations. The control system is PLC based and provides simple controls, including speed matching and position control, as well as fault diagnosis. The control systems may only be operated by authorised Opera House staff.

### Stage Extension

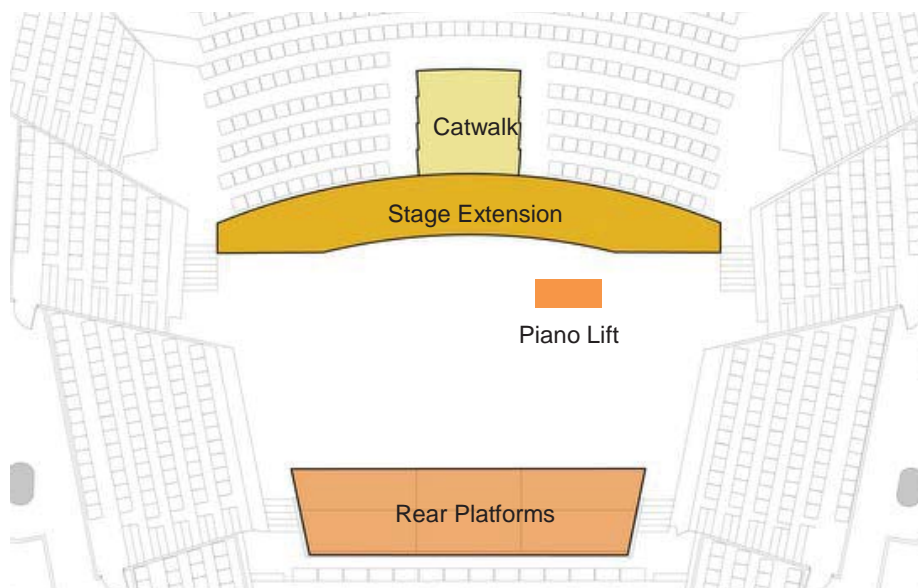
The optional stage extension is comprised of five independent hydraulic scissor-lift platforms, each with a load bearing capacity of 3300kg. Seats in stalls rows A, B and C (85 seats) are removed to accommodate the extension. The extension adds 2.25m depth at the centre line and 1.10m at the sides.

### Catwalk

Another two platforms under the seats in the centre of the front stalls (rows D – G) can be raised to create a catwalk of 3.75m wide by 3.80m deep (each platform is 1.90m deep), after appropriate seat removals. A single platform can be used if required. Each hydraulic lift is independently adjustable in height, with a travel range from the auditorium floor (0m) to stage floor height (+1.30m).

### Rear Hydraulic Platforms

Six scissor-lift platforms are installed in two rows of three across the upstage edge of the stage, adjacent to the upstage wall. Each platform is 1.5m deep and varies from 3.85m to 4.95m in width. Height settings are individually adjustable, with a travel range from stage level to 1720mm. The platforms have a maximum static load capacity of 3000kg each. They may be used individually or as a set of six.



## Acoustic Clouds

A set of 21 clear Perspex acoustic reflectors hangs over the stage. Known as “clouds”, they are used to help balance the live acoustic in the hall. The reflectors are driven on electric motor winches. The height can be adjusted on request, as a single set, individually or in rows, by the Opera House Stage Manager or technical crew. The performance dead is variable, usually around 9m above the stage for an acoustic orchestra. When not required, the clouds can be stored at their top dead, just below ceiling height.



## Winch Sets

There are 16 winch sets spaced over the stalls, stage platform and rear choir stalls. They have limited variable-speed electric winch drives, controlled through the main winch control system. The winches may only be operated by authorised Opera House mechanists.

The winch lines are suitable for hanging scenic elements and additional lighting and sound equipment, but are not designed for live flying cues during performances. They may be used to hang head battens or truss directly onto the lines, or to support a mother truss under which more technically operational rigs may be installed. Tri-truss sections are available in 2m and 3m lengths for use with these winches.

The maximum distributed load for the winch lines varies from 250kg up to 450kg, however there are restrictions on the total load that can be applied to different areas of the ceiling above the stage. Please discuss your rigging design with your Production Manager. For larger or non-standard rigs, it may be necessary for us to obtain specialist advice from our engineering consultant to ensure that loads are safely distributed in the ceiling void.

## Suspension Points and Heavy Duty Load Winches

A number of rigging points are established in the ceiling structure for point loads and heavy-duty winches. Please discuss your needs with your Production Manager.

## Piano Storage Lift

Located in the stage floor in the downstage Opposite Prompt (Stage Right) area, this lift allows temporary storage of a concert grand piano beneath the Concert Hall stage. Its bronze-edged frame is visible in the stage floor, but sits flush with the floor. The lift is not available for use during performances, when it must be locked in the stage level position.

# Staging Equipment

## Orchestral Furniture

We have in stock orchestral equipment to furnish a large symphony orchestra. Furniture includes adjustable orchestra chairs, bass stools, music stands, adjustable rostra and conductor's podium.

The adjustable Megadeck rostra have a non-slip, timber top measuring 1m x 2m each. The minimum height is 200mm, then adjustable in 200mm increments from 400mm to 1000mm. The load capacity of each rostrum is 500kg/m<sup>2</sup>.

## Drapes and Masking

A full set of black wool masking is available to fit the Concert Hall stage. Tab tracks, gauzes, white fill cloths and plastic cycloramas are also available. Our staff can also assist with hiring in additional equipment on your behalf, if required. Please discuss your requirements with your Production Manager in advance.

## Platform access steps

Removable access treads are available to provide access between the stage and auditorium floor when the stage extension is used. These are particularly useful during bump in and bump out, and can be removed for the performance. They may be left in place for the performance if required. If they are required during a performance, additional seating may need to be removed. Your Production Manager can advise you on the best stage configuration for your performance.

## Floor Coverings

Black carpet and black Tarkett floor coverings are available to cover the timber stage surface, if required. This is most commonly needed for amplified concerts and dance work.



John Waters, March 2014



# Keyboard Instruments

---

## Pianos

There is a choice of Steinway 9' D series concert grand pianos, Yamaha CFX 9' concert grand piano, Yamaha baby grands and Yamaha upright pianos (subject to availability). Our production staff will normally select the most suitable piano for your event. However, provided time is set aside in your production schedule, it is possible for your pianist to play and select from the available options. Please advise your Account Manager if you require a piano selection session at the time of confirming your production schedule. Venue hire fees do not include piano hire or tuning costs.

## Pitch

Our pianos are tuned just above the A440 standard concert pitch to A441 (A = 441 Hz). Tunings for Opera House pianos are arranged through our contracted piano tuner. Only minor variations to the tuning pitch will be considered. Please discuss any special requirements with your Account Manager as early as possible so they may be discussed with our tuner.

## Care

Mechanisms of instruments may not be tampered with (or "prepared") in any way without our express permission. Requests will be discussed with our piano tuner and any agreed preparation will be done by our tuner. No food, liquid or heavy props are to be placed on the instruments.

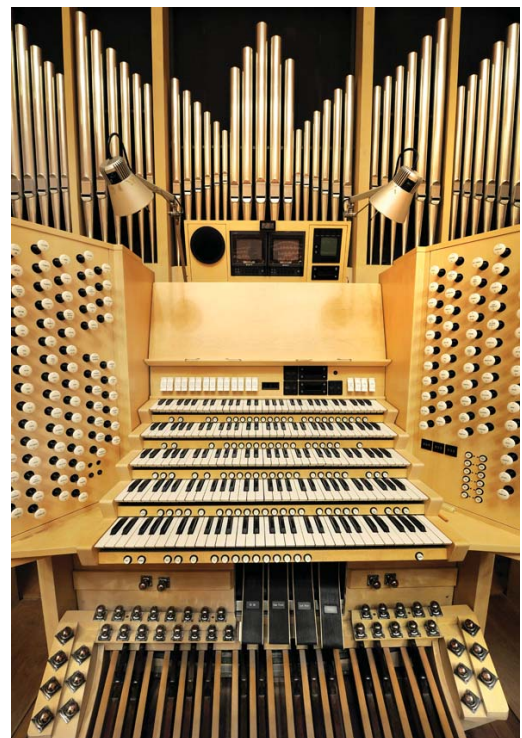
## Grand Organ

The Concert Hall features what is believed to be the largest mechanical action pipe organ in the world. It is an exceptionally significant instrument and must be treated with care. In order to protect the instrument from damage, only authorised performers are allowed access to the organ loft area, and the instrument may not be tampered with in any way.

Designed and built by Ronald Sharp, the Grand Organ, contains 10,244 pipes, 201 pipe ranks, 131 speaking stops, five manuals and a pedal drawstop console. The organ is driven mechanically and it has a number of electronic accessories, such as recordable pre-set memories for playback and recording.

The instrument is 15m high, 13m wide and 8m deep. It is built into the rear (southern) wall of the Concert Hall, with the consoles built into a loft around 9m above the stage platform, overhanging the organ gallery seating behind the stage. The façade displays 109 show-pipes of 95% burnished tin and 24 bronze bells.

There are 2 x colour CCTV monitors - a full stage-view and a conductor-view (which can be mirror-reversed if required).





There is a foldback speaker from the stage to the organ, and a microphone connection for the organist to communicate with the conductor or the audience. Communication with the Stage Manager is by red and green cue lights and direct communication can be arranged on request.

We require that organists who are not acquainted with the instrument attend a familiarisation session with the Opera House organ tuner. The familiarisation and any rehearsal time, if required, need to be programmed into your production schedule. The Opera House Stage Manager will arrange access for the organist at the scheduled times.

Smoke or haze effects cannot be used in the Concert Hall when the organ is in use. For safety reasons, technical set up cannot continue in the venue while the organ is being played, so organ pre-setting and rehearsal time needs to be scheduled independently of your technical time.

The full specifications of the Grand Organ, including the allocation of ranks and stops, and electronic specifications, are available in a separate document on the Concert Hall venue information page at [sydneyoperahouse.com](http://sydneyoperahouse.com)



# Stage Lighting

---

## Control

Stage lighting in the Concert Hall is controlled by an ETC EOS computerised control system with an EOS Remote Processor Unit tracking backup system. Both systems have 8000 channels and use the ELC DMX over Ethernet system for DMX distribution.

An EOS Net3 Remote Video Interface is installed on stage, in prompt corner and an EOS Net3 Remote Video Interface is available for use with designer's monitors at the Production Desk in the auditorium. Various remote control units are available for rigging and focussing on stage

A stand-alone Grand MA 2 Lite control system, shared with other venues, can be added to the network and used for specialist plotting and performances, with or without channel partitioning.

If lighting console operation is required from the auditorium stalls, additional seats will need to be removed to accommodate. Please discuss your requirements with your Production Manager prior to tickets going on sale so seats can be reserved.

## Data

The building has an ELC DMX over Ethernet system. It utilises sACN to distribute an almost infinite number of DMX universes. In the Concert Hall, DMX appears in the Control Room, the Dimmer Room, on the stage platform and in the stalls. Some points have permanently installed Ethernet to DMX nodes. Extra nodes can be installed on request.

External network devices must be approved by us prior to installation onto the network. Please discuss your needs with your Production Manager.

## Power

All general and dimmed electrical power supplies are 240V AC @ 50 Hz.

Additional 3-phase supplies (415V AC) - both Wilco and Powerlock- are available. Our staff will install a distribution board if required, by prior arrangement. Electrical installations may only be done by Opera House staff.

The supply of any additional power must be discussed with your Production Manager well in advance of the event.

## Dimmers

There are 348 x 5kW dimmers installed in various locations, of which 24 are dedicated to house lights and architectural lighting and 24 are dedicated to the crown lights directly over the stage.



## Fixed Concert Lighting

The fixed Concert Platform lighting is designed to provide optimum open white lighting coverage of the stage for orchestral performances. These lights cannot be refocussed or gelled for other production requirements.

Position	Lamps	Notes
Back Spots	8 x Source 4 Lustr 2	2 pairs per side (4 circuits) US & DS
Crown	72 x RGBWA LED	Full stage focus, 32 areas
Choir Stalls	8 x ETC SOURCE 4 PAR	4 per side on 4 circuits
Organ Specials	2 x Strand SL 10°	Organ console
Organ Keyboard	1 x Strand Patt 23N	Overhead light on organ keyboard
FOH Position 1 (‘Old FOH’)	22 Selecon Arena PC (2 rows of 11 units)	1 row covers the front of the main stage, 1 row covers the stage extension, angle to front of stage is 60-65°
Side Lights	6 x 1.2kW pole-operated Polaris Fresnels	2 each side, individual dimmers, side light + 1 each side, individual dimmers for Choir Stalls.

### LED Crown Lights

The Crown lights are a high power RGBWA LED that accurately replicates the colour temperature shift that is a characteristic of an incandescent lamp when dimmed. The use of RGBWA gives the added benefit of being able to produce not only excellent whites, but rich vivid colours.

If colour other than open white is required there may be the need for additional programming time, please discuss your requirements with your Production Manager.

## Additional Lighting Equipment

A wide range of additional equipment (including theatrical and TV lanterns, moving lights, etc.) is available, subject to the demands of the other theatres. Our staff can also assist with hiring in additional equipment on your behalf, if required. Please discuss your requirements with your Production Manager in advance.

The installation of additional lighting equipment may require additional rigging infrastructure to be installed. This may involve tri-truss rigged on the existing winch sets, or custom fittings on the box fronts in the hall. Time needs to be programmed into the production schedule for this to be done, if required.



## Moving Lights

- 8 Mac Viper performance
- 10 Mac Viper profile
- 8 Mac 101 CTW
- 18 Mac Quantum profile
- 18 Mac Quantum wash
- 10 Mac 700
- 8 Mac III profile

## Followspots

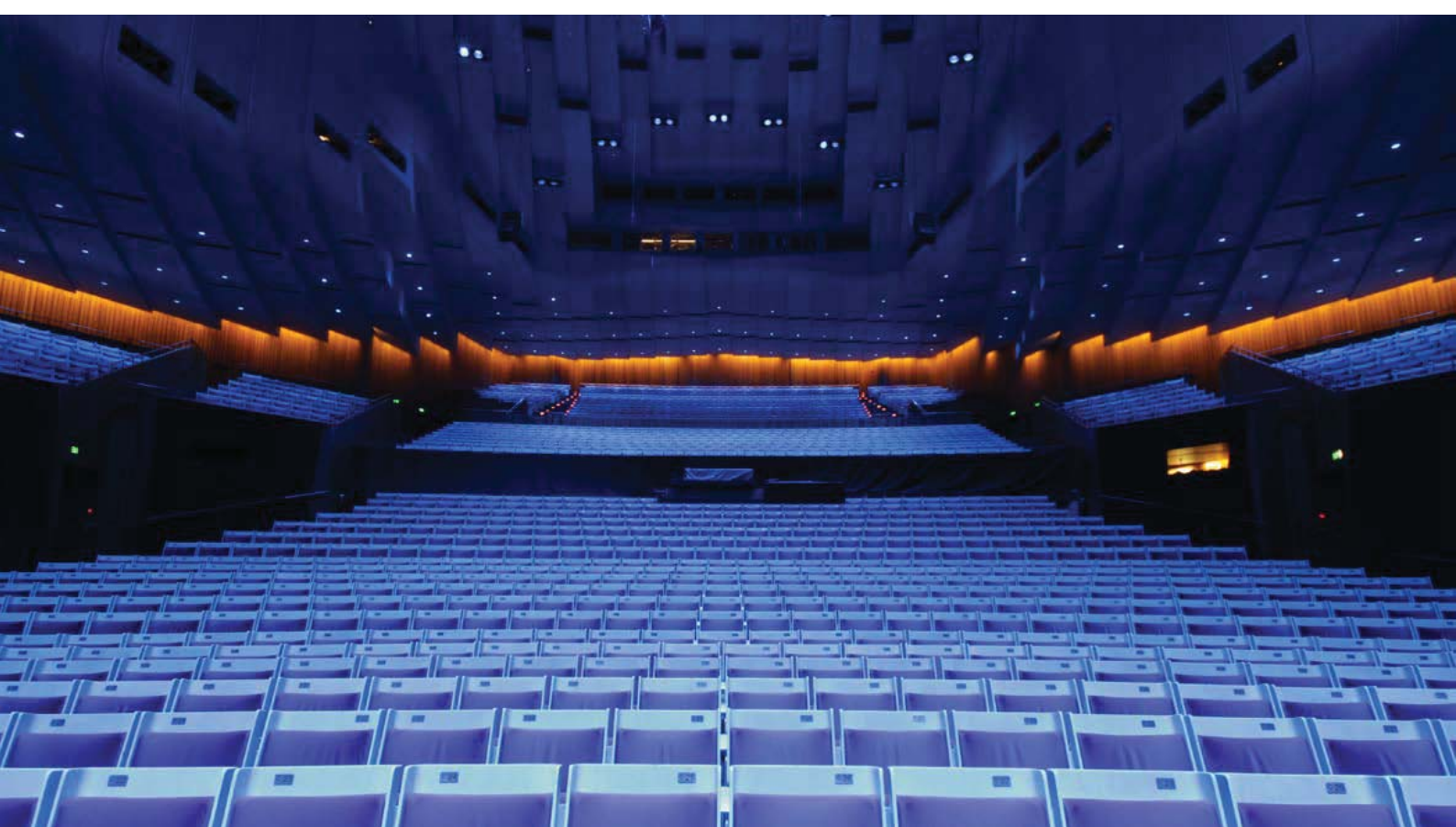
Four Robert Juliat “Cyrano” 2.5kW HMI followspots with manual colour changers are permanently located above the Dress Circle in a dedicated followspot room. The angle to the downstage edge is approximately 30° and the throw is 36m. Additional portable followspots with stands and colour changers may be available by prior arrangement. Seats may need to be held from sale if followspots are to be set in the auditorium, please discuss requirements with your Production Manager prior to tickets being released for sale.

## House Lights

The house lights are controlled by the lighting control system and also by manual faders on a highest-takes-precedence basis. The house lights are RGBWA LED fixtures, which mimic the colour temperature of incandescent lights, but also provide the ability, if required, to change colour and isolate specific areas. If colour other than open white or area specific lighting is required, there may be the need for additional programming time, please discuss your requirements with your Production Manager.

## Music Stand Lights

24V LED scone lights are available to fit music stands. Please discuss your needs with your Production Manager.





## Effects

### Colour

A full range of LEE Filters are available.

### Smoke and fog machines

A number of haze machines are available, subject to requirements in other theatres. Any haze, dry ice machines that are brought into the Opera House must be approved prior to use. A 'material safety data sheet' will be required for any machine that has not been previously approved for use within the Opera House. The Production Manager must be consulted whenever any smoke, fog or haze effects are used. The Stage Manager must also be informed prior to each use of an effect, as arrangements must be made to isolate the automatic fire alarm system.

Smoke or haze cannot be used in the Concert Hall while the Grand Organ is in use, and special effects of any type are not permitted to be installed in or around the organ loft.

### Strobes

For audience comfort and safety, the use of strobes may require warning notices to be displayed in the foyer. Please discuss this with your Production Manager.

### Pyrotechnics, naked flame and lasers

Pyrotechnics, naked flames and lasers may only be used with prior written approval. Your Production Manager can assist with submitting an application.





# Sound & Audio Visual

---

## Acoustics

The Concert Hall is 'live' and 'bright' with strong reverberation and a high ceiling. The reverberation time is around 2.2 seconds from 100Hz to 8KHz with a full audience.

The Concert Hall was designed as a home for Sydney Symphony Orchestra, and classical music is normally performed without acoustic reinforcement. Amplification is recommended for musicals, contemporary music, films, conferences and talks.

The reverb time is significantly reduced with the addition of the temporary acoustic canopy, drapes and carpet, which is usually recommended for amplified productions. Please discuss with your Production Manager regarding requirements and cost, and to allow time in the production schedule.

There is a permanently installed loudspeaker system designed to cater for all audio aspects of productions in the Concert Hall.

## Loudspeaker System

The D&B Audiotechnik loudspeaker system ensures that the highest quality audio is achieved in all areas of the venue and all operational scenarios are catered for. The system is comprised of a number of sections, programmed to achieve full coverage in-the-round. All speakers have been carefully focussed and aligned to provide best coverage with minimal reflections by reducing the sound projecting onto walls and reflective surfaces.

The Main Arrays can be set to one of three preset heights, depending on your production requirements.

### Main Array

The Main Array forms the main front-of-house system providing excellent coverage to the Stalls, Lower Circle and Upper Circle. The array is comprised of nine elements, each divided into three zones; the upper four D&B Audiotechnik J8 elements in pairs cover the Upper Circle, the next three D&B Audiotechnik J8 elements cover the Lower Circle into the stalls and the lower two D&B Audiotechnik J12 elements cover the rest of the Stalls. They are suspended by a dual hoist winching system to allow easy adjustment to the three preset positions.

### Delay Arrays

The Delay Arrays are aligned to the Main Arrays to provide clarity in the Upper Circle and are aligned to maintain audio image from the stage area. There are two D&B Audiotechnik Qi1 arrays of four elements each.

### Side Fill Arrays

The Side Fill Arrays are designed to continue coverage of the main arrays around to the side boxes. There are two D&B Audiotechnik Ti10 arrays of five elements each on either side of the platform to cover downstage and upstage.

## **Choir Fill Arrays**

The Choir Fill Arrays are designed to provide coverage to the Choir seating area behind the stage. There are two D&B Audiotechnik Ti10 arrays of 6 elements each.

## **Subwoofers**

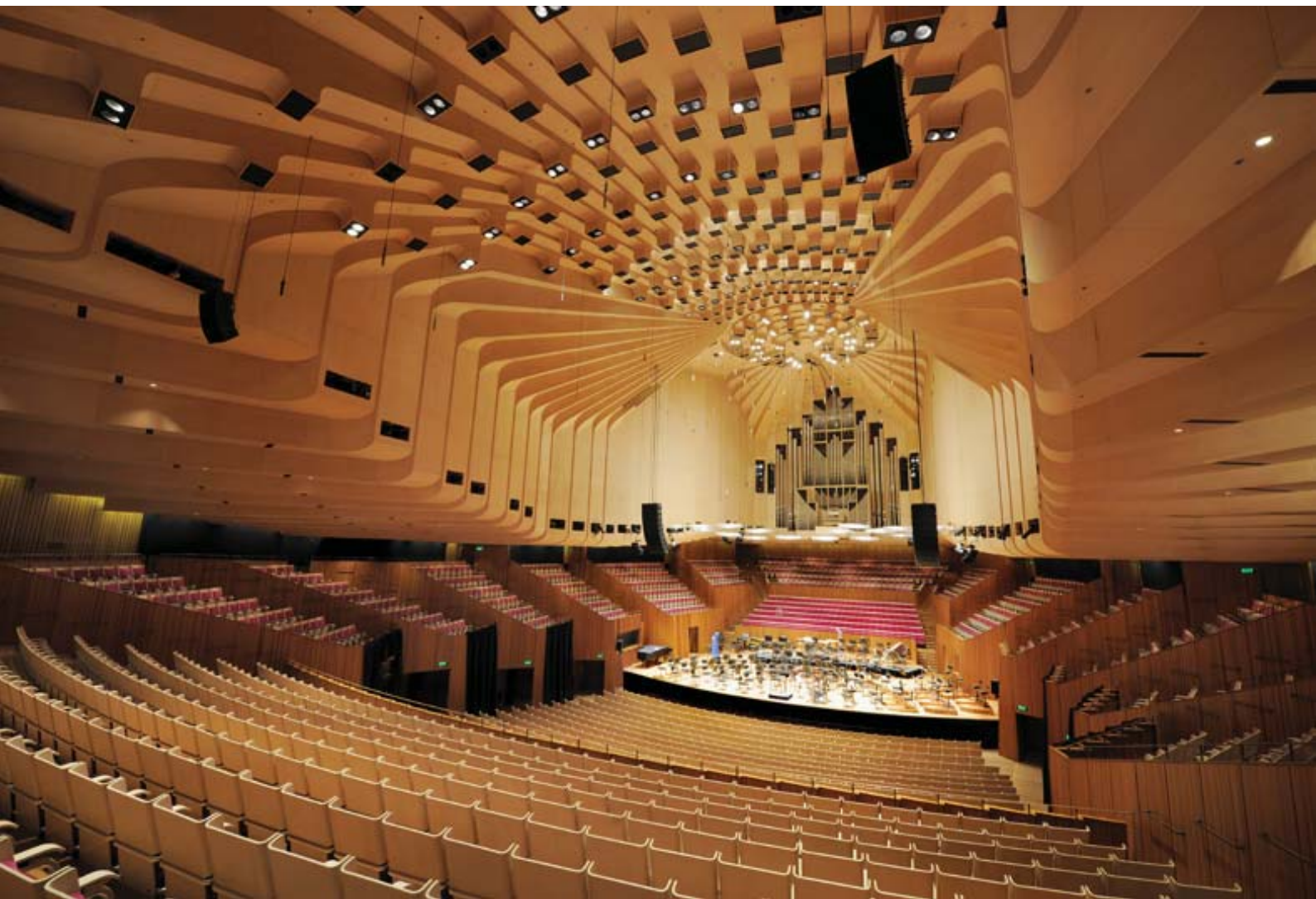
The Subwoofers are optional, depending on performance requirements. They provide full bass extension capable of most music types. They are comprised of one or two D&B Audiotechnik J Subs per side running in Hyper Cardioid configuration. These are either ground stacked at the sides of the stage, or under the stage when utilizing a single sub per side.

## **Front Fill**

The Front Fill is comprised of 8 individual D&B Audiotechnik E3 loudspeakers positioned equally along the downstage edge. They provide clarity to the front rows of seating by augmenting the Main Arrays.

## **Temporary Image Speakers**

The Temporary Image Speakers are comprised of a single D&B Audiotechnik J12 stacked on top of the D&B Audiotechnik J Subs, both sides of stage. These are used as required to add extra level and clarity to the front rows of seating. The Temporary Image Speakers are designed to provide a more powerful LR image for high power productions.



# Dolby Lake Controller

The Dolby Lake Controller software runs on a Sydney Opera House tablet PC to allow individual tuning of the Concert Hall system. This allows a flexible and 'on the fly' system tuning facility to engineers using the Concert Hall.

## Control Positions

### Front of House (FOH)

There is a Midas XL8 audio console installed at the FOH mix position at the rear of the stalls. There are 96 Midas preamps installed in the Concert Hall on stage level (there are 48 extra mobile microphone preamps available), the Midas DL431 Input Splitters have two individual preamps for each mic input, the FOH takes the A and Monitors take B. This allows individual preamp control from both FOH and Monitors. The Midas digital network transports the audio to the installed D&B Audiotechnik D12 amplifiers via the Dolby Lake Processors.

A Klark Teknik DN9696 hard drive recorder can be used for recording and playback during productions.

Sidecar console options are also available if required. Please discuss this with your Production Manager.

Our in house engineers are certified Midas (CMDU) operational compliant. Full [Midas XL8 specifications](#) are available online.

A total of 14 seats are removed from the auditorium (W22-27, X21-28 Stalls) to accommodate the FOH mix position, if required. Please inform your Production Manager as soon as you think this position will be required so the seats can be removed from sale. The console is stored on a sliding frame mounted directly behind the FOH mix position at the rear of the Stalls. Once the seats have been removed, the console is easily extracted from behind the wall at the push of a button.

### Monitor Console

There is a Midas Pro2 available to be used as the monitor console, this Midas Pro2 patches into the B inputs of the Midas DL431 microphone splitters giving both FOH and Monitor individual preamp control.

### Box U Control Position

There is an alternative sound operating position that is set up behind Box U in the Concert Hall if required. It does not require the removal of any seats. This position is only used for productions with minimal audio requirements with a small mixing desk. Standard consoles that can be used are a Yamaha O1V, Midas Pro1 or Midas Pro2c.



## **Additional Equipment**

The following equipment belongs to a house-wide inventory and can be allocated to your production, subject to the demands of the other theatres. Please discuss your needs with your Production Manager.

### **Mixing Consoles**

- Midas Pro2
- Midas Pro2c
- Midas Pro1
- Midas ProX
- Yamaha PM5D RH V2

### **Additional Outboard**

- Lexicon PCM 80
- DBX 160SL Stereo compressors
- DBX 1066 Stereo compressors
- Drawmer 501 Stereo gates
- Yamaha SPX990
- TC Electronics M5000
- TC Electronics M3000
- TC Electronics M2000
- TC Electronics D2
- Denon DNC 640 CD Players
- Summit MPC- 100A Tube Mic pre-amp/Compressor /Limiter

### **Stage Monitors**

- D&B Audiotechnik M4
- D&B Audiotechnik E15X SUB
- EAW SM200ih
- Martin WTM0.5

### **Radio Microphones.**

#### **Shure Axient Wireless System**

- Shure AXT 100 Belt packs
- Shure AXT 200 Handhelds with Neumann KK105 head
- DPA 4066 Head mic
- DPA D:Fine
- DPA D:Fine 66
- DPA 4061 Miniature Lapel mic

#### **Shure In-Ear-Monitors**

- Stereo PT10T Dual Wireless Transmitters
- Stereo channels hard-wired Shure PSM700 in-ear-monitors
- Shure SE425 Earpieces

## Microphone Selection

The Opera House has a wide range of microphones from brands such as Sennheiser, Shure, AKG, DPA, Beyer and Neumann. Please discuss your needs with your Production Manager.

## Additional Speakers

- D&B Audiotechnik Q10
- D&B Audiotechnik JSUB
- D&B Audiotechnik E12
- D&B Audiotechnik E8
- D&B Audiotechnik E6
- D&B Audiotechnik E15X SUB
- Meyer UPJ 1P
- Meyer UPA 1P
- Meyer UPM 1P
- Fostex 6301BX Powered Monitor

## Additional Playback

- MacBook Pro running Qlab
- SFX Laptop

## Other

- 240V to 110V drop down transformers



## Video Replay, Switching and Patching

The Sound & Audio Visual department has a range of playback options and switchers. Opera House vision equipment is shared between all theatres and its use in the Concert Hall is subject to availability. Please consult your Production Manager as early as possible in regard to booking this equipment.

### Switchers

- Barco Screen Pro II
- Folsom Image Pro HD
- Blackmagic Design ATEM 2 M/E Production Studio 4K

### Vision Playback

- MacBook Pro
- Doremi NUGGET Pro
- DVD – Pioneer DVD-V8000

## Projection

There are a number of options available for projector placement within the Concert Hall. There are provisions for front and rear projection. Please discuss these with your Production Manager. Please note that in order to facilitate projection, truss and a screen must be rigged and some seats may need to be pulled from sale.

### Projectors

- Barco HDX14

### Screens

- Stumpfl 7.3m x 4.1m (24ft x 13.5ft) 16:9 ratio fastfold - this frame comes standard with options of front, rear and perforated screens
- Stumpfl 6.1m x 3.4m (20ft x 11.3ft) 16:9 ratio fastfold - this frame comes standard with options of front and rear projection screens
- Stumpfl 2.4m x 1.8m (8ft x 6ft) 4:3 ratio fastfold - this frame comes standard with options of front and rear projection

## Video Monitors

There are long view and conductor view cameras installed for backstage video monitoring.

Samsung 75" and Samsung 55" display monitors can be supplied, or other equipment hired in as required, for presentations to the audience or monitoring back to the stage. Please discuss your needs with your Production Manager.

Our staff can also assist with hiring in additional equipment on your behalf, if required. Please discuss your requirements with your Production Manager in advance.



# Recording & Broadcast

---

Recording, broadcast or photography of an event may require a separate Recording Agreement to be made with the Opera House and may incur a recording fee. A Recording / Broadcast Allowance (RBA) may also be payable to technical staff working on the event. Please discuss recording plans as early as possible. Written permission must be sought before recording an event for any purpose.

## Commercial Audio Recording

A commercial recording can be made from the Concert Hall control room or in the Sydney Opera House Recording Studio via an advanced optical fibre based network. Multi-track digital recording is available on Pyramix Genex or Pro Tools.

The Recording Studio is located 2 levels below the Concert Hall and is equipped with a Euphonix System 5 Digital Console.

A Recording Agreement must be negotiated with the House and a recording fee is usually payable.

In addition, a Recording / Broadcast Allowance (RBA) is usually payable to technical crew working on the event.

Archival audio recording (where no part of the recording is to be used for commercial purposes) is available as a digital file.



## Video Recording

A 'Commercial Recording' is any recording made for the purpose of sale, broadcast, exhibition or any activity resulting in financial gain for the owner of the recording. A Recording Agreement must be negotiated with the House and a recording fee is usually payable. In addition a Recording / Broadcast Allowance (RBA) is usually payable to technical crew working on the event.

An 'Archival Recording' is a recording made for the sole purpose of documenting technical and performance aspects of a production. Archival Recordings are exclusively for the use of creative and management employees directly associated with a Company, Artist or the House. Archival Recordings are not intended to create a direct commercial benefit for the owner of the recording, and are not to be used for broadcast, exhibition, distribution or sale in any form. For all Archival Recordings, application should be made to the House for waiver of any recording fee or RBA payments.

The standard archival recording format is digital file via download or hard drive. Broadcast standard recordings can be arranged. Any special requirements should be discussed with your Production Manager.



*Sydney Opera House Recording Studio*

Photo: Geoff Ambler, courtesy of Scott Carver Architects

## Outside Broadcast

There are two outside broadcast interconnect points at the northern end of Central Passage: OB East and OB West. Vehicles up to 4.2m high and 8m long can normally be accommodated via the north door.

Both OB points are equipped with three 40A 3-phase Wilco outlets and six single-phase 10A GPOs, with a total available power supply of 100A across all outlets. Both OB points contain video, audio, and camera (triax) patch panels linking them to each other, to the Concert Hall and the Joan Sutherland Theatre, and further afield via the Central Control Room (CCR).

Outside links can also be arranged using Telstra's Digital Video Network (DVN) or the AARNet IP network. Presenters are encouraged to discuss their requirements with our Technical Support department before committing to an OB design.

Communications system integration between OB trucks and the Concert Hall stage intercoms and two-way radios is also possible. Please consult your Production Manager while scoping your broadcast.

## Signal Transport

A comprehensive optical fibre network interconnects all venues, the OB positions, and the Recording Studio. This allows broadcast-quality audio and video to be transported using Riedel MediorNet, network bridges from Klark Teknik, or the Stagetec Nexus network. The Opera House also broadcasts using video conferencing and web streaming equipment.

# Communications

---

## Stage Manager's Desk

A state-of-the-art Stagetec Stage Manager's Desk (SMD) is located in Prompt Corner (Stage Left). The desk is fully programmable, includes four broadcast-quality show relay screens, two integrated Riedel Artist communications panels and dynamically assignable tactile LED buttons.

The SMD controls audio and video relay to both front-of-house and back-of-house spaces, and can be used to broadcast live or pre-recorded announcements to backstage or foyer spaces. There is an automatic message stacking facility to prevent conflict with other venues when announcements are simultaneously sent from other theatres to common areas of the building, such as the Green Room. Features include dynamic allocation of paging, program audio relay, cue lights, and foyer bells. Front-of-house functions are generally managed by the theatre manager from a touch screen in the foyer, however these functions are also accessible at the SMD.

## Show Relay

### Show Relay Long View

A colour image of the Concert Hall stage is distributed to the SMD, lighting control, sound control, Green Room, some dressing rooms, and venue foyers. The Stage Manager has pan, tilt, and zoom control of the long view camera. A low-light camera is also permanently installed and sends vision to the SMD.

Longview and low-light feeds can be sent to most parts of the building by arrangement and can be sent to the Recording Studio for archival recordings.

### Show Relay Conductor View

An image of the conductor from a camera under the organ loft is distributed to the SMD and two screens in the TV booths at the back of the Stalls. The Stage Manager has pan, tilt, and zoom control of the conductor view camera.

Conductor view can be sent to most parts of the building by arrangement and can be sent to the Recording Studio for archival recordings. Please consult your Production Manager for details.

## Headset Communications

The Opera House provides a Riedel Artist wired intercom system that operates across all venues. Permanent talkback stations are available in lighting and sound control locations. Wired headset tie lines are installed at all regular operating positions. Additional headsets and desktop stations can be supplied. Please consult your Production Manager for details.

A Riedel Acrobat CC-120 wireless belt pack system operates in the Concert Hall. This integrates seamlessly with the Riedel Artist wired intercom system. 16 WB-2 wireless belt packs are reserved for the venue, with additional units available by arrangement with your Production Manager.



# Backstage Facilities

---

## Dressing Rooms

The Concert Hall includes use of the 11 associated dressing rooms, during the hours the venue is booked.

There are seven soloist's rooms, accommodating 2 to 4 artists each. These rooms include an ensuite bathroom with shower, toilet and locker facilities. Some rooms include a piano.

The Conductor's Suite (Dressing Room 72) is reserved for conductors, soloists or company management. This room has a lounge area with a baby-grand piano, a writing desk and a television with relay view of the stage. Dressing facilities include a dressing table, full-length mirror, wardrobe rack and an ensuite bathroom.

There are three larger rooms that are suitable for choirs or dance groups.

Lockers in the dressing rooms are fitted with a staple and hasp. In order to lock a locker, a performer or presenter should bring their own padlock/s. Lockers must be cleared at the conclusion of the hiring period, or at the end of each day where other hirers will be using the Concert Hall between your sessions. Your Stage Manager will inform you if this is required.

## Rehearsal Rooms

There is no rehearsal space dedicated to the Concert Hall. Rehearsal space is very limited across the Opera House. Requests should be discussed as early as possible to determine availability. No guarantee is given that any rehearsal space will be available.

## Wardrobe and Laundry Facilities

There is one washing machine and one dryer in the Concert Hall dressing room area. Irons and ironing boards, steamer and wardrobe racks are available from Stage Management upon request.

## Visiting Management Office

There is a Visiting Management office suitable for up to 4 people, located off the Orchestra Assembly Room one level below the Concert Hall stage.

## Wi-Fi

Complimentary Wi-Fi is available back-of-house in the Green Room and in some of the Concert Hall dressing rooms, and front-of-house in the Foyers and Lower Concourse. Log in as **SOH\_Guest**.

# Staff & Artists

---

## Sydney Opera House Staff

Our staff are covered by the Sydney Opera House Enterprise Agreement (2013), and remain under the direction of Sydney Opera House management at all times.

The Agreement is designed to ensure a safe working environment and staff wellbeing. For this reason, certain restrictions apply to hours of work, the allocation of specially qualified staff to specific tasks, minimum crew numbers on certain tasks, and mandatory rest breaks.

Sydney Opera House management reserves the right for our staff to access our venues at any time for any reasonable purpose.

In order to ensure safety, the correct operation of specialist equipment and/or the protection of the Opera House from damage, certain tasks may only be performed by Opera House staff using our equipment. The Account Manager and/or Production Manager assigned to your event will advise you of the staffing arrangements suitable to your event.

## Green Room

The Green Room is located one level below the Concert Hall stage, adjacent to the dressing rooms. Offering a Harbour view to the north, the Green Room includes a cafeteria, a licensed bar, complimentary Wi-Fi, a lounge area and a small games area with a pool table. The Green Room is common to all theatres in the Opera House and is for the exclusive use of artists, crew, staff and their guests. It is intended to be a private environment for performers and crew to rest, enjoy a meal, prepare and socialise before and after the performance.

Any visitors must be signed in at Stage Door and escorted to the Green Room by the host artist or staff member and remain with their host at all times. Access to the Green Room is not available to the general public or patrons. For the privacy of artists and staff, photography is not permitted in the area.

## Access and Other Conditions

- All Opera House staff, members of performing companies, other authorised personnel and all back-of-house visitors must enter or exit the building via the Stage Door, located on the ground floor level off the Vehicle Concourse, at the southern end of Central Passage
- Identification cards must be worn at all times, except by artists when on stage
- Access will only be granted to contractors and production staff after attending an Opera House safety induction



- All visitors must be signed in at the Stage Door, be issued with and wear a Visitor's pass and be accompanied by their host at all times. It is the responsibility of the host to escort the visitor to Stage Door when leaving and return the Visitor's pass
- Smoking is not permitted in any of the interior areas, or any of the designated exterior areas of the Opera House
- Smoking, matches, pyrotechnics and other naked flames are prohibited on stage unless written permission is granted – please discuss your production needs with your Account Manager
- Artists and management should keep their particular areas clean, tidy and secure
- Access for visiting staff and artists is restricted to only those areas connected to the hired venue, common back-of-house areas and public spaces
- The use of Central Passage and the Green Room is common to all theatres
- The Green Room is for the exclusive use of artists, presenters, Opera House management and staff and their visitors. Members of the public or media are not permitted to use these facilities.
- No food is to be prepared in dressing rooms, locker rooms or other back-of-house areas
- No crockery or eating utensils may be left in any area other than the Green Room
- No filming, recording or photography, is allowed on-site unless formal permission has been obtained from the Opera House
- Pets, including animals to appear on stage are not permitted in the building without special permission in accordance with the relevant regulations
- Artists, staff and management must comply with the regulations in the Sydney Opera House Trust By-Law (2010) made under the Sydney Opera House Trust Act 1961

"Performing at Sydney Opera House... it's like stepping into a postage stamp. It is naturally one of the great icons of the world. It is a beacon of confidence, and I have to pinch myself to think that it will happen. It is a great honour, I am very thrilled."

STEPHEN FRY

