THEATRE ROYAL
WHAKATŪ NELSON

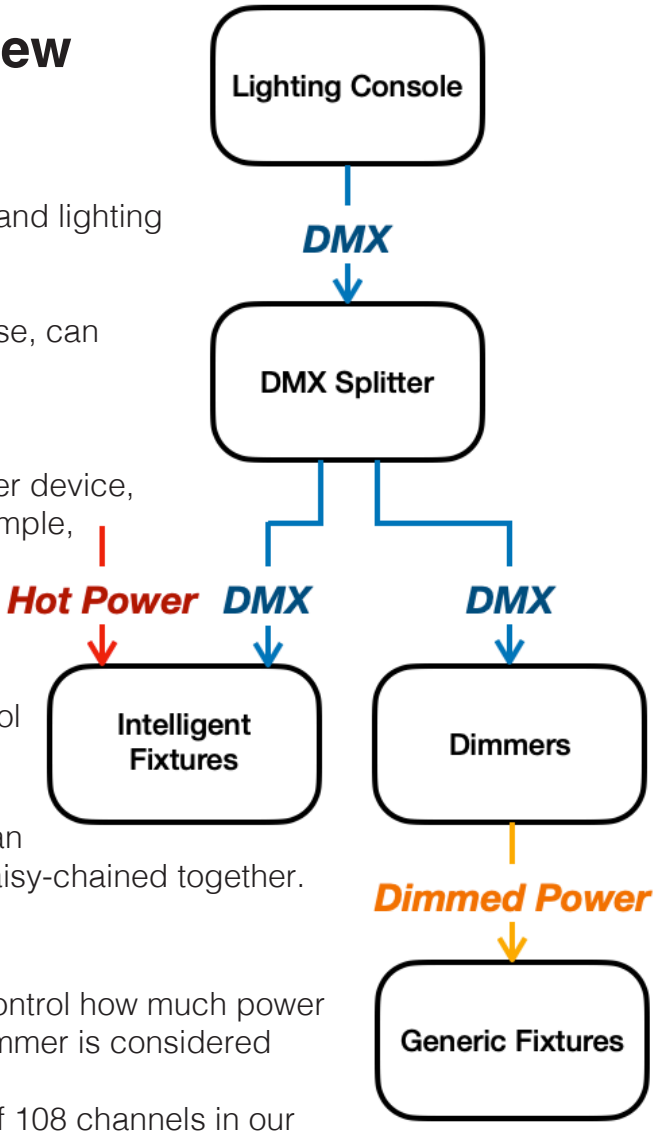
Theatre Royal Nelson
Technicians Handbook

www.theatreroyalnelson.co.nz

Version May 2020

VenueTech

Lighting Control : Basic Overview



DMX

DMX is the control of lighting systems.
Lighting desks generate a DMX signal, while dimmers and lighting equipment will listen to it.

A single run of DMX cable, also referred to as a Universe, can contain 512 addresses of control.
Each address can be at a value between 0 and 100%.

Basic devices like dimmers will use just one channel per device, while more advanced fixtures will use multiple. For example, our LED's use as few as 5 to operate their Red, Green, Blue and White and Intensity values.

Our Cue-Master lighting desk can control addresses 1-120 of a single universe, while our ETC Ion can control 2048 addresses, spread over 4 universes.

While only one console can be the source of DMX, it can be split for distribution, and multiple devices can be daisy-chained together.

Dimmers

Much like a household dimming circuit, our dimmers control how much power is being passed on to a generic lighting unit . Each dimmer is considered one circuit and has its own unique DMX address.
We have a total of 112 dimmers in-house, comprised of 108 channels in our dimmer rack and a further 12 externally.
To connect a dimmers a fixture, we use our patch panel and way-line systems.

Each dimming circuit supplies a maximum of 2400w, approximately 2 in-house lamps. Fluorescents or other electronic equipment will be damaged if powered by dimmers.

Way-lines

Way-lines are essentially extension cables built into the theatre to interconnect equipment.
Represented by the arrows above, way-lines are dedicated to Power, DMX and Data (Cat5e).
260 power, 14 DMX and 60 way-lines run from the Dimmer room to various locations around the theatre. Each way-line circuit is identifiable by a unique number.
When we rig lights, we plug them into the most convenient way-lines and note the number.

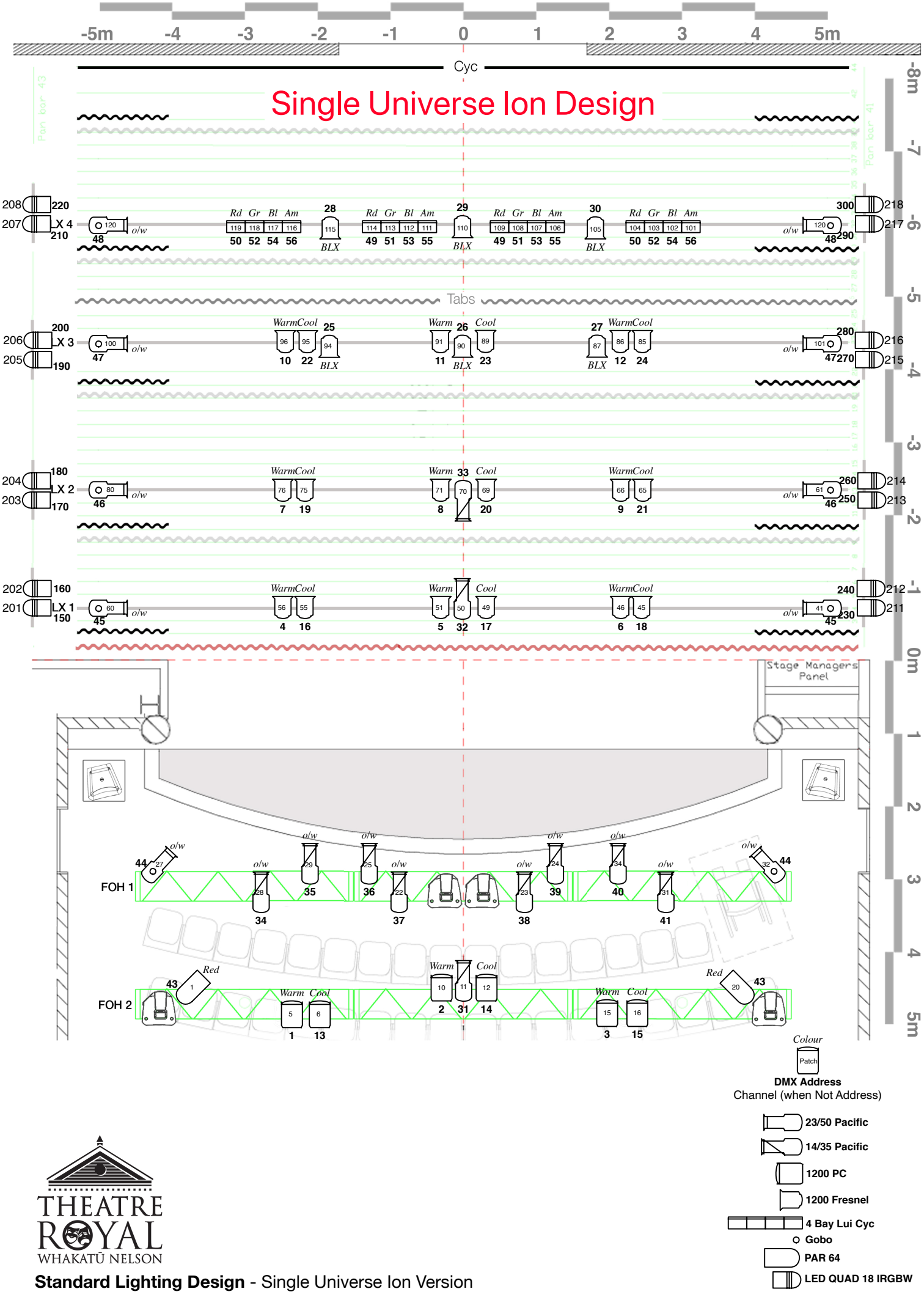
Patching Generics

Generics are tungsten lamps that require dimmed power only to operate.
Once we know which way-line a lamp is plugged into on the bar, and the dimmer we wish to control it with, we simply connect the dimmer and way-line together with an IEC patch cable.
e.g. If dimmer 1 is to control a light plugged into way-line 60, we patch dimmer 1 to way-line 60.

LED, effects and moving head fixture

These devices require standard power for their on-board electronics to operate, and a direct source of DMX for control. We can still use way-lines, but connect them to a hot-power outlet instead of a dimmer outlet

Single Universe Ion Design



Colour Patch

DMX Address
Channel (when Not Address)

- 23/50 Pacific
- 14/35 Pacific
- 1200 PC
- 1200 Fresnel
- 4 Bay Lui Cyc
- Gobo
- PAR 64
- LED QUAD 18 IRGBW

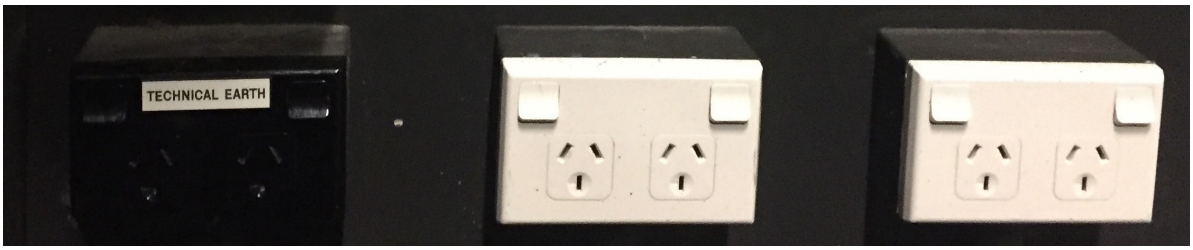
THEATRE ROYAL WHAKATŪ NELSON

Standard Lighting Design - Single Universe Ion Version

Building Outlets

These outlets are located throughout the building and provide a range of connectivity options.

Power



Black - Technical Earth (above, left)
Sound equipment is prone to a troublesome 50Hz earth-loop buzz. This is caused when more than one piece of sound equipment are interconnected by audio cabling, but are powered off differing electrical outlets with separate earths. The black 'Technical Earth' outlets are dedicated for sound equipment as they share a common earth, removing the possibility of an earth hum.

White - GPO's (above, right)
Standard 10A wall power such as in your home. General power outlets for most other devices.

3 Phase Power
32 Amp and 63 Amp varieties are used to power high consumption equipment such as dimmers or touring distribution racks. Dedicated technical earth 3 phase outlets also exist for sound.

32 Amp

62 Amp

Working Lights

These sockets are specifically for powering additional white or blue working lights if installed. They are controlled at the stage managers panel.

Comms

Our comms system is typically used by the production stage manager to call show cues to the various departments and crew members over headsets. Powered by a master station that is usually located at the operating position, additional headsets can be patched into any of the ports around the building in order to join the conversation. Holders are supplied for wall storage.

We have 2 lines for comms, line A and line B.
The A line is our main channel, and often the only one used.
Larger shows may require the use of a B channel for the sound department, follow-spot operators or anyone else who needs to communicate without interfering with critical show cues.

DMX

Fed by the DMX splitter when connected at the DMX patch panel, DMX controls lighting equipment. Read more about DMX in the lighting system overview section.

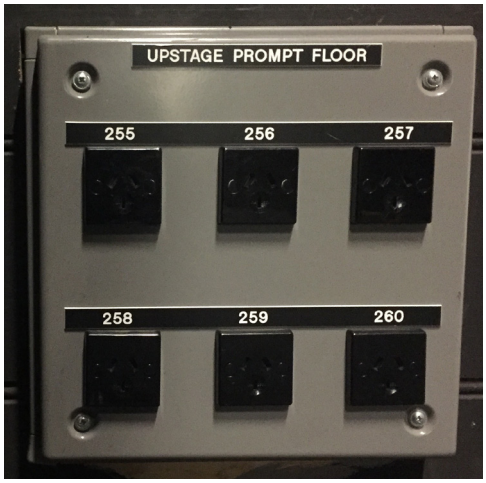
Data / Cat6

The data or Cat6 system in our building is utilised for multiple functions. It is the back-bone of our WIFI, phone, ticketing and printing servers. Backstage, we use these data lines for video (to projectors etc), digital sound snakes, DMX over Ethernet or any other network capable devices.

All of the ports are 'home-run', which means they lead back to a common location: a patch panel in the dimmer room. When we connect devices to two ports, we use a small patch lead to tie the two ports together in the patch bay, effectively joining the two together. This flexibility lets us run a signal between any two ports throughout the theatre.

Sound Snakes

3 sound snakes run from stage to the operating position.
Each offers 12 channels from stage and 4 channels to stage.
Snakes A and B are located downstage OP and C is in the port hole at the top of the dimmer room stairs. C is transferable to the orchestra pit if required.



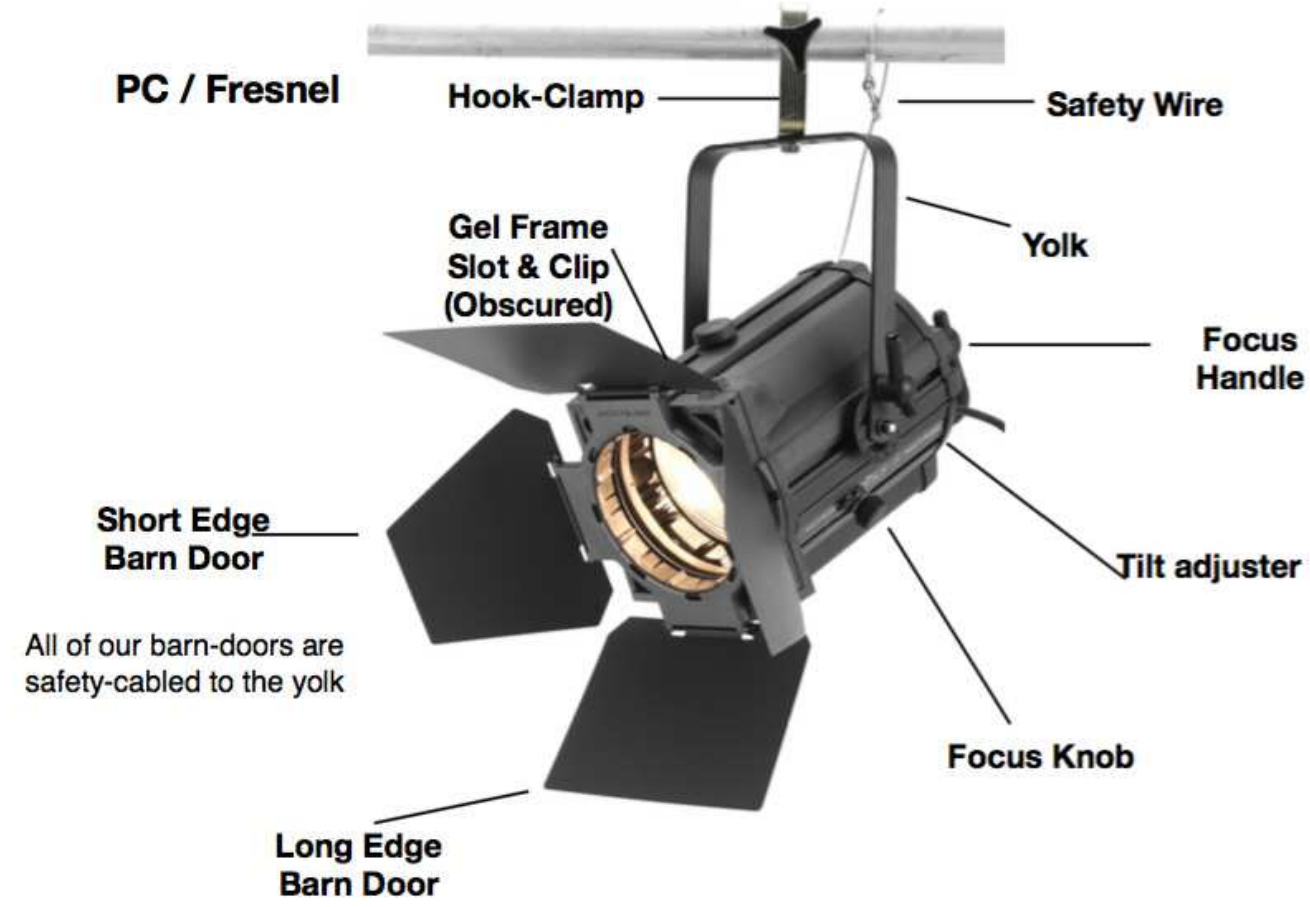
Lighting Way-lines

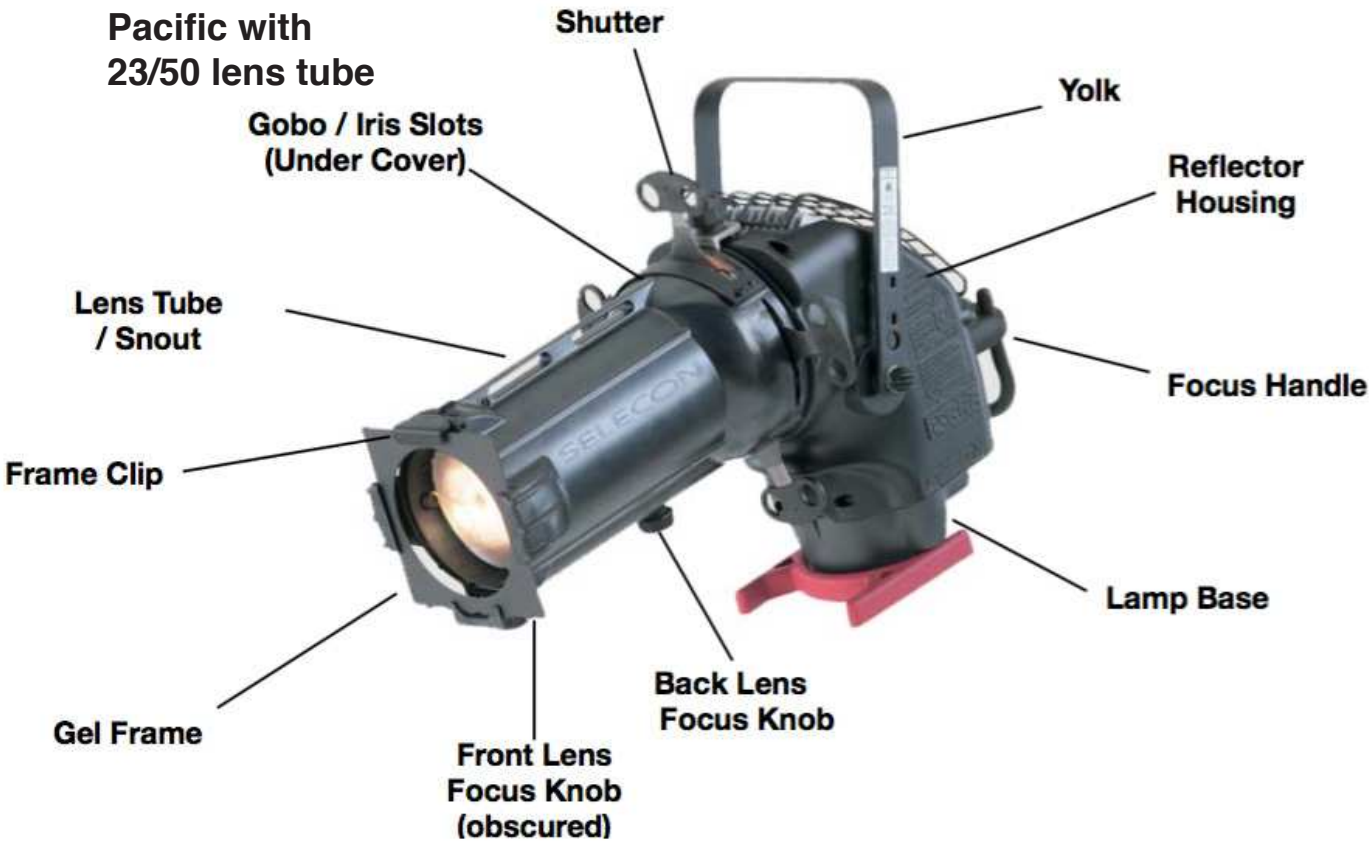
Way-lines are not a source of power. Rather, they are an installed extension that leads back to a patch bay in the dimmer room (much like the data system). There are nearly 260 way-lines located throughout the theatre, each with it's own unique number.

Most of our way-line outputs are standard 10A power sockets, except for 5x 'stage spot bar' positions located on the prompt gallery. Each position has 4 weiland sockets that contain 5 circuits each (20 per spot bar). Spot bar 1-4 correspond to the electric sets on LX 1-4 which have weiland connectors and are hard-wired with standard sockets for connecting lighting fixtures.

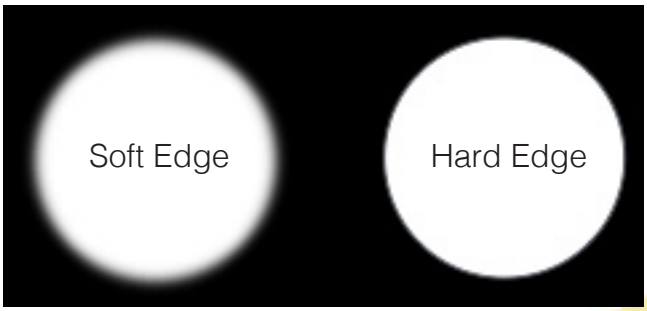
We use way-lines primarily for lights. When we rig a light, we can connect it to the nearest way-line, and then later in the process we patch it using the dimmer room patch bay.

Via the patch bay, we can choose to connect the fixture on the other end o to either a dimmer (if generic), or hot-power (if DMX intelligent).


PC / Fresnel
Hook-Clamp
Safety Wire
Gel Frame
Slot & Clip
(Obscured)
Yolk
Focus
Handle
Short Edge
Barn Door
All of our barn-doors are
safety-cabled to the yolk
Tilt adjuster
Focus Knob
Long Edge
Barn Door


Pacific with
23/50 lens tube
Shutter
Yolk
Gobo / Iris Slots
(Under Cover)
Reflector
Housing
Lens Tube
/ Snout
Focus Handle
Frame Clip
Lamp Base
Back Lens
Focus Knob
Gel Frame
Front Lens
Focus Knob
(obscured)

Focus Terms



Lighting Fixture Types

The Theatre Royal in-house fixtures can be loosely divided into 4 varieties

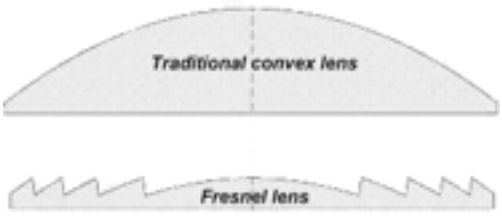
- Wash / General
- Spot / Special / Profile
- Cyc
- LED Par's

General / Wash Lights

Lamps that cover large areas with an even light.
Commonly used for front and backlight.

We hold Selecon brand Rama PC's & Fresnels.
On both of these units, a single focus knob slides the lamp back and forth within the fixture to determine the beam angle (area covered).
Although these two lamp types look almost identical, our PC's are actually slightly longer in body, but the the main difference is the lens type, which also affects their behavior.

PC (Plano Convex)
The traditional convex lens in a PC makes its beam more focused. While reducing flare, this makes the beam edge more noticeable. This lens type also might create a hot-spot or a dough-nut effect at certain stages in the focus.

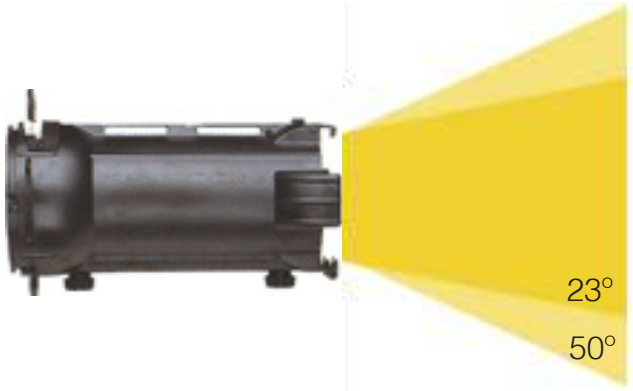


Fresnel
The concentrically sawtooth lens of a fresnel creates a less focused beam with even coverage at all beam angles. The beam edge naturally feathers off which helps to blend multiple lamps into a larger area of light.

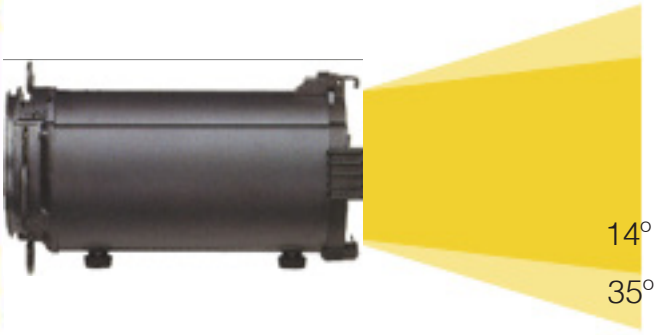
On both of these fixtures, barn-doors tidy up lens flare or can square off beam edges.

Spotlights / Profiles / Specials

We stock two versions of Selecon's Pacific which are zoom-spot style profile lighting fixtures. The back end of these fixtures are an interchangeable 1000w lamp base and reflector system which can accept the range of pacific lens tubes available. We stock 23/50 and 14/35 lens tubes. The numbers assigned to lens tubes, denote the minimum and maximum beam angles achievable.(i.e 23-50 degrees) You also have control of the sharpness / softness of the edge.



23/50 lens tube and beam angle range



14/35 lens tube and beam angles range

Cyc Lights

Designed to light cyclorama screens and add a colourful backdrop to a performance. A more technical approach is to use both flown and floor mounted units to create gradients that resemble sky-scapes.

We have four Selecon Hui units, each unit consists of four individual cells/circuits. These units live on LX4, positioned at the optimum distance from our cyclorama screen.

Par Cans

Par cans are a simple fixture of which we have 30 PAR64's. These are no longer included in the house rig, but are legacy items available for hire.

Each fixture can housing a variety of lamp types which determines the beam angle. That aside, there are no other ways in which to focus the light excluding pan and tilt. By default we have CP62 MFL (medium flood light) lamps installed, although we also have limited stock of CP61 (Super narrow).

LED 'Pars'

LED 'Pars' are a modern energy efficient, multi coloured alternative to traditional par cans. Available in various formats, typically tri, quad or hex - which denotes the qty of colour elements, these lights require standard 10A hot-power (not dimmed!) and DMX signal to control the multiple colour channels. Each unit is addressed individually and depending on the settings available, may use between 3 & 10 ch's to control the various functions.

Our house LED Pars are a QUAD18's. QUAD 18 denotes 4 colours are possible with the 18 LED engines. These colours are Red, Green, Blue & White, although other controls are available to manipulate intensity, Strobe and other macro functions.

Fit-up Roles and Responsibilities

The process of fitting up for a show can be complex and there are always hazards to negotiate. In order to create a safe and efficient environment, each crew member must understand their role and place within the team.

Lighting Crew Overview

LX HOD
Ultimately responsible for delivering the design to the production company, the venue lighting systems and managing / maintaining the crews standard of work; ensuring they meet building and industry safe working practices.

LX Crew
Responsible for handling the lighting fixtures and maintaining a safe working environment.

Fly-Tower Manager
Either a member of Theatre Royal technical staff or professional.
Responsible for all crew working around the fly rigging system, maintaining a safe working environment and managing changes made to the fly rigging system.

Fly-Operators
Duly trained and certified member of crew.
Responsible for loading cradle weights on request by the fly tower manager or operating balanced lines.

Under health and safety legislation, ALL persons working in the theatre hold responsibility for maintaining a safe working environment. This includes volunteers operating at ANY capacity.

If you see something that you believe is unsafe, you have a responsibility to acknowledge, report, isolate or reduce the risk. You become more liable when ignoring hazardous situations!

Resetting Lighting Fixtures

This is the process undertaken when preparing to remove already rigged lights.

- Unplug the fixture and coil the cable, set the coil into the focus handle
- Return the pan to centre, and tilt to straight down to zero degrees
- Close the shutters / barn doors
- Set the focus to full-spot
- Remove the gel frame and re-secure close the gel frame retention clip
- Remove any accessories i.e Gobo or Iris.
- Remove the safety cable, fix it back loosely to itself
- Loosen the hook clamp enough to lift the lamp off the bar
- Do not remove weight from the bar until instructed.

Adjusting an existing rig

The way in which the lighting crew approach the rigging process will depend on the state of the lighting system upon arrival. It will be one of the following:

Strip and re-rig

This gives you a clean slate to work from and is the best option when what your given, looks nothing like what you want.

- Reset lamps on the bar and have their safeties and hook clamps loosened.
- The fly-tower manager will instruct the loader to remove the relevant weight, and the LX crew to remove lamps until each bar is empty.
- Lay out lights on the floor below each bar with placement as indicated in the design.
- The fly-tower manager will call for the fixtures to rough hung on the bar, and then weights on the cradle added to achieve a balance.
- The bar can then be raised to a comfortable working height while lamps are secured and patched etc.

Option B: Shuffle & Substitute

This is the best option when the rig is there or thereabouts.
Circumstantially, this option can be quicker in appearance than fact.

- Shuffle fixtures on the same bar to match their intended positions in the design.
- Swap-out fixtures for those required while maintaining the same weight on the bar.
- Make one final adjustment of weight and fixtures.

Clear Communication

Clear communication between crew working with the fly rigging system is critical its safe operation. Particularly at times of loading this will require a quiet working environment

Loading Example

What follows is an example of a safe and well-communicated work flow when making weight changes to a line-set. Every instruction should be responded to with a repeat of instruction to confirm the message was received correctly

Fly Manager	>>	Loader	“ 3x 15’s (kg) onto line-set 14”
Loader	>>	Fly Manager	“ Three 15’s onto line 14”
Fly Manager	>>	Loader	“Yes Please”
Loader	>>	ALL	“Loading on line set 14!”
Loading Occurs	3x clunks are audible		
Loader	>>	Fly Manager	“3x 15’s are on 14”
Fly Manager	>>	Loader	“Thank-you, I’ll float that”
Checks Balance			
Fly Manager	>>	Loader	“That’s good, Thank-you”

Rigging Lighting Fixtures

When rigging lamps, care must be taken to ensure that every fixture receives full attention. Ensuring devices are safe, handled and rigged correctly and will be easy to focus are paramount.

Never alter the weight of a fly batten unless instructed by the fly-tower manager.

Step 1 Lamp Preparation

- Confirm the presence of a current electrical test tag, confirming general safety as handling.
- Ensure the Hook clamp is secured onto the yolk of the lamp.
  It should have enough play that it can be adjustable for focus, but not loose or wobbling.
- Ensure the tilt adjuster is secure so the lamp wont swing as you handle it.
- Remove the gel frame.
- Understand which direction the lamp will be pointed.
- Position the lamp on the floor with the top of the unit is facing the planned direction.

Step 2 Hang The Lamp

- When instructed, hang fixtures by their hook clamps with the tri-nut facing upstage.
  It is acceptable to rough hang lamps in order to achieve balance of the fly system before tightening clamps. Clamps should be secure but not over-tight.
- The lamps should not be able to wiggle or rotate on the pipe.

Step 3 Safety-wire

- Wrap the safety wire over the bar and secure the carabiner back to its wire.
- The wire must not run over cables or around the hook clamp. Just the pipe, and only once.

Step 4 Patch

- Patch the fixture into the closest available way-line socket.
- Always leave enough cable slack for pan and tilt adjustments during focus.
- For flown bars, thread the power cable over one of the pipes to to hold excess cable
- Never wrap cables around (and around and around) bars
- For truss/scaffold mounted lights, run the cable a top the bars to the nearest patch point.
- Secure any excess cable on the lamps focus handle.
- Use electrical tape only, preferably grey. Never use use duct tape or cable ties.
- Use the ‘event wrap’ technique, and leave a courtesy tab.

Step 5 Prepare for Focus

- Tilt / pan the lamp in the direction noted in the plan and confirm sufficient cable slack.
- Ensure the Lamp is not upside down! The gel frame should insert from the top.
- Fresnels / PC’s : Set focus to full-spot (knob to rear), open the barn-doors.
- Pacific’s : Set focus to full spot (one forward one back), open shutters
- Par Can : Set ceramics to a uniform vertical or horizontal position.

Step 6 Gel

- Frame up the correct gel and insert into each lamp ensuring they are properly secured.

Step 7 Safety Check

- Once all the lamps on a rigging system are done, double check all of the above again before lifting to height.
- It may be necessary to go along the bar with tools to re-tension the yolk bolts.

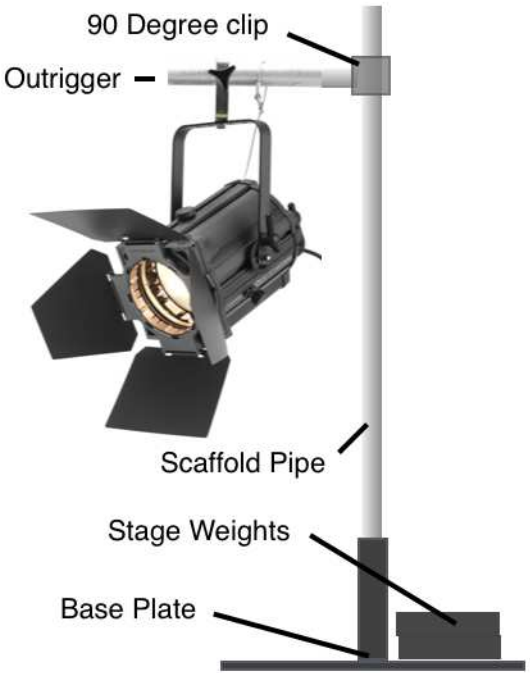
Step 8 Note the patch

- On a master document, note the way-line into which each lamp is connected for patching.

Floor Based Rigging

Turtles

A turtle is a small flat floor-stand that is attached to the yolk of the fixture replacing the hook clamp. Shifting the yolk below the lamp body allows it to sit on the floor.
Turtles and hook clamps require different hardware (nuts bolts and washers). Always keep the correct hardware with its relative rigging method.



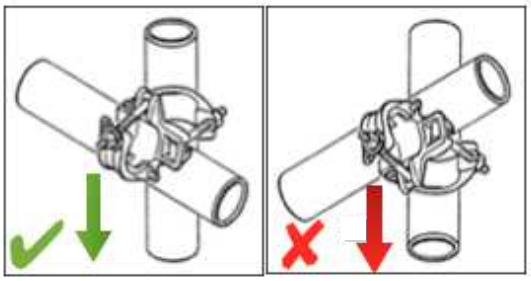
Boom-poles

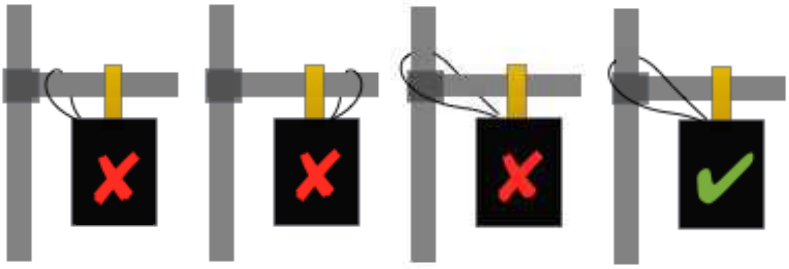
Boom poles allow for additional lamp rigging positions, where permanent ones don't exist.
A long piece of scaffold is fitted vertically into a base-plate and 90 degree clips with shorts (outriggers) provide a horizontal to allow fixtures to be hung.

Simple pipe structures such as illustrated here can be built with basic scaffold experience. More complex structures may require venue-support or a certified scaffold rigger.

Scaffold Pipe / Boom Pole Basics

- All pipe and clamps must be secure and tightened (but not overtightened!) by tools.
- There is a right and wrong way up for 90degree clamps - illustrated below.
- Sufficient stage weights must be applied to ensure the loaded structure remains firm, even with external forces (i.e a physical push) applied.
- All ground rigged objects (Boom poles / turtles etc) which are in the path of backstage cast or crew must be safety flagged with white tape for visibility.
- Cables running to lamps across walk-ways must be taped down, and flagged.
- Safety chains are only required on outriggers when the object is overhead or at height.





Left: Correct & Incorrect orientation of a scaffold clip.
Right: Correct placement of a safety chain on boom pole.
Below: Boom-pole and base plate dance rig for touring Black Grace

In-House Lighting Fixtures & Equipment List

Lamp-stock:

24x Selecon RAMA Fresnel 1200 with B/Doors
6x Selecon RAMA PC 1200 with B/Doors
12x Selecon Pacific 14/35
13x Selecon Pacific 23/50
30x Par 64 Can (CP62 lamp)
16x LED QUAD18 (IRGBW)
4x 4 Way Selecon Hui 1000W Cyc Units
2x Mini Fresnel 650W
12x A sized Gobo Holder
10x B sized gobo holder
10x Iris for Pacific

Control Equipment

1x 120 Channel Theatrelight Cuemaster Control Desk
1x ETC IonXe20. 2048 Channels, Dual touch screens.

108x 2.4KW Dimmers DMX (Theatrelight PID II)
1x Theatrelight 12channel Dimmer packs
260x Way-lines to stage, gallery, fly floor and auditorium
1x IEC Based patch bay

DMX

Saturated DMX - All outlets are patched to a common universe by default.
2x 10ch Primary DMX splitter w/ way-lines to stage, galleries and auditorium.
1x 8ch Secondary DMX splitter feeding LX Bars and PS Ladders
1x 4ch Secondary DMX splitter feeding OP Ladders

DMX runs to all overhead LX bars and ladder positions in both 3 & 5 pin.

House Lights

Independent system controlled at the SM panel and operating position.

Standard Configuration

Our standard lighting configuration provides:

- Full stage warm and cool front light
- Full stage back-light
- Full Stage Break-up Gobo
- Red and Blue Front Colour
- LED RGBW Sidelight
- 8x Spotlight specials
- 4 Colour Cyc wash

For full and current technical specifications, please visit our website:
www.theatreroyalnelson.co.nz/docs

Sound System

The Theatre Royal sound system provides excellent coverage throughout the auditorium to 110dBa and is suitable for theatre, musical theatre, dance playback and concert applications.

System Specifications

- 2x QSC HPR 135i
- 2x Peavey Q118 subs w/ Samson SX3200 amplifier
- 4x QSC K12 - 2 way active Speakers
- 2x EAW VR-62 front fill speakers w/ QSC USA450 amplifier 1x DBX Drive-rack Venu 360
- 1x Allen & Heath ZED16 - 8Mic Pre, 4 Stereo in mixer
- 3x 12/4 XLR Snakes to stage
- 10x XLR returns to amp rack
- 2x Stage fill JBL M825 speakers w/ Phonic amp
- 1x TASCAM CD-1U CD player
- 1x SM58 microphones and stand

2x HPR 3way speakers are stacked on riser boxes above an 18" sub on the auditorium floor either side of the proscenium arch. These form the basis of the PA providing full range coverage to the auditorium.

2x EAW fill speakers are stand mounted in front of the stage and below the edge which provide high frequency fill to the first few rows of the stalls. 2x K12s are flown on the FOH 2 truss to provide high frequency fill to the balcony.

2x Additional K12's are flown in the centre of FOH 1 truss. Oriented 1 flat, 1 tilted, these offer a separate centre system for vocal mics in musical theatre applications or sound designs.

The system is tuned via a Drive-rack Venu360. The HPR and K12 speakers are run in stereo pairs on channels 1+2 and 3+4 respectively. Subs and front fill are mono on channels 5 and 6.
Drive-rack settings are locked, on request we can create a duplicate profile for you to tune.
The central input is mostly routed direct to the 2x K12's, with some being routed to the front fill speakers courtesy of the centre channel of the DriveRack.

Sound Engineering

Sound Engineering is too complex to cover in this document.
In any case where a quality result is sought, we highly recommend engaging a professional.
However for shows with simple requirements, maintaining an overall volume that is pleasant, words or lyrics that are intelligible, and an overall balance that reflects the emphasis of the piece are the primary goals.
Music playback may be quite loud for dance, less so as accompaniment of a singer, and even less when providing an emotive backdrop to an un-amplified theatrical scene.

Playback Management

Computer based sound playback software offers superior flexibility like retaining volume settings, timed fades, auto follows, triggering multiple effects at once and creating complex sequences which can fire off a single cue - and without the risk of skipping!

'QLAB' (for mac only) is the industry leader and is available as a limited stereo output version.
'Go Button' is good iPad app for firing simple sound cues.

Theatre Royal Nelson - Standard House Hanging Plot

Setting line is upstage edge of proscenium arch.
Heights are house standard trims to the underside of the flown object.

Line	mm to setine	Item	Trim Height	Weight	Notes
1	100	House Curtain	4.3m	Bat + 60kg	Red Velvet, overlapped split, 5.5m Drop
2	280	Black Legs #1	6m	Bat + 5kg	
3	460				
4	640	**LX 1**	5.3m	Bat + 125 kg	20 Pre-Wired Circuits
5	820				
6	1000				
7	1180				
8	1360				
9	1540	Black Border # 1	4.5m	Bat + 5kg	6m Drop
10	1720	Black Legs # 2	6m	Bat + 15kg	3m Drop
11	1900				
12	2080				
13	2260	**LX 2**	5.3m	Bat + 125 kg	20 Pre-Wired Circuits
14	2440				
15	2620				
16	2800				
17	2980				
18	3160				
19	3340				
20	3520	Black Border # 2	4.6m	Bat + 5kg	6m Drop
21	3700	Black Legs # 3	6m	Bat + 15kg	3m Drop
22	3880				
- STRUCTURAL BEAM -					
23	4290	**LX 3**	5.3m	Bat + 140 kg	20 Pre-Wired Circuits
24	4470				
25	4650				
26	4830	Tab Rail		Rail 45, Tabs 30	Tabs 6m Drop, rail centre opening
27	5010				
28	5190				
29	5370	Black Border # 3	4.7m	Bat + 5kg	6m Drop
30	5550	Black Legs # 4	6m	Bat + 15kg	3m Drop
31	5730				
32	5910	**LX 4**	5.5	Bat + 160 kg	20 Pre-Wired Circuits
33	6090				
34	6270				
35	6450				
36	6630				
37	6810				
38	6990				
39	7170	Black Border # 4	5m	Bat + 5kg	6m Drop
40	7350	Black Legs # 5	6m	Bat + 20kg	3m Drop
OP pan		3 x LX Ladders		Bat + 80kg	Ladders in wing bays 1, 2 & 3
42	7710	Cinema Screen	5m	Bat + 40kg	5.2m High, White, Front Proj (90%Gain)
PS pan		3 x LX Ladders PS		Bat + 80kg	Ladders in wing bays 1, 2 & 3
44	8070	Cyc	5.5 m	Bat + 55kg	5.5m High, Black Fr/Rr Proj (50% Gain)

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