

**NRM WONDERLAB
RIBA STAGE 3 : DESIGN GUIDE**

30th March 2021

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Introduction

This Design Guide summarises the Concept Design proposals for the new Wonderlab gallery at the National Railway Museum.

We have worked through various iterations and approaches to delivering the brief collaboratively with the client team over Stage 2, taking inspiration from the existing features of the iconic engineering workshop and to deliver an aesthetic that is both authentic and rooted in the history of the site, welcoming, inspiring and sophisticated to create a space offering a unique and hands-on opportunity to discover, create and test exciting engineering principles.

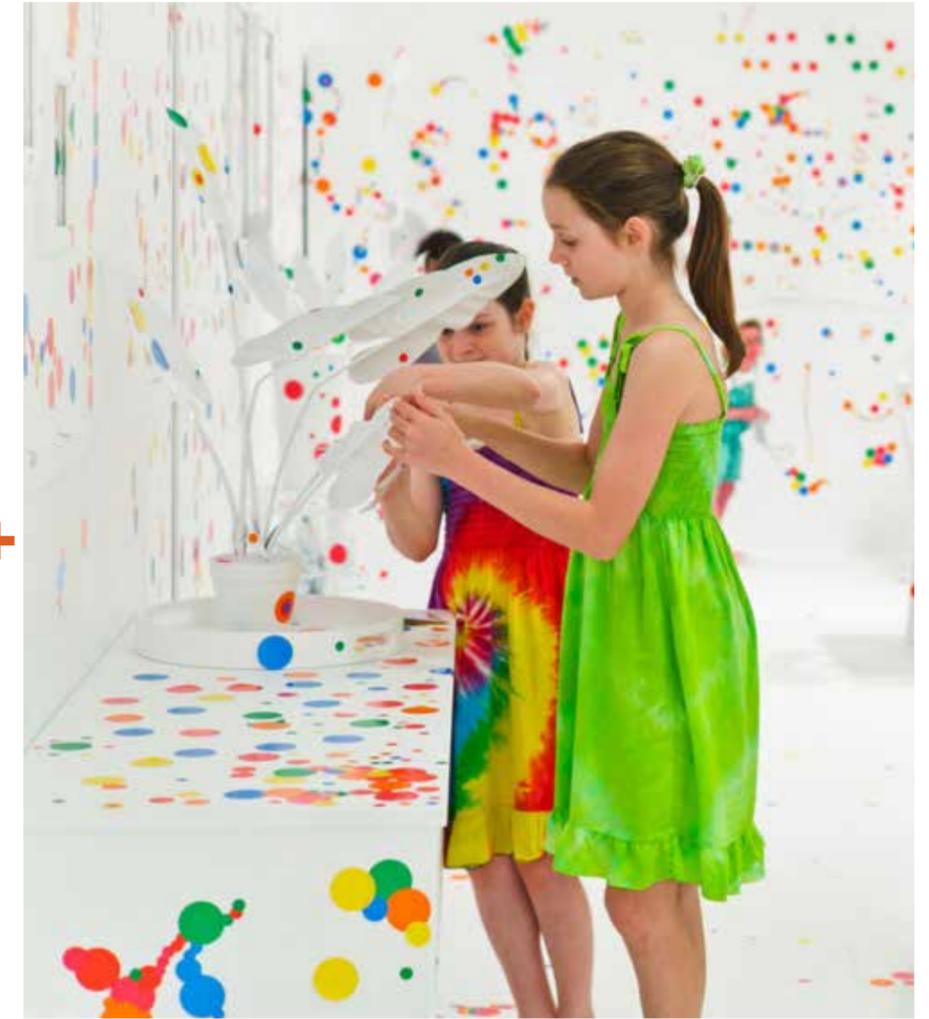
Exhibit design should develop within the design concept for Wonderlab:

‘A new engineering adventure playground’

Exhibits should feel welcoming, accessible and have a playful quality to foster curiosity and interaction, but not be childlike. Where appropriate exhibits should feel as though assembled from engineering parts and fragments found in the workshop and capable of being produced in this iconic railway workshop.



DMR Design Concept



Railway engineering workshop

- Value heritage / character of the iconic workshop
- Celebrate primary infrastructure - wheel-drop / track pits / cranes.
- Reveal existing textural material qualities
- Retain robust / raw / gritty quality
- Re-imagine railway engineering fragments / workshop equipment

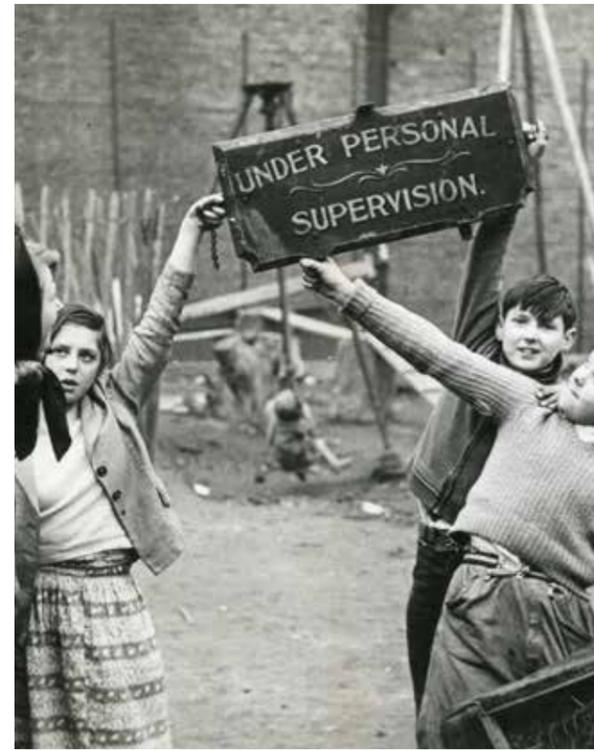
Apple store

- Modern / future facing elegant / sophisticated improvements and additions
- Juxtapose against existing to enhance and focus place-making
- Illustrate innovative / imaginative engineering principles / technology / fabrication
- Deliver a sustainable present and future

Yayoi Kusama - Make your mark

- Transform a repair workshop to a discovery workshop for *sparking, making and testing*
- Foster a creative engineering mindset in a safe yet stimulating environment.
- Be thought provoking
- Be bold and experimental

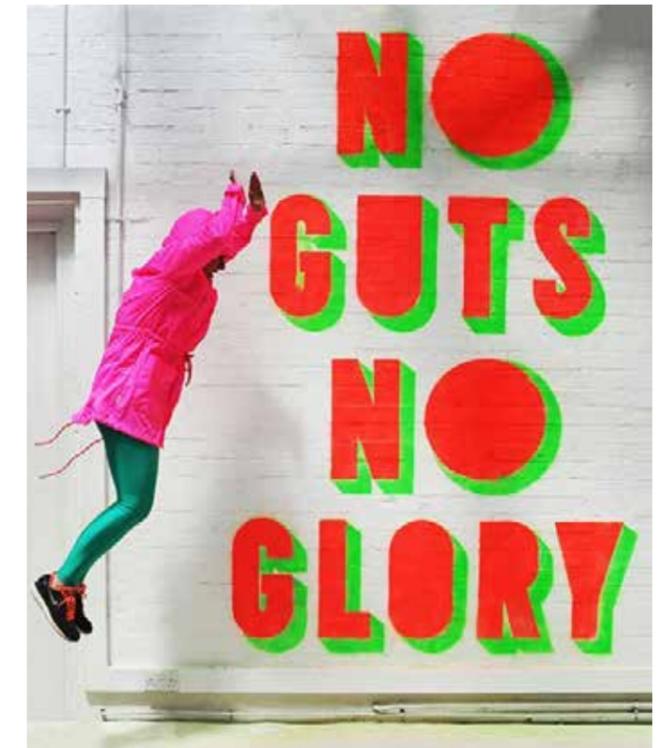
A new Engineering 'Adventure Playground' to inspire an inquisitive Engineering Mindset



DMR's design celebrates the iconic railway workshop as an adventure landscape, communicating engineering phenomena and inspiring creative confidence in a safe yet stimulating and thought-provoking environment.

Within the authentic and raw repair workshop interior, a new sustainable landscape of 'as found' and re-imagined 'railway engineering' fragments and 'workshop equipment' delivers an engineering playground in which young people can play, create and shape, dream and imagine. Encouraging an engineering mindset in an adventurous environment to inspire our future explorers, engineers and creative thinkers.

Making your mark: Thermal Imaging Wall, Conductive wall



Testing and Making: Play revolution, kapla, arch bridge

Viewing your world from a different perspective: The pulleys, the big machine

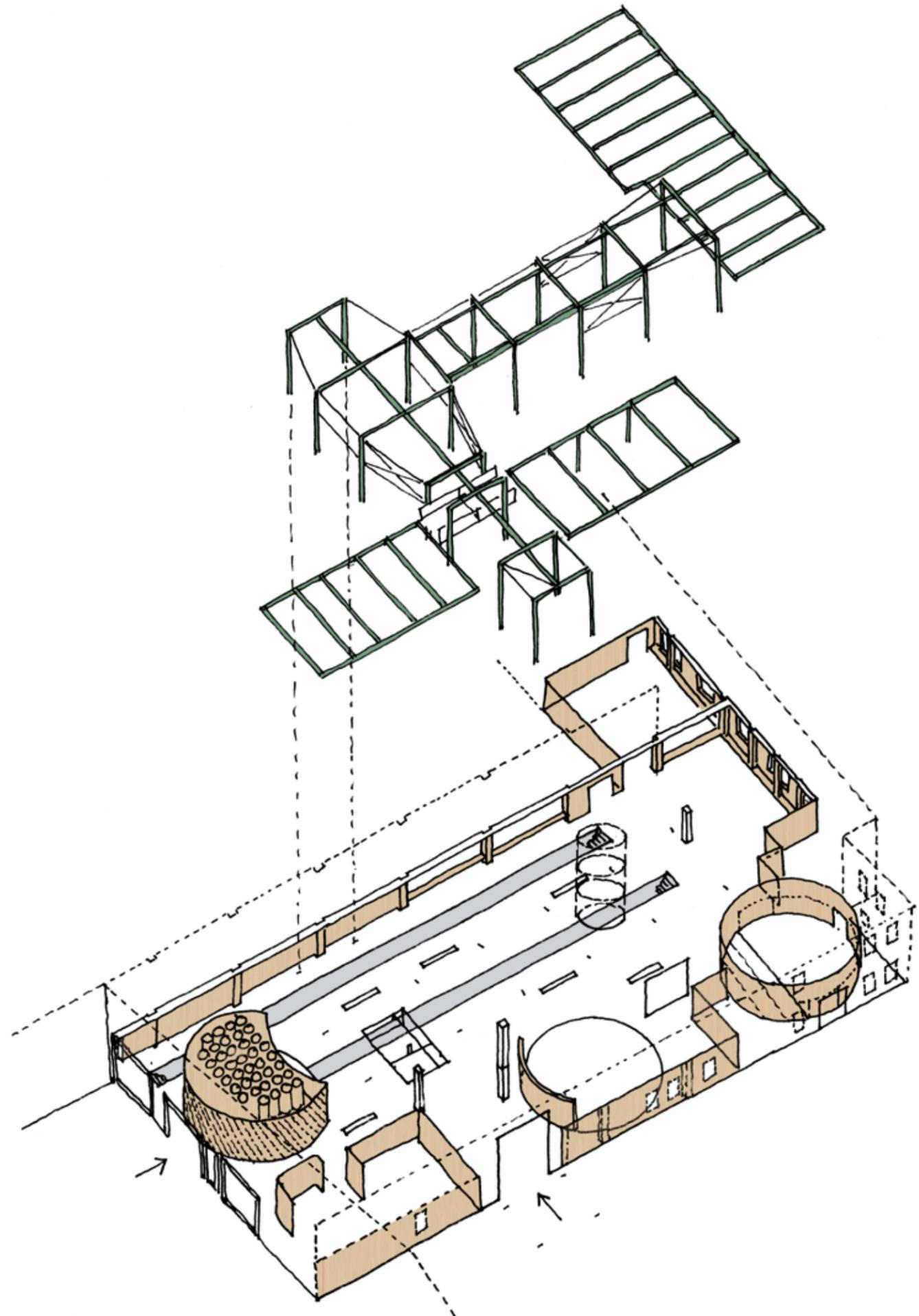
Make a Loco, Build a Bridge

A new Engineering Playground occupies the raw existing Workshop, retaining and elevating the existing material/textural qualities which are emphasized and refined by a new perimeter timber wall lining, holding a family of 3 engineered timber enclosures defining 3 core zones inspired by railway engineering.

As Wonderlab is located at the heart of the National Railway Museum site, it is important to understand and abstractly convey its radical past and evolution as a crucial railway hub. As well as the globally significant collection housed within the Museum, the grouping of railway buildings making up the NRM site are significant railway artefacts in their own right. The iconic Engineering workshop within which the gallery is located is not listed though it's functional and authentic nature will be carefully elevated and integrated within the scheme.

In latter years the Museum has grown and developed in a more piecemeal manner and the aim of the vision 2025 is to integrate these into a coherent and fluid whole. The gallery's adjacencies to the Great Hall, the Open Store and newly proposed Central Hall are important and should be maximised to offer exciting views and visual and thematic connections with other parts of the Museum.

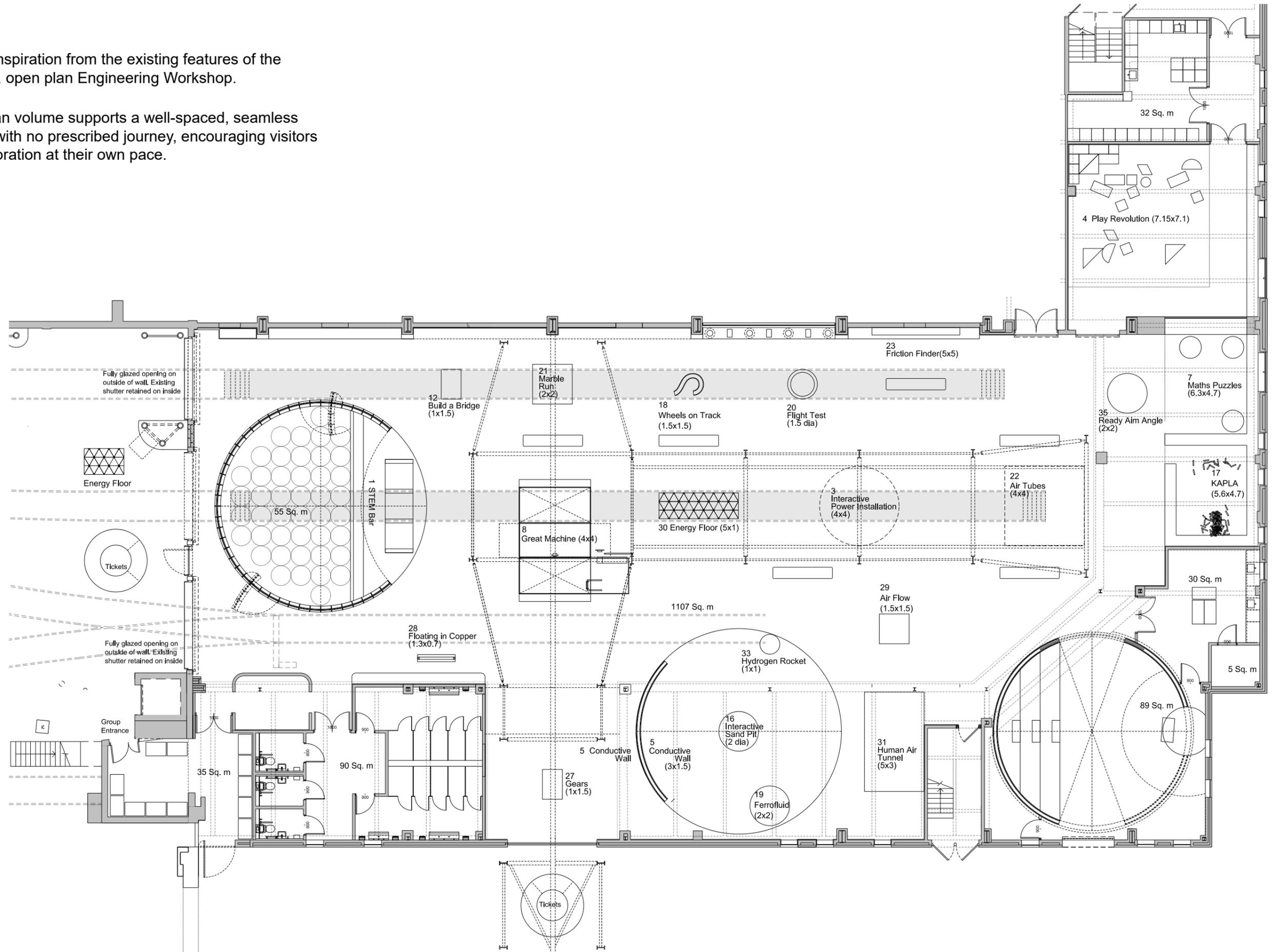
Where possible, we aim to retain the patina and texture of the existing workshop and its primary structures built up through decades of use and to reveal and celebrate these.



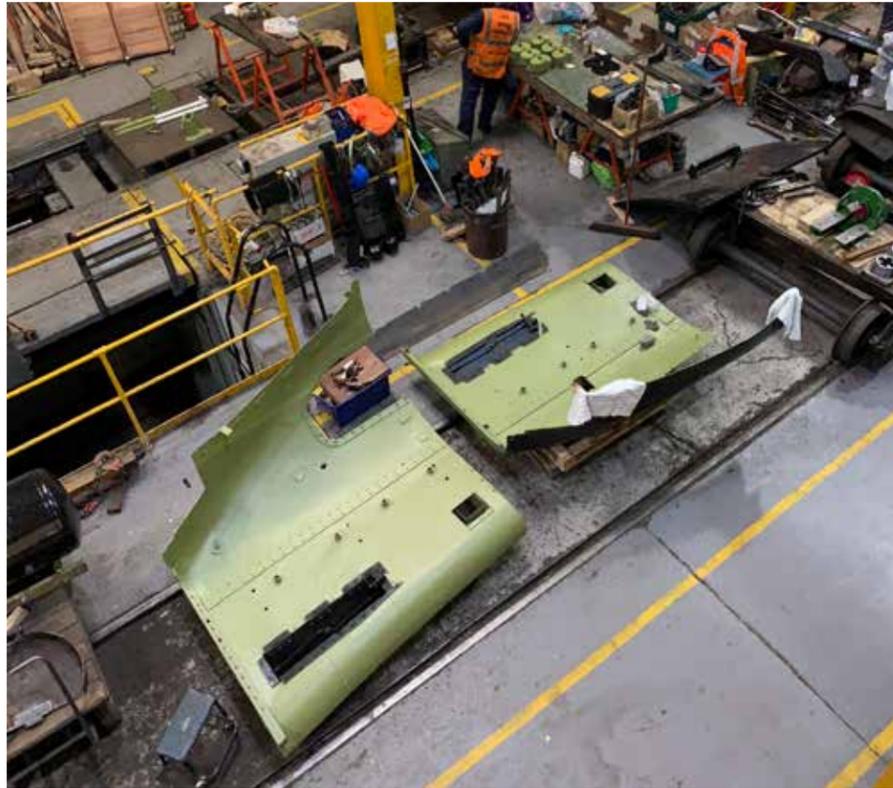
Proposed Layout of the new Engineering Playground

The gallery takes inspiration from the existing features of the current large scale, open plan Engineering Workshop.

This large open plan volume supports a well-spaced, seamless visitor experience with no prescribed journey, encouraging visitors in self-guided exploration at their own pace.



The existing workshop space is occupied with large railway engineering fragments which we value



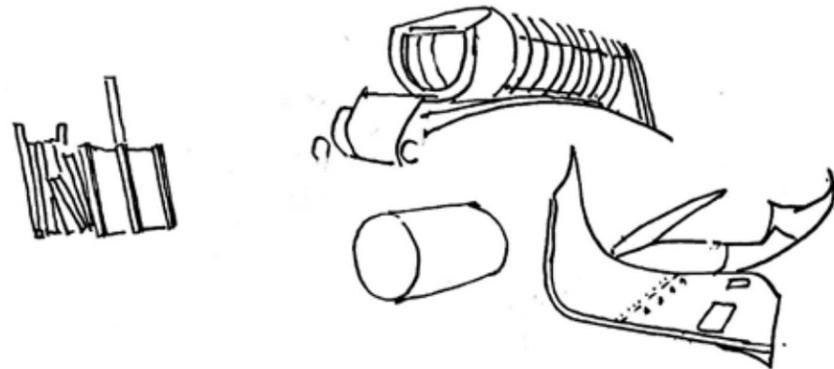
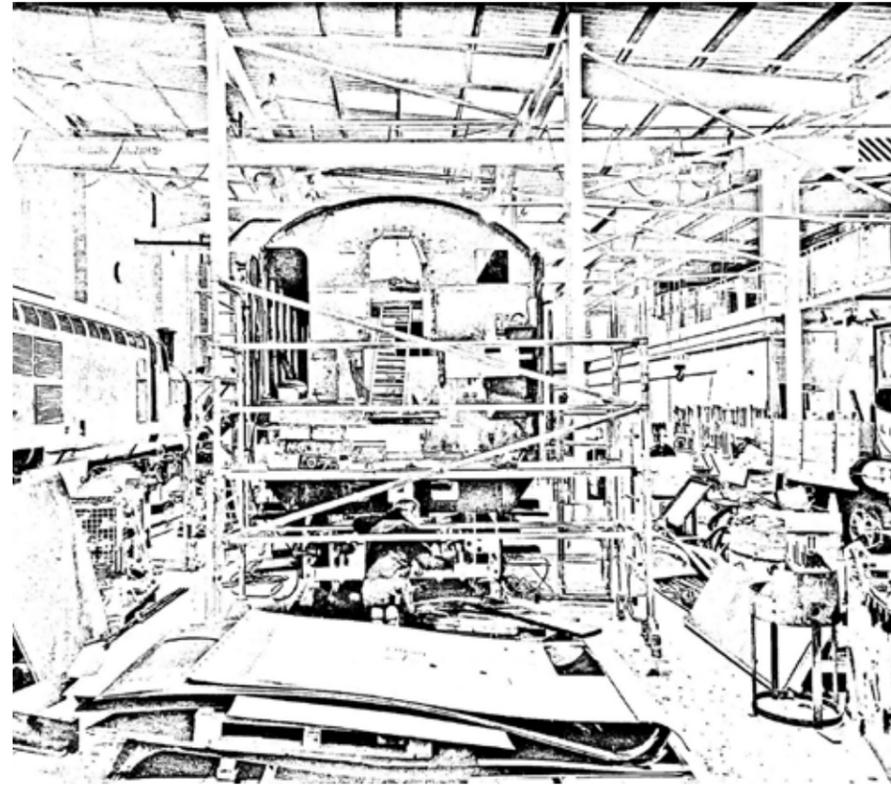
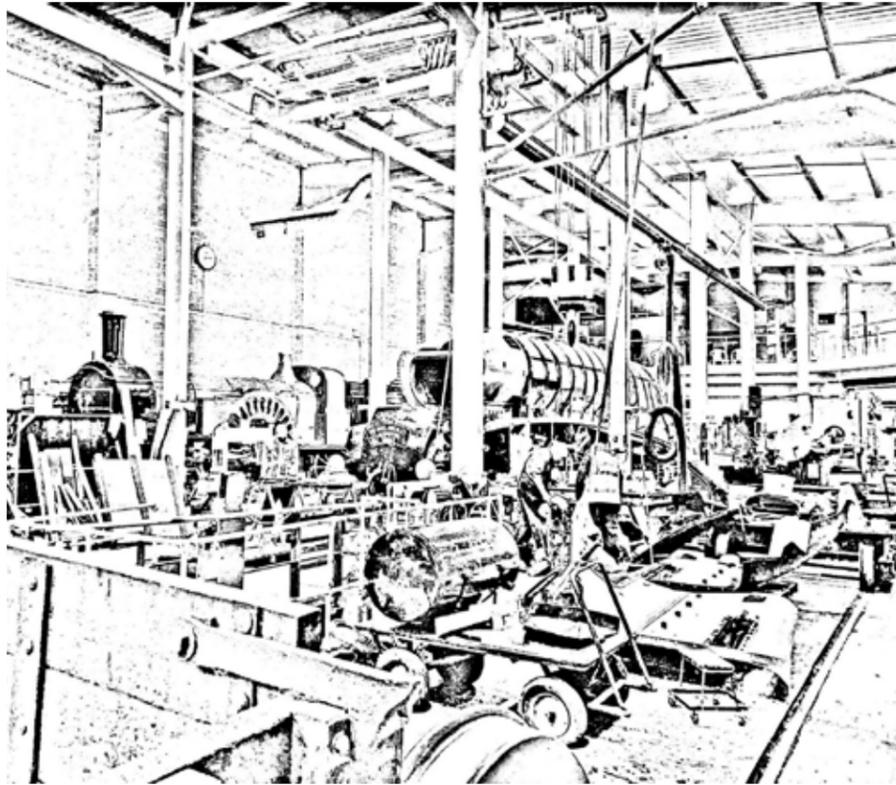
What makes the existing workshop so exciting is the activity, uses and possibilities housed within it as well as the structure, machinery and objects used to support its function. With the removal of these, how does one embody the sense of energy and excitement that the space currently holds? In addition, how does one bring 'order' to the apparent chaotic, messy nature of the workshop without losing its character.

The space will transform from a repair workshop to a discovery workshop for *sparking, making and testing* and to foster an engineering mindset in a safe yet stimulating environment.

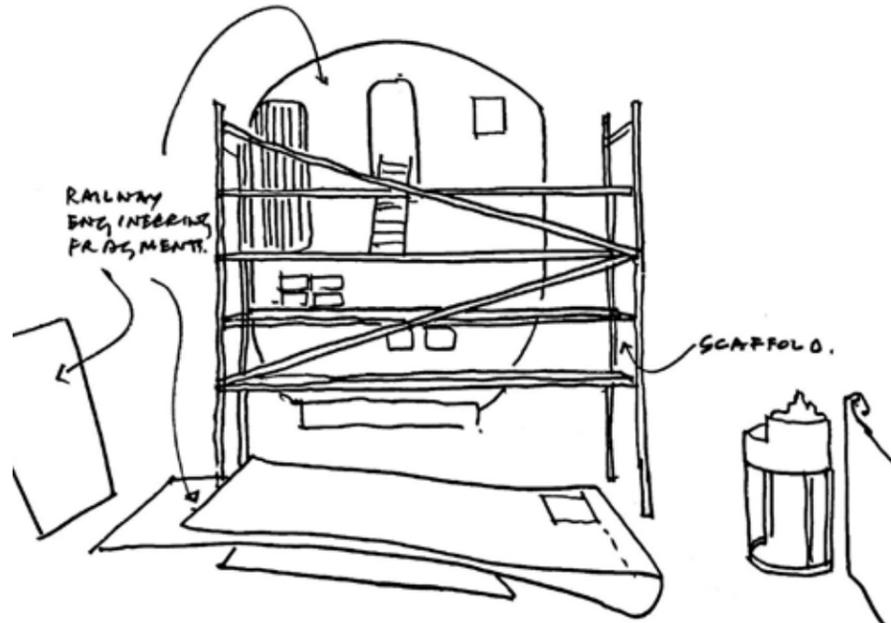
It is our aim to maintaining the memory, rawness and energy of its current use whilst re-activating the larger scale permanent structures such as the wheel drop, pits and the cranes to form the framework and supporting elements for the new content of Wonderlab.



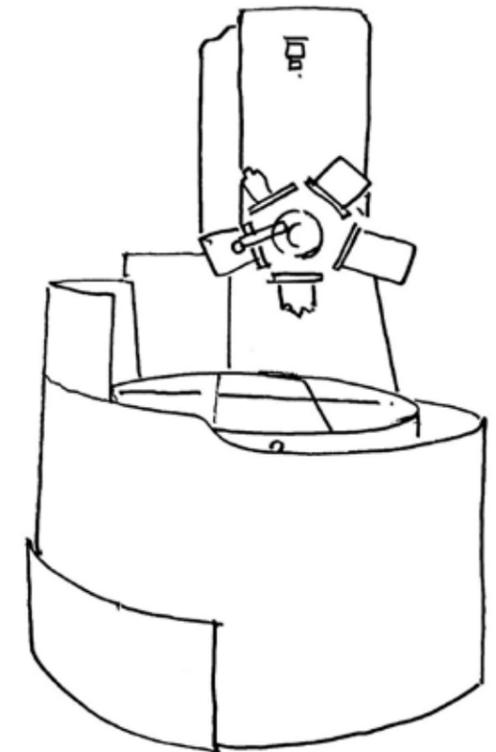
Engineering fragments and equipment provide a sense of adventure and possibility within the workshop space



1 Railway engineering fragments

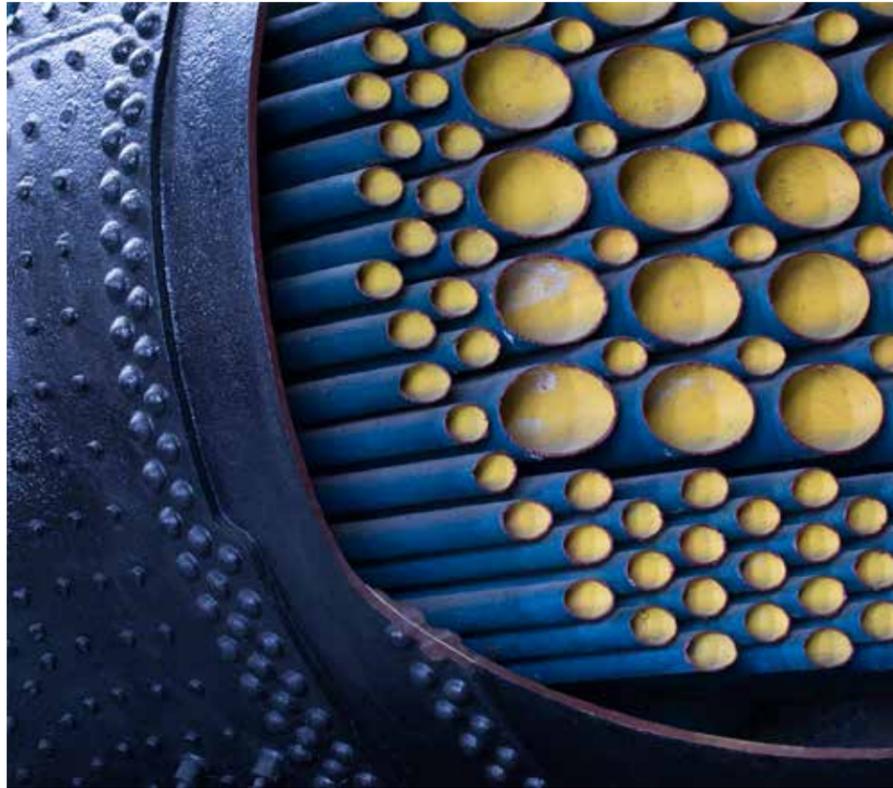


2 Workshop temporary structures



3 Engineering workshop equipment

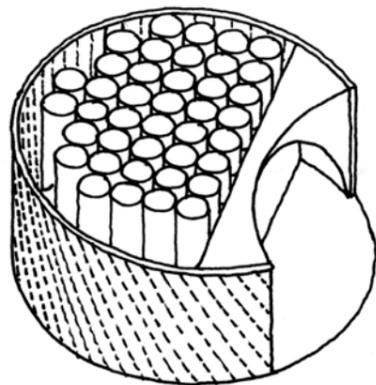
**A family of new 'engineering playground' timber structures inspired by iconic railway engineering fragments :
Communicating core railway engineering principles**



1 BRIEFING SPACE

Loco Engine Firetubes

Sectional cut out of the Ellerman Lines steam loco



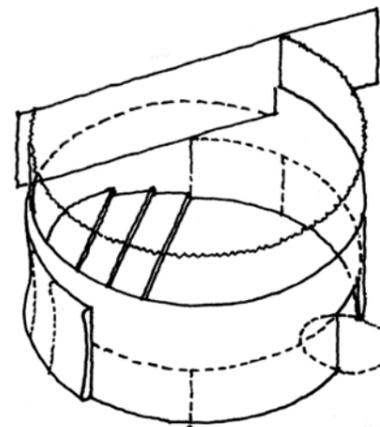
POWER



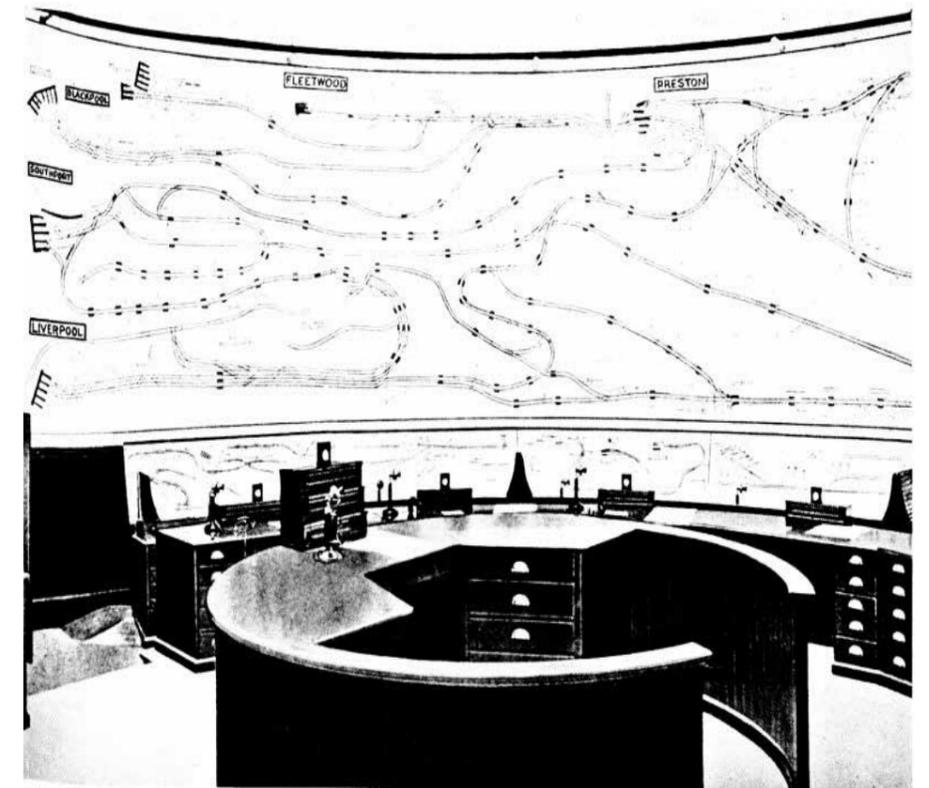
2 SHOW SPACE

Driving Wheel

Ellerman Lines steam loco driving wheel



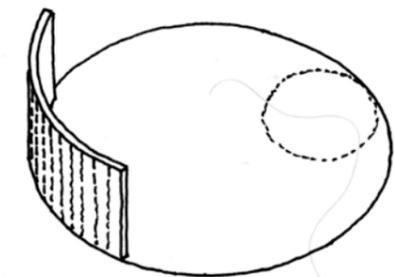
MOTION



3 FLOW LAB

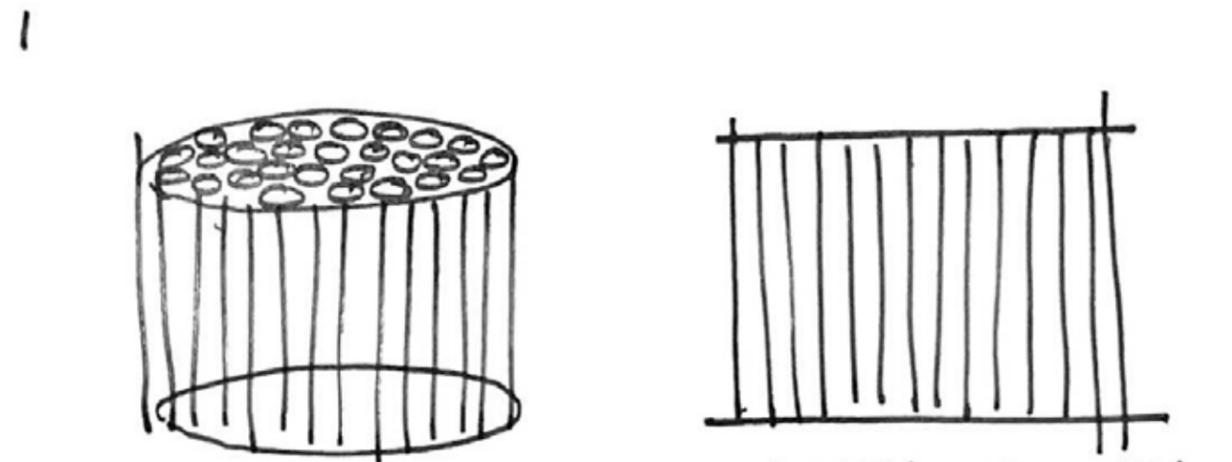
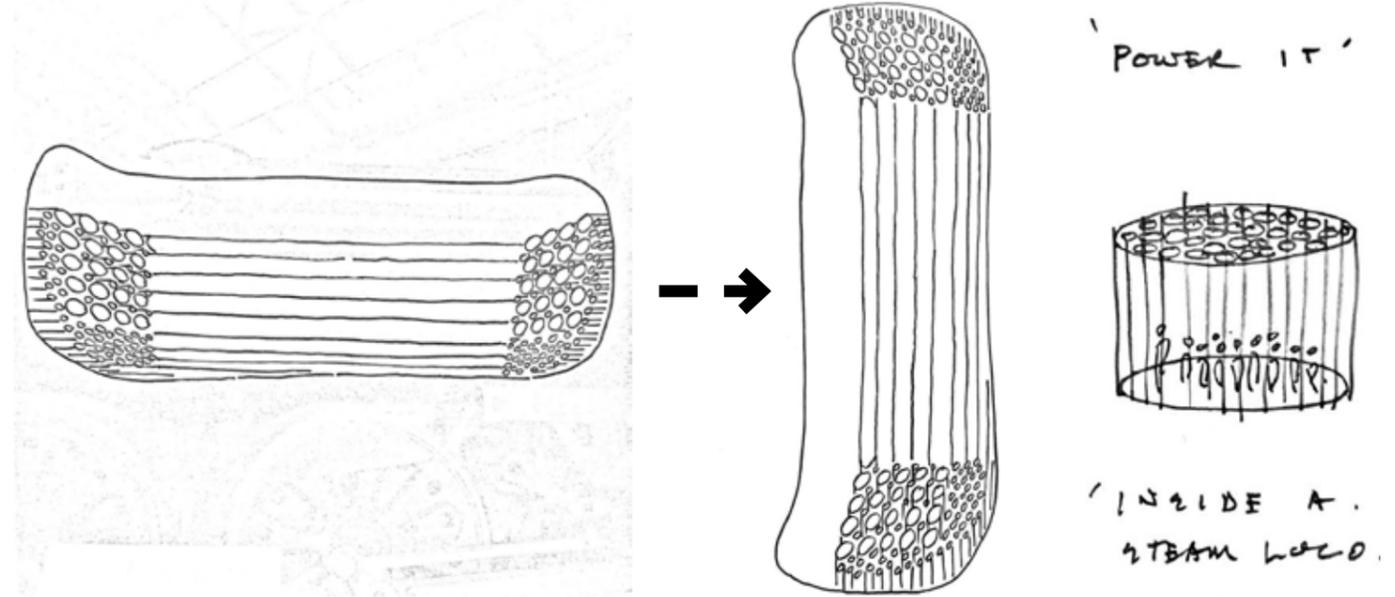
Signal Control

*Divisional Control Office of the Lancashire and Yorkshire Railway
at Manchester Victoria 1926*

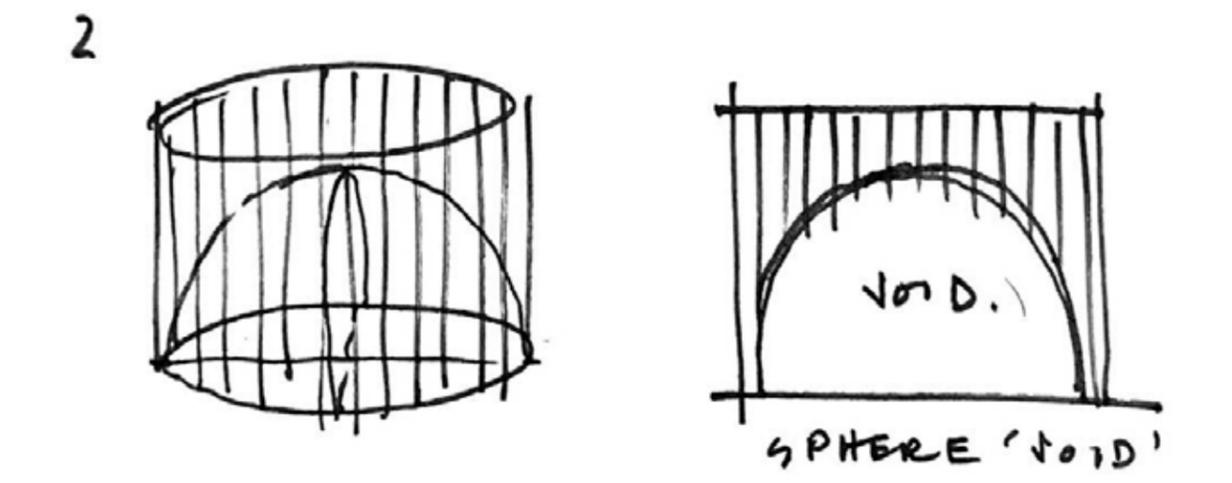


CONTROL

1 Briefing Space : *Power* : A space to 'energise' the visitor : Inside the 'steam loco'



OUTER CYLINDER WITH INNER TUBES.



SPHERE 'DOME'

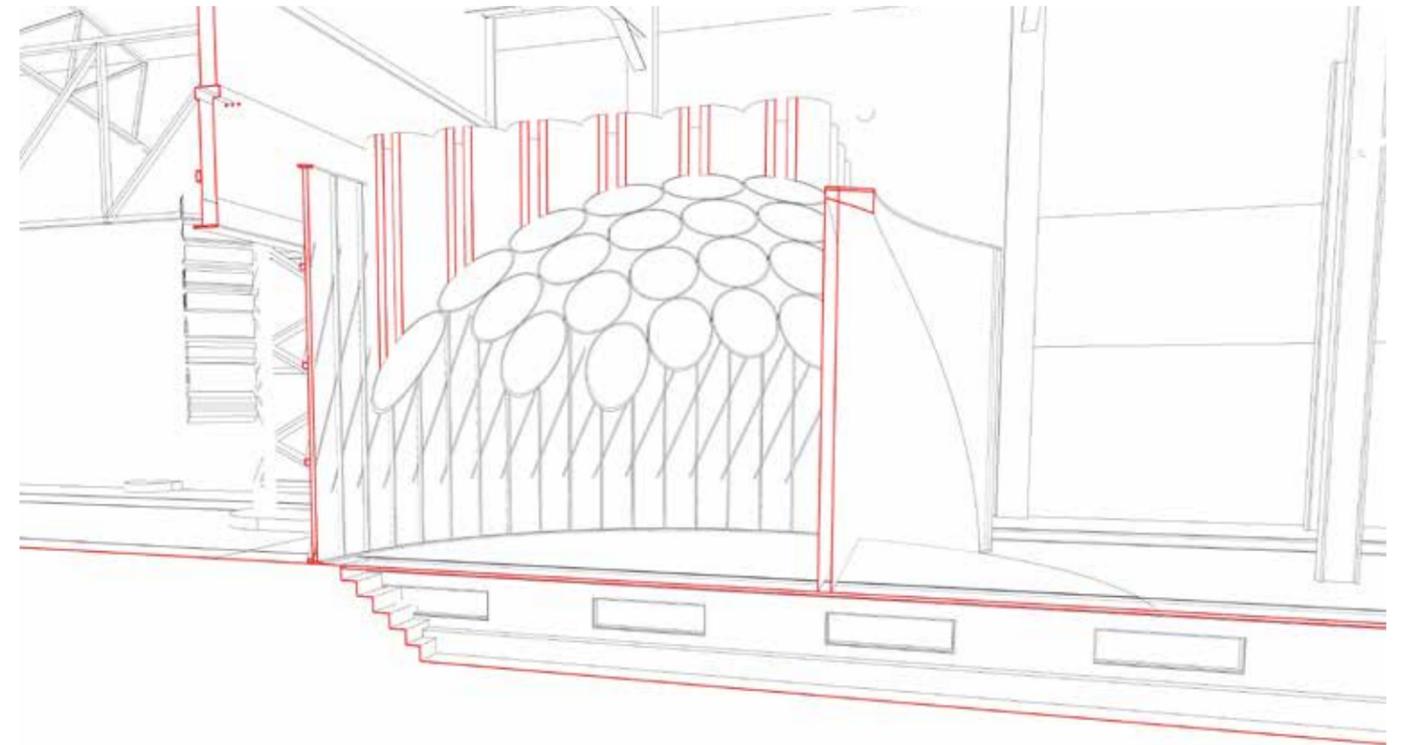
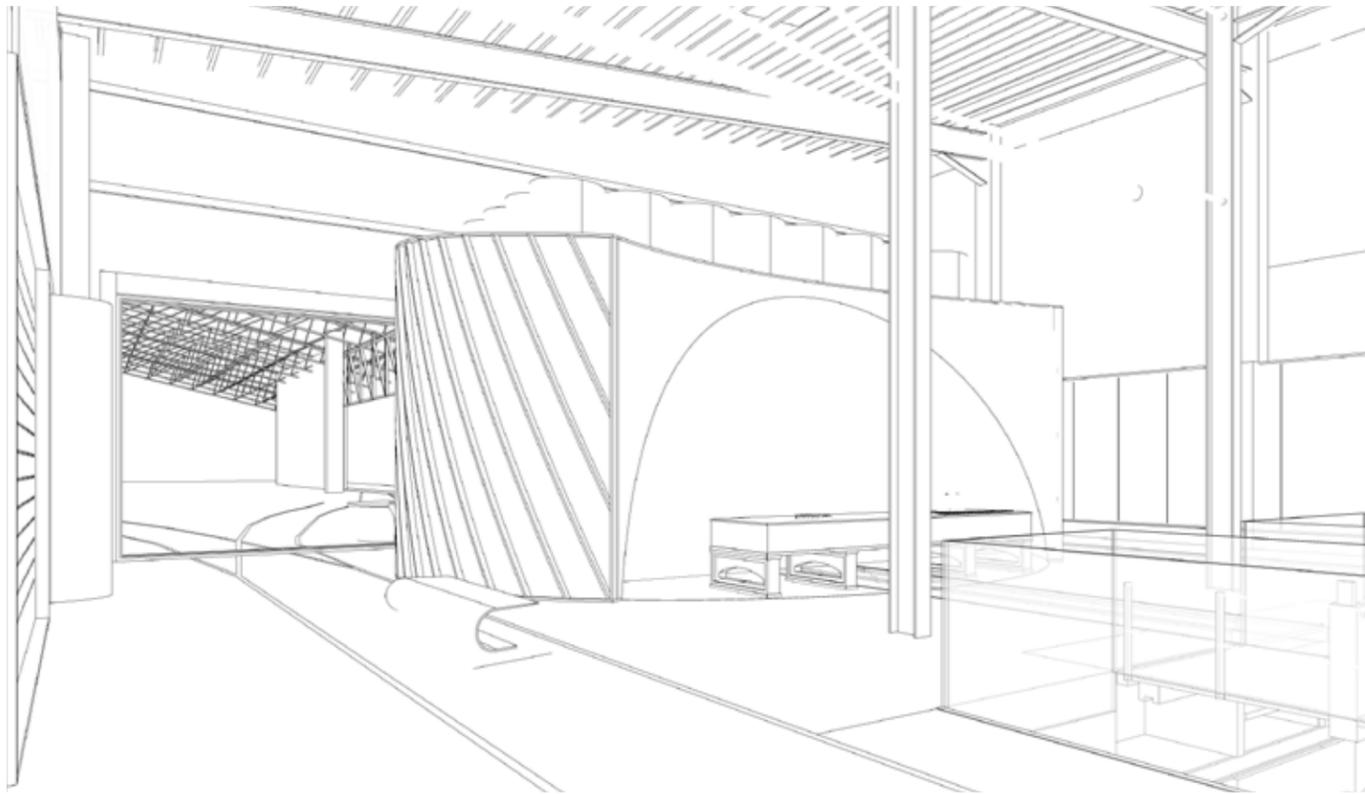
We are intrigued and mesmerised by the section cut outs of the 'Ellerman Lines' steam engine. The locomotive provides a close glimpse of the internal construction and the inner workings of a modern steam engine. This exhibit very powerfully brings to life and helps to visually express and reveal the magic of how these large scale locomotives functioned with steam power generated within.

The pipe work is functionally arranged and enclosed within the riveted cylindrical metal structure of the boiler locomotive casing and we have used this as an inspiration source for the design of the Briefing Space.

As school groups enter the Briefing Space, the 'wow' and inner workings of a unique roof structure is revealed. Visitors are almost reduced in scale to the size of the steam particles within the 'engine enclosure' and are 'powered up' to further explore and discover the engineering concepts within the Wonderlab gallery. The shape, structure, materials and engineering of this volume will have visual and structural clarity forming an integral part of our 'building as a learning tool' approach.

This extraordinary, yet practical and robust space will double up as a unique event space facilitating income generation

1 Briefing Space : *Power* : A carved-out hemispherical volume forms the backdrop to the STEM Bar Exhibit



The proposed sustainable timber construction of the briefing space is to be fully expressed and carefully detailed to convey clear engineering principles.

Similar to the Ellerman Lines locomotive, the Briefing Space is contained by a cylindrical envelope. Its timber structure is fully expressed exposing rhythms reminiscent of engineering cogs and wheels. The exterior feels calm yet subtly dynamic as though it could 'rotate' at any time. It is the visitors however who circulate around its curved sides and the cut away volume within the main hall provides the theatrical backdrop for the core STEM Bar exhibit.

Conceptually the cylinder is filled with tubes and the briefing space is found within a void carved out from the volume of the tubular structures. The component parts of the roof are revealed upon entry. The space feels unexpected and intriguing. In conjunction with a structural engineer, we will further investigate sustainable options for the construction of the roof structure pipework such as plywood sheeting or cardboard tubes used as concrete formwork etc.

The cutaway tubes can be lined in absorbent acoustic fabric to dampen and baffle the sound from the main gallery hall and vice versa.



Large cogs

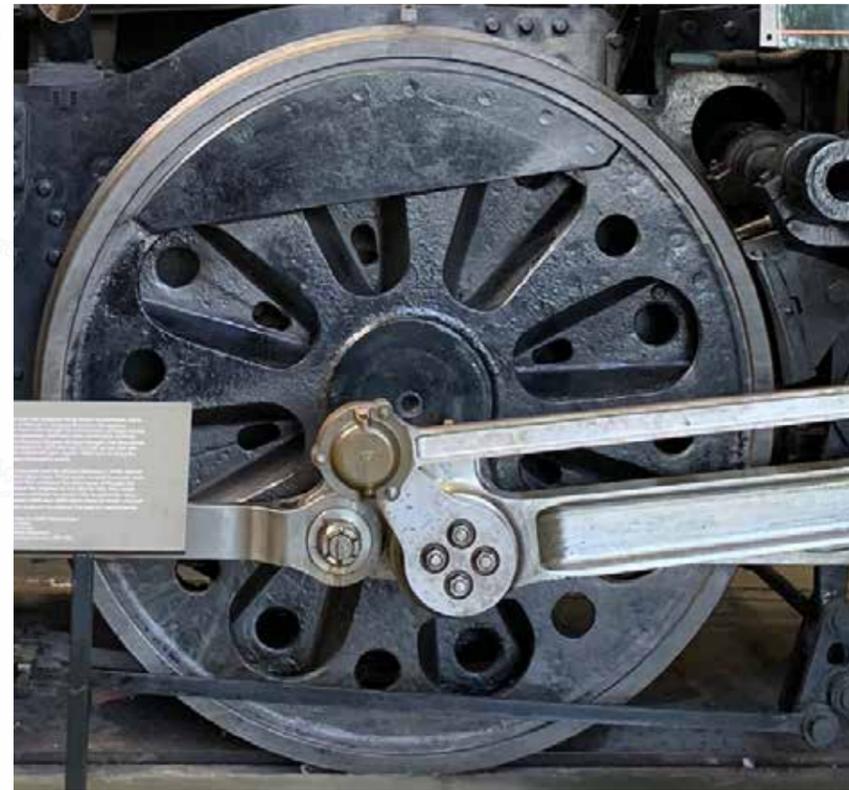
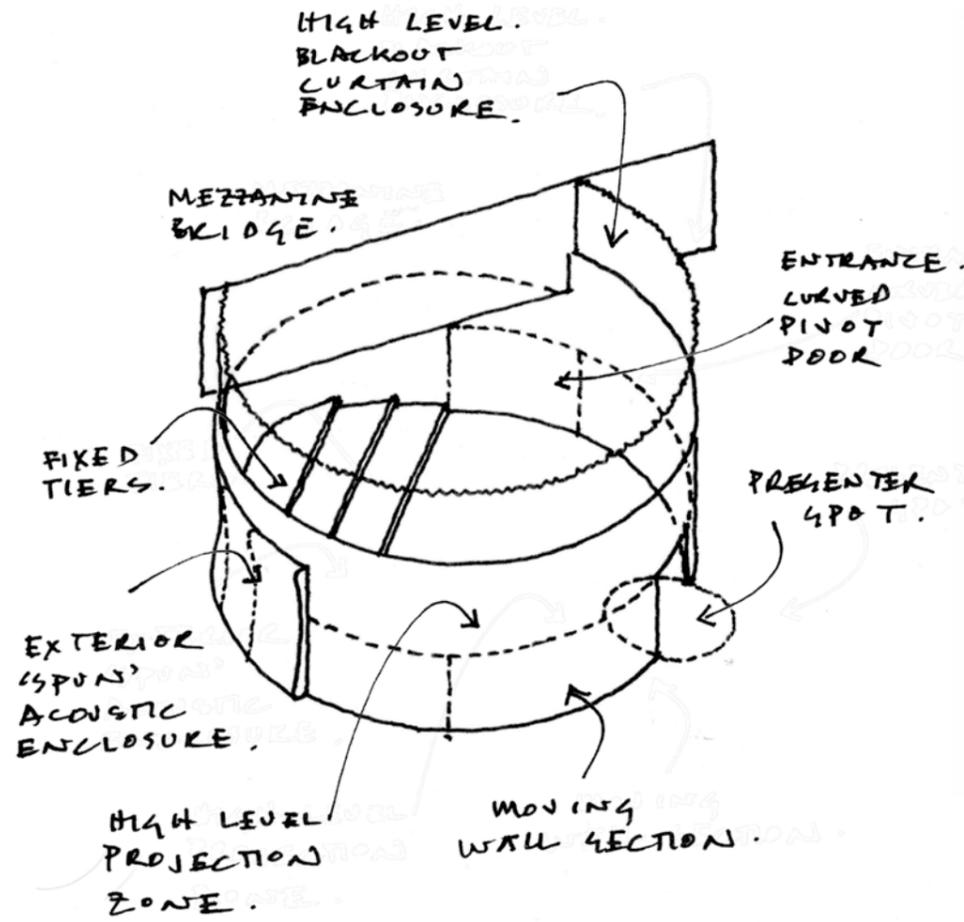


Structural cardboard tubes



Void space precedent

2 Show Space : *Motion* : A circular kit of moving parts for flexibility and environmental control



Elerman Lines steam loco asymmetric driving wheel



LocHal Library, Tilburg, Holland precedent



Daylight - opened curtain - closed wall



Daylight - opened curtain - retracted wall



Blackout - closed curtain - no projections



Blackout - closed curtain -projections in the round

2 Show Space : *Motion* : Communicating in the round



Exterior view of the Show Space 'spun' dark stained timber enclosure with glazed slots to adjacent walls.



Interior view of the Show Space with large format curved screen and fixed rear tiering.

The volume of the Show Space has a reciprocal dimension and shape to the briefing space and has a similar material quality and treatment. Its curved timber walls can slide away to increase the volume of the space and reveal the rougher quality and texture of the existing workshop. From the top datum of the timber cylindrical volume rises a white banding that can facilitate surround projections in the space should this be required.

Large scale curtains can enclose the space to provide the required blackout during certain presentations. The quality, texture and in parts the diaphanous nature of the fabric will be further explored.



Unseen Blue 2002 - James Turrell



Apple auditorium

3 Flow Lab : Control : Physical and Digital



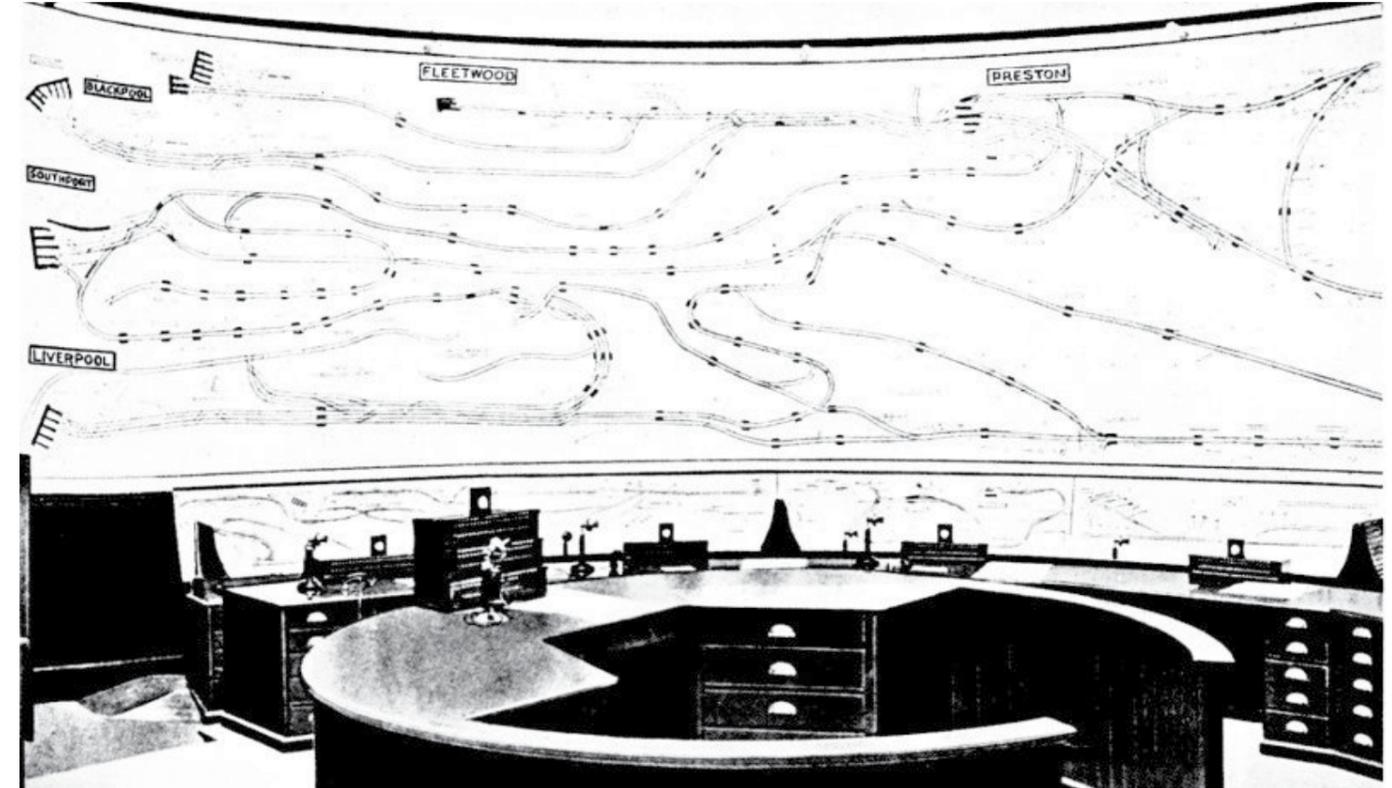
Network Rail's Digital Railway Control Centre 2019

The 'Flow Lab' is inspired by railway signalling control centres. The functional layout of these has remained relatively constant through time, with the focus on large information screens that monitor and carefully coordinate the safe passage of locomotives in each region. These are the silent hubs crucial to keeping the railway running smoothly, effectively and efficiently.

The Flow lab is the third 'object' within the space defining an enclosure that marks a character change in the Wonderlab gallery.

A large timber curved screen with exposed engineered structure and construction partially encloses the zone screening this off from the main hall allowing lighting control in this zone. The lowered lighting levels facilitate the possible installation of a 'conductive wall', the mechanics of which can be exposed on the external face of the curve screen, themselves becoming learning instruments.

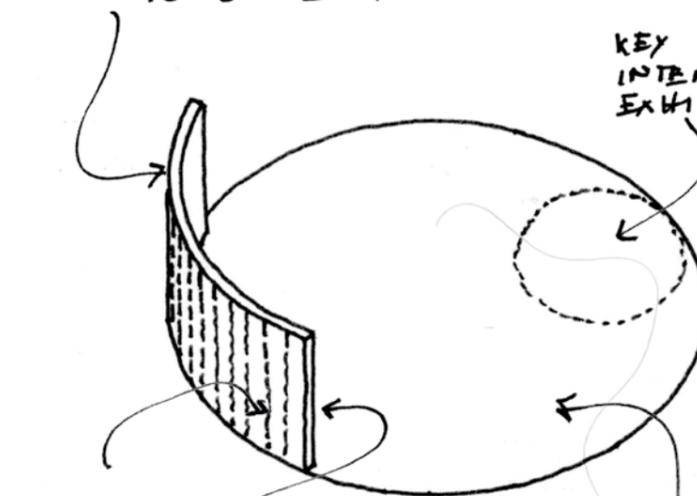
With the lower ceiling height, this intimate area under the mezzanine will be defined with a darker tonal and absorbent material treatment to focus the zone and provide a different sensory experience to the main space.



Divisional Control Office of the Lancashire and Yorkshire Railway at Manchester Victoria 1926

SCREEN WALL
PARTIAL ENCLOSURE
TO ZONE.

KEY
INTERACTIVE
EXHIBITS TANGENT
TO ZONE CIRCULAR
PERIMETER.



POSSIBLE
CONDUCTIVE
WALL ON INSIDE
WORKINGS
PART/FULLY
EXPOSED

TONAL FLOOR
FINISH TO
DEFINE ZONE.

Entrance from Great Hall : Phase 1



Entrance from Central Hall : Phase 2



A new engineering 'adventure playground'



A new engineering 'adventure playground'



A new engineering 'adventure playground'



A new engineering 'adventure playground'



Perimeter timber wall lining incorporating bench seating

Black Steel



Concrete Block



Triboard Lining



Polished Concrete



Perimeter timber wall lining incorporating 'workbench' and framing new windows to store

Colour Accent



Concrete Block



Triboard Lining



Polished Concrete

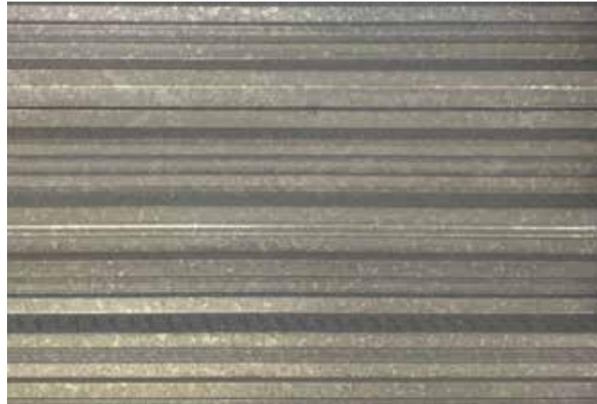


Perimeter timber wall and floor lining incorporating seating and framing of windows to define interactive areas

Steel Frame Colour



Galvanized metal deck



Triboard Lining



Timber Flooring



Perimeter timber wall lining incorporating framework for wall interactive exhibit

Steel Frame Colour



Concrete Block



Triboard Lining



Polished Concrete



The Show Space enclosure

Steel Frame Colour



Concrete Block



Triboard Lining



Polished Concrete

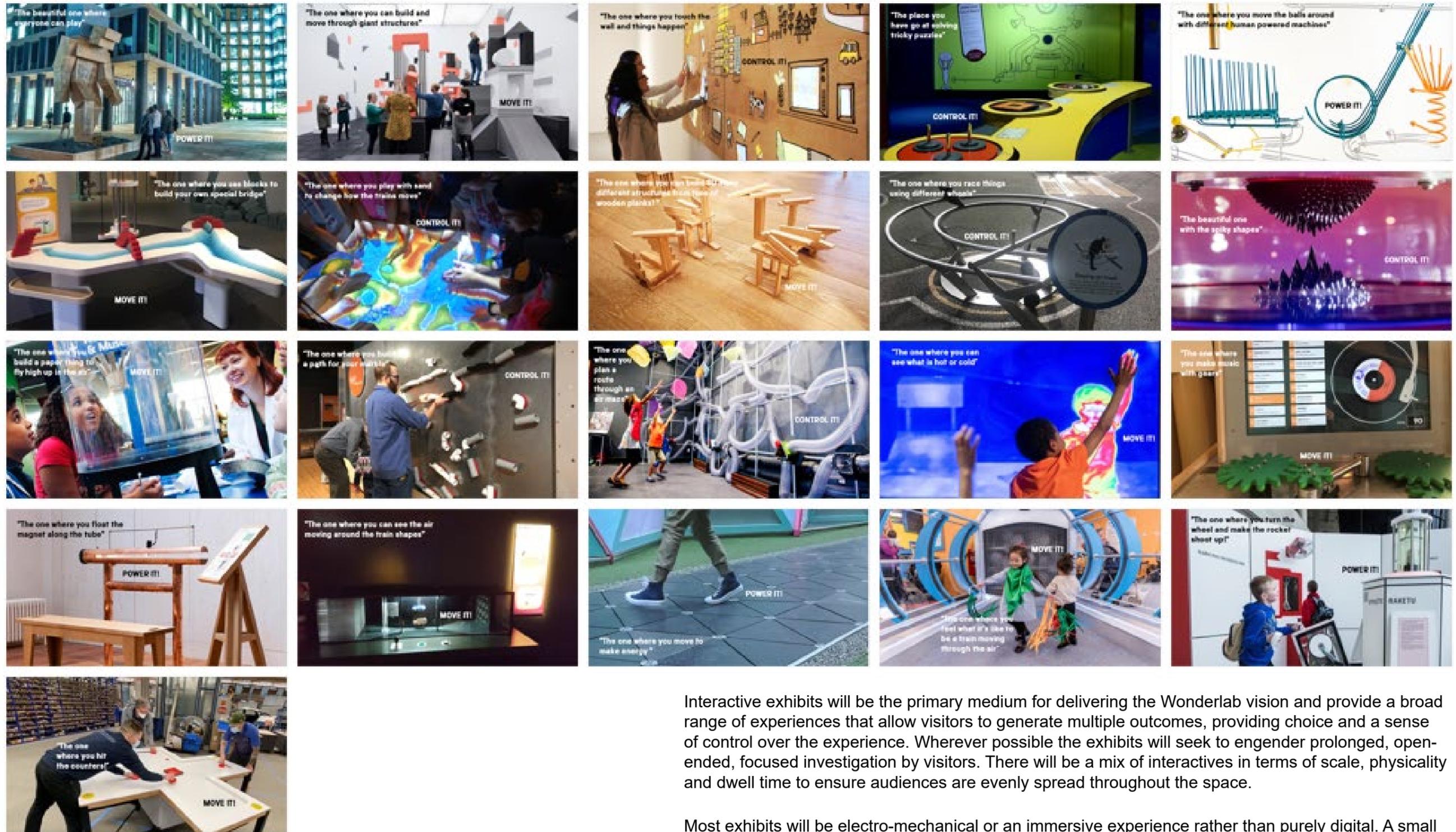


3 DESIGN PRINCIPLES FOR EXHIBITS

A discovery workshop for *Sparking, Making and Testing*



Approved Exhibit List



Interactive exhibits will be the primary medium for delivering the Wonderlab vision and provide a broad range of experiences that allow visitors to generate multiple outcomes, providing choice and a sense of control over the experience. Wherever possible the exhibits will seek to engender prolonged, open-ended, focused investigation by visitors. There will be a mix of interactives in terms of scale, physicality and dwell time to ensure audiences are evenly spread throughout the space.

Most exhibits will be electro-mechanical or an immersive experience rather than purely digital. A small number may have digital augmentation to reveal an invisible phenomenon but, in the main, digital exhibits will not feature in the gallery. Exhibits will focus primarily on the skills of being an engineer and the approach engineers take to problem solving.

Exhibits : Artist Led Commissions

03: Interactive Power Installation

”The beautiful one where everyone can play”

- Through exploration and play visitors will discover how to make the sculpture work as they input energy which will ultimately result in a rewarding, entrancing and delightful payoff
- Visitors will walk away from the exhibit with unique memories and a Wonderlab mindset; ready to explore, be creative, awakened by the power of engineering.
- Visitors play, experiment, and explore to discover how to make this interactive sculpture work (and make it work better!)
- Visual wow sets the tone of the gallery as a place for curiosity and wonder.
- The direct actions of visitors will produce energy- and the exhibit will show the results of this, highlighting the immediacy of sustainable energy sources.
- Visitors play together to power a system which rewards them with a surprising and ethereal effect in contrast with the hard lines of workshop crane and environment
- Blends ideas of science, engineering and art to stimulate conversation about sustainable futures,
- Should encourage visitors to think creatively about how we can generate electricity in more sustainable ways.



Key Design Parameters

- The Interactive Power Installation is located over the central glazed over railway track pit allowing visitors to engage with an immersive exhibit on all sides including access through the middle of this.
- This key showcase exhibit is located along the central axis of the gallery and a counterpoint to the Great Machine. The proposed location allows design freedom for the design concept development of this exhibit.
- The Interactive Power Installation should be awe inspiring and with the sophisticated thought provoking aesthetic. The installation will be inspired by and link directly to sustainability.
- Energy Floor components should be integral to the exhibit and will provide the user-driven power generation/harvesting aspects of the sculpture to activate this. Users need to clearly understand cause and effect as they observe the payoff.
- The installation must have scale and act as a key orienting node within the gallery.
- It is expected that the installation could have height up to 6m and that users will be able to engage with the Energy Floor components either side, within or under the installation itself.
- This exhibit should engage with and take as much support as possible from the crane which frames the installation area.
- It is desirable to make visible the energy generating components of the energy floor cells which will need to be set and supported within the track pits and framed by walk-on glass floor either side. Supporting structure as necessary will be provide by the main contract works. Floor cell surface material could perhaps be glass.
- Consideration should be given to the rooflights located either side or directly above this exhibit to ensure maximum visual impact and visual contrast as it is anticipated that 'light' powered by the energy floor cells will form the main activating component of the installation.
- The operation of the exhibit should minimise noise generation.

Exhibits : Artist Led Commissions

04: Play Revolution

“The one where you can build and move through giant structures”

- A super-exhibit which allows visitors to engage in the full cycle of Design, Build, Test activities.
- Visitors will use their imagination to build giant structures with playfully shaped blocks.
- Large scale & memorable – a defining Wonderlab/NRM experience .
- Open-ended, creative play supports the message that engineers are creative in their work.



Key Design Parameters

- Room-sized interactive with seating which be can be closed off for events, and workshops.
- Capacity should allow for a class on a school trip to do an activity together at this exhibit.
- Artist could collaborate with a community group that has mobility needs during development
- Must deliver a sophisticated aesthetic and considered interpretation/ graphic identity to ensure that this exhibit doesn't become default soft play.
- Select materials that are clearly recycled could help the visitor make connections with wider sustainability issues.
- Graphic design integration within floor/wall linings and furniture is to be explored. Opportunity to use inspiration images and prompts from the real world - bridges, tunnels, tracks.

Exhibits : Architect led exhibit environment

01: STEM Bar

“Where you see the most amazing demonstrations”.

- The STEM Bar is an exciting focal point within the gallery. This is a live presentation and demonstration space where all visitors are provided the opportunity to interact directly with our Explainer team and other experts. This is a programmed space that comes alive through science, technology, engineering and maths experiments and demonstrations.
- This demonstration area should deliver a sense of awe, wonder and excitement about the process of science and engineering which is drawn out in the staging and design of the STEM Bar.
- There are two modes of operation for the STEM Bar: Non-Activated and Activated and both modes the bar should showcase a STEM way of thinking.



Key Design Parameters

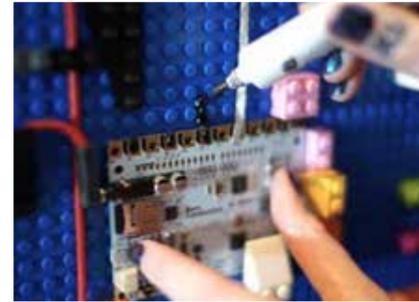
- Base supports of the GWR engineering table are to be adjusted to straddle the central track pit.
- The table will sit within the floor area corresponding to the footprint of the Briefing Space which will delineate areas for explainers and visitors when demonstrations are running.
- The circular floor finish footprint will further indicate the gathering of visitors around the GWR demonstration table.
- The explainer will have audio/mic facility and acoustic consideration is required to ensure good audibility and avoid distraction from noise levels around the Great Machine exhibit which is in close proximity.
- The GWR demonstration table area will be supported by a back counter with designed storage area and integrated with an ‘engineering installation’ providing the theatrical backdrop against which demonstrations will take place.

Exhibits : Integrated within gallery fit-out

05: Conductive Wall

“The one where you touch the wall, make connections and things happen.

- Conductive wall will provoke visitors to think and act like engineers – figuring out how the wall works, testing their ideas, and trying to discover new ways in which it to make it work and make it work better.
- The exhibit is literally about making connections – exposing the visible “workings” of the exhibit could encourage visitors to look carefully to figure out how it works – revealing that its not magic although it might seem it!
- Visitors can work together, or separately, to build and test circuits. With an aim to dim the lights, detect a train or make something move, they must get to grips with how a circuit works, and alter it for their goal.



Key Design Parameters

- Located in an area of the gallery with lower light levels for increased engagement with projection effects. The area needs to open, and intriguing for observers whilst they wait for their turn
- Exhibit should have a significant visual presence and will be designed to form an integral part of this area’s screen wall.
- Th installation should not feel applied to the surface of the screen wall, but rather be the ‘intelligent’ surface of the screen wall.
- Circulation space on both sides of the wall to allow visitors to dwell, explore and discover.
- Interaction with the wall should work on different levels for visitors of varying heights as well as wheelchair users.
- Internal lighting should be considered to accentuate the inner workings of the conductive wall.
- Development of the learning experiences will evolve during the planned community activity.

Exhibits : Integrated within gallery fit-out

07: Maths Puzzles

“The place you have go at solving tricky puzzles”

- Visitors will relax and enjoy a variety of brain-building puzzles, problem solving by thinking with their hands.
- Photographs of pattern in rail engineering will create a relaxed feel in the space and emphasise the beauty and creativity of engineering.
- Community Partnership project encourages young people to see the world differently through the lens of a smart phone – developing creative confidence using familiar tools and changing perceptions about engineering.



Key Design Parameters

- A relaxed daylight environment defined by gallery architectural design which needs to open, and provide an environment to support conversation and collaboration or solitary focus.
- An area which supports visitors to build confidence and resilience in tackling tricky problems.
- The area This is a great place to sit and relax but design of puzzles needs to ensure it doesn't become just a rest location.
- It's relationship with Kapla/Play revolution is really crucial – puzzles should contrast and relate.
- Graphic design integration within floor/wall linings and furniture is to be explored. Maths and graph grids could provide inspiration.

17: KAPLA

“The one where you can build SO many different structures from tons of wooden planks! “

- This interactive is cross curricular- highlighting how engineering skills can span across art, design, history, maths, and physics.
- Visitors can work together, or separately, to create anything they'd like- from bridges to buildings. This activity is about free play, letting them take time to design, build, test and learn
- Quantity of blocks encourages visitors to work together and build something impressive in its scale or intricacy.



Key Design Parameters

- A relaxed day-lit environment defined by gallery architectural design which needs to open, and provide an environment to support conversation and collaboration or solitary focus.
- An area which supports visitors to build confidence and resilience in tackling imaginative construction.
- It's relationship with Maths Area/Play revolution is really crucial.
- Graphic design integration within floor/wall linings and furniture is to be explored. Maths and graph grids could provide inspiration to avoid the 'white page' syndrome.
- Wooden blocks should contrast with materials being used to architecturally define this area.
- Research shows that freedom to build on floor and multi-level building surfaces can support collaboration and creativity.

Exhibits : Integrated within gallery fit-out

20: Flight Test

“The one where you build a paper thing to fly high up in the air”

- Visitors will begin to realise this is engineering in action and has clear links to the study of air flow in relation to vehicle movement.
- Visitors will be able to respond to their own challenges, problem solving and changing design after watching and evaluating their flying creation
- Using limited and simple resources to experiment with variables in design providing an opportunity to observe and learn from other people’s solutions in sociable activity.



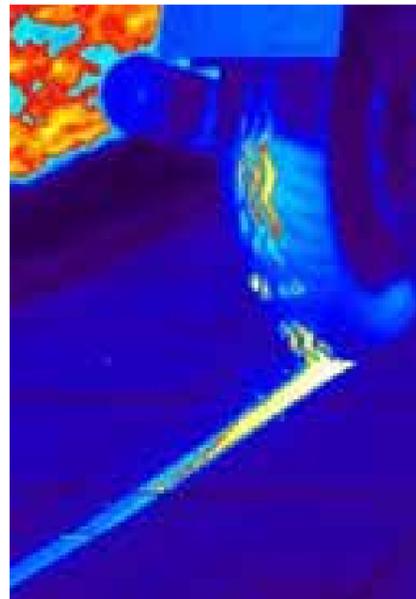
Key Design Parameters

- This exhibit will be supported by a workshop counter recessed into the architectural timber wall lining of the gallery. The Gallery fit-out will provide the architectural setting into which exhibit accessories can be integrate (consumable dispensers, bins).
- The wind table will be located over a track pit and there is therefore the ability to recess some or part of the wind generating base into the floor - facilitating improved accessible heights.
- A large diameter circular unit is envisaged with the design of the base feeling integral to exhibit as a single piece.
- Acoustic control will need to be considered to reduce impact of noise from air fan.

23: Friction Finder

“The one where you can see what is hot or cold”

- Visitors of all abilities can get involved and see that we all emit infrared radiation- this fun exhibit will encourage them to consider why seeing heat might be useful for a range of engineering and other applications.
- Visitors can see their own image on screen as they have fun experiment watching the thermal camera make the invisible, visible.



Key Design Parameters

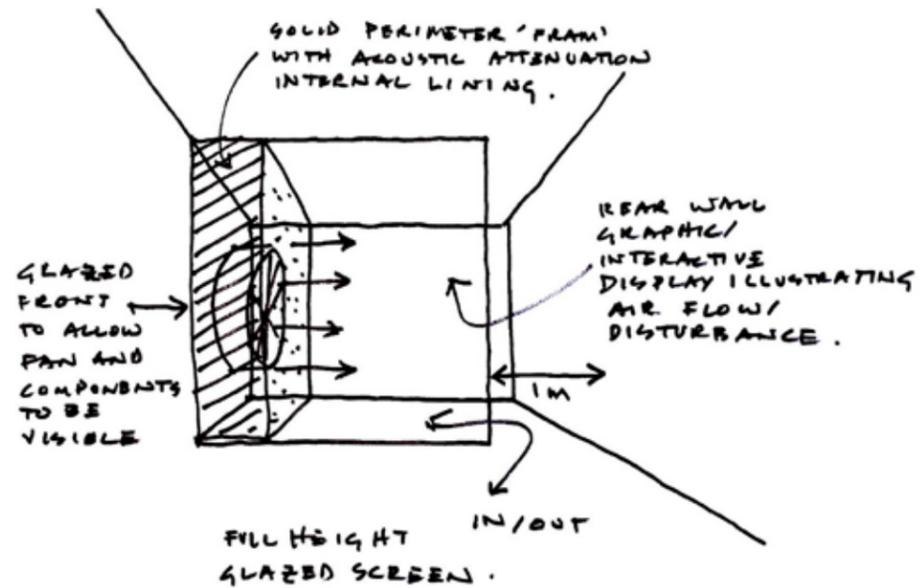
- This exhibit will integrate with or be recessed into the architectural timber wall lining of the gallery. The Gallery fit-out will provide the architectural setting and support framing into which this exhibit will integrate..
- Wide camera range and large screen to ensure people in wheel chairs, small children, and tall adults can be seen on screen.
- The screen should be integrated and as large as possible for maximum gallery impact and to capture more of the 'background' gallery activity including 'hot' spots within the gallery floor behind the users. Preferably almost down to the floor.
- Physical access options should provide full and partial body interaction.
- Friction test props should engage with the rail tracks located in front of the exhibit screen.
- Good photo opportunity – visitors can see an image of themselves.

Exhibits : Integrated within gallery fit-out

31: Human Air Tunnel

“The one where feel what it’s like to be a train moving through the air”

- Visitors have a full-body experience of the effectiveness of different train designs by “travelling” in a wind tunnel.
- Highly interactive exhibit that all can get involved with and have fun!
- Sensory experience of air flow and aerodynamics.



Key Design Parameters

- This exhibit is located under the mezzanine and it is anticipated that this would be almost completely enclosed with the exception of the access point to avoid a 'door'.
- The exhibit has solid walls on the East and South sides. To the north and west sides full height glazed walls to allow visibility through to the fan mechanisms and the user experience area anticipated. The specification, design and integration of the exhibit enclosure glazed walls should be considered to contain and attenuate the noise generated.
- There is also the opportunity to apply noise attenuation to all solid surrounding surfaces.
- The exhibit area needs to be large enough for family groups to get involved together.
- The air flow must be very strong and useable by all visitors, as disappointing and weak air tunnels are very underwhelming for visitors.
- Auto switch on/off for the fan so its not running all the time
- Usually, children hold floaty materials or streamers in the tunnel, but we'd like to have 'shields' to hold so the effect of streamlined form can be felt.
- Graphic design integration within floor, ceiling and wall linings is to be explored. Opportunity to represent and visualise air flow as contextualising feel of air tunnel.
- This exhibit provides a great photo opportunity - and should show movement and dynamic quality.

Exhibits : Self contained with integrated support

08: Great Machine

“The one where you move the balls all around with different machines”

- Great Machine is the heart of the gallery and the heart of engineering- is an exhibit that fuses machinery, industry, art, design, physics, history, and the future.
- Collaboration, conversation and excitement- that’s the feeling of the Great Exhibition and the feeling of Great Machine.
- 1851 commission is a credit to how important the Great Exhibition was – our vision is that the Great Machine will become iconic within NRM Wonderlab.
- Large scale and visitor-powered, this is an experience people remember and a reason to come back.
- Innovative ways of moving balls will inspire visitors to think differently about new applications for everyday mechanisms.
- This exhibit provokes 3-D systems thinking..

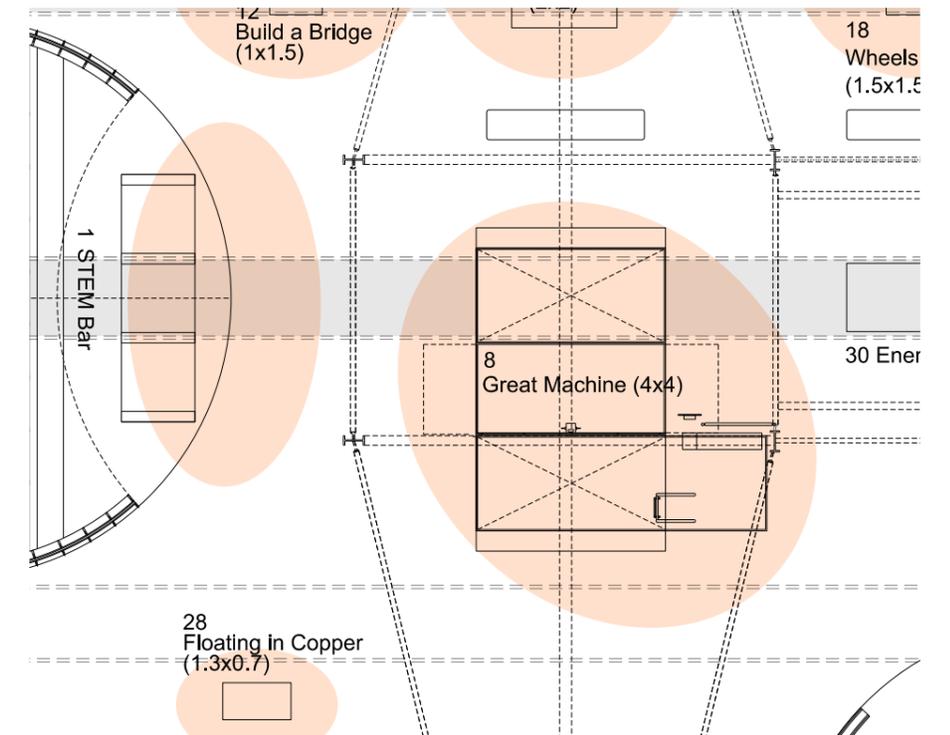


The existing Wheel-Drop



Key Design Parameters

- The Great machine installation sits within the Wheel-Drop and rises around the wheel-drop bridge platform allowing visitors to engage with the exhibit on all sides including access through the middle of this.
- Above a height of 2.5m the Great Machine can expand outwards and upwards to engage with the crane steel framework which is centred over the Wheel-Drop.
- The Great Machine should engage with and take as much support as possible from the Wheel-Drop and crane.
- User engagement points should be located along the north, east and south sides of the wheeldrop to reduce the number of visitors along the west side which is in closer proximity to the STEM bar exhibit demonstration area.
- The Great machine should feel as though it could have been manufactured in this engineering workshop and be ‘remarkable’ with the sophisticated aesthetic of a smooth well oiled running machine.
- Internal illumination to enhance the visual impact should be considered and the operation of the exhibit should minimise noise generation.



Exhibits : Self contained with integrated support

18: Wheels on Track

“The one where you test out different types of wheels on track”

- Visitors will assemble and test various wheel profiles on a rail track to see if they can make their wheelset turn a bend.
- Visitors may have come on a locomotive or may have looked at them around the museum. This draws attention to the science behind movement, and small details on the wheels they can look at in future.
- Large exhibit allows for a great centrepiece for visitors to engage with, but also to watch from afar. This exhibit is as much about doing and choosing, as it is about watching and learning from the variation.



Key Design Parameters

- Exhibit will be located along a glazed track pit and could engage with this. Adjacent timber wall lining can support the storage and access to Wheels on Track components. Alternatively components will need to be accommodated within the unit frame.
- A support/framing structure taking primary support from the rail tracks beneath it establishing a clear visual connection with real-life rail tracks.
- Wheel components must be durable to withstand frequent assembly/disassembly.
- Ensure use of elements to withstand continual dropping and to avoid stray loose components as much as possible.

19: Ferrofluid

“The beautiful one with the spiky shapes”

- Ferrofluid may be beautiful and awe inspiring, but it is also an exciting and smart material that is used by engineers to improve everything from space technology to audio speakers.
- Although less active, this exhibit provides an exhilarating visual response that will provoke conversation at how something so beautiful and magical can be used in engineering.



Key Design Parameters

- Located in an area of the gallery with lower light levels for increased engagement with projection effects.
- Exhibit should have a significant visual presence to attract more of an audience- 360 design.
- A large diameter circular ‘machine’ is envisaged with the design of the base/framework feeling integral to exhibit as a single unit.
- Internal lighting and concealed camera will relay close-up image to adjacent wall mounted AV screen. Screen to be integrated within architectural wall linings and associated graphics, requiring clear line of sight.

Exhibits : Self contained with integrated support

21: Marble Run

“The one where you build a path for your marble”

- Visitors will design, build and test a 3D transportation system using simple materials and a marble.
- This interactive develops individual design skills, but allows visitors to converse with others, to discuss their design, and find where it may link to someone else’s idea.
- Trial and error, testing is key
- Visitors can work together to create a maze run to watch how they can affect the marble’s journey. Visually, it’s an intriguing exhibit too.



Key Design Parameters

- Exhibit will be located along a glazed track pit and could engage with this. Adjacent timber wall lining can support the storage and access to Marble Run components.
- Marble Run is completely open-ended for the visitor to take their systems thinking as far as they are able.
- Typically a 2D wall mounted exhibit, this 3D version will allow engagement in the round. Perhaps avoid prescribing use of pipes.
- A support/framing structure taking primary support from the rail tracks beneath it will allow for the assembly of marble run components in a 3D arrangement which will allow users to change and build on each other’s assemblies.
- Ensure use of elements to withstand continual dropping. Ensure testing of magnet strength – this is usually the most limiting factor for younger children. Strength of magnets or other fixings should be considered for vary manual dexterity needs.

22: Air Tubes

“The one where you shoot scarves through an air maze”

- Visitors will discover that they “think like an engineer” and use systems thinking when navigating the rail system.
- Visitors choose settings at junctions, predicting and planning their scarves’ route to the top.
- Surprising and exciting interactivity (scarves fly out of the top of this exhibit)
- This exhibit provokes systems thinking in 2-D, complementing the 3-D system of the Great Machine.



Key Design Parameters

- The Air Tubes network should engage with and take as much support as possible from the crane.
- This exhibit should feel as though it could have been manufactured in this engineering workshop and be ‘remarkable’ with the sophisticated aesthetic of a smooth well oiled running network.
- A network of ‘clear’ tubes held in space with secondary steel framing supported of the crane is envisaged allowing for visibility through the exhibit , but with user engagement from one crane side only.
- Internal illumination to enhance the visual impact should be considered and the operation of the exhibit should minimise noise generation.
- Scarves will fly out of the top of this exhibit - surrounding area needs to accommodate this.
- Workings behind (or below) the exhibit must be easily accessible for technicians in order to troubleshoot any jams.

Exhibits : Self contained with integrated support

28: Floating in Copper

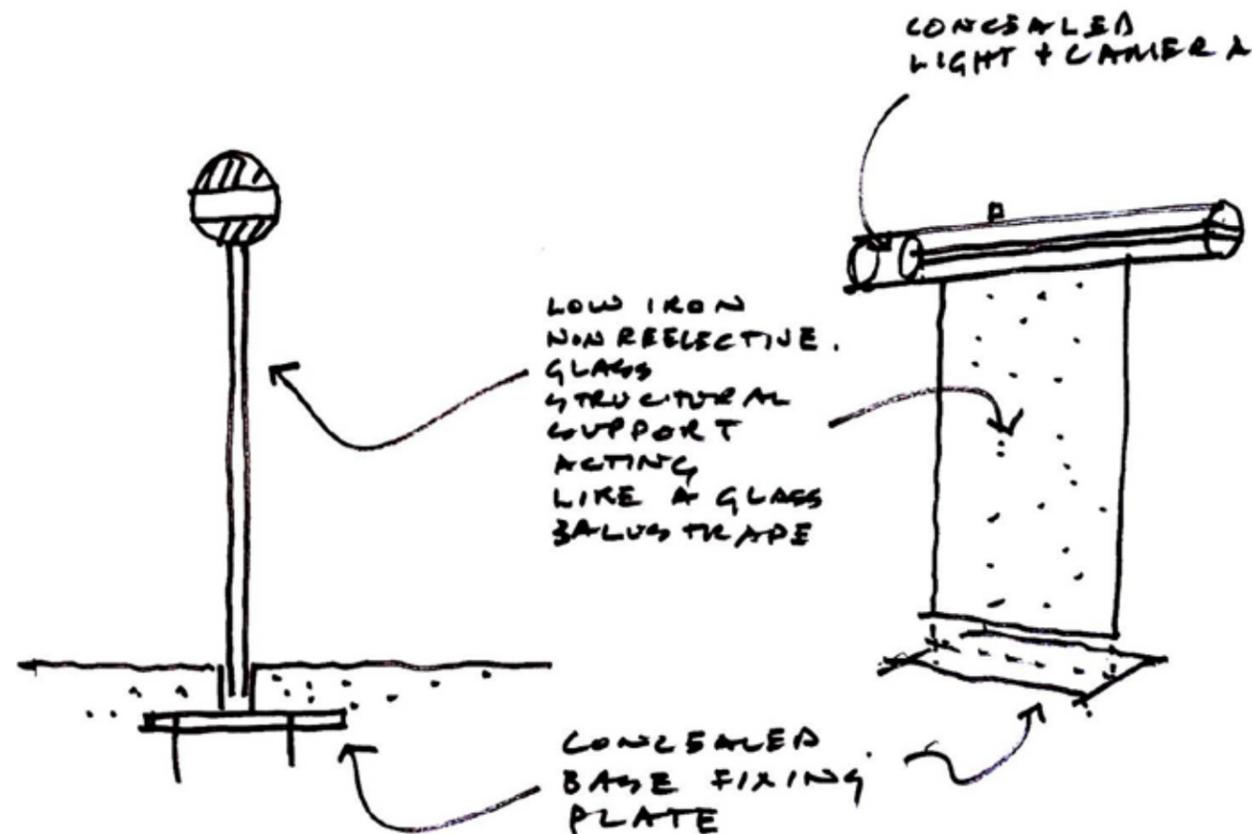
“The one where you float the magnet along the tube”

- The exhibit takes something that is quite small scale, intricate and abstract, creating a large, accessible and visually intriguing interactive – making the invisible, visible.
- The magic of the floating magnet will insight curiosity and wonder, and get visitors to question how this visually amazing exhibit is using the quite abstract and invisible power of magnetic fields.



Key Design Parameters

- Located in an area of the gallery set against new timber wall panelling with a built-in bench along on side.
- Exhibit will benefit from an additional ‘attractor’ such as film footage of the effect in action.
- Internal lighting and concealed camera could relay close-up image to adjacent wall mounted AV screen. Screen to be integrated within architectural wall linings and associated graphics, requiring clear line of sight.
- Previous version of this exhibit has supporting exhibit legs also in copper and integral to the exhibit. NRM version could explore having the supporting legs/frame in a different material to provide focus on the exhibit horizontal copper ‘tube’. The exhibit copper ‘tube’ itself could almost appear as if it is ‘floating’ rather than anchored to the ground. A vertical glass or acrylic ‘blade’ support could perhaps hold the copper.



Exhibits : Self contained with integrated support

33: Hydrogen Rocket

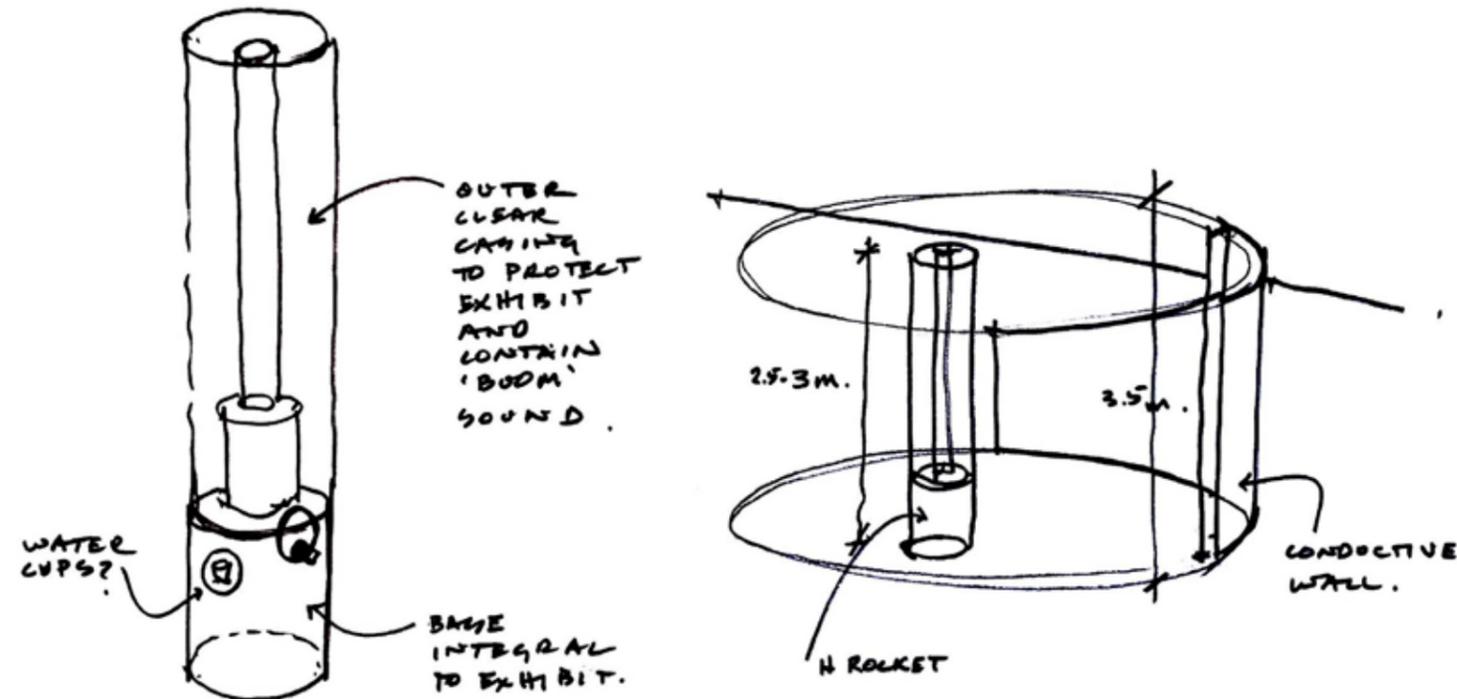
“The one where you power the rocket with electricity and water to create an explosion”

- Highly relevant due to hydrogen power running on the UK mainline for the first time in 2020. This demonstrates the science behind innovative ways of creating motive power – which can be used for rockets or trains.
- Visitors will be able to draw distinctions between the piston power of steam engines, but in a new sustainable way. Hydrogen fuel cells power the shuttle’s electrical systems, producing a clean byproduct, and here it demonstrates a cleaner way to produce the same result as fossil fuels.



Key Design Parameters

- Located in full height area of the gallery, this exhibit should have a significant visual presence to attract more of an audience- 360 design.
- A tall circular ‘machine’ is envisaged with the design of the base/ framework feeling integral to exhibit as a single unit.
- The exhibit could benefit from being able to see combustion at slower speed.
- Potential to ‘reuse’ water for plants to emphasise that the by-product of hydrogen rocket is pure could be considered.
- Acoustic control will need to be considered.

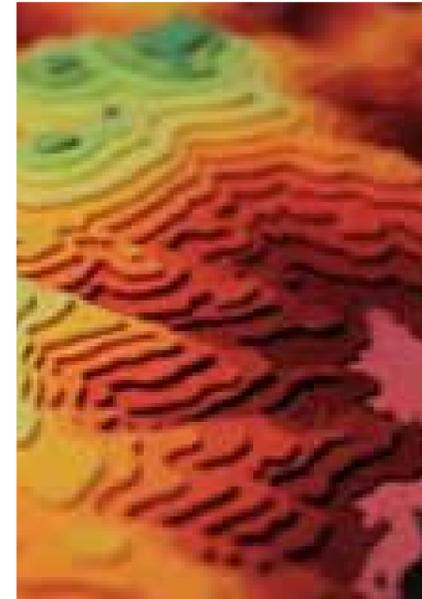


Exhibits : Requiring table / frame support

12: Build a Bridge

“The one where you use blocks to build your own special bridge”

- Visitors will think about the environment that bridges cross – how does bridge location affect the complexity of its design.
- Visitors will use blocks to build a bridge across a valley. This could be simple, or quite complicated, but will be unique to them!
- This allows visitors to tinker, and spend time seeing how small differences they make affect the structure. This interactive enables design and conversation about durability and use.



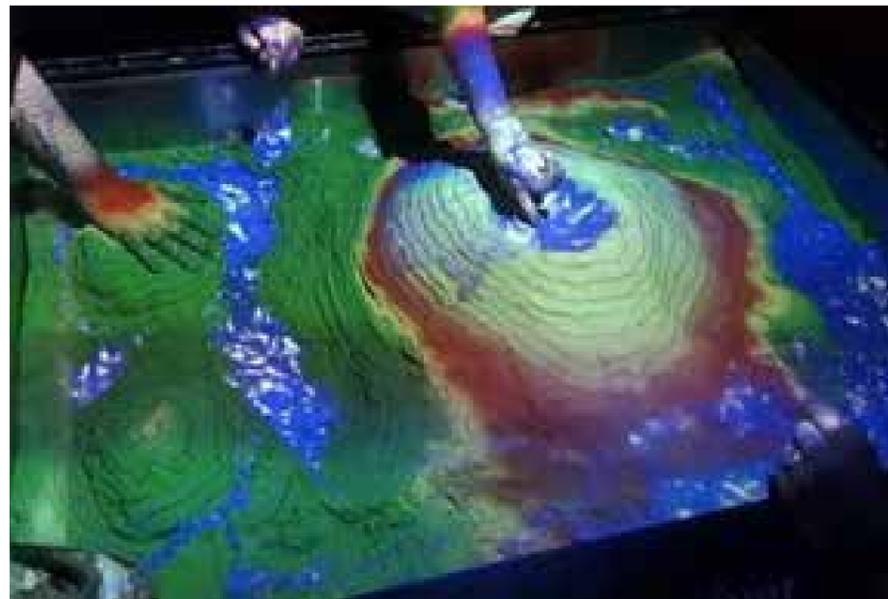
Key Design Parameters

- Exhibit will be located along a glazed track pit and could engage with this.
- A support/framing structure taking primary support from the rail tracks beneath it will be designed as a gallery furniture element and delivered for exhibit mounting.
- Ensure use of elements to withstand continual dropping. Nylon blocks are likely to be a sustainable choice due to durability and longevity – this could prompt a conversation about the most sustainable option not necessarily being the most obvious

16: Interactive Sandpit

“The one where you move the sand to change how the trains move”

- As sand is pushed around the tray, images of hills and valleys are projected onto the surface allowing visitors to simulate and conceptualise large-scale infrastructure projects.
- This is a multi-user exhibit which must allow for simultaneous, collaboration from several visitors. The look of the graphics should make it clear that all visitors are manipulating the same system and that an individual's actions can affect the whole table.



Key Design Parameters

- Located in an area of the gallery with lower light levels for increased engagement with projection effects.
- A large diameter circular sand pit is envisaged with the design of the base feeling integral to exhibit as a single unit.
- Design of the exhibit enclosure should consider mitigation of sand transference as high priority.

Exhibits : Requiring table / frame support

27: Gears

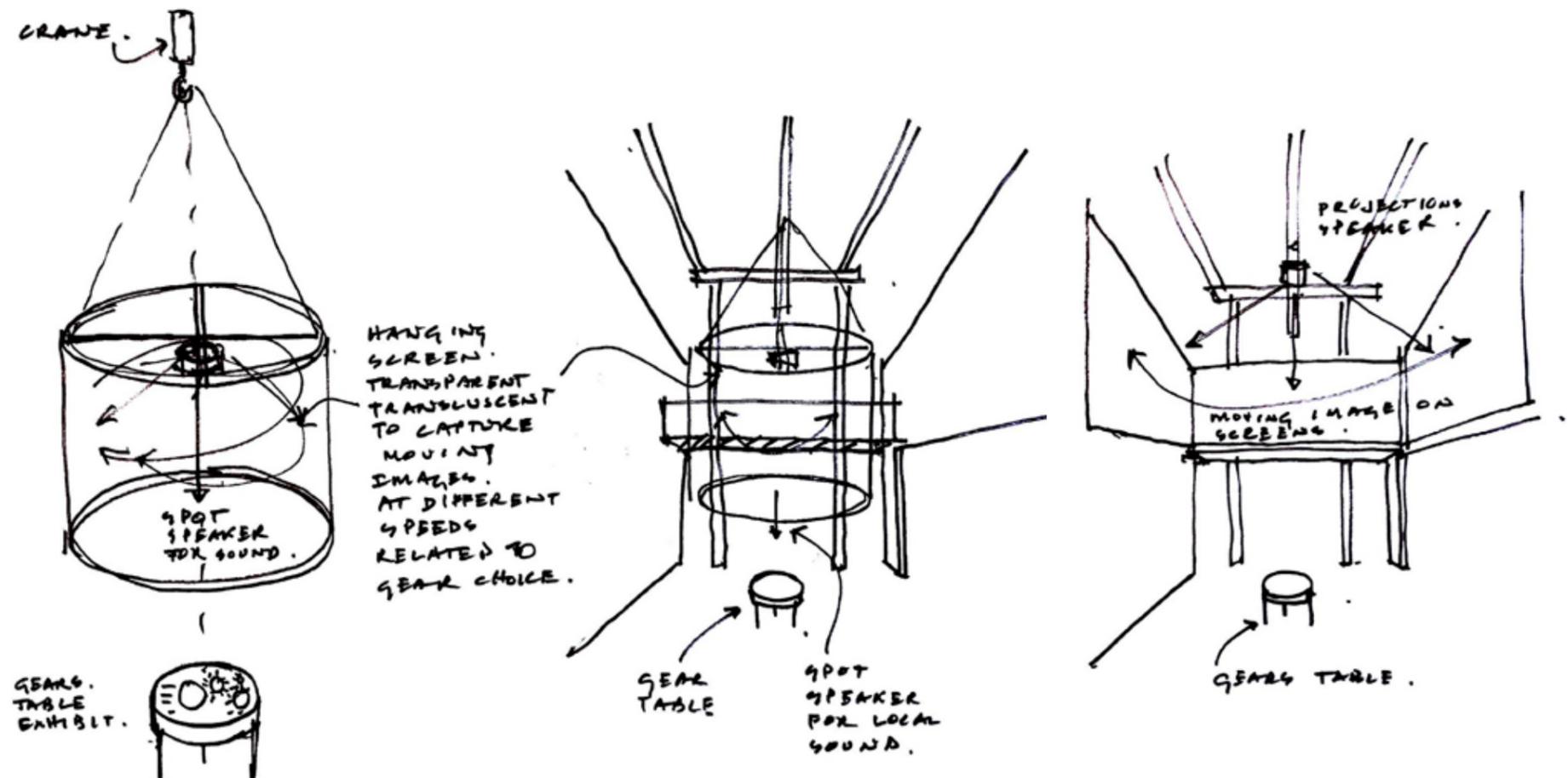
“The one where you make music and images with gears”

- Visitors will spend time choosing which gears connect – noticing the effect that changing size and position has on the efficiency of their design
- Visitors will be able to construct their own mechanical knowledge through repeated interaction with the exhibit which will reward persistence with a song/sound playing fast or slow as the amusing pay off!
- Exhibit encourages prolonged engagement with a fun and engaging audible and visual reward.



Key Design Parameters

- This is a smaller physical exhibit designed to deliver an immersive audio and visual experience for direct users and those passing in the vicinity.
- Exhibit designed to be experienced by user and observers in the round and avoid having a ‘front’ and ‘back’.
- Many 7-14 year old visitors may have never seen a record player or be aware that records can be played at different speeds. Perhaps a modern/current music player equivalent can be envisaged.
- Images could be viewed on an integrated screen or perhaps these could be larger scale projections around the exhibit on surrounding surfaces.
- A circular table base is envisaged and it will be designed as a gallery furniture element, delivered for exhibit mounting.
- ‘gears’ should be relatively lightweight for ease of handling by users of all ages and ability.

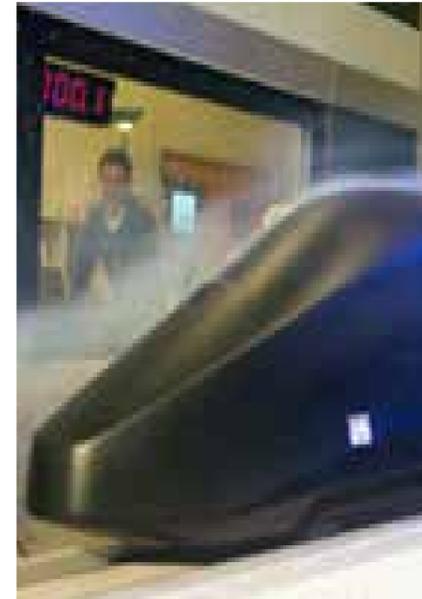
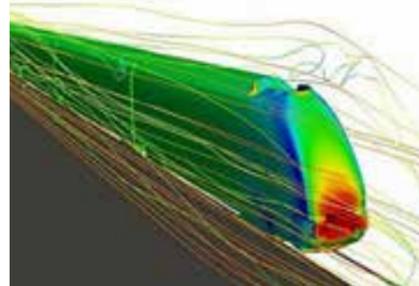


Exhibits : Requiring table / frame support

29: Air Flow

“The one where you see how different train designs move through the air”

- This interactive gets visitors thinking about motion, but in a different way. Transportation often focuses on moving forward, but this looks at the resistance in pushing back, and how vehicle design can overcome that challenge.
- This exhibit will use different shapes of locomotives to make clear railway links but visitors will be able to relate to car design or even the feeling of riding a bike as the air flows by.
- Small to large - small scale model will allow visitors to look closely all around something that can be seen at full scale in the museum



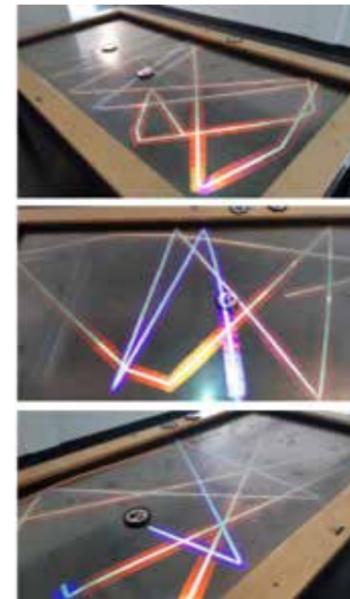
Key Design Parameters

- Larger scale and impactful to draw attention. Located in close proximity to Human Air Tunnel.
- A large rectangular table is envisaged with the design of the base feeling integral to exhibit as a single unit.
- It should be possible to view this exhibit from both sides to allow visitors engage fully and to create photo opportunity. The glass/acrylic enclosure lid should be above adult eye level for ease of visibility and to ensure presence within the gallery.
- This exhibit will have miniatures of the trains in the museum – makes motion connection with stationary exhibits.
- Air flow could emerge from the exhibit to enhance the sensory experience. If external airflow is added this should be possible to switch off if required.

35: Ready Aim Angle

“The one where you hit the counters and they bounce off each other”

- This table adds a dynamic exhibit to the puzzles area of the gallery, and allows visitors to explore maths in a fast paced and active way.
- This exhibit gives visitors a stimulating area to explore how projectiles move, bounce and ricochet at different angles
-



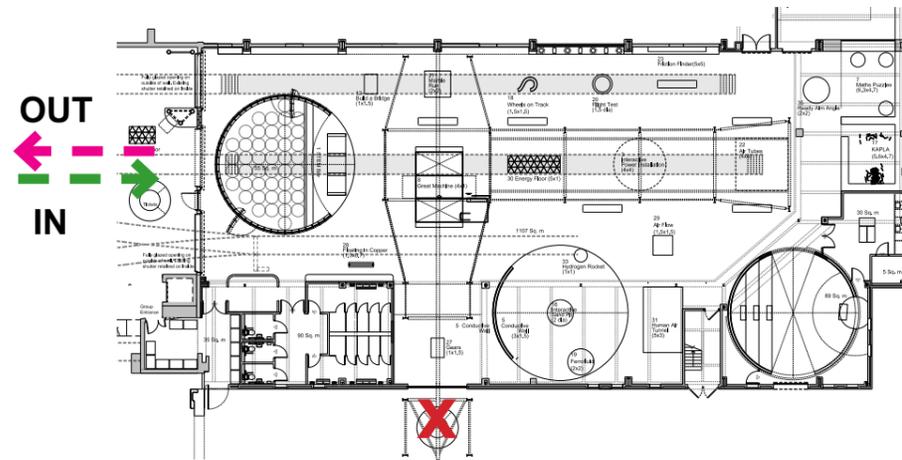
Key Design Parameters

- Located within the Maths area, the design aesthetic and materiality of this exhibit will need to be coordinated and correlate to that of the Maths area furniture.
- A large diameter circular table is envisaged with the design of the base feeling integral to exhibit as a single unit.
- Needs space to circulate all around and consideration of flying pucks.
- Possible collaboration with gallery graphic design with regards to table markings and ‘memory’ of angles travelled by puk.
- Acoustic control will need to be considered.

A gallery design approach enabling multiple Phase 2 entrance/exit options with minimal impact/cost

PRE-CENTRAL HALL

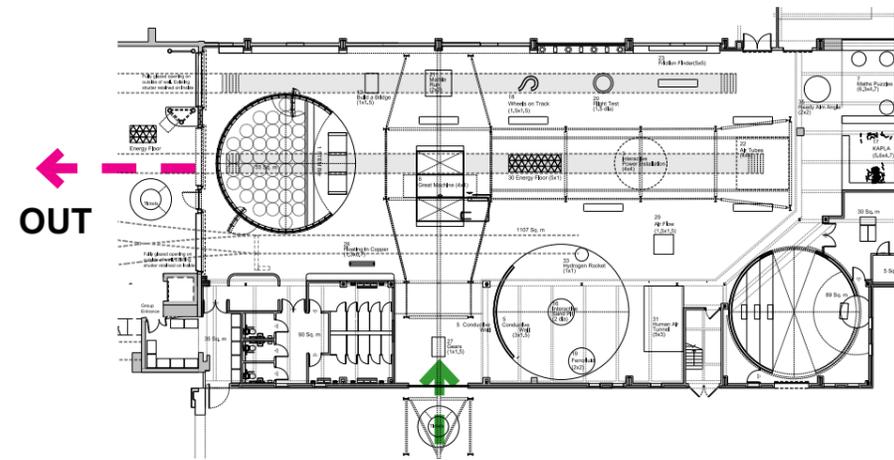
PHASE 1



DAYLIGHT

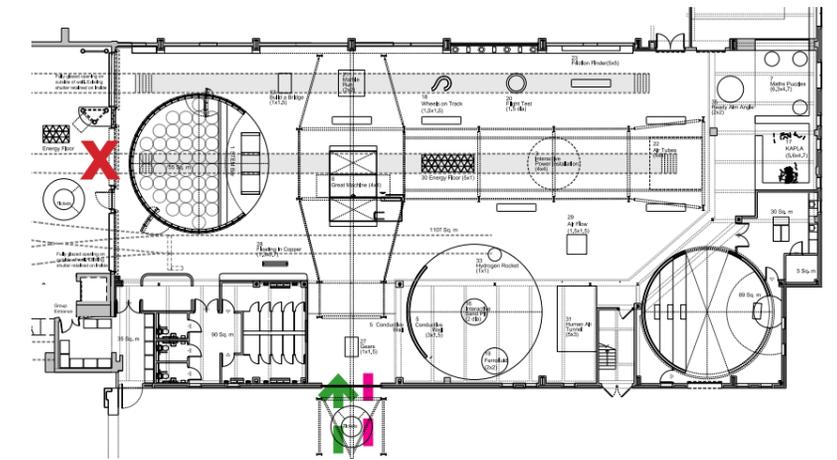
POST CENTRAL HALL

PHASE 2 - OPT 1



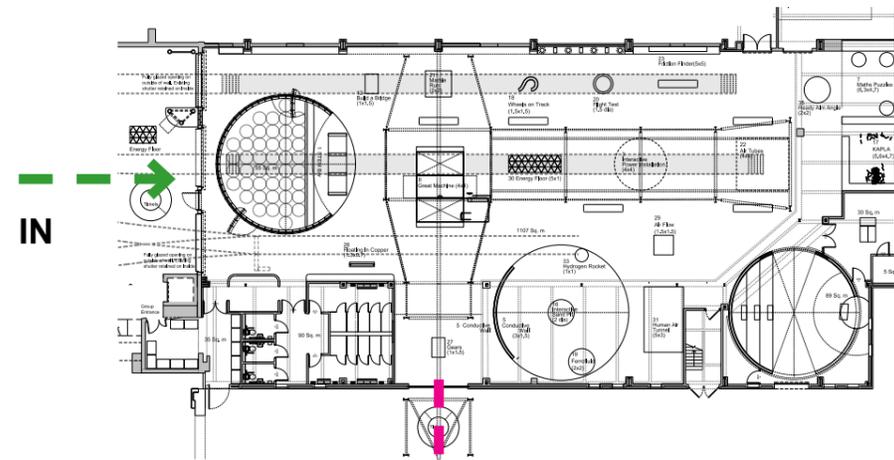
DAYLIGHT

PHASE 2 - OPT 2



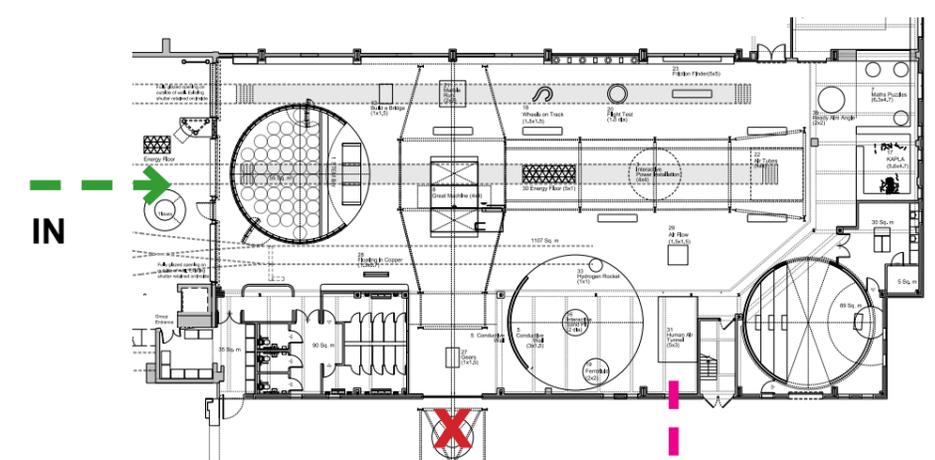
IN
DAYLIGHT
OUT

PHASE 2 - OPT 3



OUT
DAYLIGHT

PHASE 2 - OPT 4



DAYLIGHT
OUT

Our proposals for Wonderlab have been developed to ensure minimal gallery/museum disruption and cost between Phases 1 and 2, facilitating multiple future integration options with Central Hall.

In all phase 2 options considered once Central Hall is built, it is anticipated that only the Wonderlab main sign and welcome desk will require relocation.

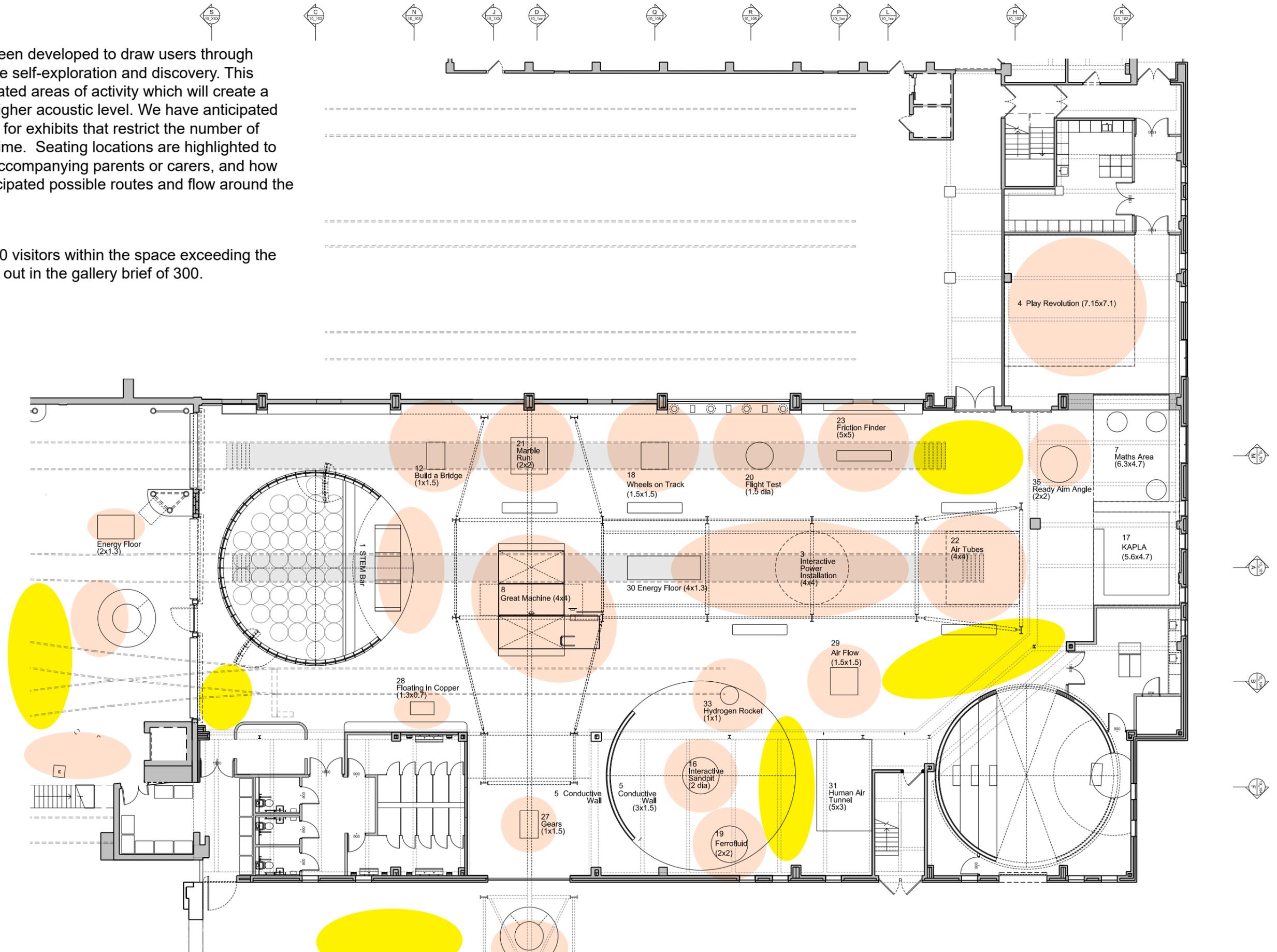
DMR have engaged with Fielden Fowles in the initial discussion of these options which will be further considered during the Central RIBA 2 development stage which is running concurrently with Wonderlab RIBA 3 detailed design.

Option 1 where Wonderlab is entered from the new Central Hall and exiting to Great Hall is our current preferred and assumed option.

Visitor Flow, Hot Spots & Seating

The gallery layout has been developed to draw users through the space and encourage self-exploration and discovery. This diagram sets out anticipated areas of activity which will create a density of users and a higher acoustic level. We have anticipated where queues may form for exhibits that restrict the number of participants at any one time. Seating locations are highlighted to show points of rest for accompanying parents or carers, and how these work with the anticipated possible routes and flow around the space.

This layout illustrates 400 visitors within the space exceeding the expected occupancy set out in the gallery brief of 300.



Proposed exhibit layout zones



The proposed exhibit layout has been informed by the following factors:

- Exhibit footprint requirements incl. interaction points, orientation, gathering/queueing
- Exhibit adjacencies (to maximise learning)
- Acoustics (noisy exhibits spaced or located under the mezzanine or on gallery perimeter)
- Maximising existing features (Wheeldrop)
- Pits and crane providing central axis & technical support (concealed services)
- Operational needs (ie Play Revolution)
- Wayfinding, flow and visitor experiences (high impact spaces vs. spaces for reflection / quiet interaction)
- Sightlines, balancing vertical elements

Zones are for exhibit development purposes only and there will be no physically zoned areas within the finished gallery environment.

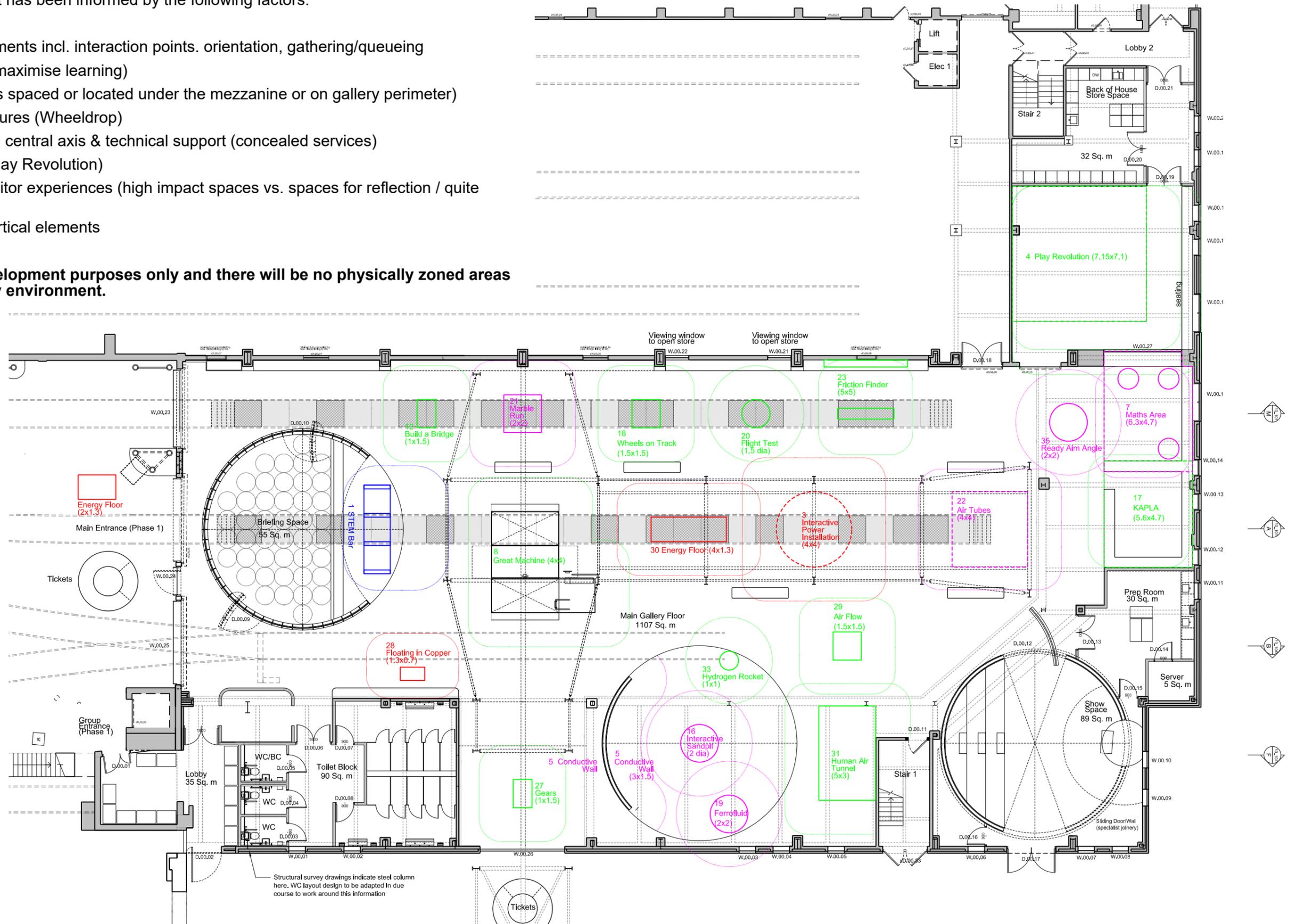
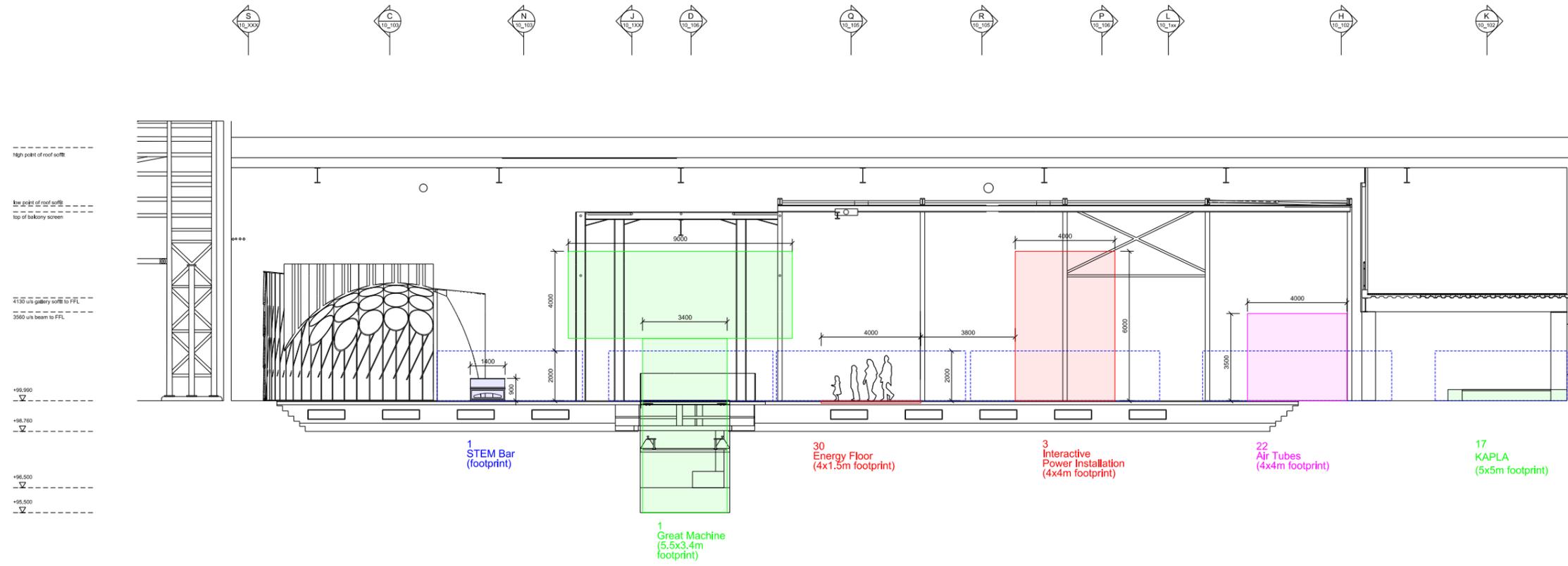
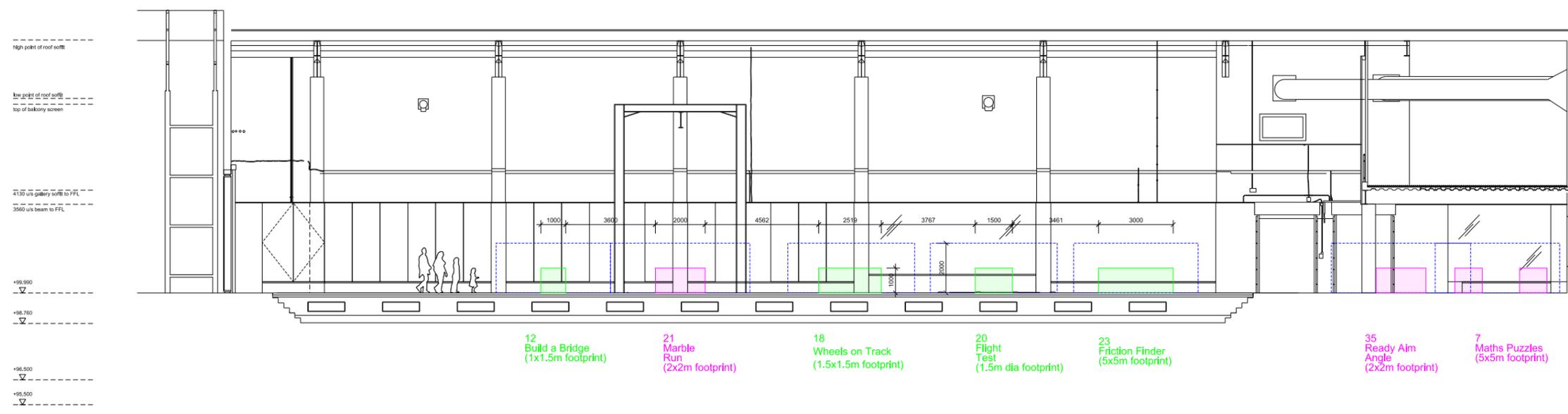


Exhibit zones : Gallery long sections



1 Section AA
 SCALE 1:100



2 Section MM
 SCALE 1:100

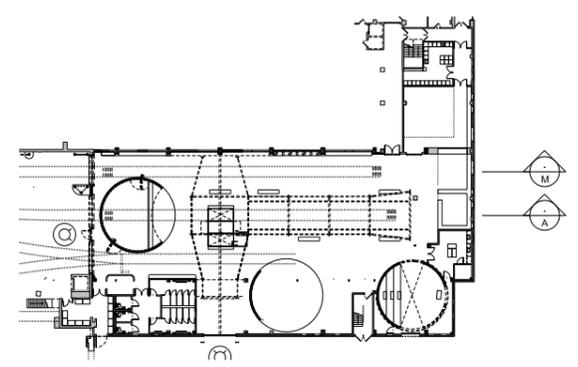
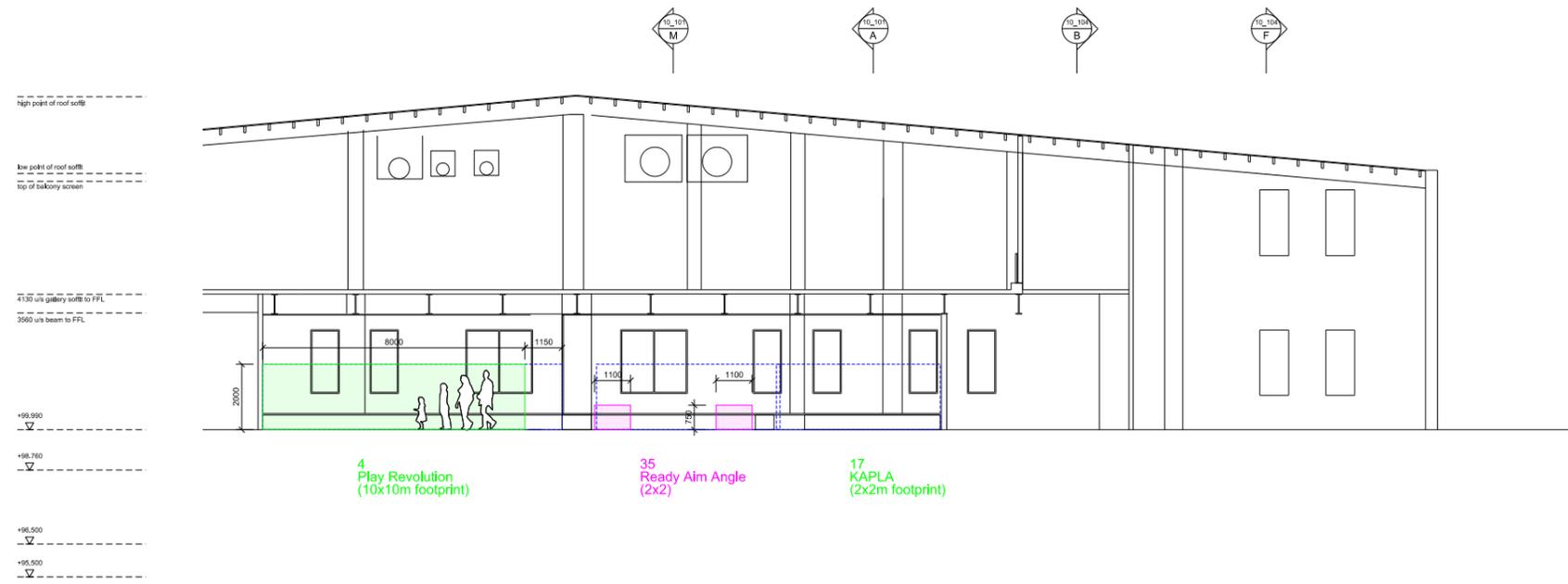
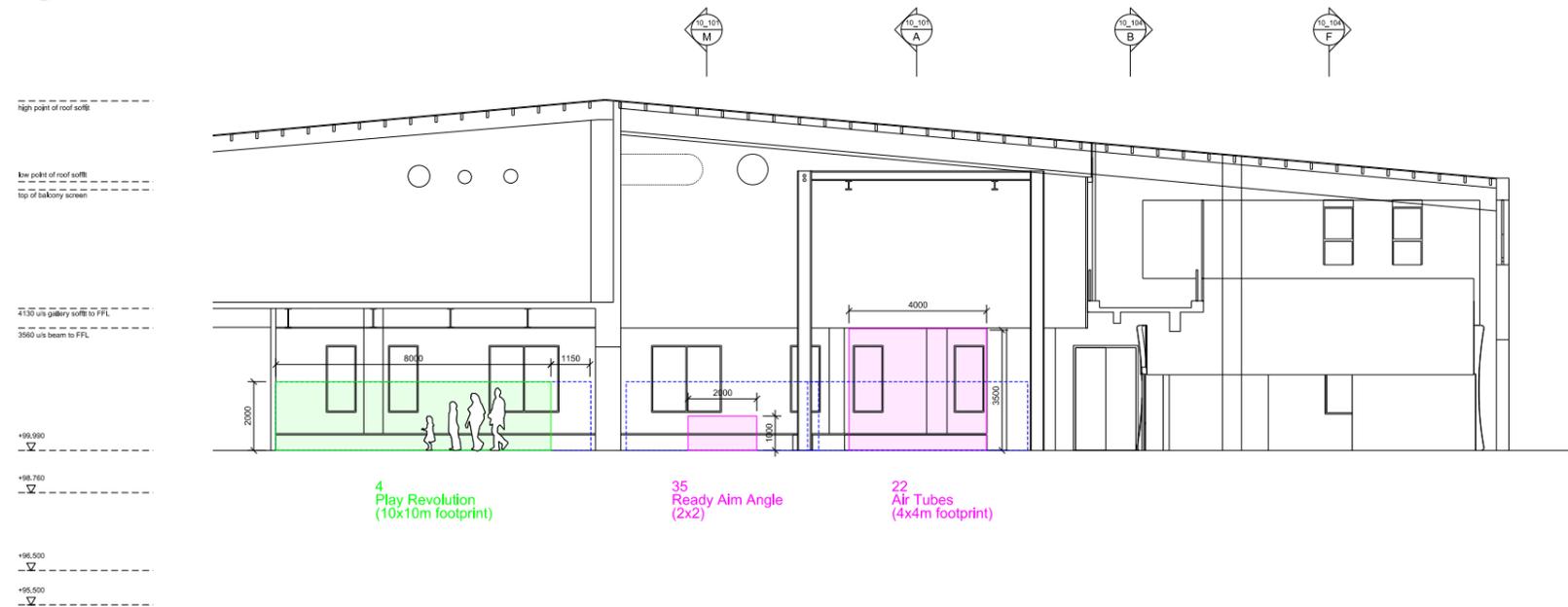


Exhibit zones : Gallery cross sections



1 Section KK
SCALE 1:100



1 Section HH
SCALE 1:100

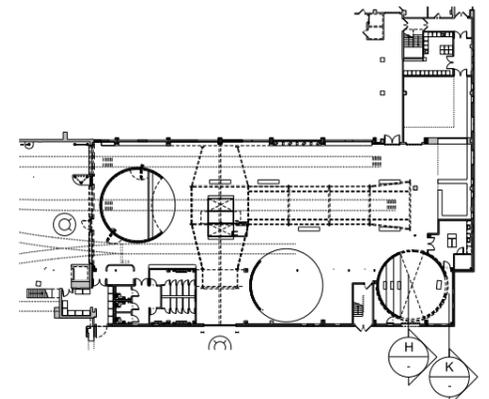
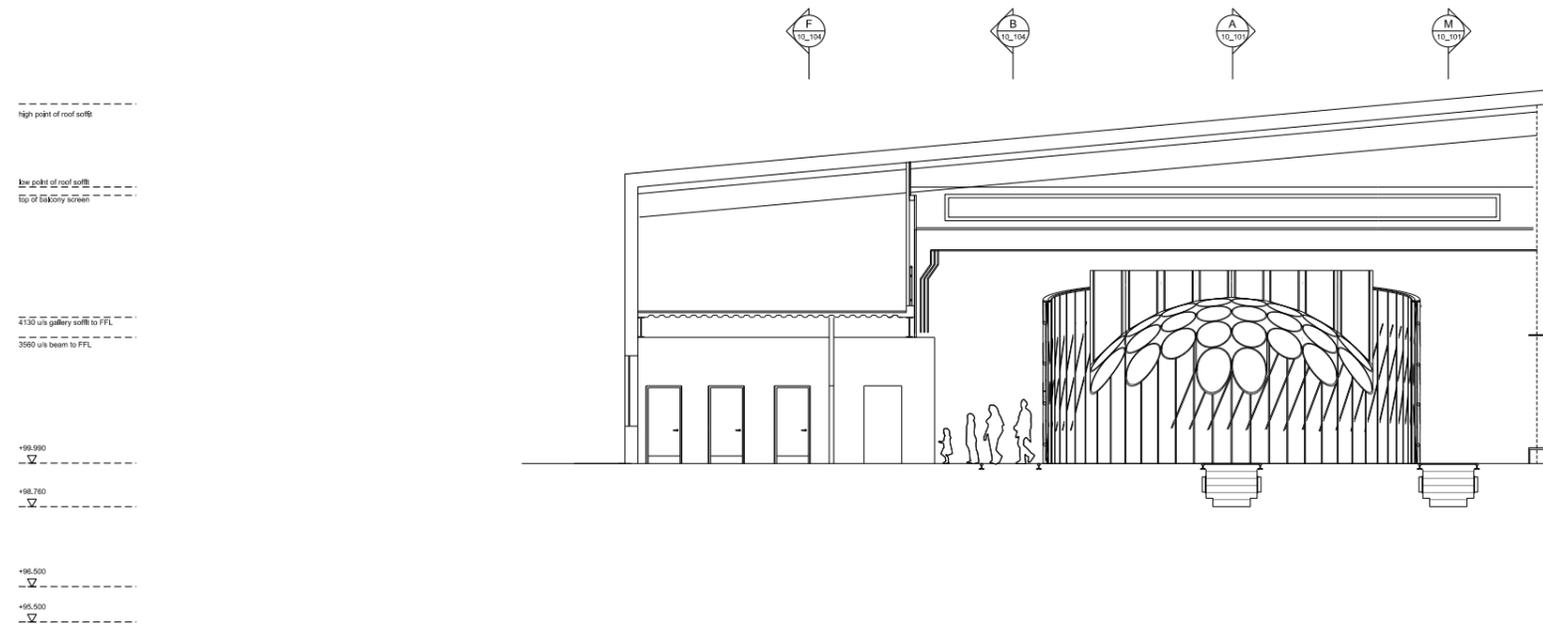
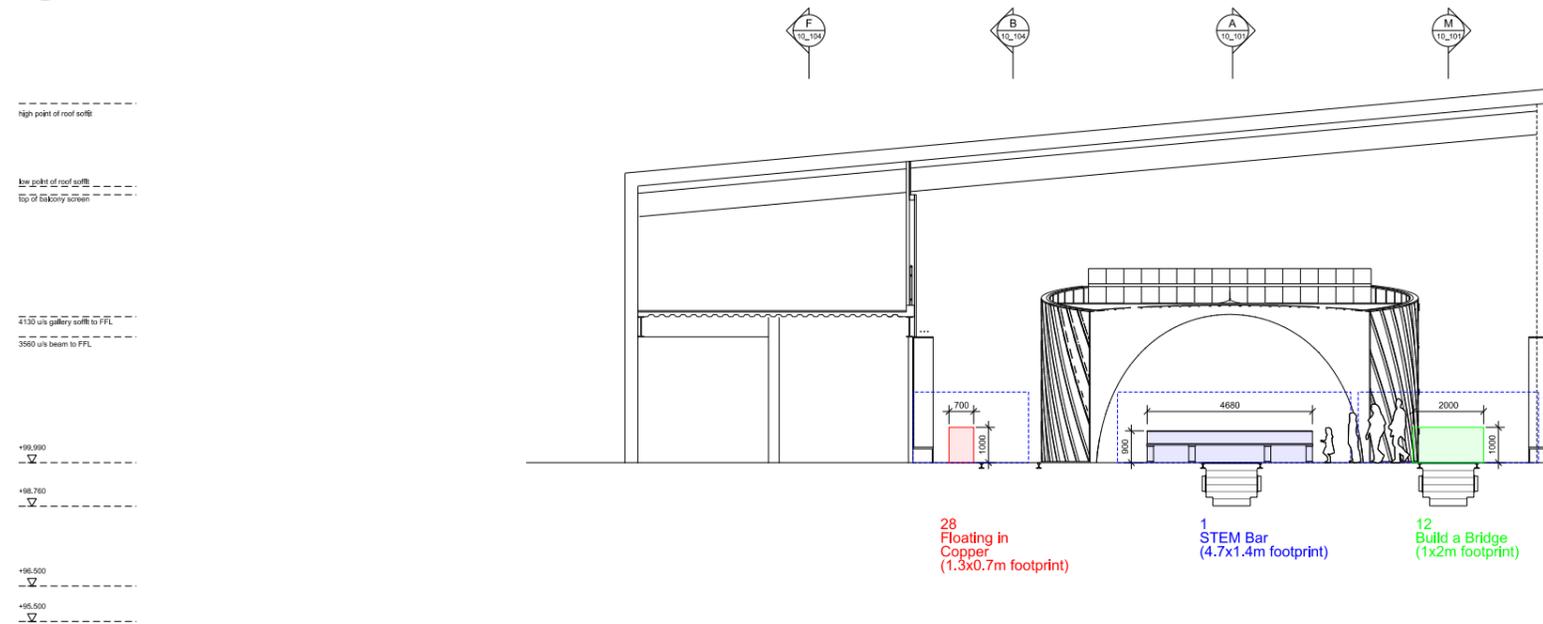


Exhibit zones : Gallery cross sections



Section CC
SCALE 1:100



Section NN
SCALE 1:100

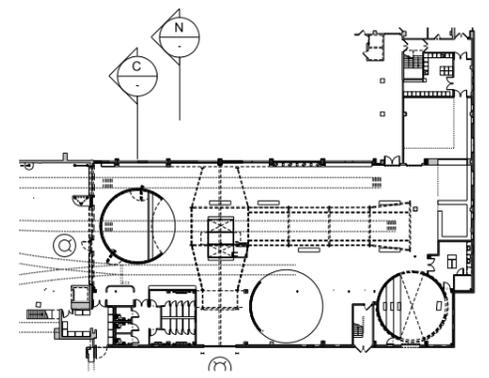
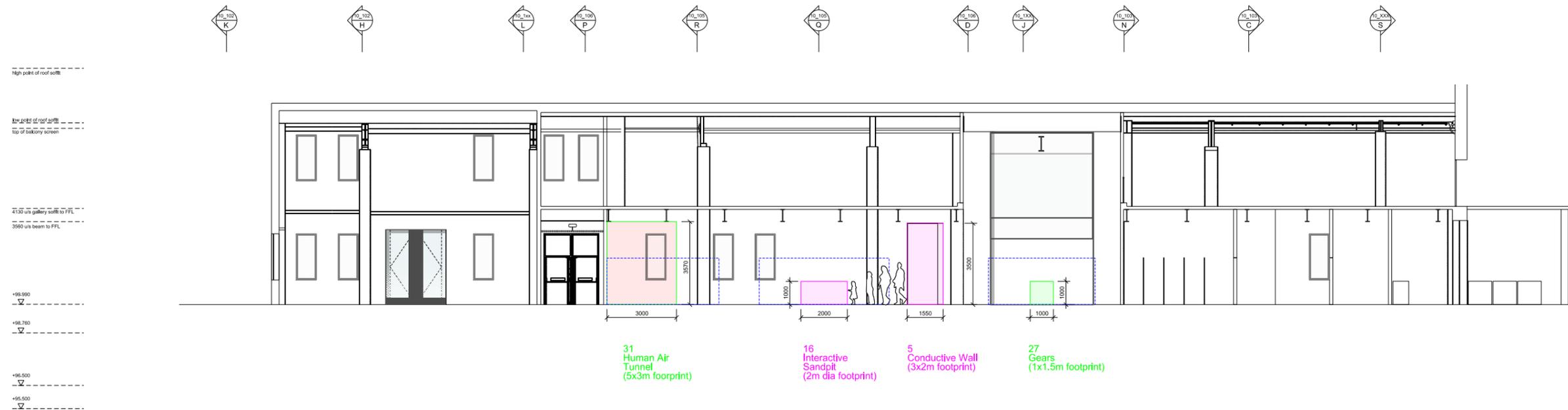
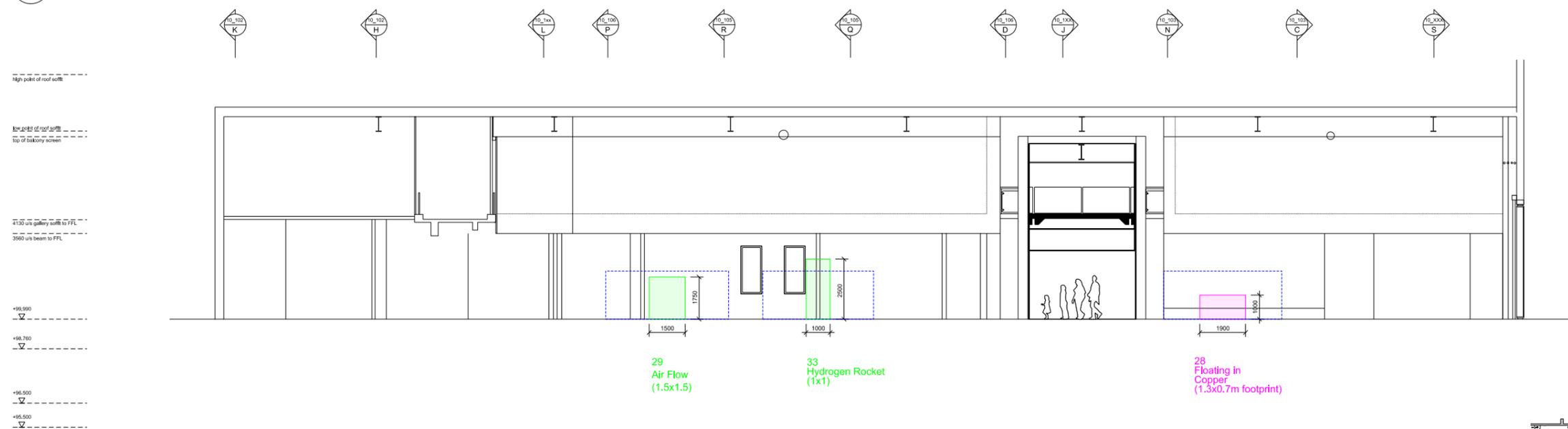


Exhibit zones : Gallery long sections



1 Section FF
 SCALE 1:100



1 Section BB
 SCALE 1:100

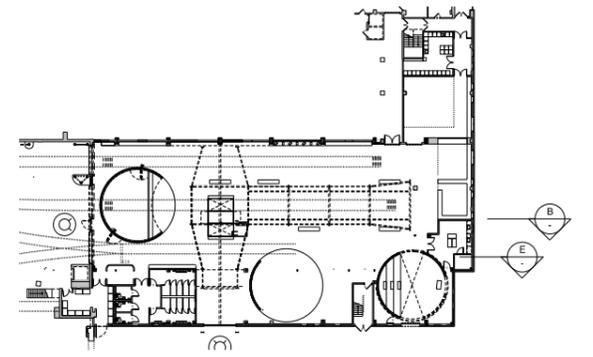
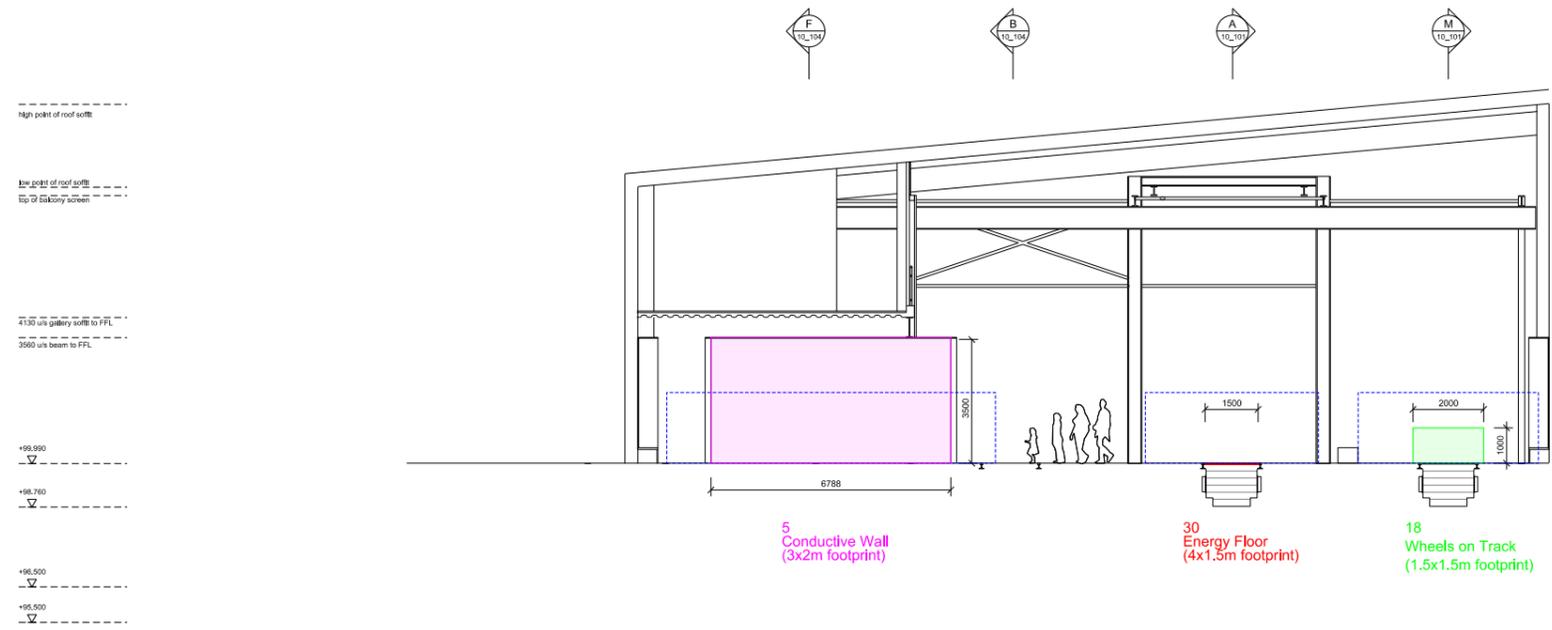
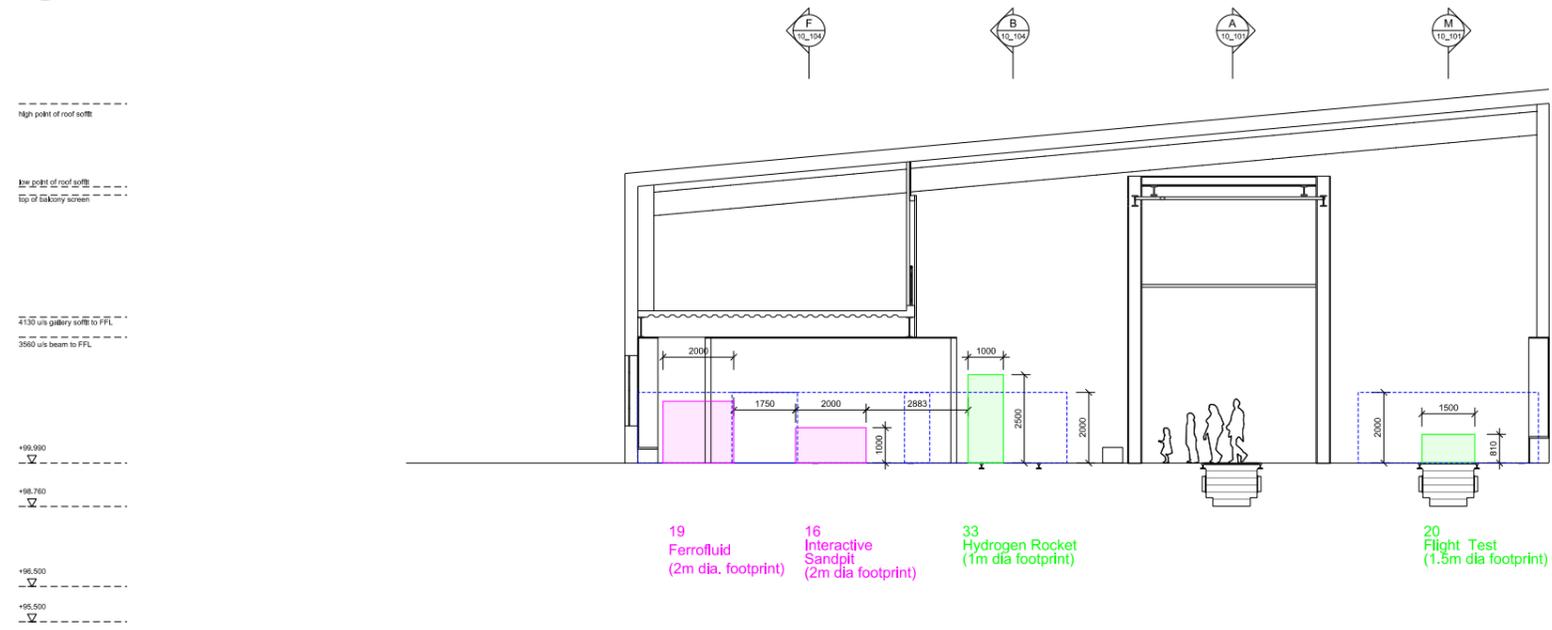


Exhibit zones : Gallery cross sections



1 Section QQ
SCALE 1:100



1 Section RR
SCALE 1:100

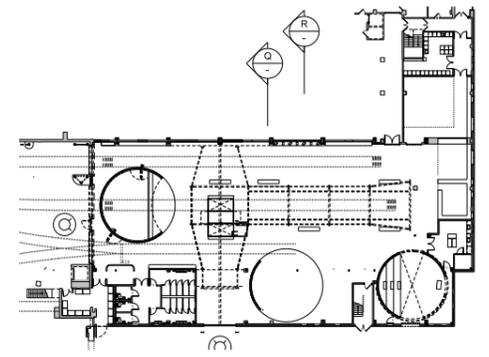
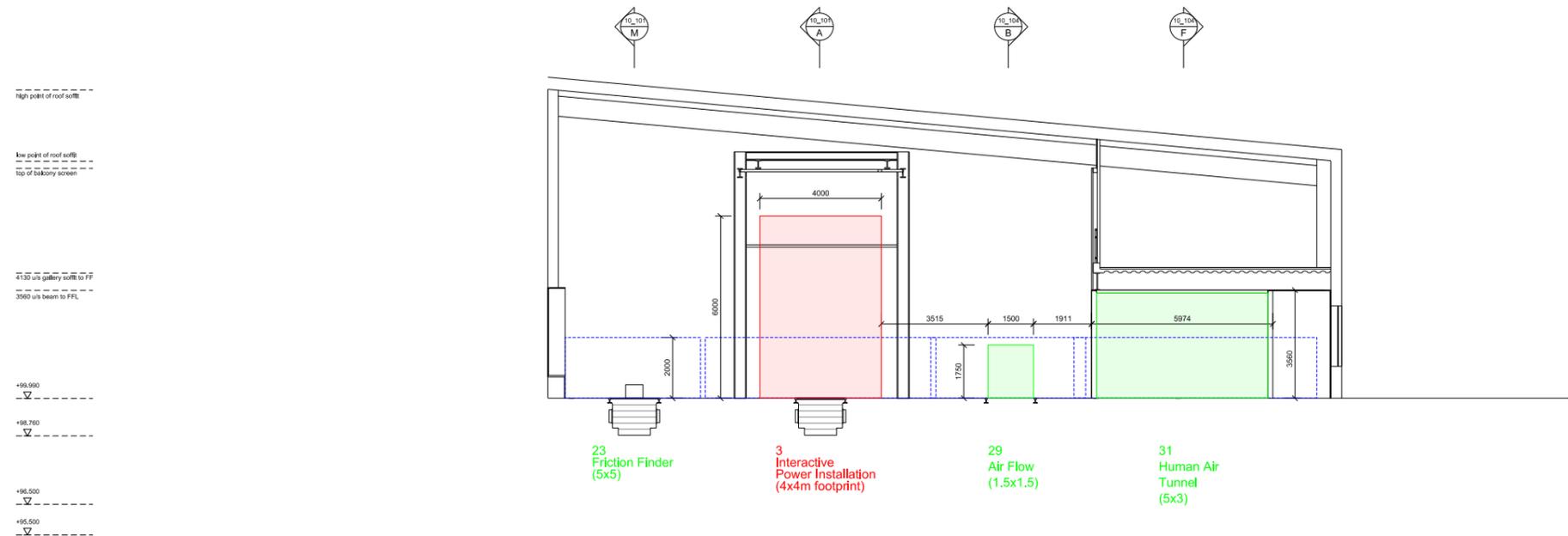
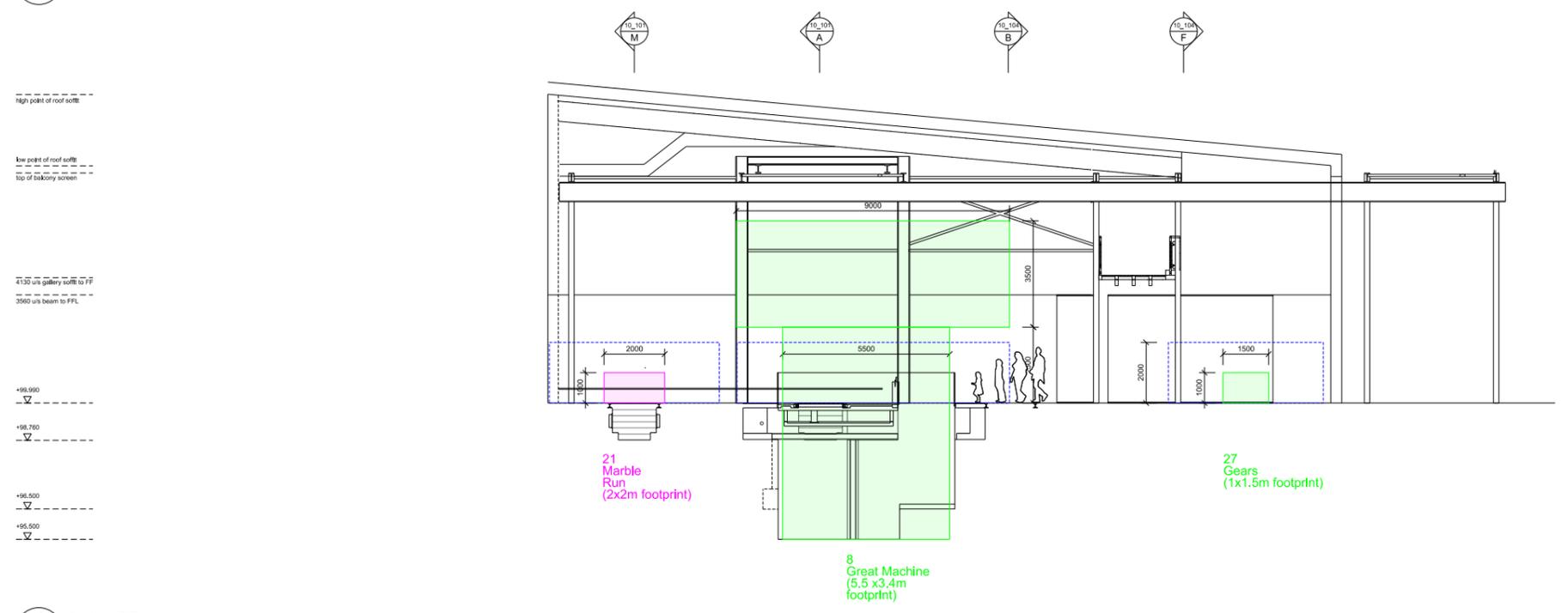


Exhibit zones : Gallery cross sections



1 Section PP
SCALE 1:100



1 Section DD
SCALE 1:100

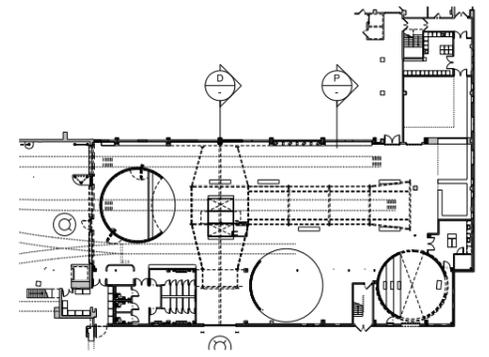


Exhibit zones : Volumetric model : View 1



Exhibit zones : Volumetric model : View 2



Exhibit zones : Volumetric model : View 3



Exhibit zones : Volumetric model : View 4



Exhibit zones : Volumetric model : View 5



Exhibit zones : Volumetric model : View 6



Exhibit zones : Volumetric model : View 7



5 SUSTAINABILITY & MATERIALITY

Sustainability

Sustainability

- SMG is committed to finding long-term, sustainable solutions to achieving appropriate environmental conditions needed to care for its collections (and those on loan from other institutions), visitor and staff comfort. We are keen to seek every opportunity to improve building efficiency to reduce carbon emissions and ongoing energy costs. The project is not required to pursue a specific sustainability rating, such as BREEAM or LEED, but we must consider all design options that would ultimately improve the buildings EPC rating.
- Wonderlab should, where economically viable in both capital and operational cost, adopt low carbon energy supplies and systems, be highly efficient in operation and use materials that minimise construction waste, water use and carbon emissions.
- Design Team will explore methods to create a stable environment through design, selection of materials, avoidance of waste and use of low-energy lighting.

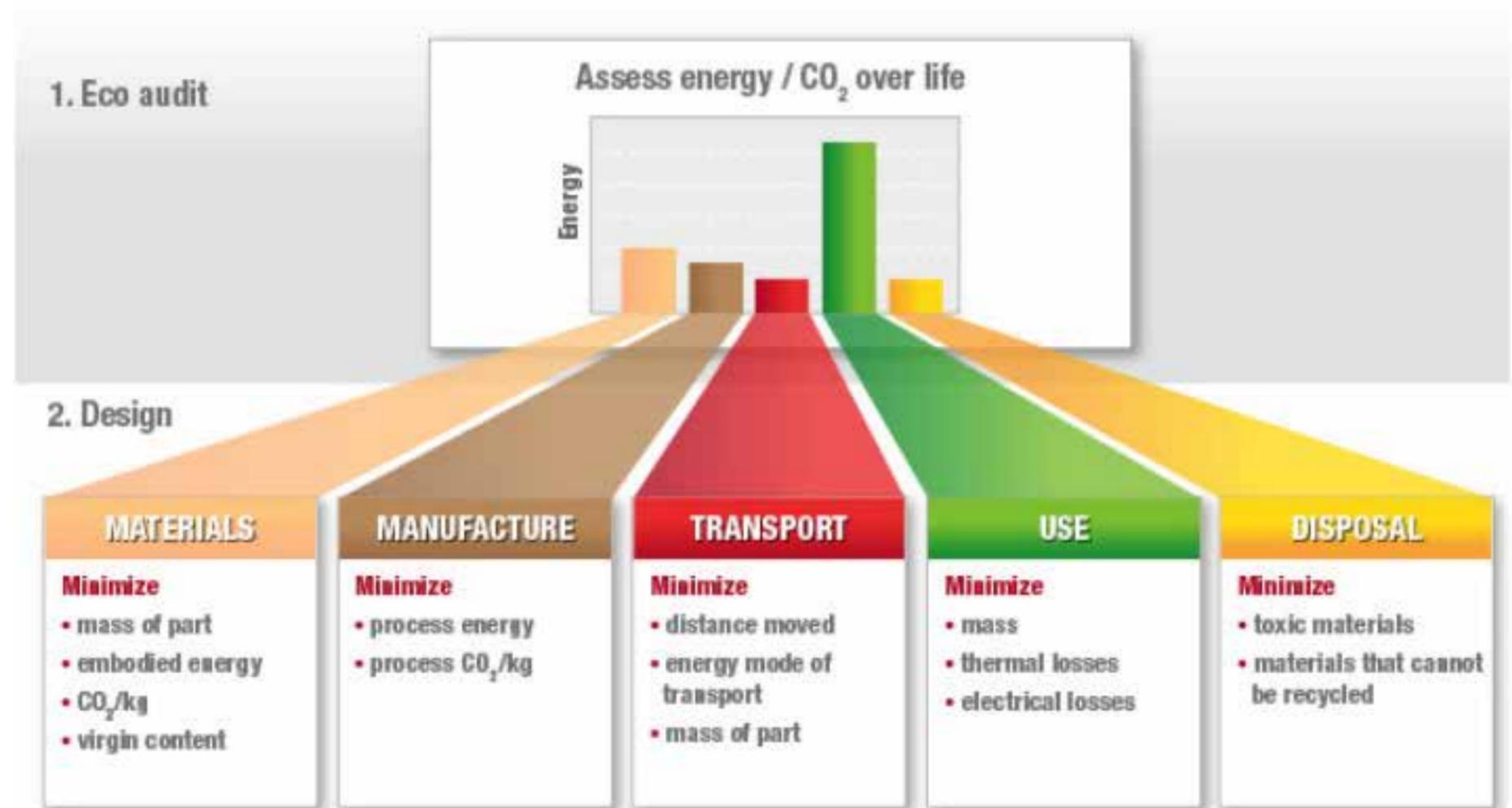
Gallery lifespan and Durability

- Wonderlab is expected to perform for 10-15 years. This will be a high-traffic gallery with enthusiastic visitors. All materials, finishes and construction methods must be durable, maintainable and cleanable.

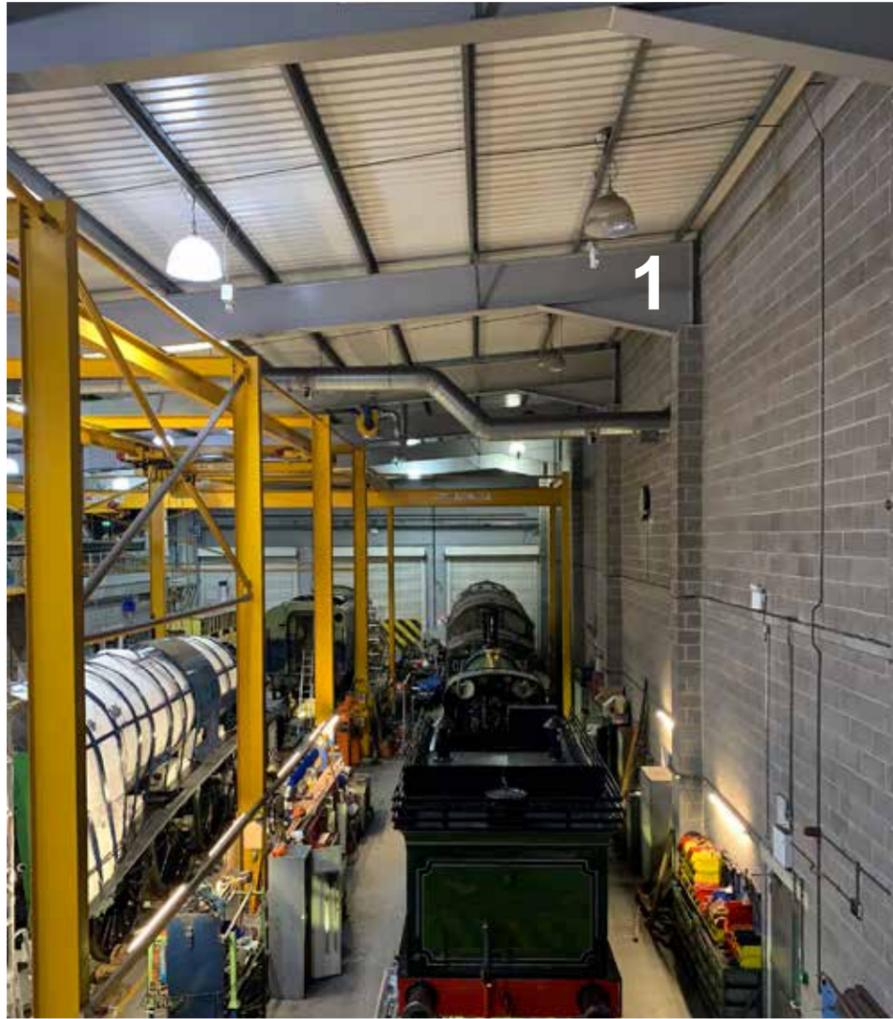
Our Commitment to De-carbonisation

Our concept for Wonderlab is driven by our commitment to a holistic approach to sustainability, engaging with both the social and environmental performance of the spaces we design to engage users, inspire and empower communities. As a practice we have signed up to the commitment that all new buildings must operate at net zero carbon by 2030, and all buildings by 2050. That said we are living through a climate emergency and we strive to deliver zero carbon buildings today. As such our proposal for Wonderlab aims for Whole Life Zero Carbon, with a 100% circular economy for raw material use and construction processes.

The design is driven by our team's low-tech simple-is-best philosophy and early-stage materials selection based on embodied energy, carbon footprint and locally-sourced materials, dramatically reducing the use of high-carbon content materials.



Unifying colour approach to primary structure



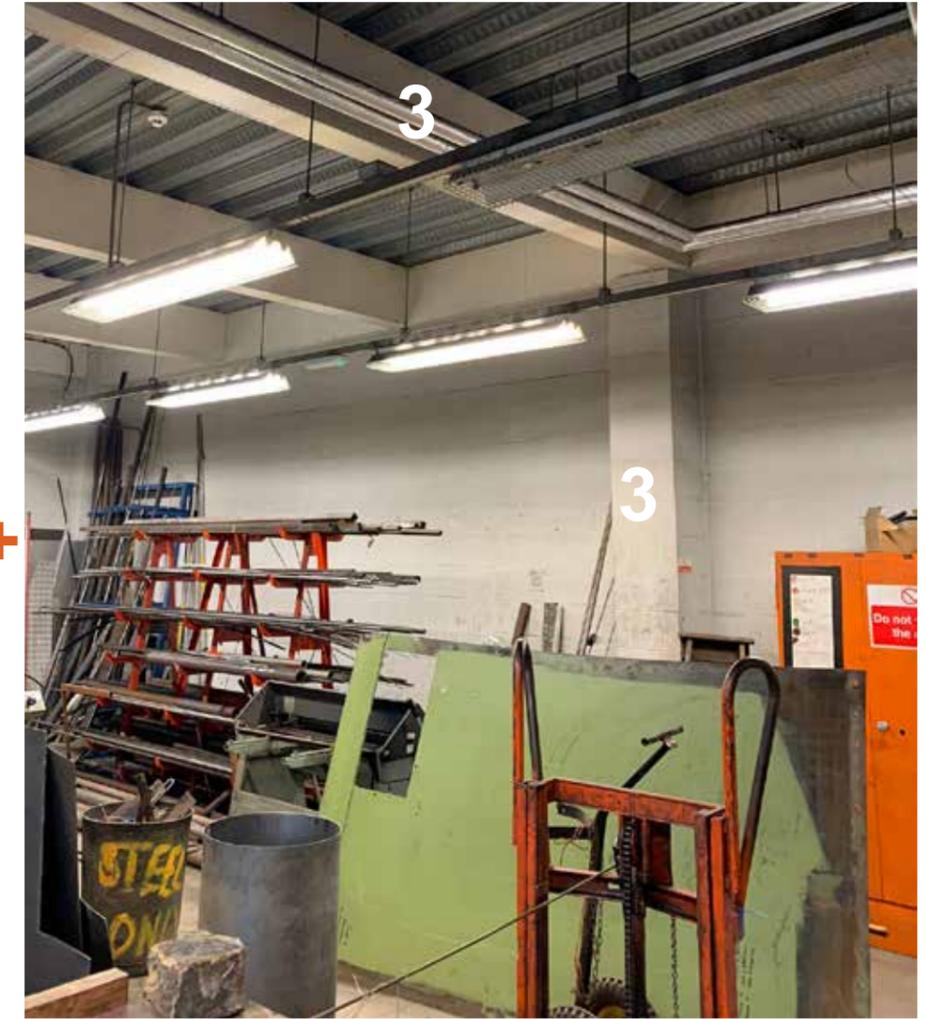
1 Building main steel portal frames

- Express all existing steel supporting structures with a uniform colour paint finish (intumescent fire-proofing where necessary) to illustrate a coherence of structural function and remove individual identity.
- These existing structural frames provide structural infrastructure for the building enclosure and to support the activities within.
- In particular the cranes, designed to support lifting activities, should now support the gallery interactive exhibits (Big Machine / Interactive Sculpture, / Pulley up / Air tubes)
- Expose the concealed structural beams and columns of the mezzanine soffit by removing fire-board casings and fire-proofing concrete block-work linings.

de matos ryan



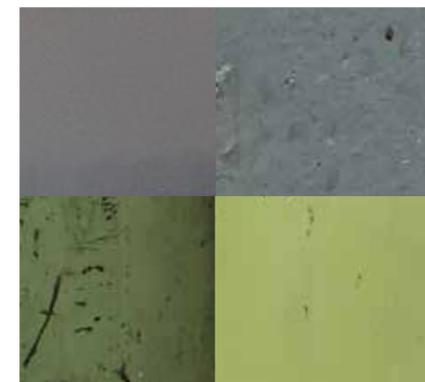
2 Steel cranes



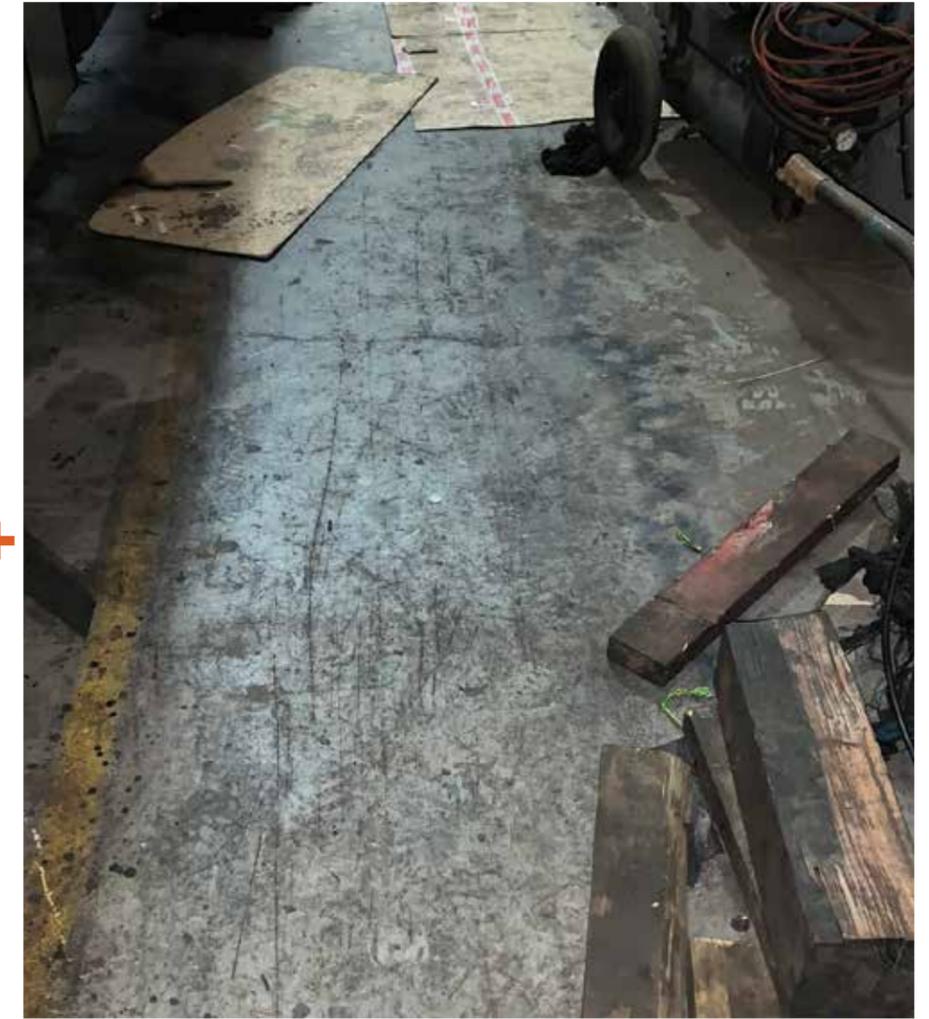
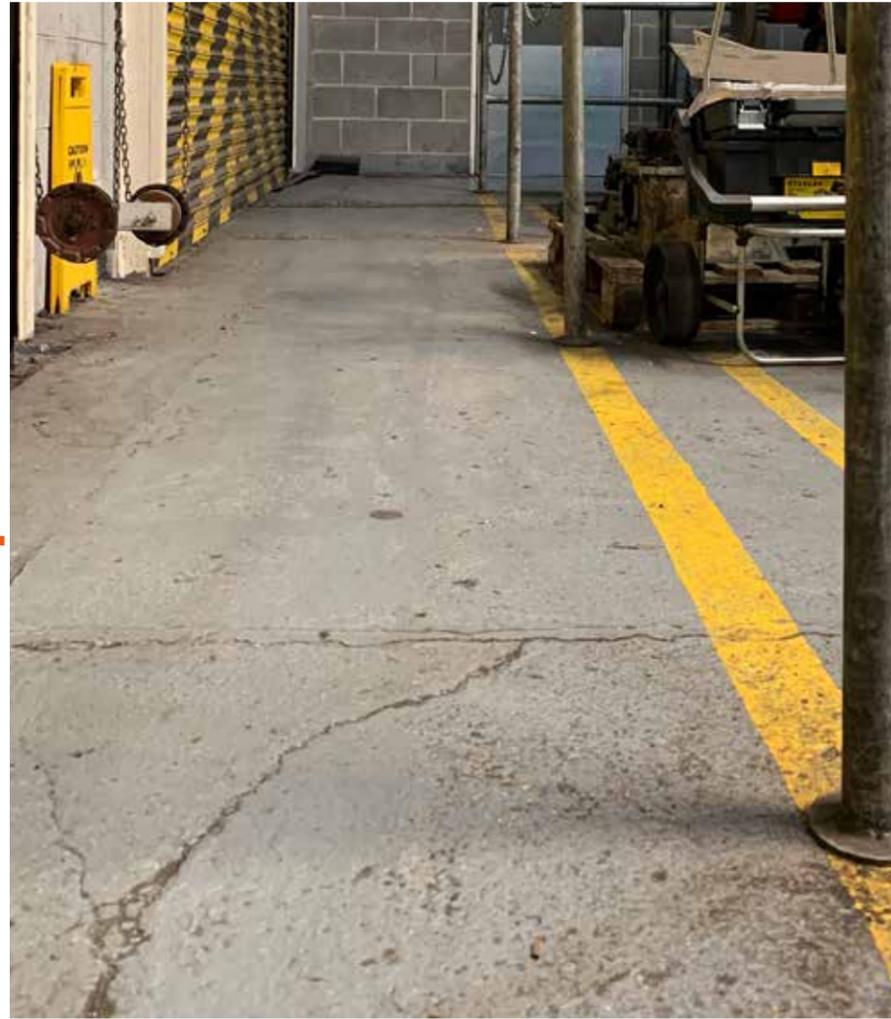
3 Mezzanine steel beams / columns

Proposed colour options:

- A 'recessive' colour tone is proposed directly inspired by the existing workshop and workshop equipment colour palette.
- The proposed 'recessive' colour will support, complement and allow the exhibit/activity it supports to take centre stage.



Elevate existing concrete slab with sealed and polished finish



1 Retain history of existing concrete

The existing floor is a painted finish on a robust concrete slab which is well trafficked and functional in nature.

Through extensive use it has developed cracks and its own patina.

Our proposal is to bring this robust and industrial material back to life by stripping back the existing grey paint and yellow markings, removing and/or sealing contaminants for safe use by visitors while retaining the patina, staining and grittiness with a revived polished concrete surface finish.

Cracks will be carefully filled to provide a safe and level surface but avoid erasing the traces of its former industrial life.

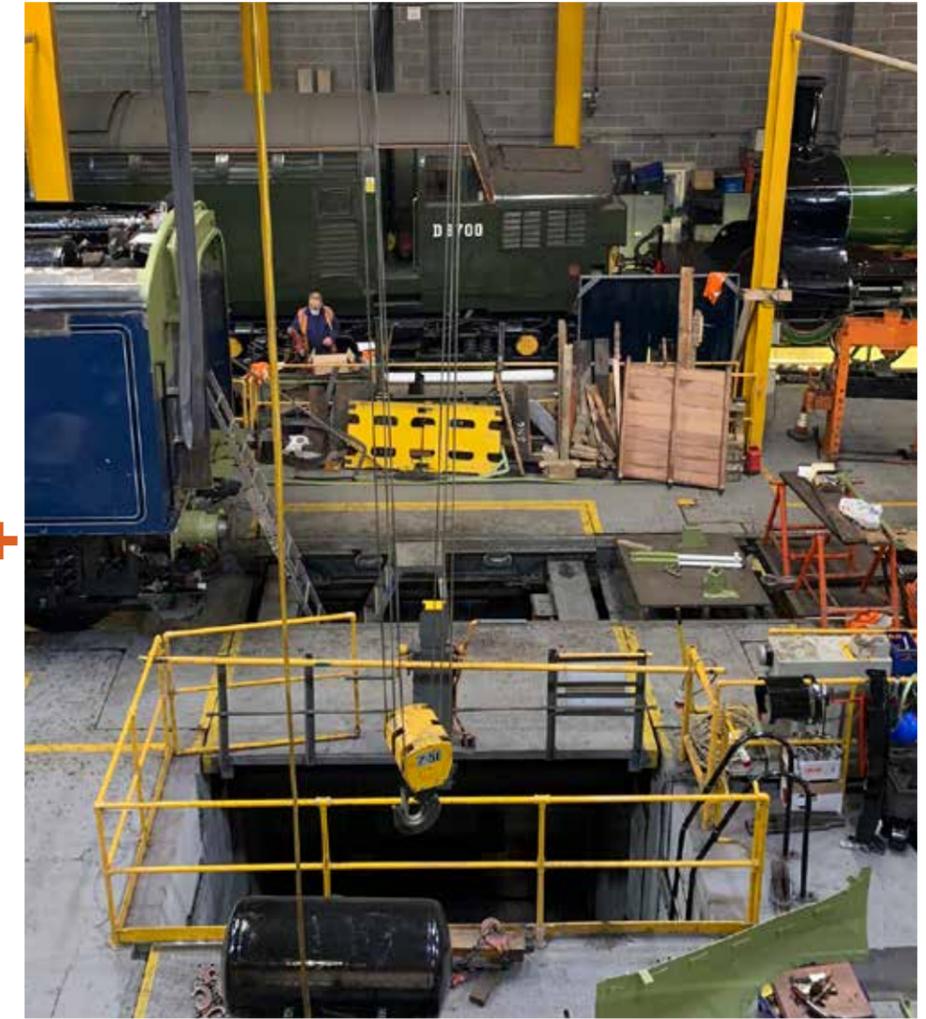
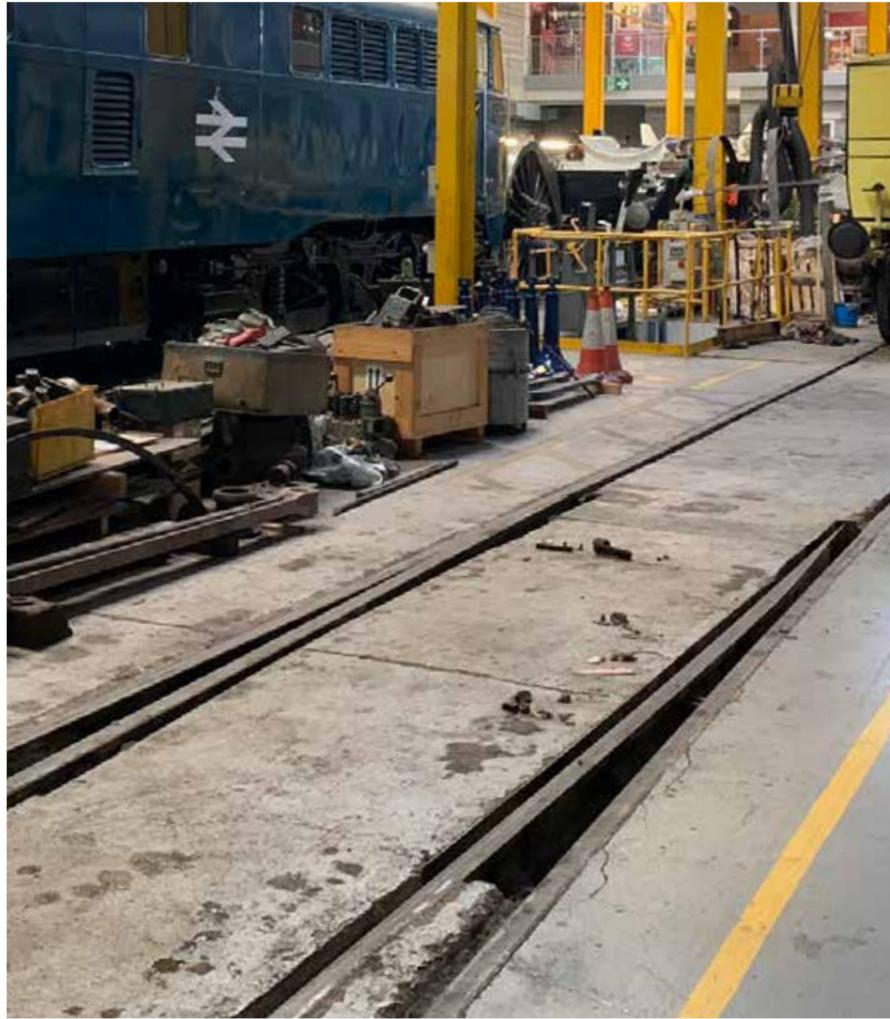
2 Strip paint to expose concrete

3 Remove / seal contaminants



Polished and sealed concrete floor precedent

Celebrate primary infrastructure



1 Tracks

The existing workshop is a museum object and learning tool in its own right and its primary repair infrastructure offers a unique opportunity to both highlight the activities that are currently housed within it and communicate and celebrate the story of its 'existing past' as a repair workshop. These primary infrastructure elements will be injected with a new life, providing orientation and a clear framework within the space to hang and support the new proposed exhibits. New frameless glass linings and balustrades will prevent falling into track service pits and the wheeldrop. New additions will be minimal, pared down and unobtrusive.

Careful infill of the gaps within the tracks will be sensitively considered to subtly highlight its previous use at the same time providing level surfaces that are accessible for all.

2 Service pits



Glazed walkways

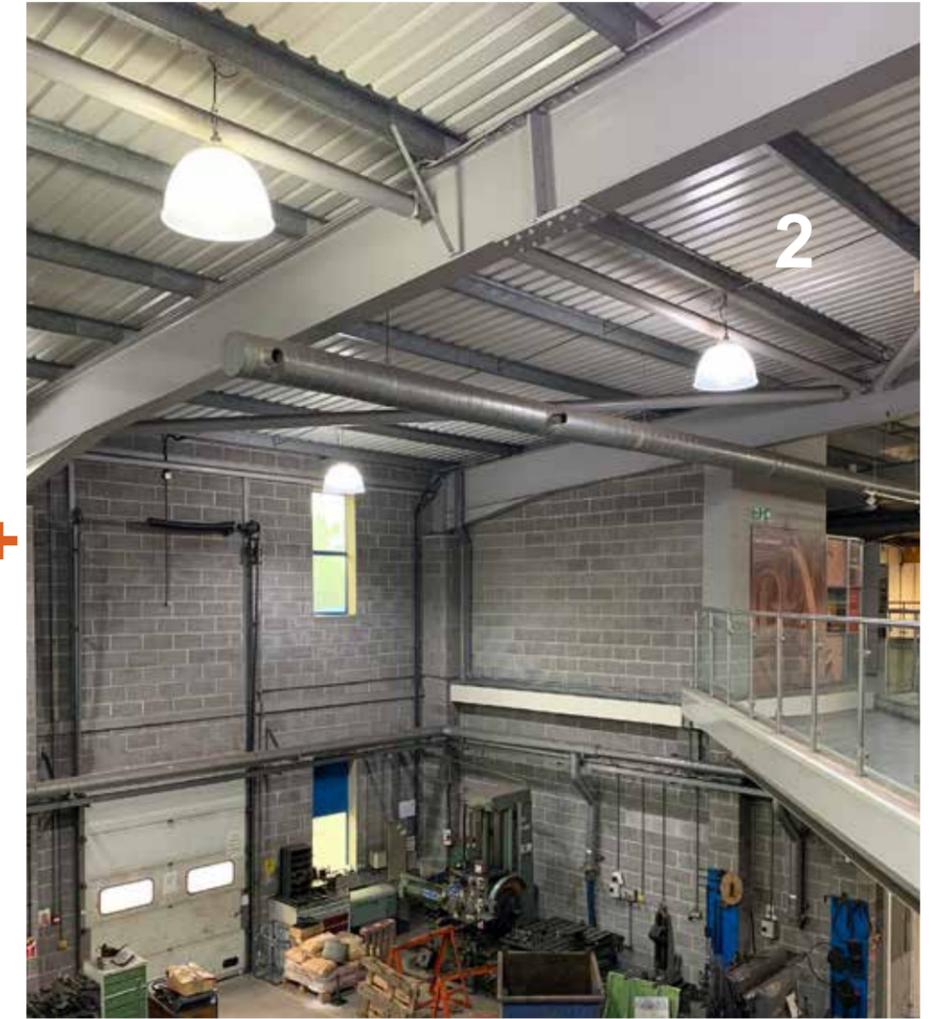


3 Wheel Drop



Museum Vlaardingen glass balustrade precedent

Visually 'lower' gallery roof with dark tone acoustic insulation lining



1 Main workshop high level roof

- Define and visually 'lower' the gallery roof enclosure with a dark anthracite tone providing an enhanced focus on the exhibits held within.
- Provide acoustic attenuation to the double height gallery hall with SonaSpray K-13 noise reduction insulation. This is a sprayed ceiling system with in-built treatment for fire and mould resistance and with uniform colouring throughout the full thickness of the coating.
- Carbon neutral and low embodied energy. Good for the environment & recyclable. Safe, recycled, natural cellulose fibre.

2 Including Show Space area



Sprayed texture



Tate Modern precedent

Enclose mezzanine with a high level screen

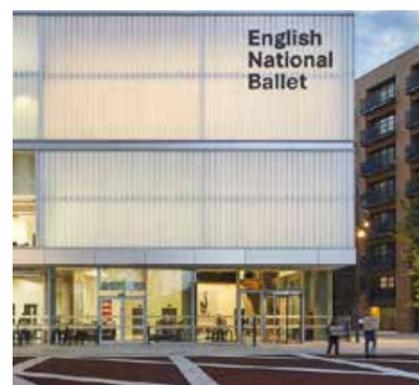


1 Mezzanine balcony

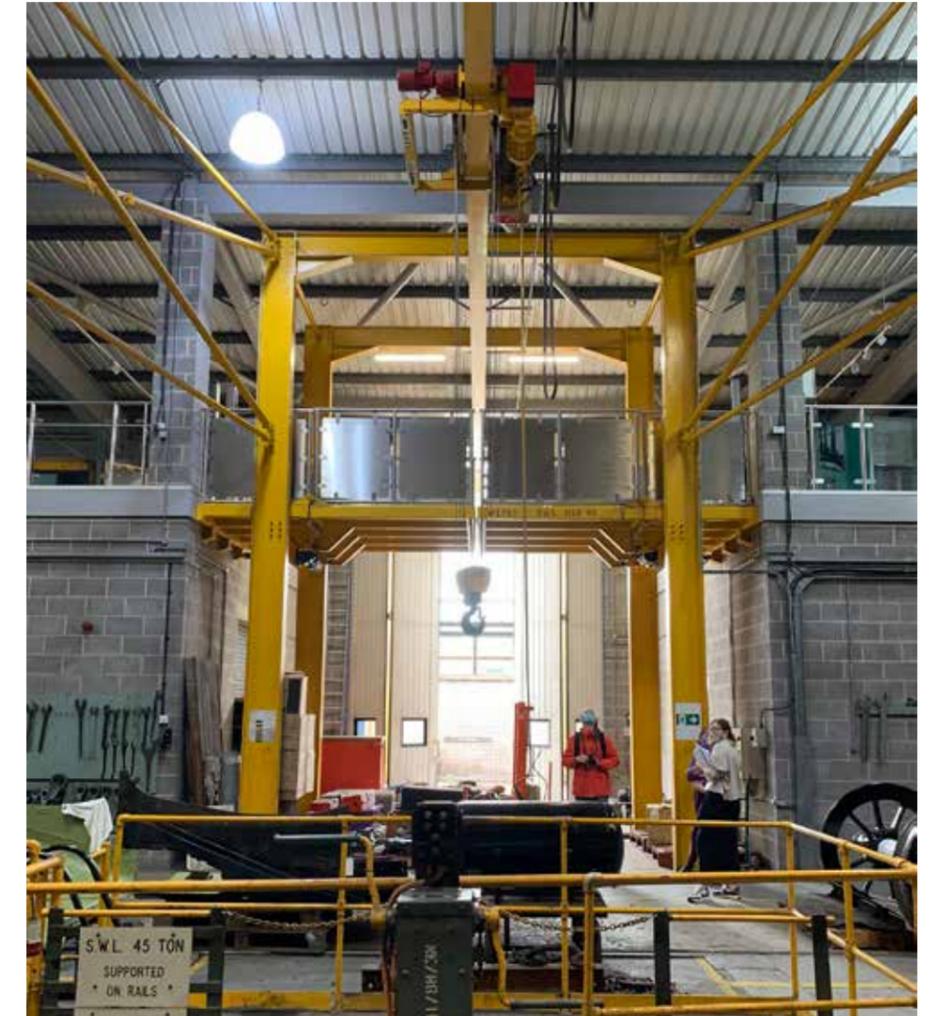
The existing mezzanine does not form part of the Wonderlab scope yet is currently visually and acoustically linked to the workshop space. The existing glass and stainless steel balustrade to the mezzanine floor, though functional, is not in keeping and is at odds with the overall aesthetic of both the existing workshop and proposed design of the Wonderlab gallery. In order to provide visual and acoustic separation, Okalux insulated glass, often used in industrial buildings for its excellent thermal properties, cost benefits and robustness, is proposed to provide a light box effect at high level and act as a calm backdrop to the space. There will be a more obscure visual connection with the mezzanine through borrowed light and the possible shadow effect of mezzanine users passing by. Further briefing and input as to the precise nature and functional use of the mezzanine will be required as the design of the space progresses.



2 Mezzanine bridge to hall



English National Ballet precedent



3 Framing either side of crane bridge



English National Ballet precedent

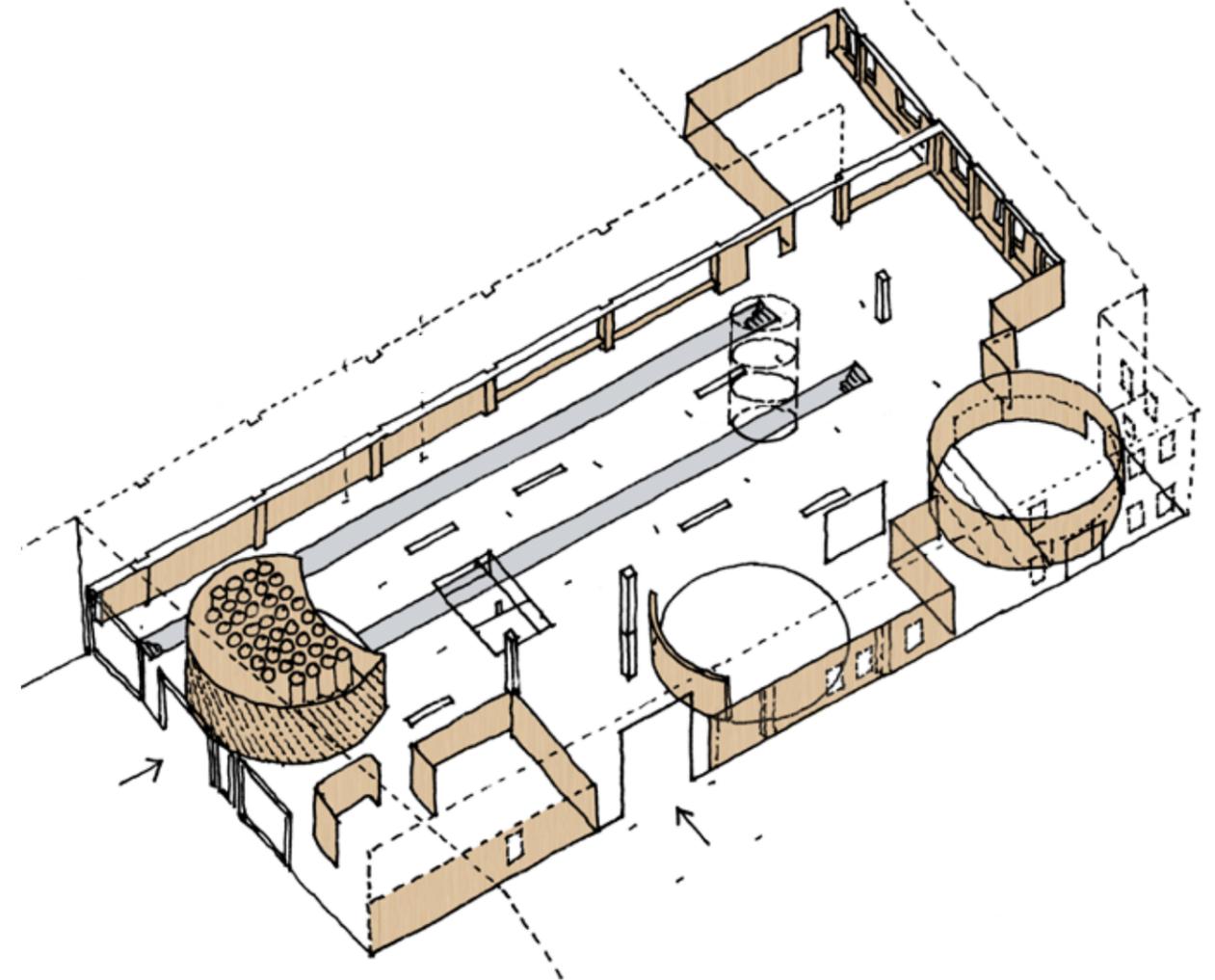
Juxtapose the texture and grittiness of the workshop concrete blockwork - with a new warm timber lining datum



1 Double height robust concrete blockwork wall left exposed

New material interventions in the gallery will be robust, hard-working and sustainable with playful accents and treatment. A calm and limited natural material palette is proposed designed to appeal to both a younger audiences as well as to users of commercial venue hire opportunities. The making and detailing of these new elements directly reflects the craft from which they are produced and where possible expose the structure that supports these.

A datum line of sustainable plywood/triboard wall lining is proposed at low level of the blockwork wall to both reduce the expense and add a layer of warmth to the cold and functional blockwork. The high level blockwork could also have graphic treatment applied to animate the large expanse of the material.

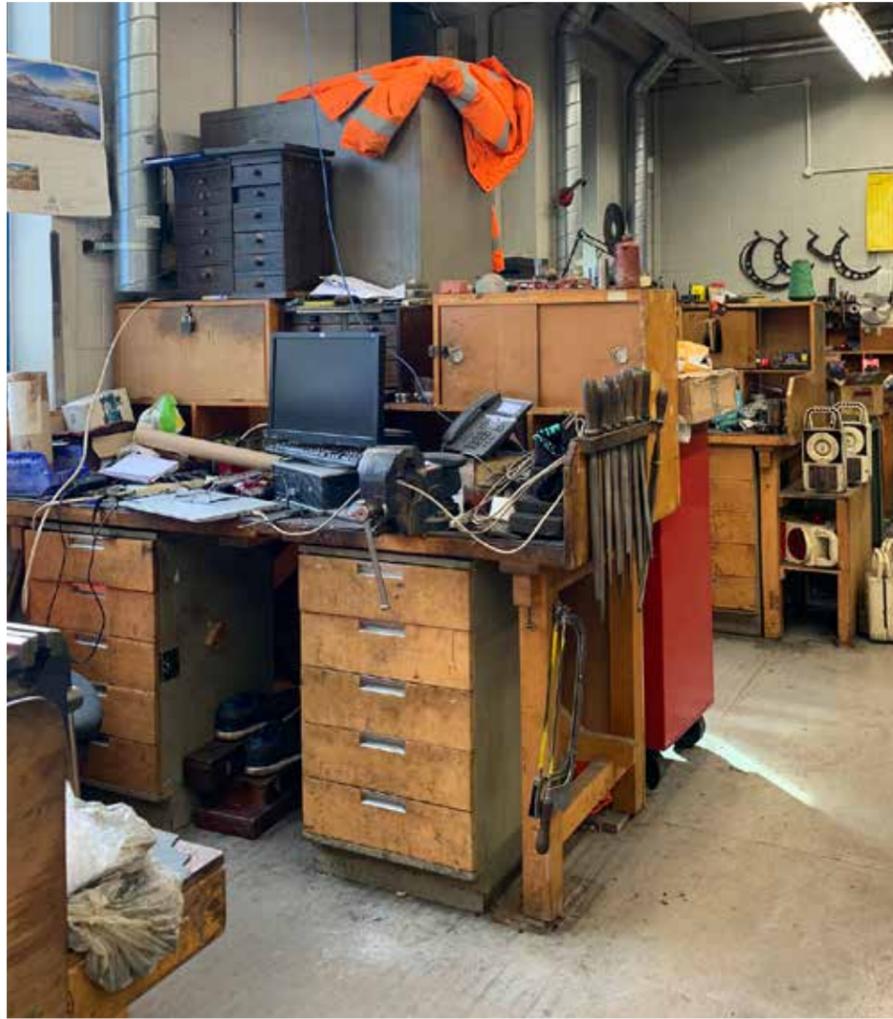


2 New timber wall lining defines the perimeter



Graphics on concrete blockwork

A new perimeter timber wall lining with 'practical detailing'



1 Woodwork workshop

The new low level panelling takes inspiration from the existing timber workshops where timber benches, peg boards and linings are used to hook and hang workshop equipment. Often recesses are created to house drawers, cupboards and workbenches.

The proposed timber lining as a material will be 'pushed' to work hard and deliver multiple functions. Perforated and CNC timber panelling with coloured backgrounds and plugs are proposed to display information, hang and support some of the exhibits and deliver acoustic attenuation. The proposed timber datum will incorporate recessed bench seating, workstations and like the existing workshop have CNC cut-outs with colour to create pattern and texture defining different and more intimate activity areas along the perimeter of the main double height gallery volume.



2 Functional hanging & pegboards



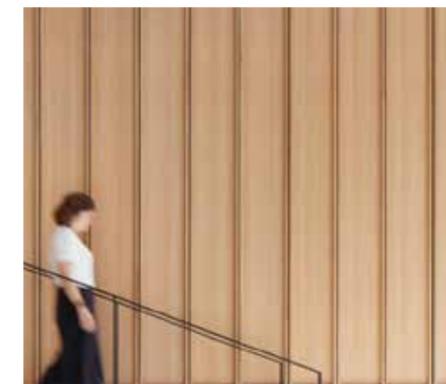
Natural plywood finish



Plywood panelling precedents



3 Tools with large graphic identity



Applying the rich workshop engineering colour palette



Accent colours



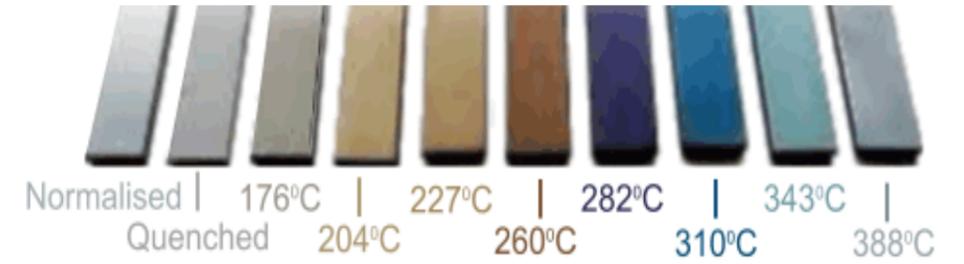
Workshop Sage



Pit White



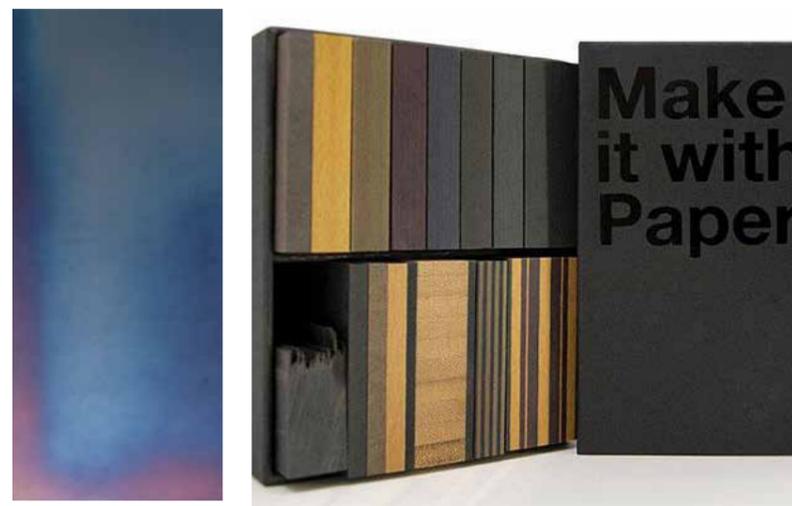
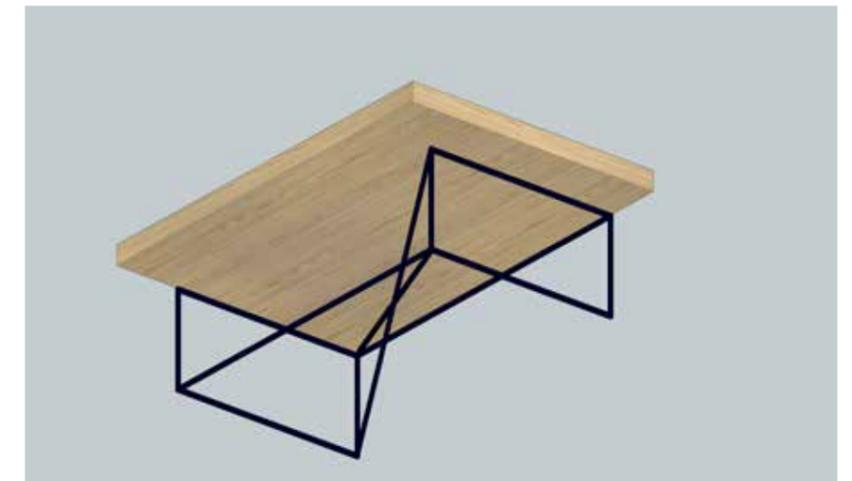
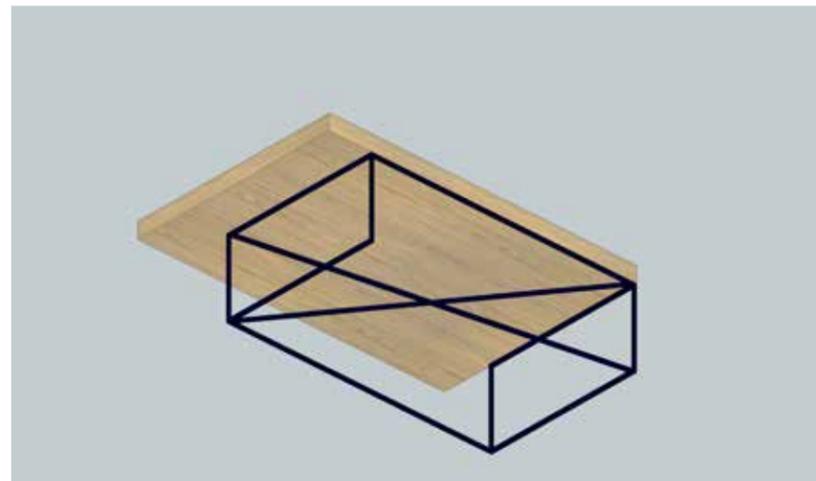
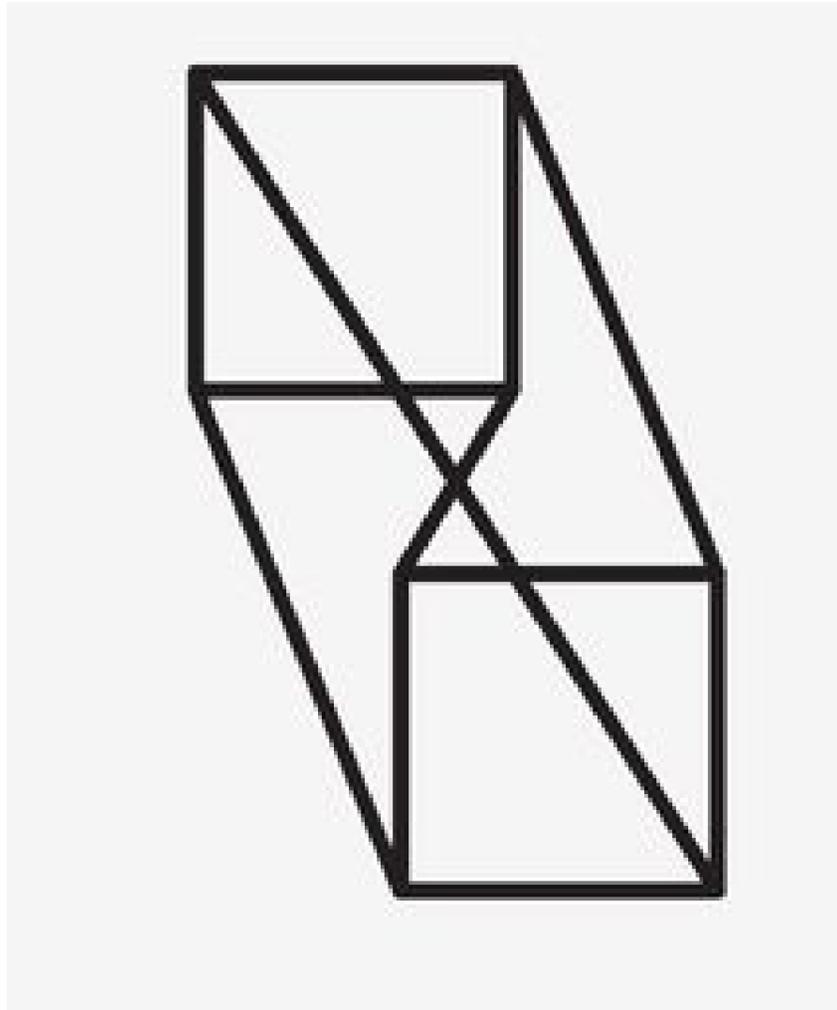
Black Steel



Tempering Colours of Steel

6 APPROACH TO FURNITURE

Design concept for exhibit tables and frames



Furniture and seating that is thought provoking and could have been manufactured in the workshop



General Specification

General Specification

1. Please note that any specific products or specifications referred to are an indication of product type and quality. The exhibit designers are free to specify alternatives for approval by the design and client team but must demonstrate the proposed alternative product relate to both the overall Wonderlab gallery design concept and sustainability objectives .

General Description of the exhibition fit-out works

1. This specification is intended to be read in conjunction with all Exhibit Briefs and other relevant documents associated with this project.
2. The Exhibit Designer will be responsible for checking all site dimensions, including, but not limited to any door headers, ceiling heights, floor levels and existing M&E before commencement of any exhibit fabrication. Any discrepancy between the drawings and site measurements must be reported to the Lead Designer, De Matos Ryan, prior to construction or fabrication.
3. All general light fittings and track are to be supplied and installed as part of the main contract works. All AV related power and data cables and cable terminations are to be installed by the main contract works contractor. Any additional cables, spurring off electrical feeds into exhibit structures, installation of integrated lighting units and specialist effect lighting required between sockets and electrical items are to be installed by the Exhibit Designer.
4. Please note that any power and lighting drawings supplied as part of this package should be read as an electrical specification and are intended for installation purposes. It will be the responsibility of the Exhibit Designer to include for, but not be limited to, providing additional wiring and installation drawings to complement the base build installation if and where required. This should be done before commencement of any site works, providing a thorough specification of fixtures and fittings for checking by the Design Team, coordinated by De Matos Ryan.

Interface with Main Contract Works

1. It will be the responsibility of the Exhibit Designer to provide adequate protection to floors and walls where necessary to a nominal 1500mm f.f.l. to avoid damage to gallery finishes, decorations and any features. Any damaged walls/structures may result in the requirement to redecorate the whole area as oppose to touching up to avoid paint 'flashing' or imperfections in colour matching.
2. The Exhibit Designer will be responsible for protecting any finished flooring as part of their works until handover.

Electrical & AV Hardware

1. Please note that all power cables and cable terminations are to be supplied and installed by the main contract works contractor. All AV data cables and data cable terminations are to be supplied and installed by the main contract works contractor.
2. All electrical equipment should simply 'plug in' using the outlets provided.
3. All electrical installations shall be provided with a suitably sized LSF multicore flex terminated in a BS 1363 13A plug top that will be plugged into a standard BS 1363 13A socket.
4. All electrical installations shall be provided with a continuous earth conductor that terminates in a suitable earth terminal for connection to the mains.
5. All flex lengths shall be kept to a minimum in order to minimise volt drop and risk of damage.
6. All exhibits containing electrical equipment shall be provided with suitable access to the respective electrical equipment/ flexes etc. to enable easy access to connection points/sockets for future maintenance. The Exhibit Designer is to bear this in mind when drawing/fabricating the structures.
7. Prior to fabrication, all electrical supply requirements and equipment shall be included and clearly indicated on the 'For

Approval' drawings and issued to the Design Team so that any fixed socket outlet and supply requirements can be ascertained and pre-installed.

8. The Exhibit Designer must ensure that discreet, lockable access panels are incorporated into the exhibits if required to aid access to power sockets/switching for testing.
9. All exhibit LED lighting should come with a 3-pin plug termination for simple connection on site.
10. Prior to practical completion the Exhibit Designer will be expected to provide a full set of 'as built' drawings and information for the O & M manuals, marked up with the new installations showing accurate setting out of items. Any specification of fittings used, identified components and parts, a list of lamps, cable types etc for the Museums maintenance manual must be clearly identified.

General Material/Finish Specification Requirements

1. Prior to the application of paint all surfaces to be fully prepared to BS 6150. Arisses are to be sanded down, with all screw and pin holes to be filled and sanded smooth with glass paper and then thoroughly dusted off prior to application of first coat.
2. Where MDF cladding is specified this must be Fire rated to class 0, unless for forming cases which must be ZF grade and fire rated class 0.
3. All metalwork is to be thoroughly degreased and prepared prior to powder coating. All powder coat finishes are to be 30% gloss unless instructed otherwise.
4. Laminates applied according to manufacturers instructions.
5. All ZF MDF is to be sealed with 4 coats of clear Dacrylate sealant ref: 103-60 (matt finish) to client approved specification.

General Specification

6. Fire proof panels – Supalux or similar to be approved this should be a high density calcium silicate 12mm sheet material min. that can be used to absorb heat from a light source. The board is to be located under the light source in the case header; sufficient space should be provided to allow for air flow around and under any light source.
7. Foamex or similar to be approved – this is intended to be a rigid compressed PVC foam board that has a fine cell structure with smooth consistently flat surfaces which makes an ideal substrate for direct to board flatbed printing or for wrapping printed graphics.
8. 3Form Chroma Reflect 15mm or similar to be approved - solid surface with transparent quality made from recycled content. The material can be formed and bonded to create robust structures with a high quality finish.
9. Solid surface material, Corian (or similar to be approved) – where specified each component should be formed from a sheet material that is solid, homogeneous and non-porous. The material is to be the same colour/consistency throughout its thickness and can be moulded or thermoformed into different shapes. This must be a high quality composite product that blends natural materials and pure acrylic polymer to create a highly durable finish. This material is to be impact resistant and should not stain.
10. The Exhibit Designer must supply samples prior to approval - a full list of requirements will be issued on commencement of contract.
2. The drawings and images included in this document show the design intent for the gallery and each exhibit. The Exhibit Designer is to ensure that the weight loadings of the exhibit are sufficiently spread and coordinated with the Design Team. It will be important that all exhibits can be carried by the weight loading capacity of the floor and cranes and on this basis all exhibit structure weights/point loads, including proposed fixing methods should be supplied for approval by the project structural engineer before starting fabrication.
3. Electrical installation – the Exhibit Designer will be responsible for the installation of electrical equipment only. They should also highlight at an early stage any discrepancies or anomalies that may impact on the ability of the electrical system to operate as intended.
4. Please note that prior to manufacturing the appointed Exhibit Designers must produce full fabrication/setting out for client, Lead Designer and wider Design Team (where applicable) approval/sign off.

Contractor Design items & Specifications

1. The Exhibit Designer will be responsible for checking the proposed gallery design proposals and for carrying out and completing the final design for each of each exhibit. The contractor is to advise as soon as possible if there are any problems with the designs to date and/or any problems in meeting the specifications provided.

A holistic approach to lighting will illuminate and focus the changing nature of Wonderlab day and night

Our proposals maximise natural daylight where possible, seeking to minimise artificial lighting requirements. To deliver this, our proposed layout frees up as many external windows as possible and glazes all of the large industrial shuttered openings to allow daylight to penetrate into the main gallery floor. In addition we propose the replacement and upgrading of the existing rooflights for improved daylight transmission.

The crane can be used to hang and support lighting infrastructure within the gallery main hall to provide the required levels of ambient lighting as well as to provide accents and highlight exhibits and key points of interaction within the space. Lighting will enhance materiality, textures and provide legibility to the space and should relate to the large scale of the workshop, in addition to the more intimate scale of its users. Lighting should also be sufficiently flexible to provide low level lighting contrast where required and higher contrast can be used for dramatic effects during events and functions.

All areas should have layers of light that can be switched or dimmed to enable the eye to be drawn onto the particular focus within a space or at a certain time of day. Sufficient flexibility should be designed into the lighting to enable a high level of contrast and change.

Light cannot be considered on its own, It must be designed in co-ordination with the materiality of the proposed finishes. The colour, texture and finish of a surface has a significant impact on the perceived illumination.

Colour changing and possible large scale projection opportunities can be explored to create a dramatic and mood changing effect for income generating events in the gallery with opportunity to easily personalised these through the coloured glow of the track pits, wheel drop and high level Okalux screen which can also double up as a projection screen for individual events.

The design of individual light fittings should reflect the designed and exposed mechanical and electrical services approach within the workshop and can have intriguing presence, clarity and scale.



Model Renders – Daylight only

Internal Views, March 21st



12PM, Sunny

Perez Sky

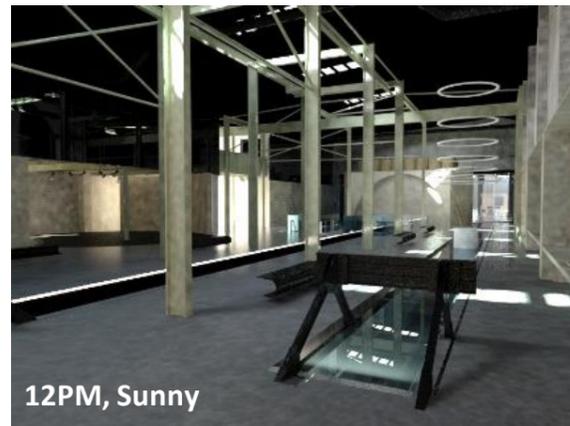
Diffuse Horizontal Illuminance: 14400 lx
Direct Normal Illuminance: 81300 lx



12PM, Cloudy

Perez Sky

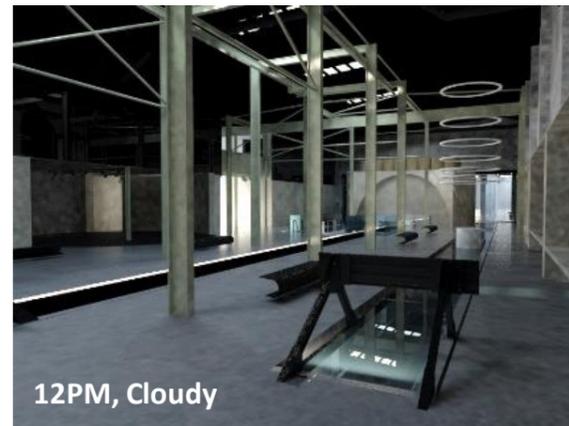
Diffuse Horizontal Illuminance: 22900 lx
Direct Normal Illuminance: 500 lx



12PM, Sunny

Perez Sky

Diffuse Horizontal Illuminance: 14400 lx
Direct Normal Illuminance: 81300 lx

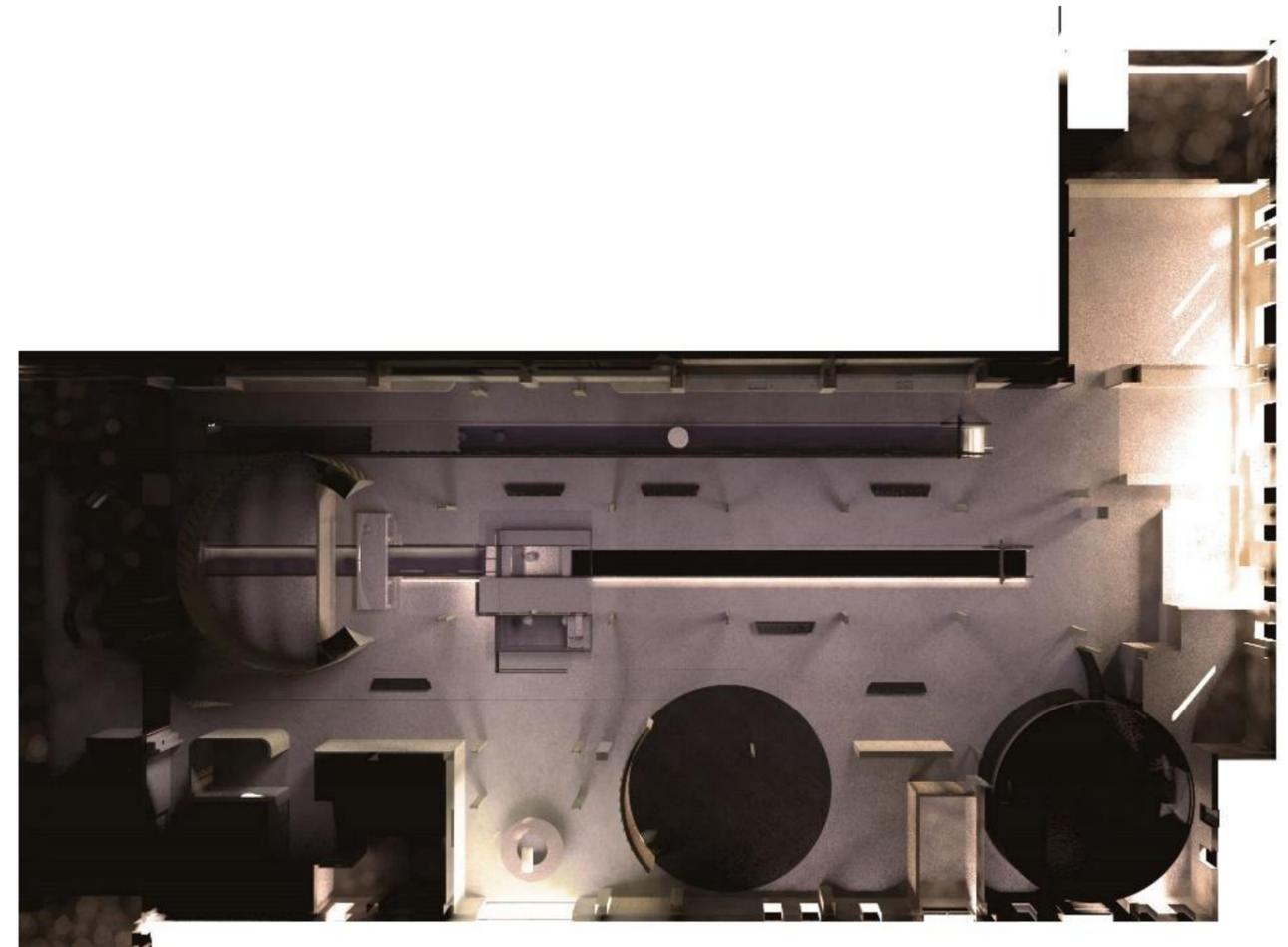


12PM, Cloudy

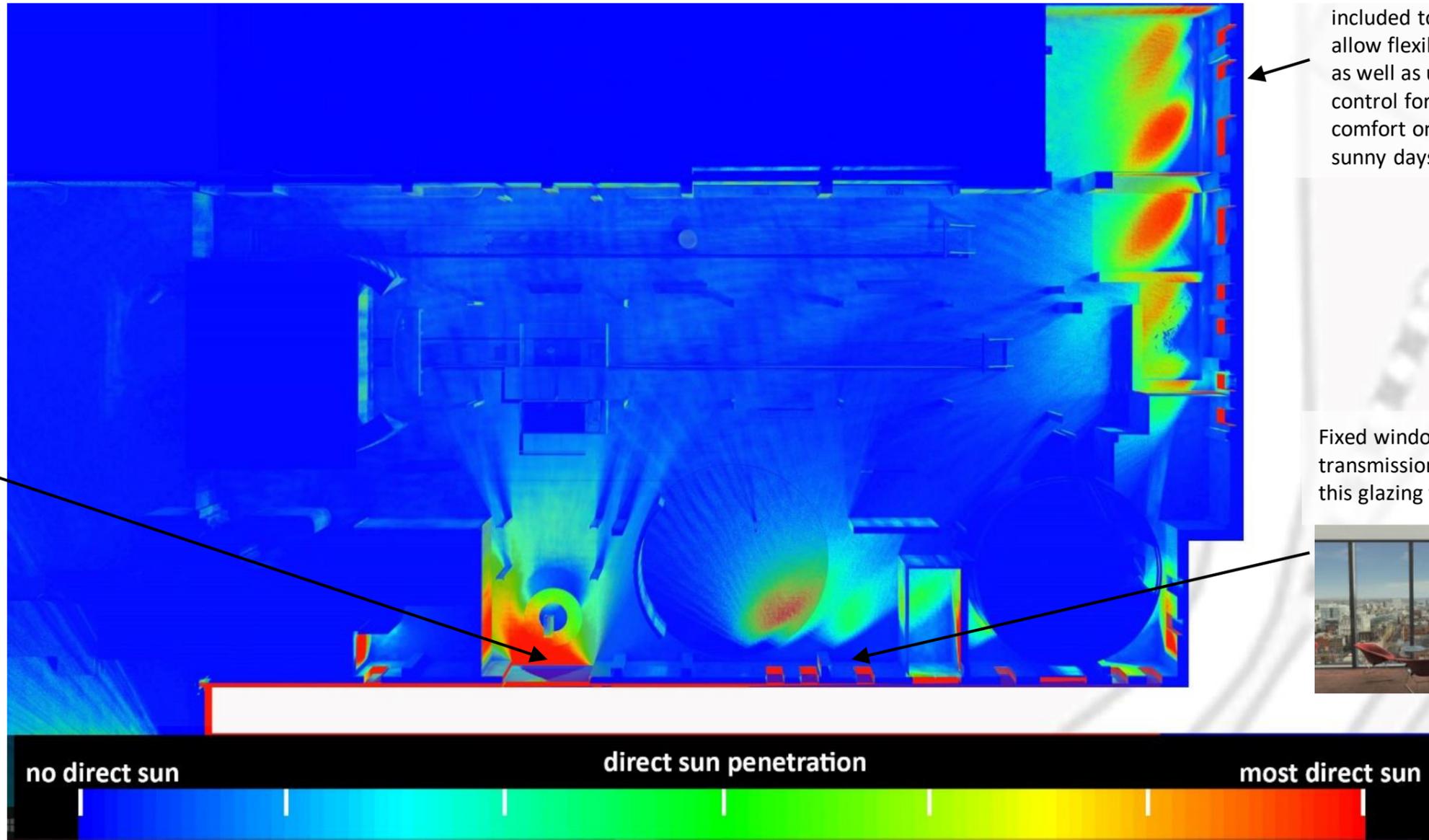
Perez Sky

Diffuse Horizontal Illuminance: 22900 lx
Direct Normal Illuminance: 500 lx

Top View, 9am, June 21st



Annual Direct Sun Penetration Analysis



Careful use of shading and solar control can reduce sun penetration here and help improve views through



Perforate roller blinds could be included to allow flexibility, as well as user control for comfort on sunny days



Fixed window films can reduce light transmission and brightness through this glazing whilst preserving the views



9 GRAPHIC IDENTITY & INTERPRETATION

Strong graphic identity

Graphic Designer is appointed and additional graphics brief will be issued on appointment.

Design principles

The look and feel of the gallery, and therefore the graphic design, will be elegant, thought provoking and well-crafted and suite well with the Museum's overall brand identity. Our principle aims for the graphics package are:

- A fully integrated graphics solution, working with the 3D spatial design of the gallery and the individual exhibits
- Clear visual hierarchy across the gallery to enable intuitive navigation
- Visual language that will last the life-span of the gallery (10 years+)
- Graphics style guide that can be extended if required for learning resources and marketing campaigns to attract our target audiences.



Approach to Physical and Digital Labelling

The style of exhibit labels used at Wonderlab in London and Bradford have been extensively, and positively evaluated. Labels at NRM Wonderlab will therefore use a similar format and will seek to address lessons learnt from these evaluations.

Labels will support the visitor's exhibit experience and serve the following functions:

- to provide instruction
- to give information
- to highlight the skills being used
- to give context by providing real life connection and examples
- to prompt and challenge through questions. They also encourage visitors to explore, experiment, pose their own questions, challenge their own assumptions and formulate meaning.

The gallery voice will be:

- Playful but not childish
- Questioning and encourage investigation
- Informative but not patronising
- Active and engaging
- Clear and focused
- Age appropriate
- Inclusive towards all audiences
- Friendly

Interpretation

In addition to live interpretation in the gallery all exhibits will have associated interpretation located in direct view of the main interaction point. Diagrams and illustrations will be used in combination with text to deliver explanatory skills, engineering and science content to the visitor at label level.

Exhibit interpretation will feature three essential elements:

- Hook – to draw visitors in (visual or auditory attractor, prominent title, provocation)
- Substance – to engage visitors (instructions, interactive activity, demonstration, skills)
- Context – to provide the 'so what' (links to engineering, the museum, the wider world)

Strong graphic identity



Existing engineering graphics



By Felice Varini



10 CORE TECHNICAL SERVICES

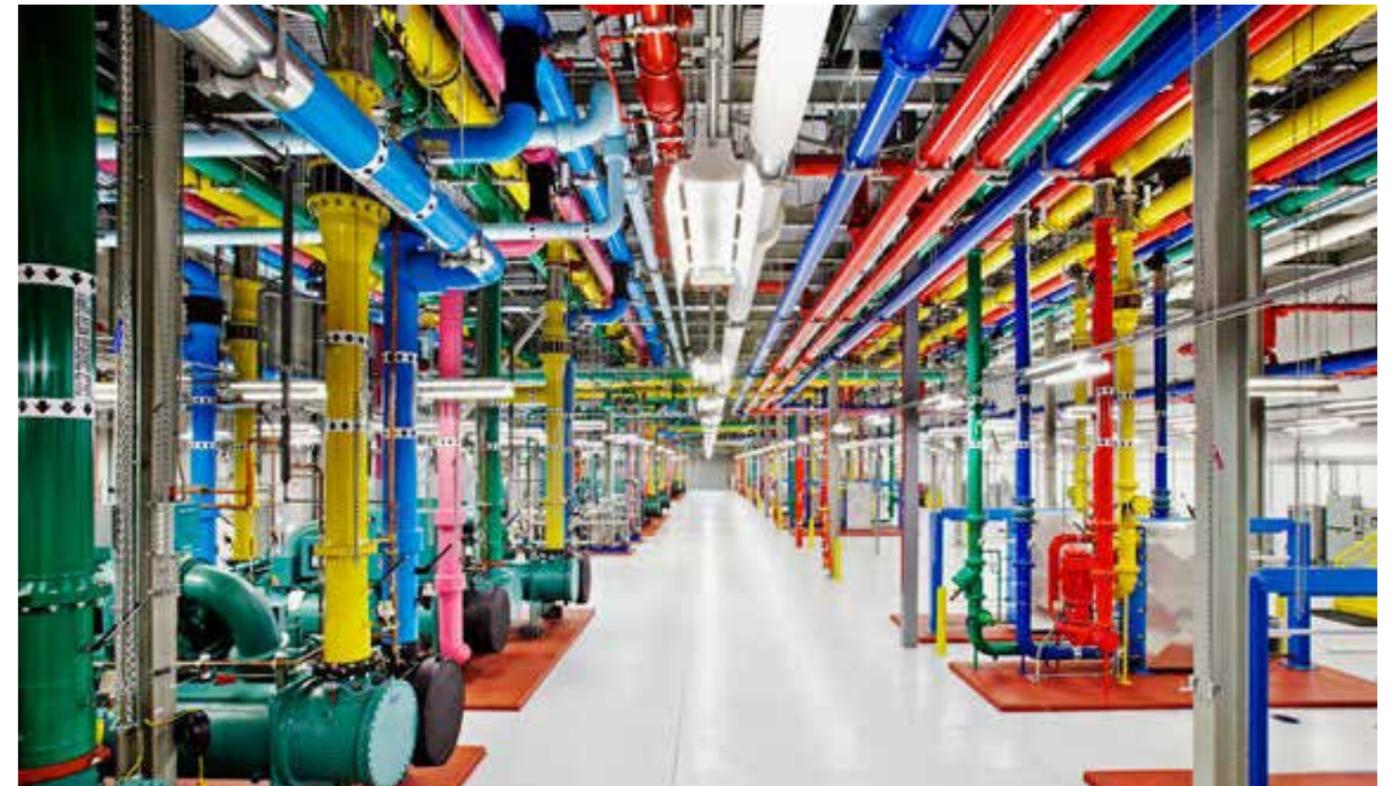
Celebrate Structure & Services

Structure

- Where external supports are required for larger exhibits it seems feasible for additional support to be provided. Positioning exhibits close to crane or significant roof structures will assist with this.
- Where external support is required, exhibit designers should indicate clearly where and what structural loads are applicable, for structural review.
- Consideration should be given to safe installation and erection of exhibits, particularly larger ones. This would likely come under CDM requirements for exhibit contractors. Similarly, consideration should be given to how larger exhibits can be safely de-constructed for removal or maintenance. These cases should be included in loads given for external supports.

MEP Services

- MEP services will be provided to suit. Further info on electrical, vent and heat loads required to comment further as the designs are developed.



AV & Exhibits : Power & data

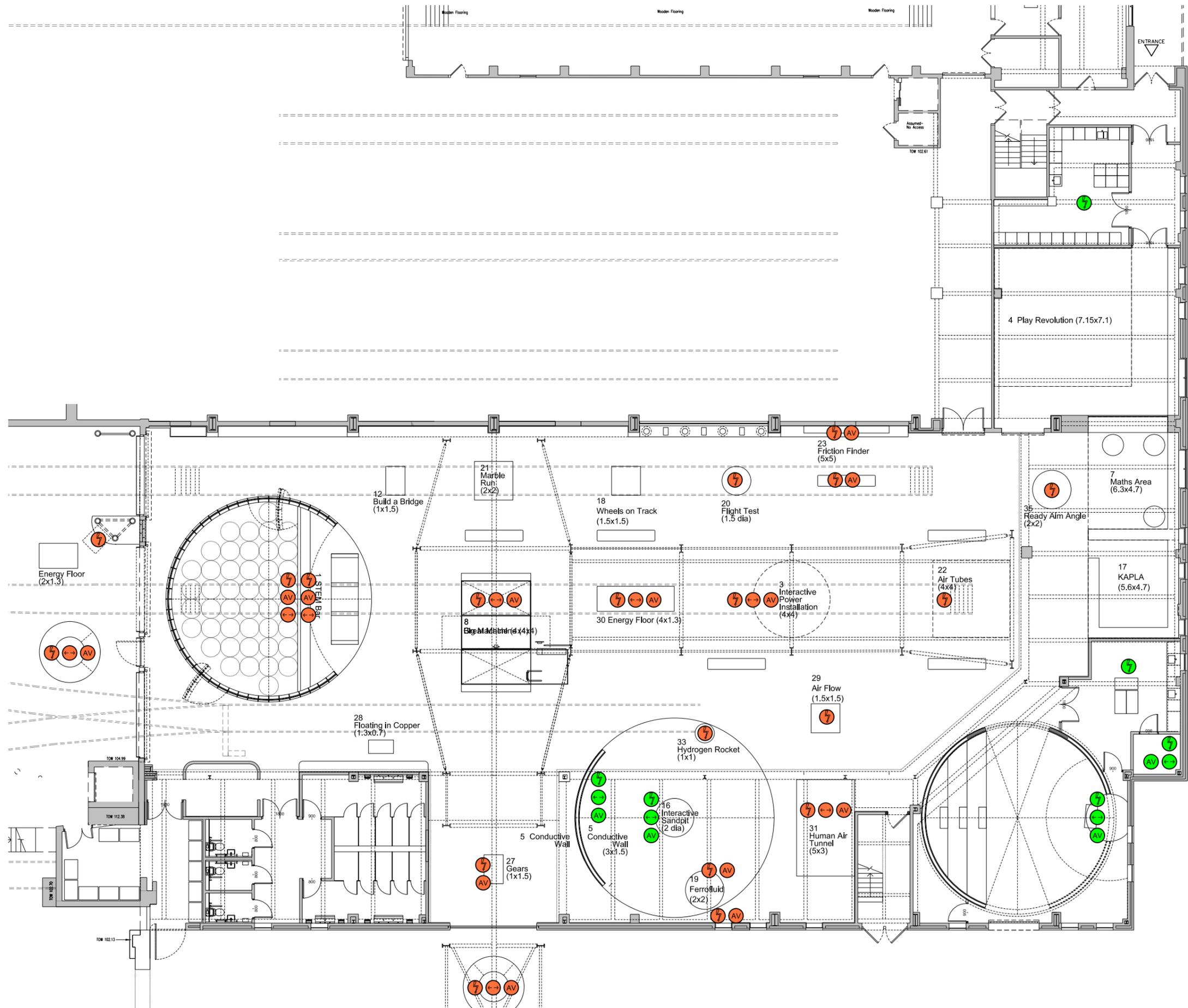
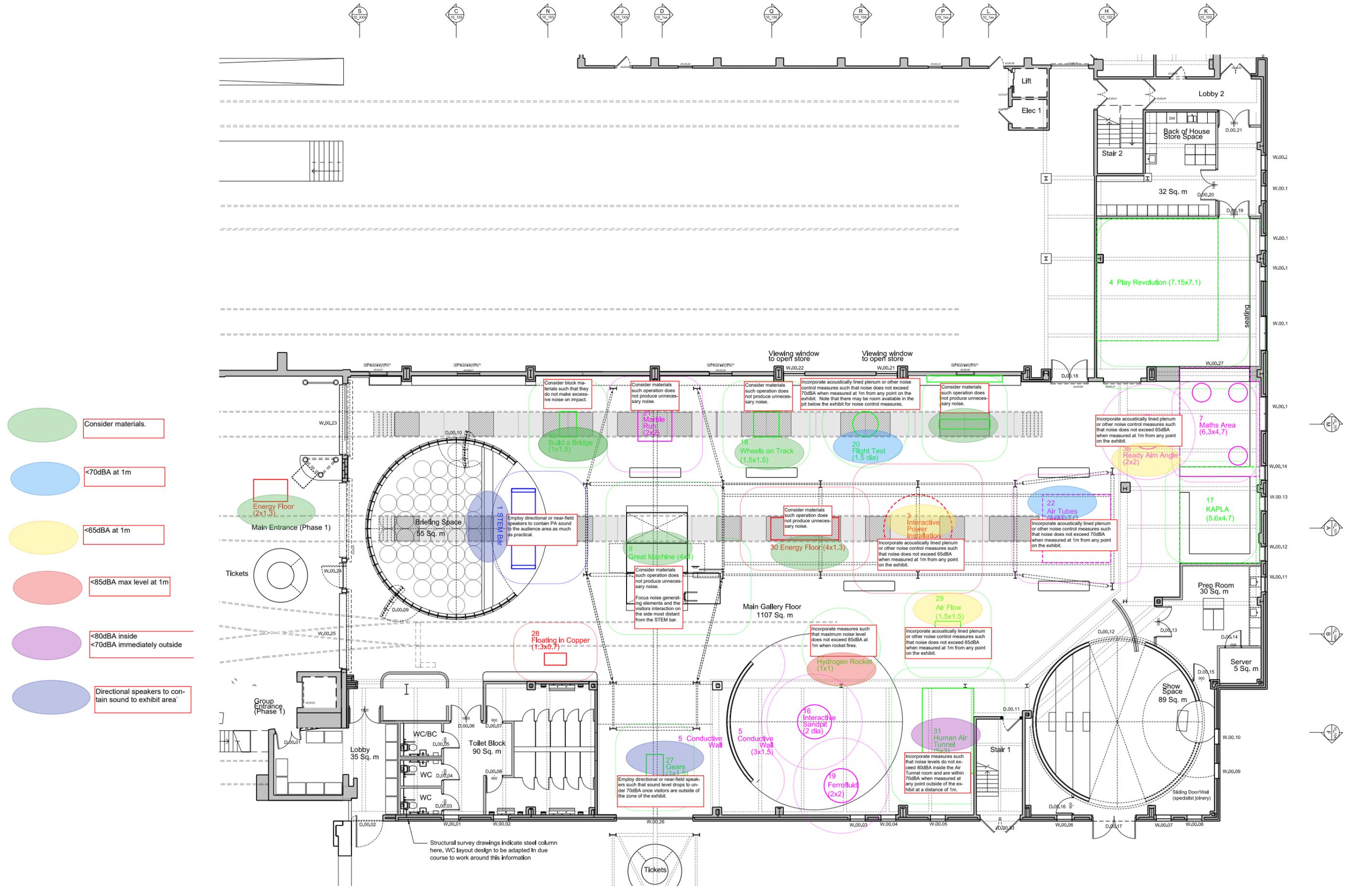


Exhibit Acoustic Performance : Maximum Noise Generation at 1m distance



SITE PHOTOS

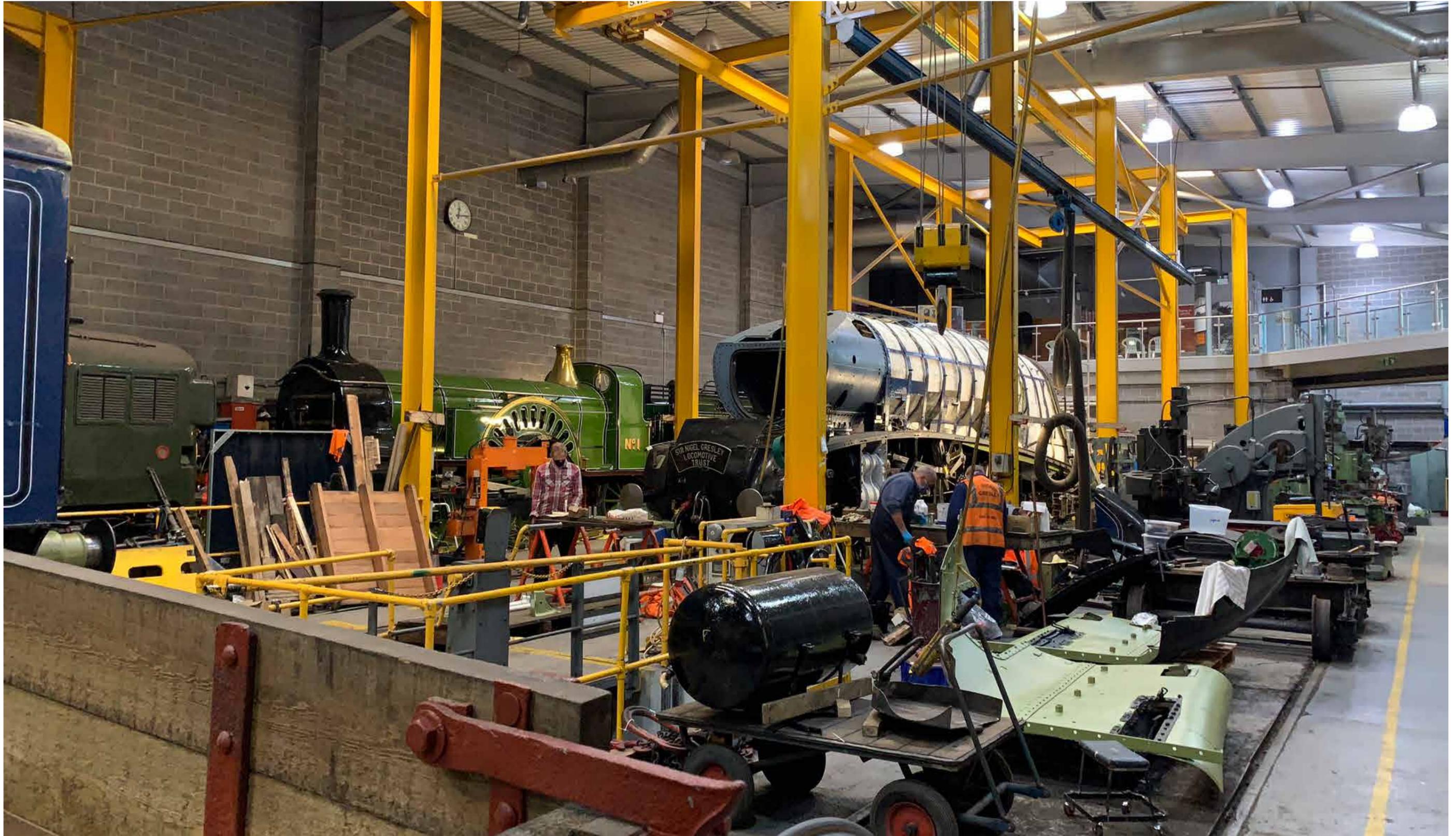
Site photo : Phase 1 Entrance from Great Hall



Site photo : Phase 2 entrance area from Central Hall



Site photo : Looking at the Wheel-drop in the foreground where the Great Machine will be located



Site photo : Looking down the central track pit where STEM Bar and Great Machine will be located



Site photo : Central track pit where the Interactive Power Installation and Energy Floor will be located



Site photo : Looking down track pit where Friction Finder, Flight Test, Wheels on Track, Marble Run will be located



Site photo : Existing woodwork workshop where the Maths and Kapla areas will be located



Site photo : Looking into workshop where Play Revolution will be located



Site photo : View from the balcony crane bridge



THANK YOU