07 technical resolution

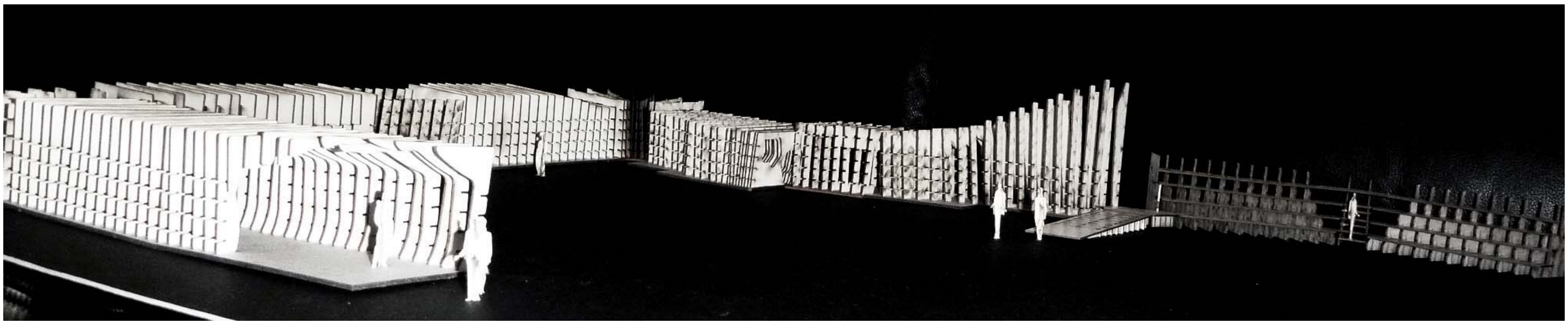


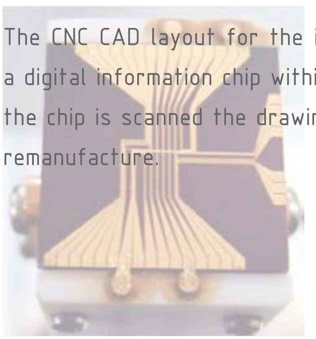
FIGURE 7.1 Final model of IFI
Installation in SCC configuration

7.1 CNC CAD DRAWING APPLICATION

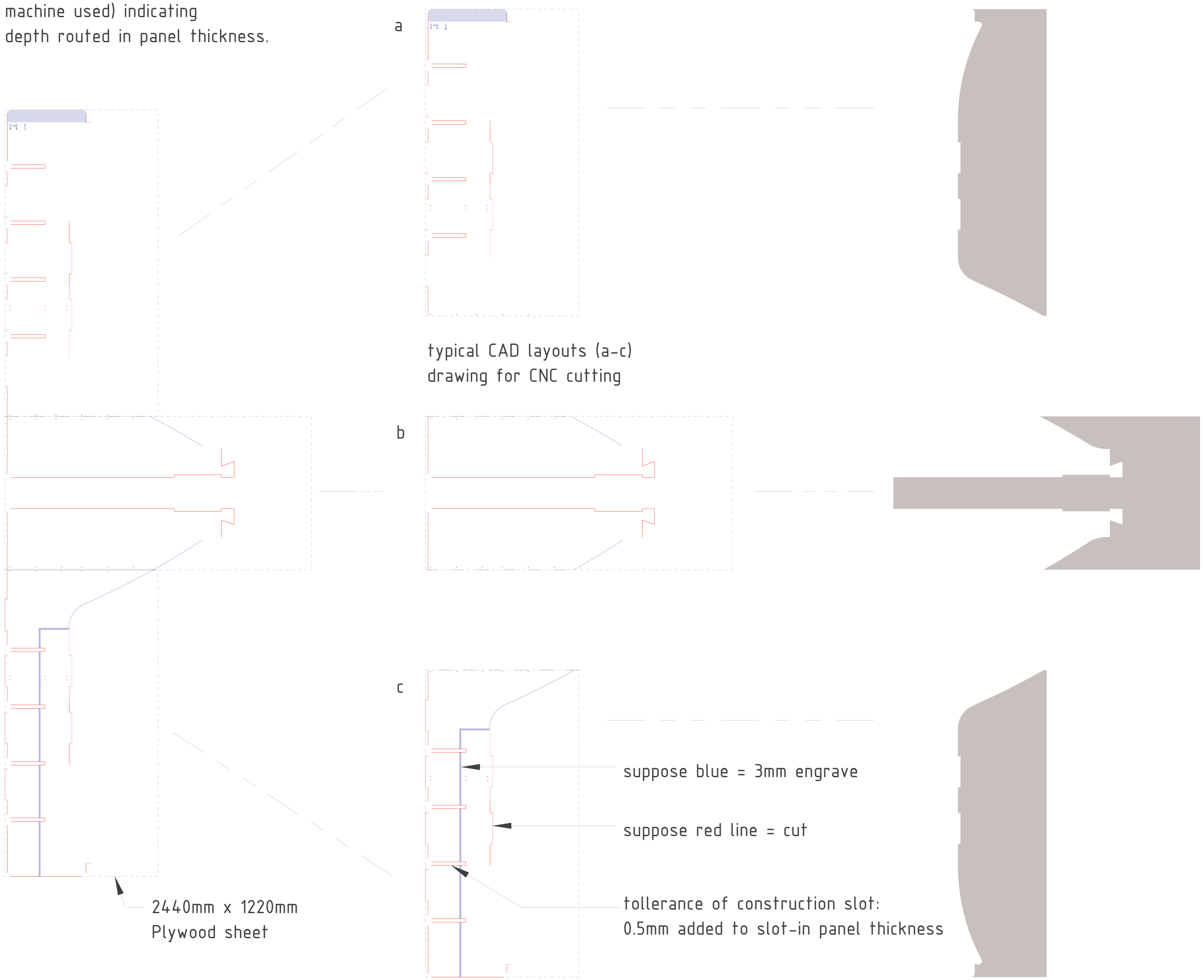
The diagram to the left illustrates typical fabrication CAD drawings prepared for CNC input. The colours used to indicate cutting and engraving are likely to be different between CNC machines.

Damaged or lost components:

If a component of the IFI Installation can no longer be used as a result of damage or loss it will be re-fabricated in the country it inhabits at the time. This will reduce the energy consumption associated with transporting the component over long distances.



The CNC CAD layout for the installation is stored on a digital information chip within each component. When the chip is scanned the drawings become available for remanufacture.



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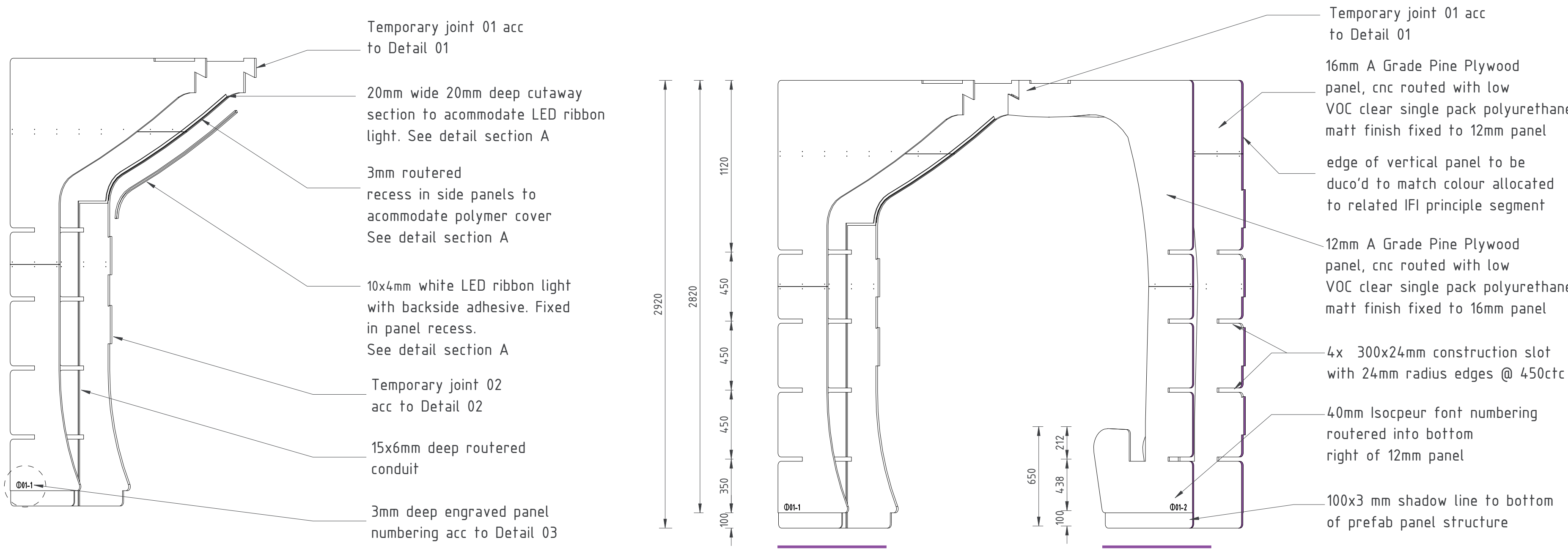
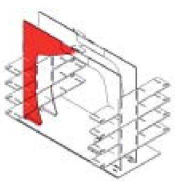
7.2 THE KIT OF PARTS

All installation components are routed from A Grade, fire retardant pine plywood panels (2440mm x 1220mm) adhered with formaldehyde-free PureBond adhesive (discussed in Chapter 5).





PREFABRICATED VERTICAL PANEL

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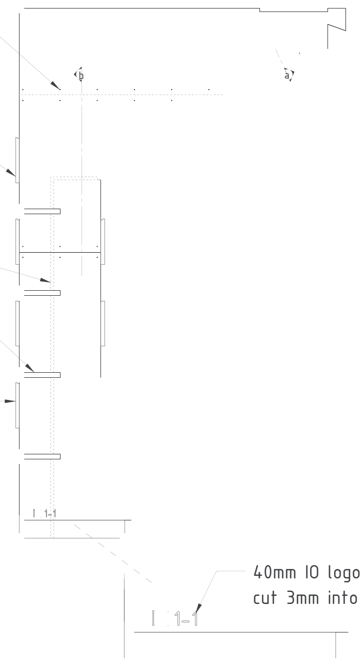
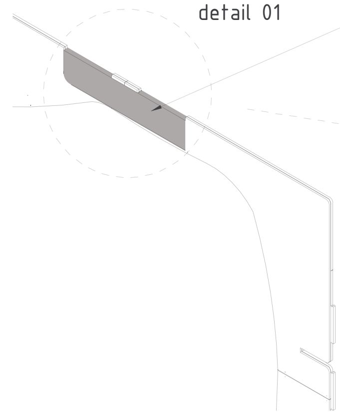
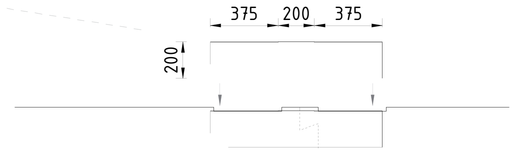
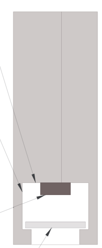


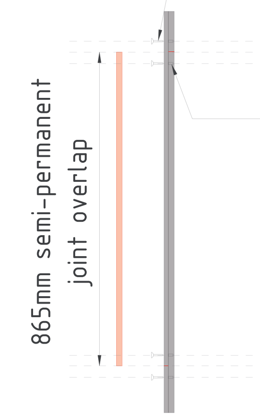




linking prefabricated vertical panels



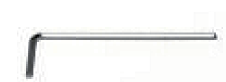
detail section a



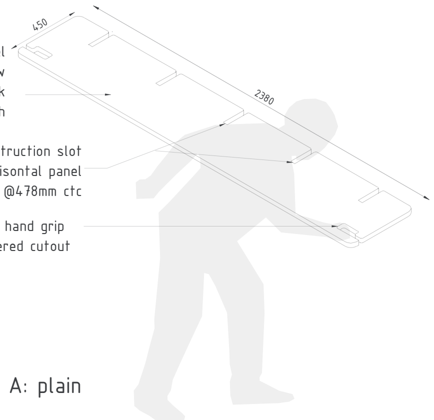
detail section b

m4x28 metric flat head bolt countersunk with hexagonal drive

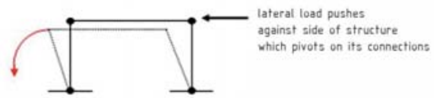
Insert-Nut 4mm thread suitable for m4 connector bolts 13mm length



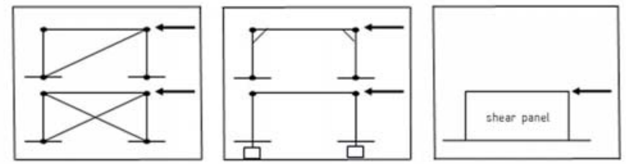
allen wrench necessary if prefabricated
panel is to be disassembled



horisontal panel A: plain



01: simplified unrestrained frame in two dimensions



02: triangulation 03: rigid structure 04: shear wall/ panel

Controlling lateral instability:

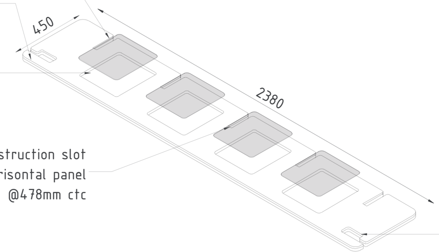
Buildings and structures are usually stabilised against lateral loads by using any or a combination of the three following structural systems (Worksafe 2011):

Triangulation – additional interconnecting diagona components (bracing) connecting the columns and beams (See 02).

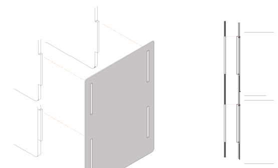
Rigid Structure – if the joints in the structure are made rigid, the structure can resist lateral loads. This can be accomplished by using knee-braces, deep footings etc (See 03).

Shear – if the supporting structure has walls rather than beams and columns, these walls or panels can be used to resist the lateral loads, i.e. a shear panel (See 04).

The IFI Installation will use shear support panels.

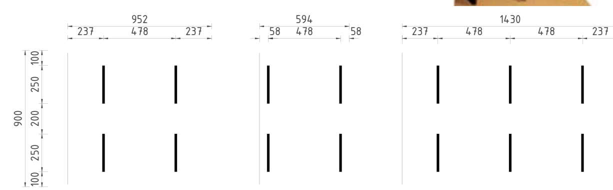


horisontal panel B: with lightbox



Detail 02: assembly- slide over and hook in

Shear panel with possible
digital screen attachment

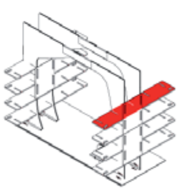


double wide double narrow tripple wide

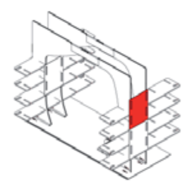
3 Standard shear panel patterns

possible panel products: 16mm plywood
16mm X Board closed cell for prints
16mm translucent white Plexiglas
16mm transparent Plexiglas

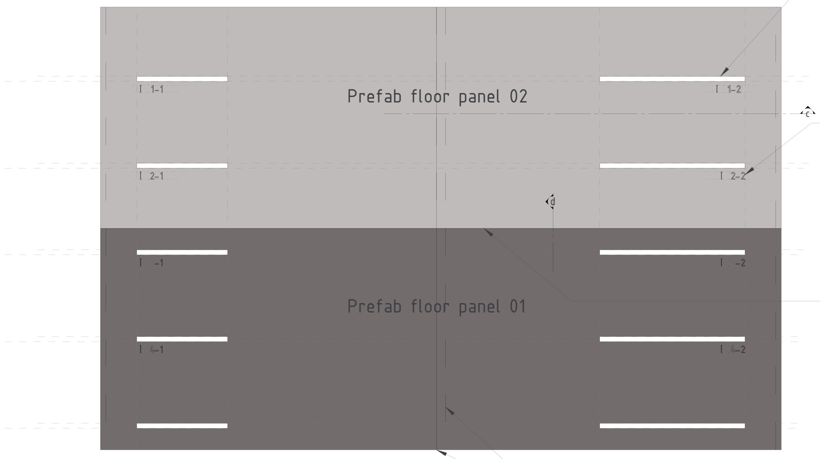
Final shear panel finish and attachments to be
determined by curator



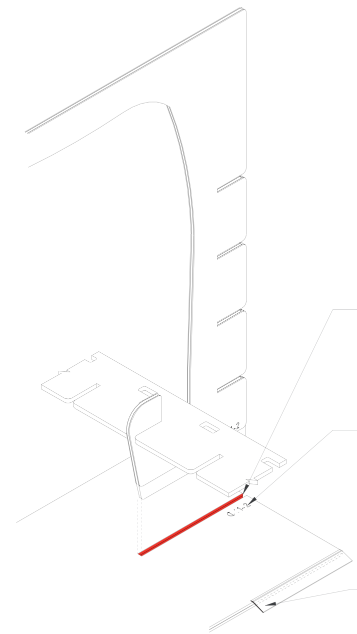
PREFABRICATED HORISONTAL PANEL



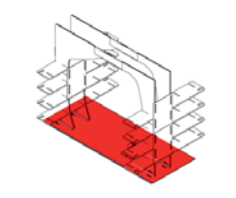
PREFABRICATED SHEAR PANEL



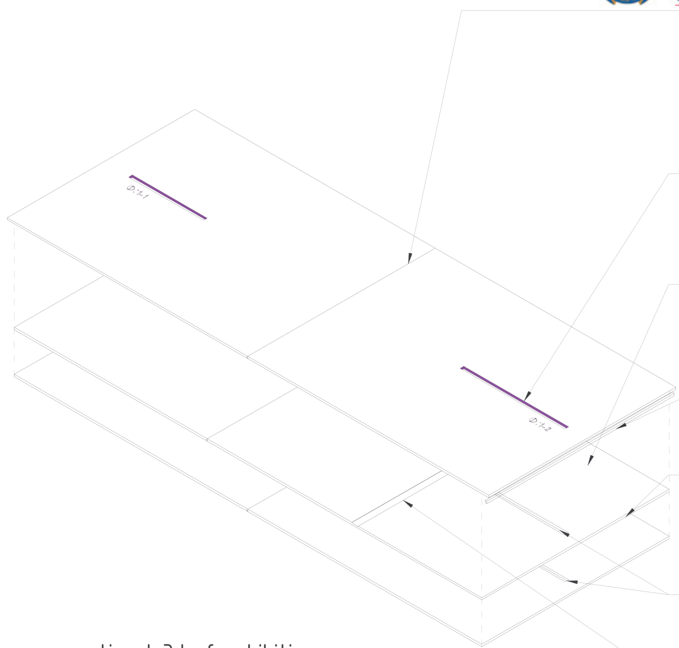
sectional plan of exhibition
flooring system



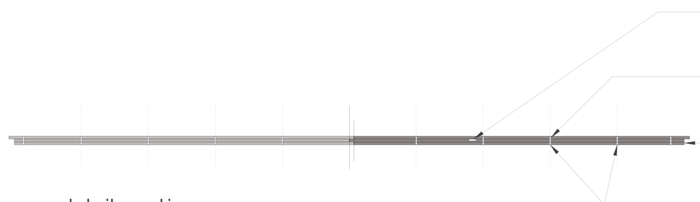
floor panel with aluminium threshold



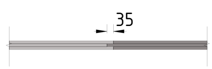
PREFABRICATED FLOOR PANEL SYSTEM



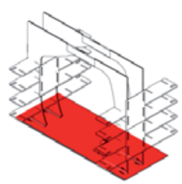
sectional 3d of exhibition flooring system

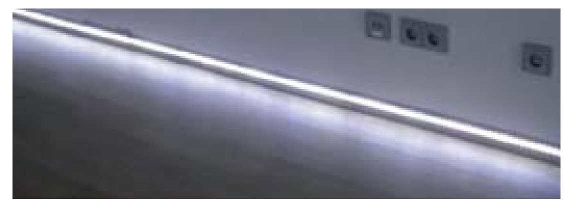


detail section c



detail section d





LED lighting effect to sides of floor panel

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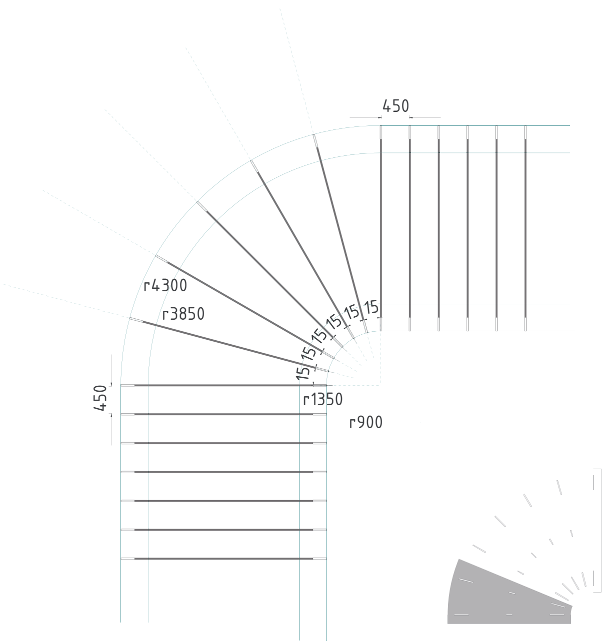
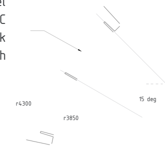
7.3 INTERMEDIATE SECTIONS

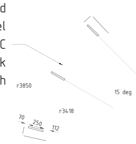


the 90 deg bend

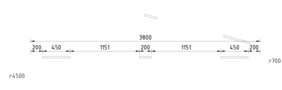
the 90 deg bend: segment



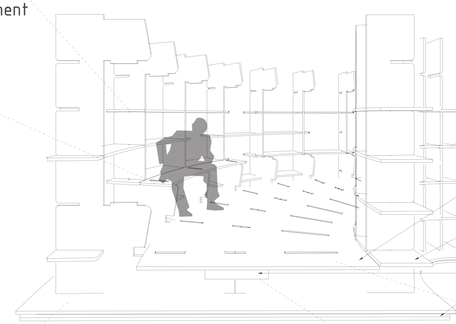
prefabricated external horisontal segment



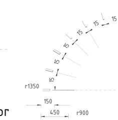
prefabricated seating segment



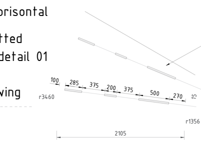
prefabricated floor system segment



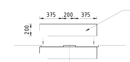
perspective elevation of the 90deg bend



prefabricated internal horisontal segment



prefabricated raised floor segment



detail 01

intermediate sections : the 90deg bend

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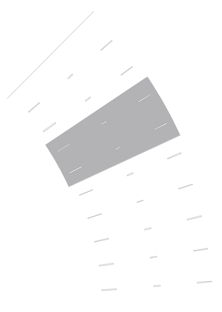
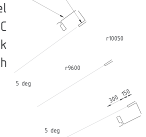
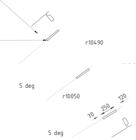
the 45 deg bend



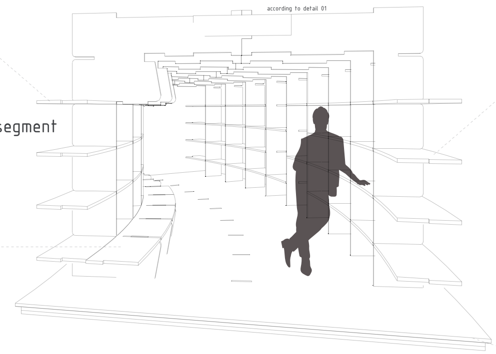
the 45 deg bend: segment



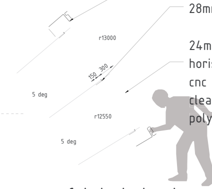
prefabricated internal horisontal segment



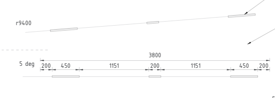
prefabricated seating segment



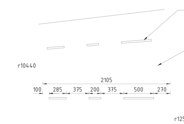
perspective elevation of the 45deg bend



prefabricated external horisontal segment



prefabricated floor system segment



prefabricated raised floor segment

intermediate sections : the 45deg bend

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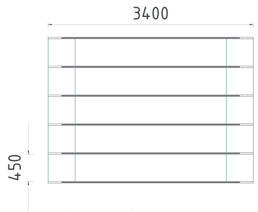
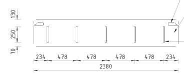
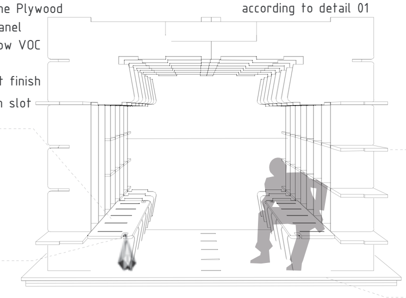


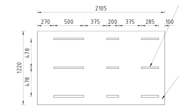
the straight



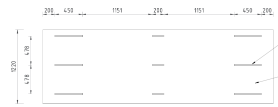
prefabricated seating segment



perspective elevation of the straight

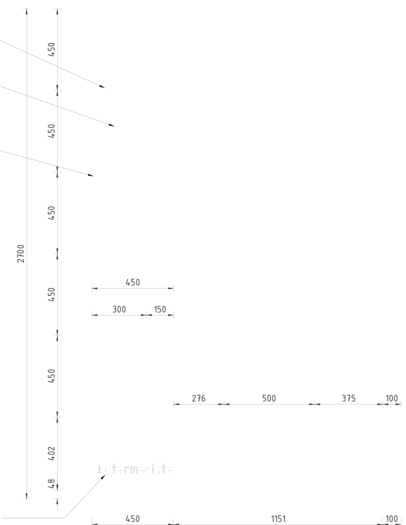


prefabricated raised floor segment

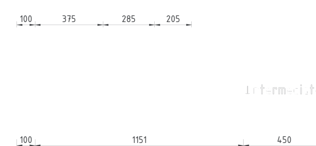


prefabricated floor system segment

possible configurations



straight down panel



seating panel

intermediate sections : the straight

interchangeable intermediate prefabricated panels

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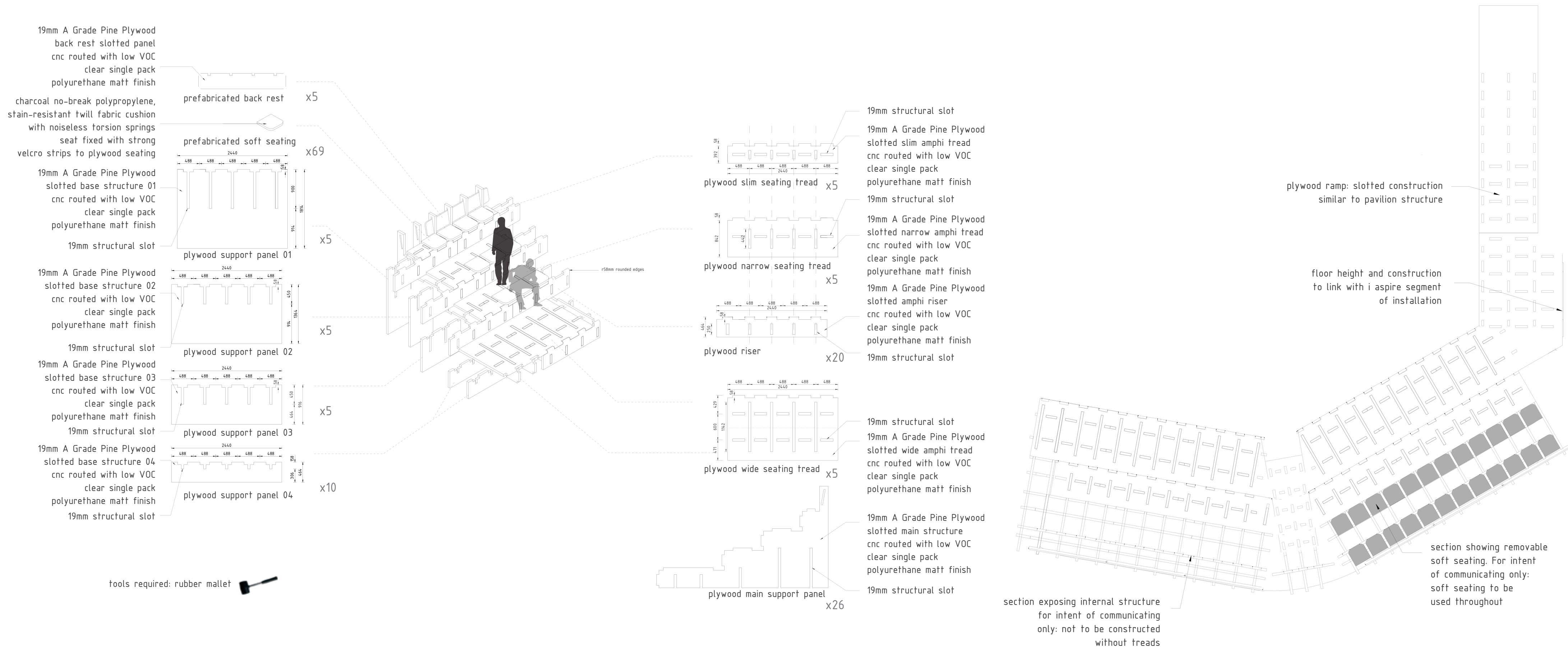
7.4 THE CONTEMPLATION PAVILION



i am contemplation pavilion
seats 90 people

i am

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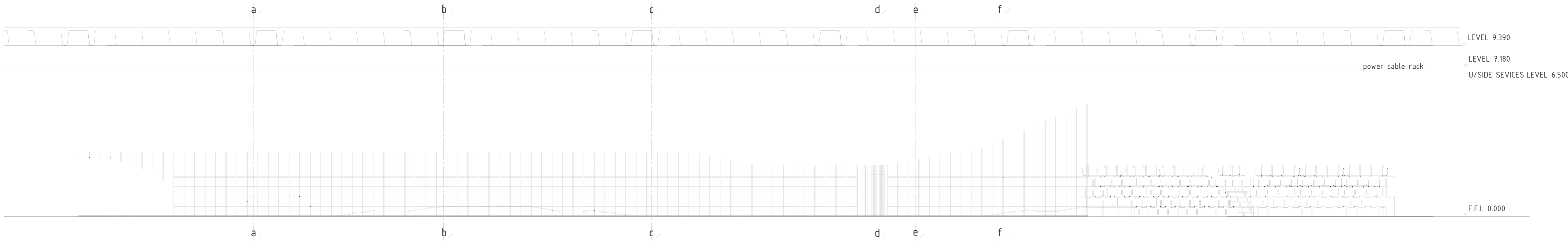
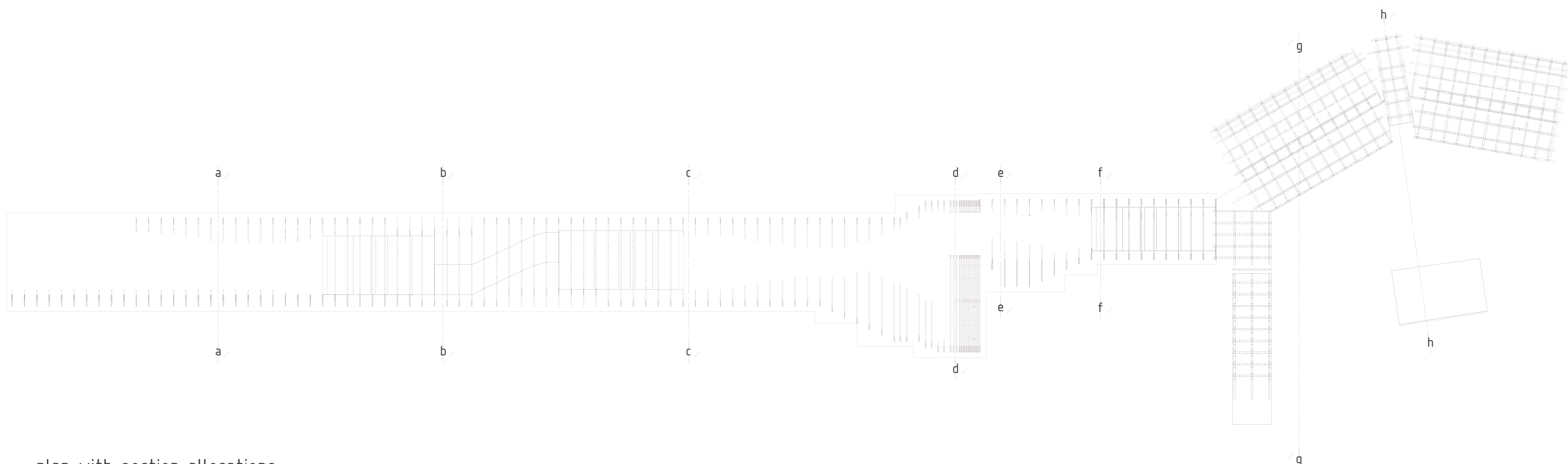


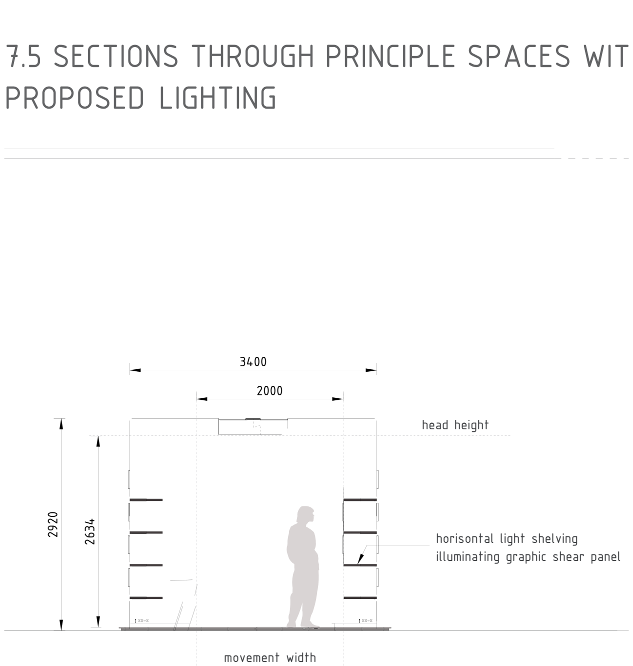
elevation with section allocations



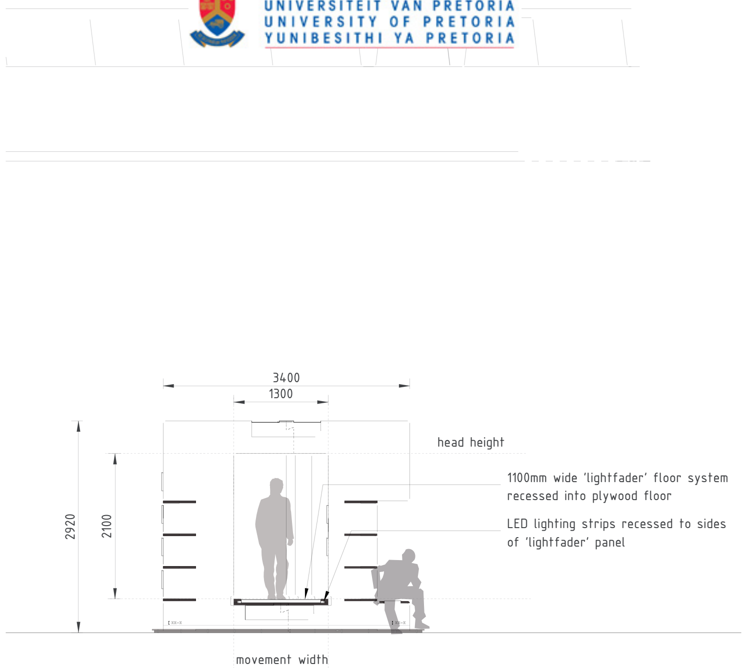
plan with section allocations

Installation: linear state

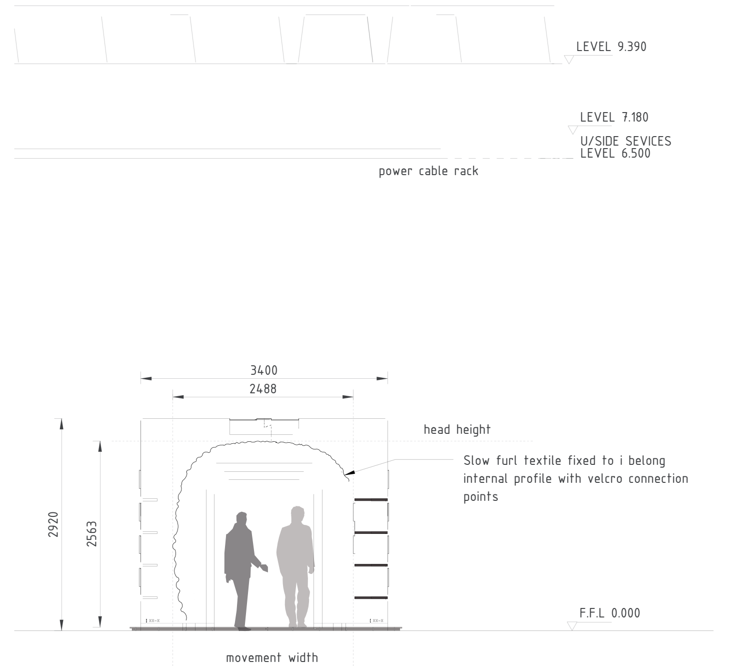
7.5 SECTIONS THROUGH PRINCIPLE SPACES WITH PROPOSED LIGHTING



section a-a



section b-b



section c-c

Lighting effect reference:
lighting from horisontal panels.
Galaxy SOHO Interior by Zaha-Hadid (Hadid 2011)

FIGURE 7.2 Galaxy SOHO Interior

When a pedestrian walks across Rogier Sterk's interactive 'lightfader' floor, his or her weight displaces fluid contained within the panel system, leaving light prints for about one minute after contact. The system may be constructed as an independent floor and can perform without the built-in light. In this installation, footprints allow light within an upper space to be visible (Sterk 2011)

where we were

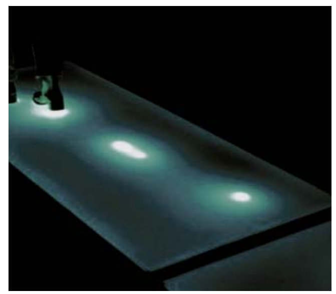
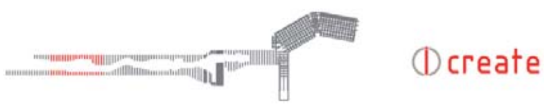


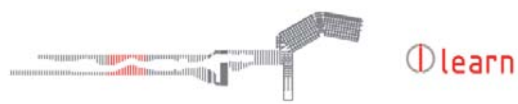
FIGURE 7.3 Lightfader floor

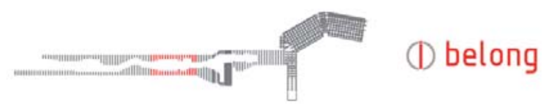
Slow Furl by Ruairi Glynn is a textile that acts and reacts on its inhabitation. The textile exists as a soft and pliable skin that lines the i belong space. The skin shifts. As guests enter and move within the 'room', the skin moves imperceptibly at deep time-frames, creating new cavities and spaces, revealing slits and apertures, manipulating light quality from horisontal light shelves (Glynn 2008).

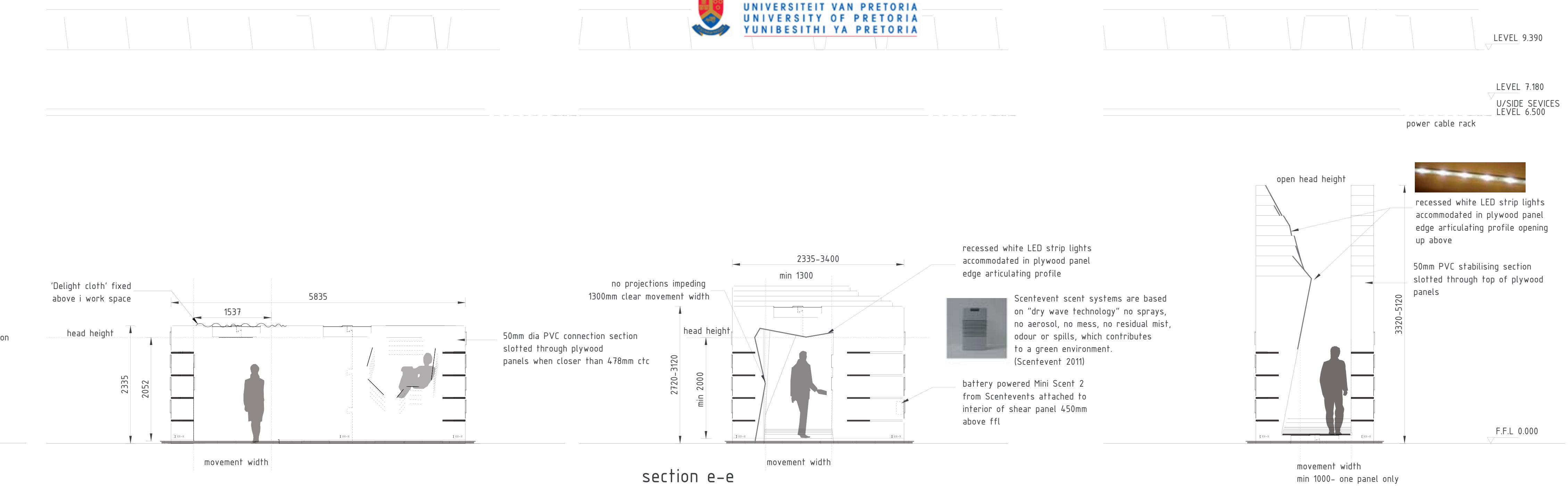
enclosed

FIGURE 7.4 Slow Furl textile









section d-d

section e-e

section f-f

Delight Cloth by Tsuya Textile Co., in conjunction with the Fukui Engineering Center consists of super thin fiber optic strands woven into a tapestry (Tsuya 2011).

where we're going

FIGURE 7.5 Delight Cloth

Lighting effect reference: The Carbon Bar, Park Hotel, Hyderabad, India (Khosla Associates 2011)

irregular

FIGURE 7.6 Carbon Bar interior

Lighting effect reference: Kuokkala Church (2010) by Lassila Hirvilammi (Hirvilammi 2010)

FIGURE 7.7 Kuokkala church interior

work

live

aspire

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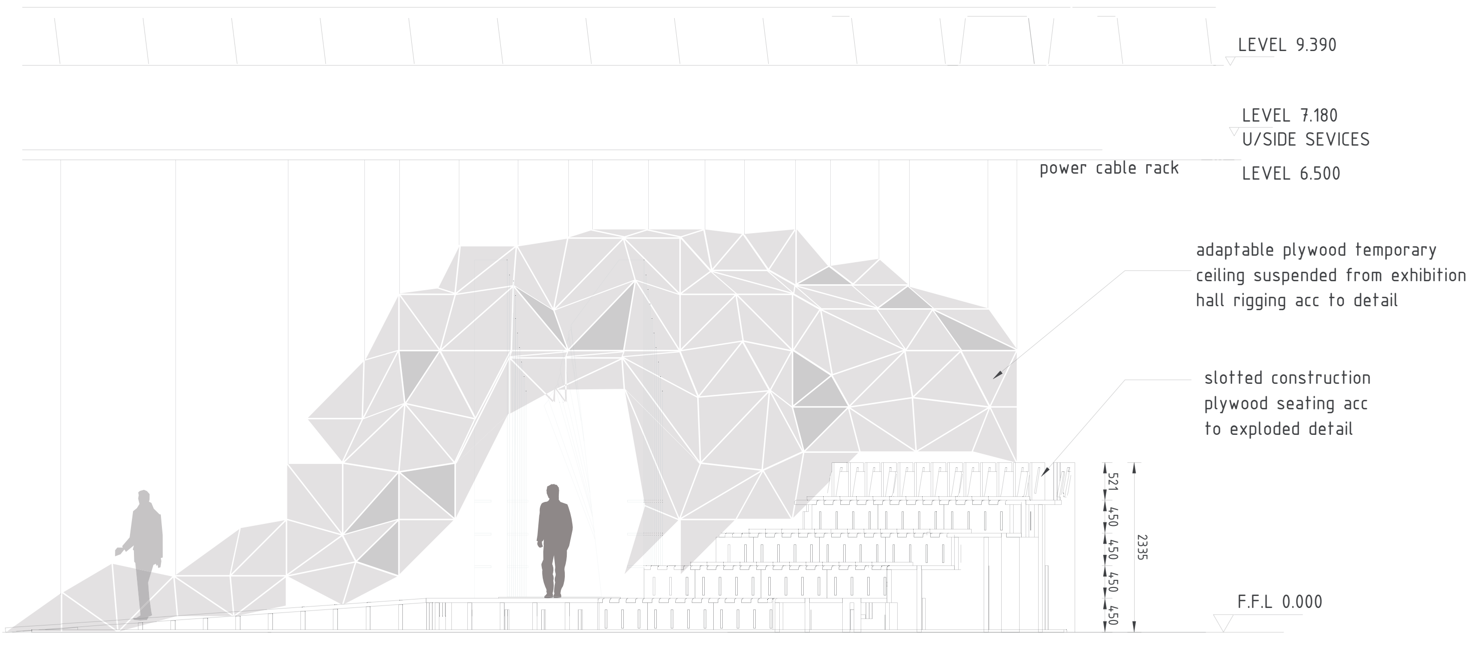
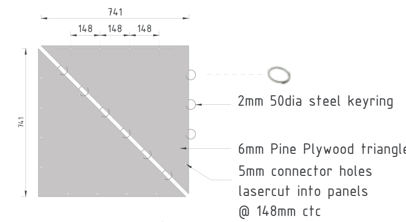
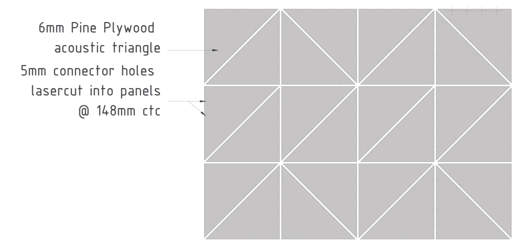


section g-g through iam contemplation space and auditorium



panel detail



suspended Plywood panelled ceiling segment

considered patterns for suspended ceiling panels

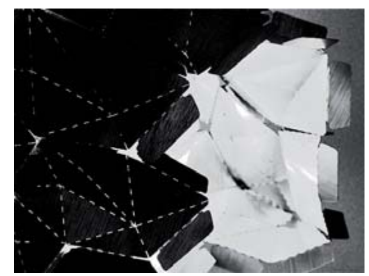


FIGURE 7.8 Ale lamp by Mocoloco

iam

FIGURE 7.9 Voussoir cloud by IwamotoScott Architecture

FIGURE 7.10 PlyLight by Projectione

FIGURE 7.11 Haze by Tara Donovan

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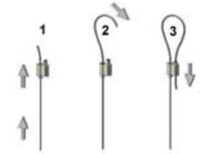
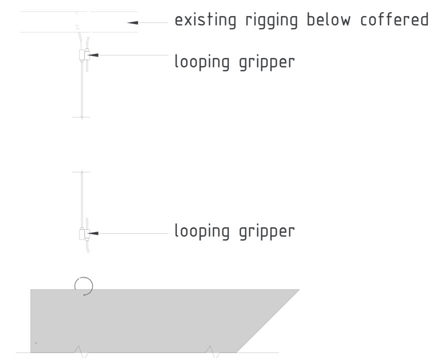


STEP 1: Insert cable into Looping Gripper.
STEP 2: Pass cable through or around anchor point.
STEP 3: Insert cable back into Looping Gripper.

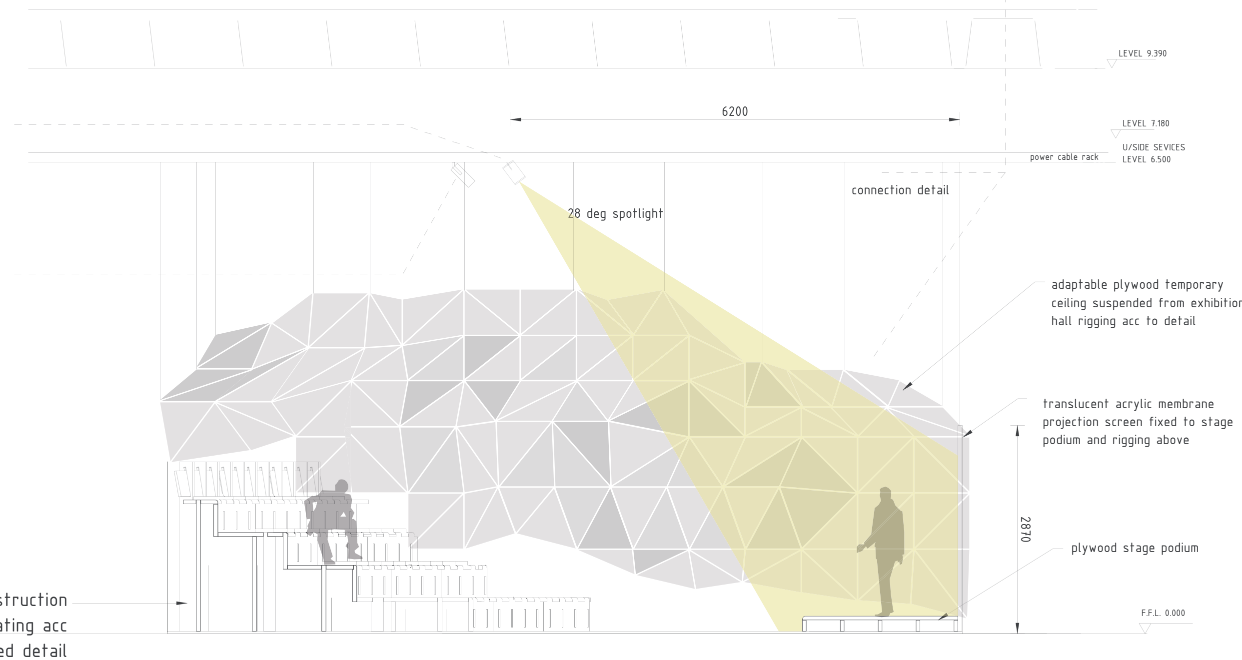
ADJUSTMENT: Remove load from cable, depress plunger & adjust cable height. Release plunger to lock cable position (cablegrippers 2010)



28 degree Sputnik spot light with LED light source from Regent Lighting

EB-Z8000 WUXGA Epson projector

Projector designed for auditoriums and large venues. The high definition, high brightness WUXGA projector featuring industry leading 3LCD technology.



section h-h through iam contemplation space and auditorium

7.6 ACOUSTIC SCREEN

The acoustic principles of the suspended pavilion screen could be described as similar to that of a lecture hall.

The goal of the space is to allow audience members to easily hear and understand the presenter without the use of a sound reinforcement system.

Related Codes & Standards (acoustics.com 2009):

- Reverberation Time (RT 60)
- Noise Criteria (NC)

Considerations:

a) Recommended reverberation time is 1 second.

b) Potential noise impact to the space from exterior sourc es and/or excessive HVAC noise which can greatly degrade speech intelligibility. The NC (Noise Criteria) level should not exceed 25 to 30.

c) The front and ceiling panels can be reflective, enabling sound to reach everyone.

d) Absorptive material on the back and side panels will help reduce the reverberation time and unwanted reflections.

e) Avoid parallel surfaces, which can cause flutter echoes. Consider splaying or canting the sidewalls.

Application:

i am space reverberation time:

length: 11 500 mm
width: 11 000 mm
height: 7 800 mm

Surfaces:

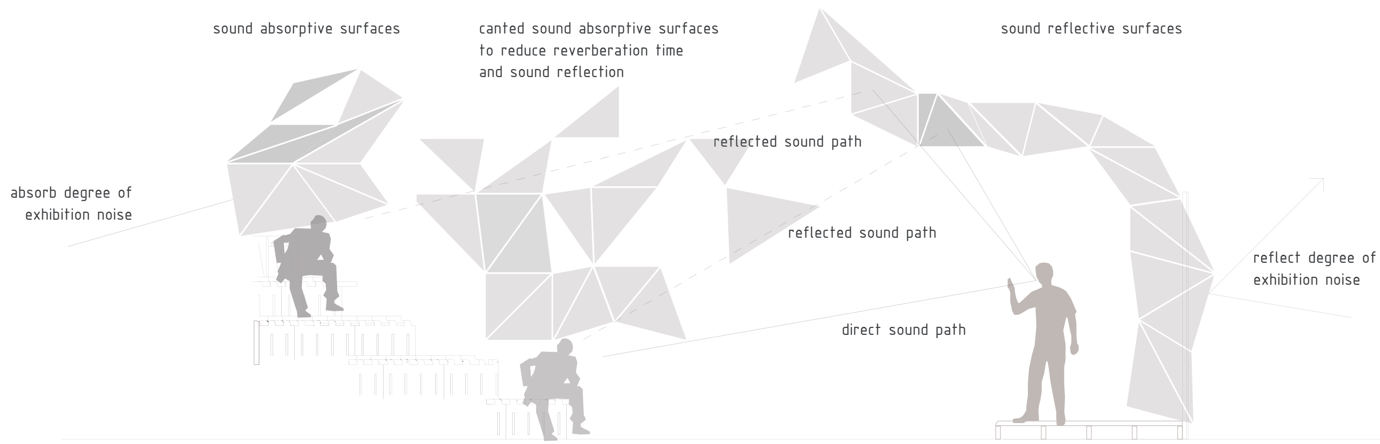
front:	reflective plywood
back:	85% absorptive plywood
left:	40/60 mixture between 30% and 70% absorptive plywood
right:	40/60 mixture between 30% and 70%
above stage:	reflective plywood
ceiling:	concrete coffered slab
floor:	carpet on plywood substrate
pavilion:	reflective plywood with upholstered seating

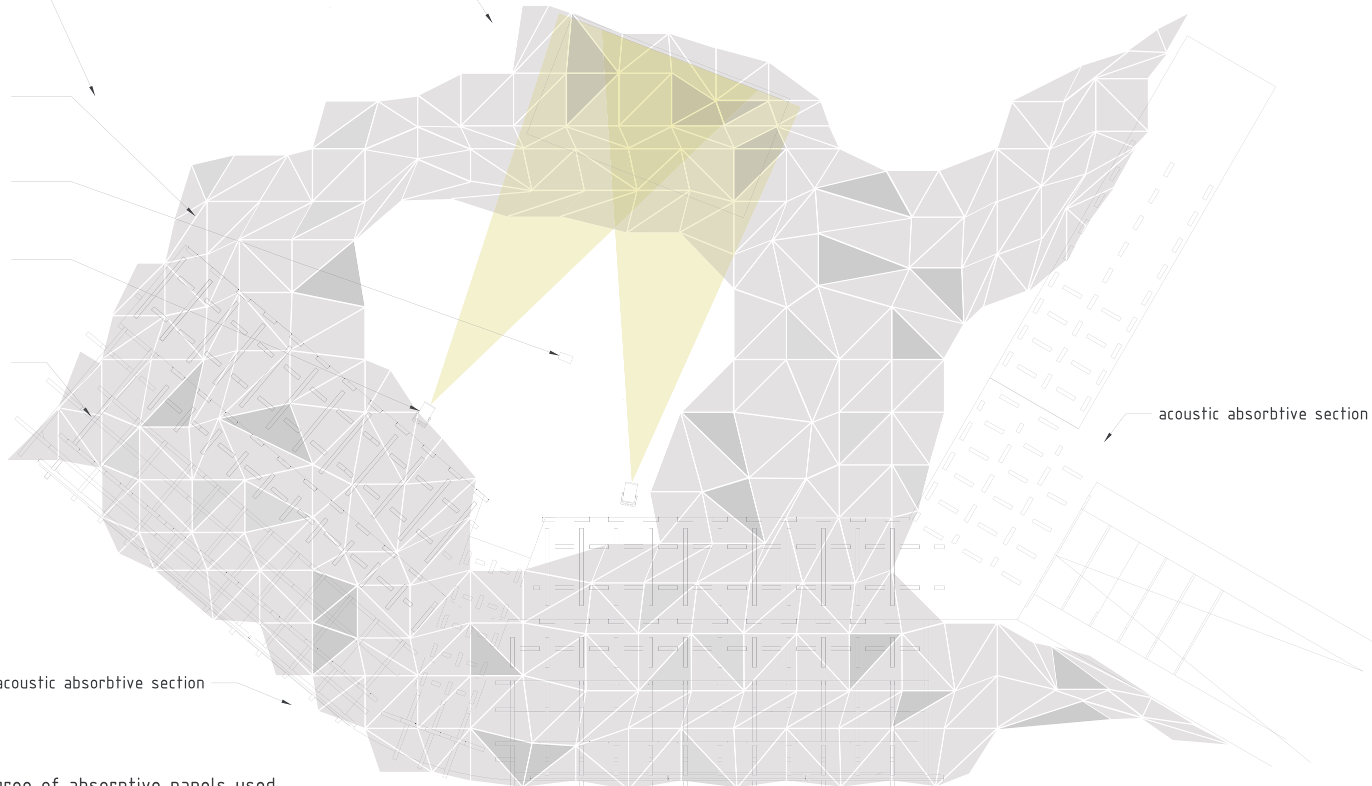
Calculated reverberation time: 1.17 second

The calculated time is slightly higher than recommended (acoustics.com 2009) but still suitable for the application.

The NC can also be managed partially by reflecting the exhibition noise external to the stage (reflective plywood) and absorbing the noise exterior to the seating pavilion (absorptive felt).

Pavilion acoustic diagram:

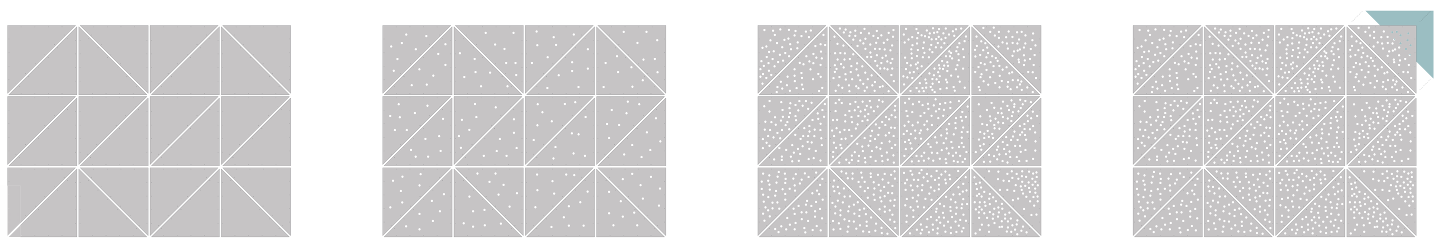




Reflected ceiling plan

degree of absorptive panels used to be determined on site prior to each event when Noise Criteria (NC) level has been established

Acoustic screen components:



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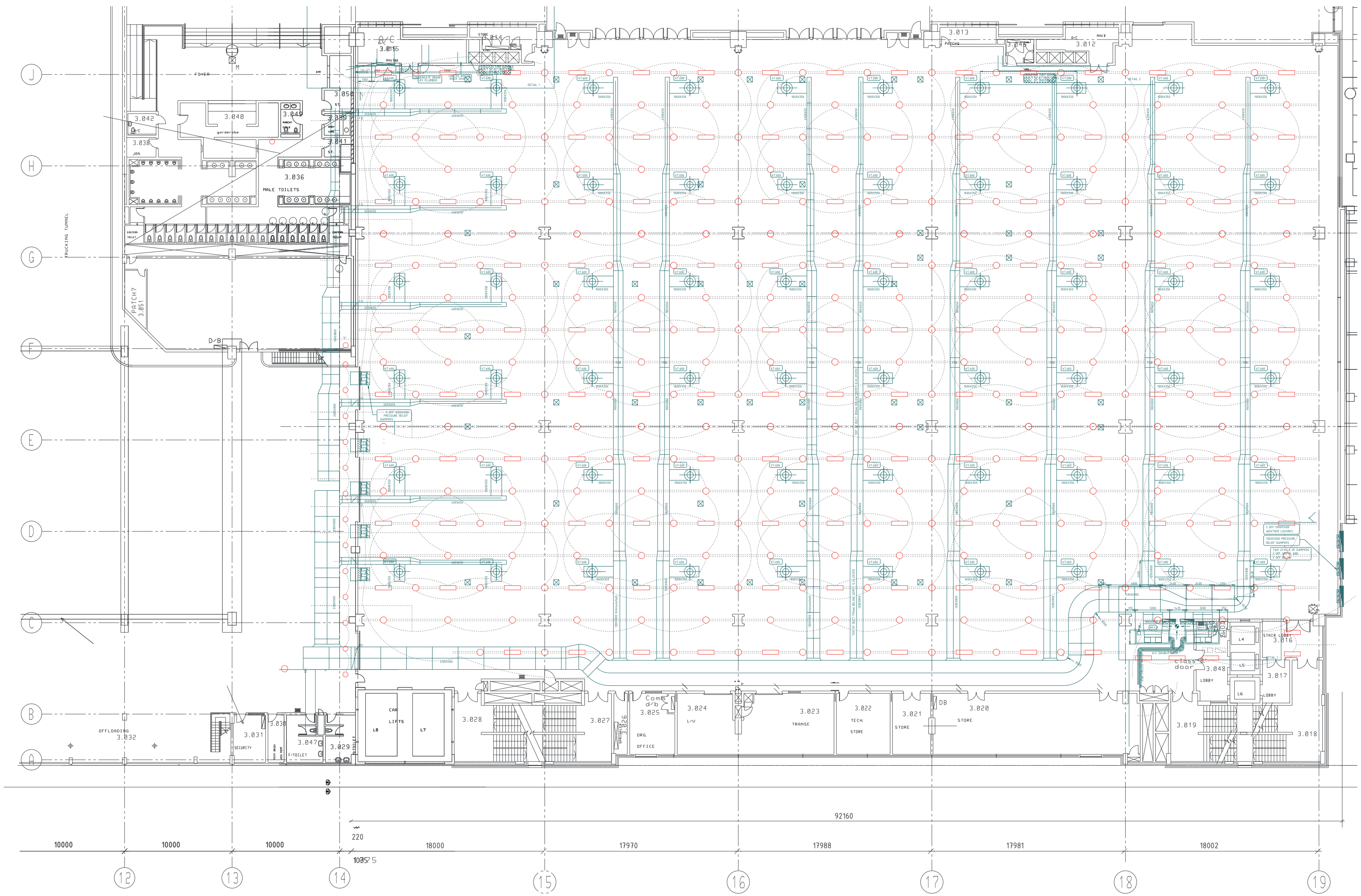
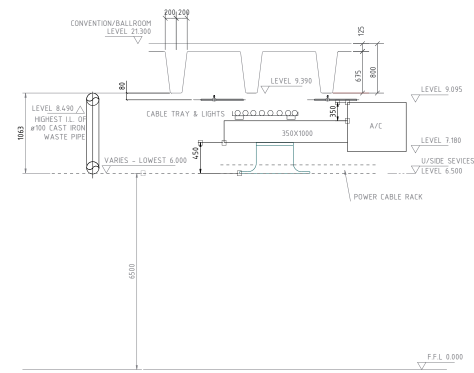
7.7 EXISTING SERVICES IN EXHIBITION 1, SCC





Typical section through coffer slab Exhibition 1, SCC

Reflected ceiling plan: existing lighting and ducting at Exhibition 1, SCC

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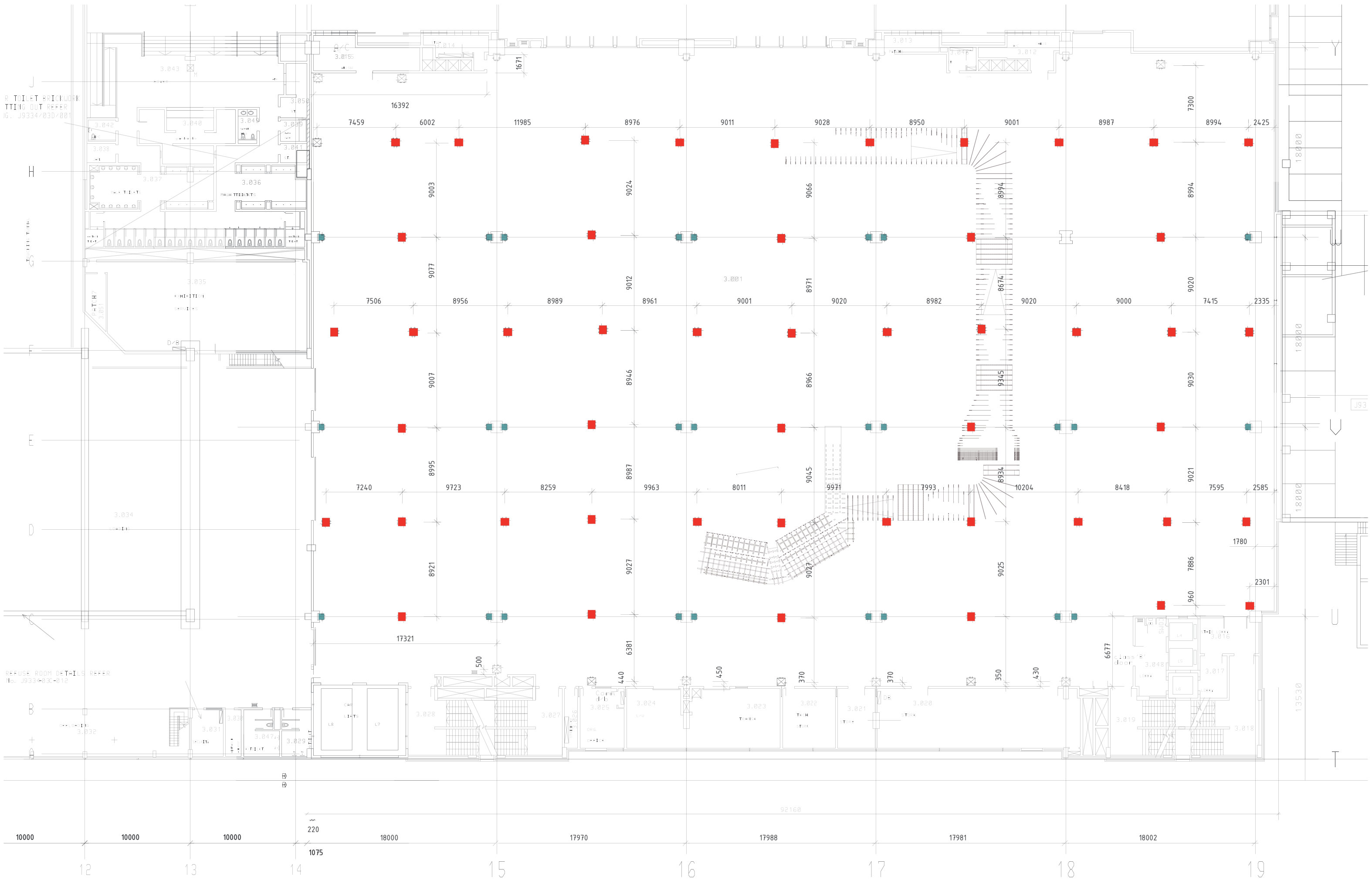


Electrical service points at Exhibition 1, Sandton Convention Centre with preferred installation layout

floor access panel

column access panel

7.8 ELECTRICAL CONSIDERATIONS AND DESIGN

The travelling nature of the exhibition would require the installation to adapt to the electrical supply of different countries.

International power supply can be categorised into two main groups (Global Electric Directory 2011) namely 50 hertz or 115V (110-130V) and 60 hertz or 230V (220-230V). To accommodate this, a voltage input switch is used along with a distribution board to control the electrical flow and protect the installation and users. Various plug types would be part of the travel kit to allow the adaptation between countries.

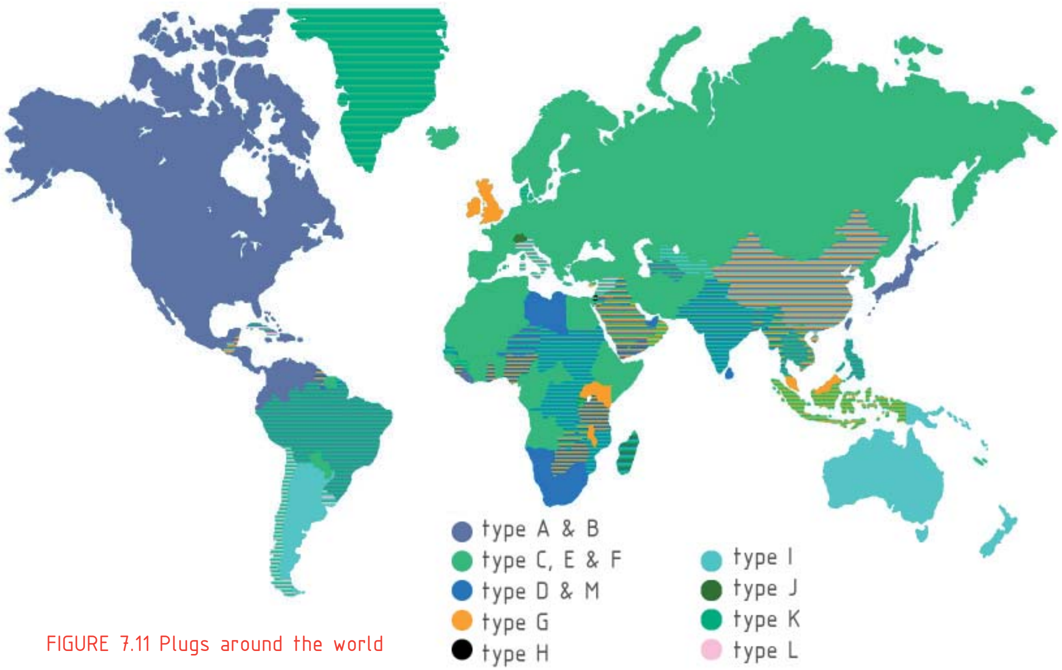


FIGURE 7.11 Plugs around the world

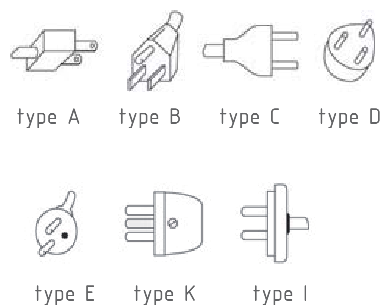
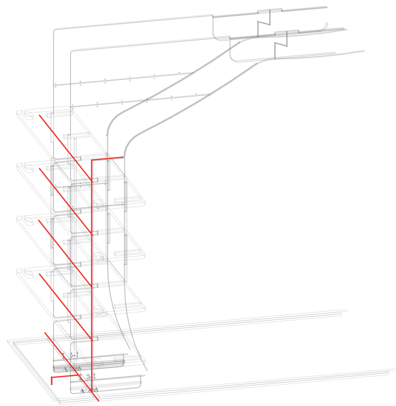
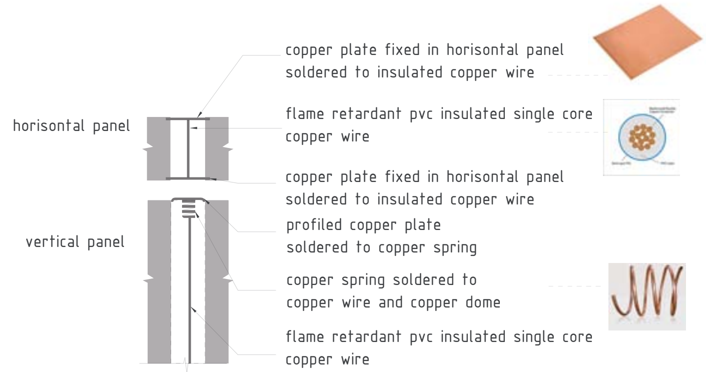


TABLE 7.1 Possible countries to be visited during IFI Interiors Biennale 2013. Original table (Global Electric Directory 2011) edited by author

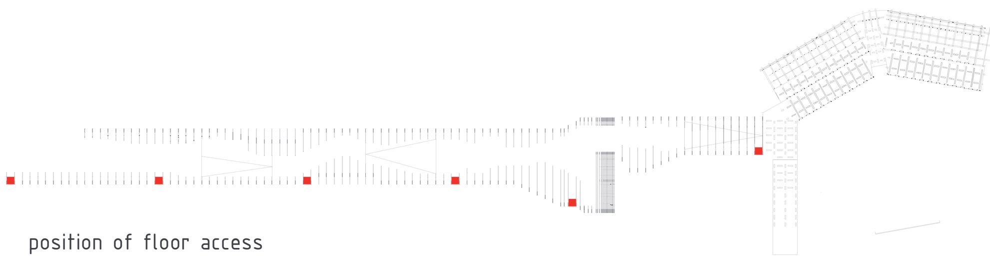
Country	Voltage	Frequency	Plug type
Australia	240 V	50 Hz	I
Canada	120 V	60 Hz	A & B
China, People's Republic	220 V	50 Hz	A, I, G
Egypt	220 V	50 Hz	C
Finland	230 V	50 Hz	C & F
France	230 V	50 Hz	E
Germany	230 V	50 Hz	C & F
Greece	220 V	50 Hz	C, D, E & F
Hong Kong	220 V	50 Hz	G, M
India	230 V	50 Hz	C & D
Italy	230 V	50 Hz	C, F & L
Japan	100 V	50/60 Hz	A, B
Mexico	127 V	60 Hz	A & B
New Zealand	230 V	50 Hz	I
South Africa	220/230 V	50 Hz	M
Spain	230 V	50 Hz	C & F
Taiwan	110 V	60 Hz	A, B
United Arab Emirates	220 V	50 Hz	G
United Kingdom	230 V	50 Hz	G
United States of America	120 V	60 Hz	A & B



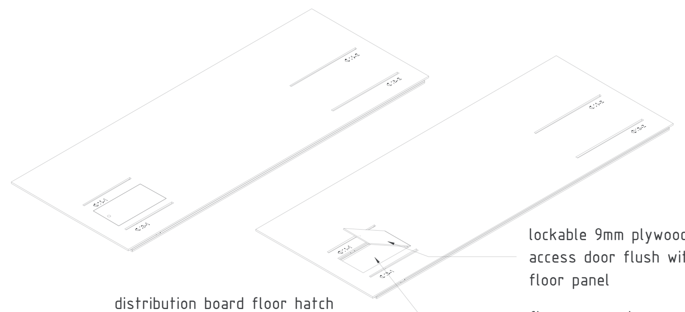
power supply from exhibition host
directed from floor service points
to installation distribution boards.
From there it is distributed to groups
of four vertical panels



electrical ducting in plywood panel detail



position of floor access
panels within installation
not to scale



distribution board floor hatch
not to scale

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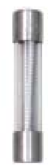
Power distribution diagram:

power supply from exhibition host → single phase distribution box → AC-DC converter with input voltage switch and replaceable fuse → distributed to systems of four vertical panels

single-phase distribution box, branched into three single-phase outputs. The distribution box to be fixed to the installation plate by screws, max. ø 6 mm, two holes in the middle 75 mm ctc

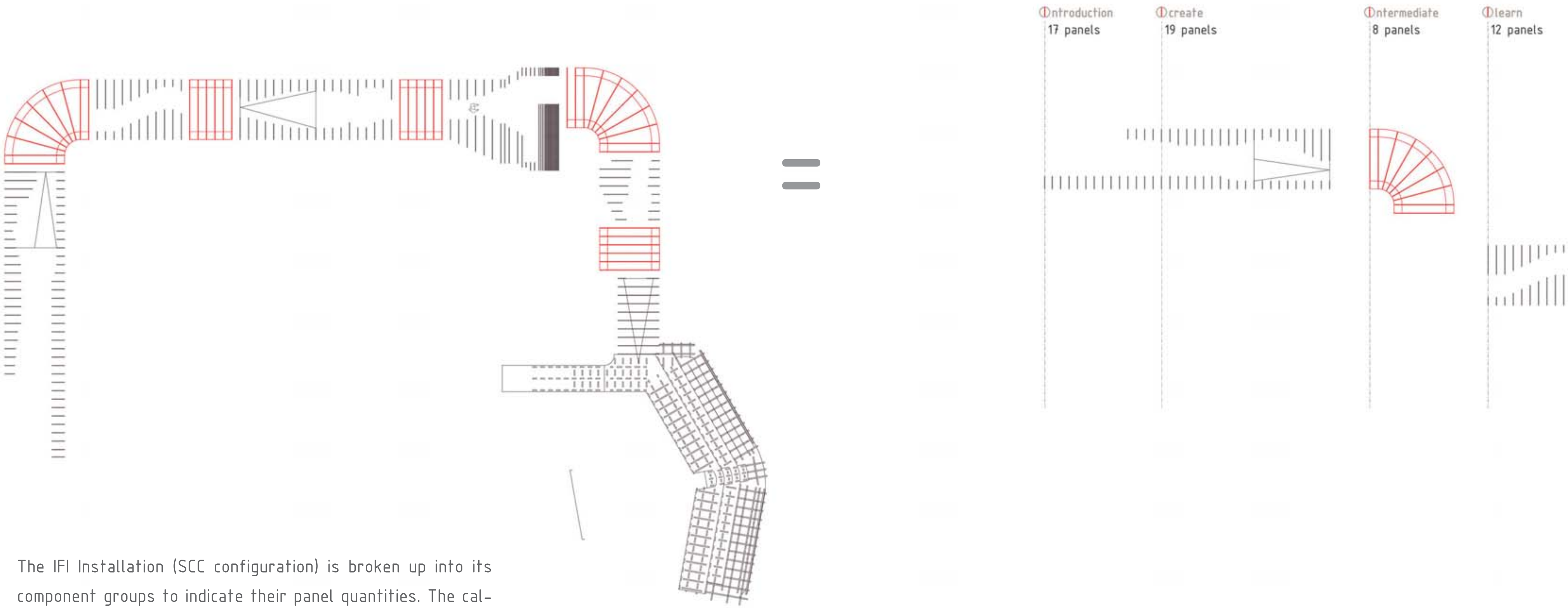
AC-DC converter

input voltage switch

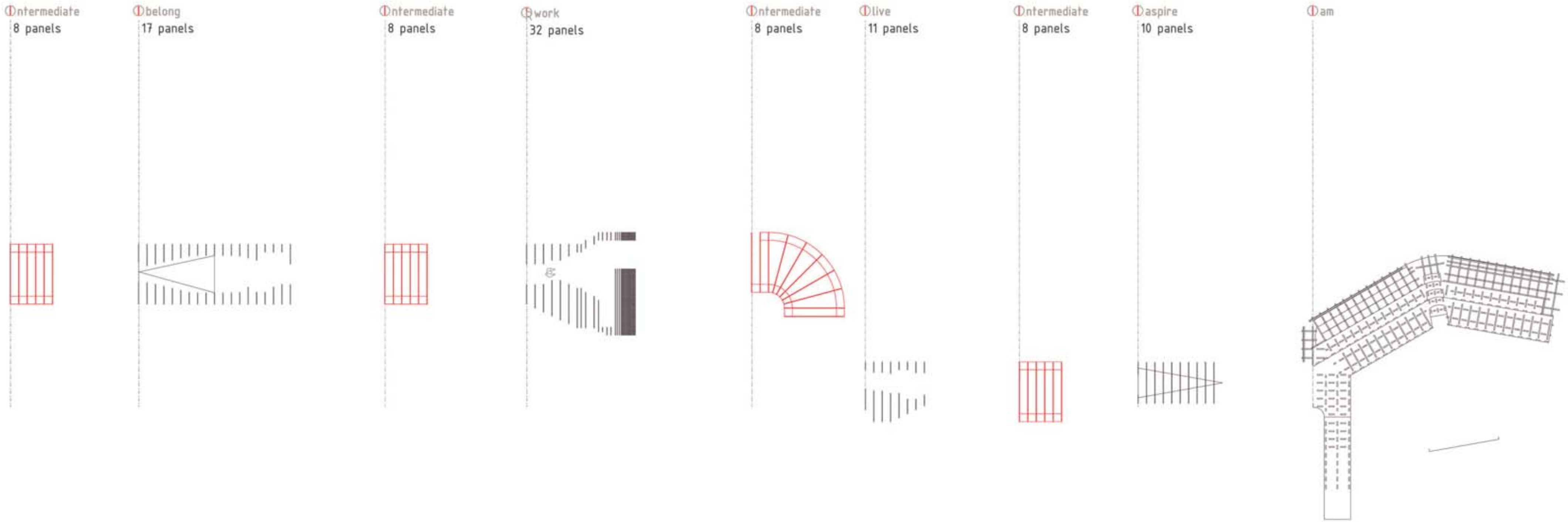


Fuses are overcurrent protective devices that contain a calibrated current-carrying element which melts and opens under specified overcurrent conditions. Fuses can be used for a variety of overcurrent and overload applications (Automation Direct 2011).

LED's use Direct Current (DC) electrical supply.



The IFI Installation (SCC configuration) is broken up into its component groups to indicate their panel quantities. The calculated panel number together with additional intermediate sections and the acoustic screen would occupy three 20-foot containers (based on container exploration in Chapter 6).


intermediate
8 panels
belong
17 panels
intermediate
8 panels
work
32 panels
intermediate
8 panels
live
11 panels
intermediate
8 panels
aspire
10 panels
am

7.9 POPULATION AND THERMAL COMFORT

Population of IFI Installation

Typical IFI installation length: 68.5m
Projected number of visitors per day: 11 thousand (100% Design London 2010)
Trading hours: 9am-19pm
10hours= 600min/day
Movement past any given point in installation:
11000/600= 18.3 people per minute
Walking speed at an exhibition is approximately 1m/s (Envisage 2010).

If walk through median time is 3min:
18.3x3mins=55

Population in exhibition: 55 people at a time
more than 1m per person at given time

Thermal Comfort

The dedicated exhibition venue provides a thermally comfortable space. The comfort range within the IFI Interiors Installation could however be influenced by several physical factors (Hausladen & Tichelmann 2010:4):

- interior air temperature
- average temperature of enclosing surfaces
- temperature distribution
- movements of the air
- moisture in the air

The above factors have a close, mutually influential relationship with the factors that are dependent on the people themselves:

- type of clothing
- physical activity
- age, sex, constitution, physical well-being
- food intake
- adaptability
- psychosocial factors
- ethnic influences
- daily and annual rhythms
- length of time in room

Further factors related to the room itself and its use have a substantial effect on the interior climate, too:

- room occupancy
- sources of heat and substances
- temperature distribution within the room
- air change rate
- air management in the room

Specific Factors applicable to IFI Interiors Installation

Room occupancy effect on interior climate

Occupant energy production between sedentary and moderate physical activity=105W/m^2 (Hausladen & Tichelmann 2010:4)

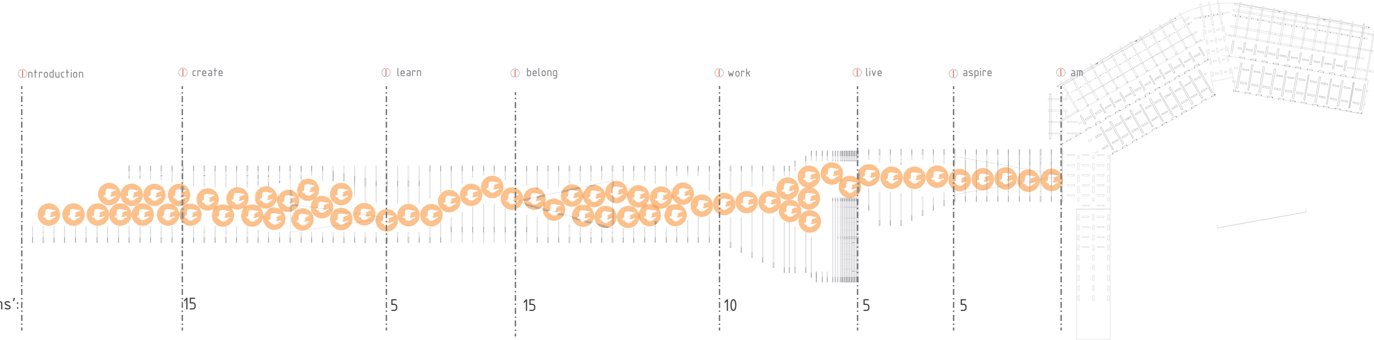
The "normal" BSA (Body Surface Area) is generally taken to be 1.7 m2 (Mosteller 1987)

Average energy production of occupant:

105 W/m^2 x 1.7 m^2= 178.5 W

1 W = 1.00 J/sec

walking speed: seconds per meter: 2.6



occupancy diagram based on population calculation

The following table applies the gathered information to calculate the heat gain in each principle space:

TABLE 7.2 Heat gain through Installation occupancy

space	occupancy	length	time occupied (seconds)	occupants energy (Watt)	occupants energy (Joule)	'room' heat gain from occupants (Celsius)
create	15	9.0 m	23.4 s	2677.5 W	114.4 J	0.06 °C
learn	5	5.7 m	14.8 s	892.5 W	60.3 J	0.03 °C
belong	15	9.0 m	23.4 s	2677.5 W	114.4 J	0.06 °C
work	10	6.2 m	16.1 s	1785 W	110.9 J	0.06 °C
live	5	4.3 m	11.2 s	892.5 W	79.7 J	0.04 °C
aspire	5	4.8 m	12.5 s	892.5 W	71.4 J	0.03 °C

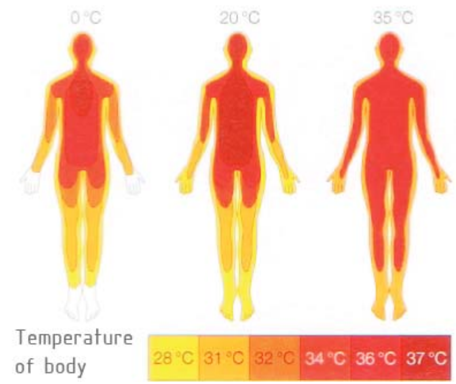


FIGURE 7.12 Body temperature in relation to surrounding temperature

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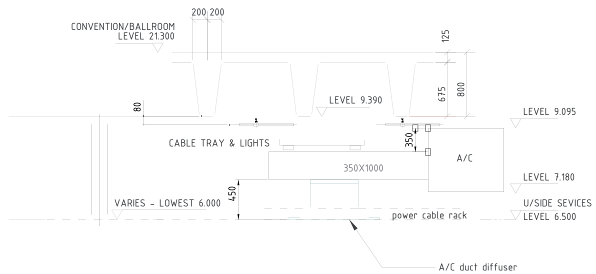
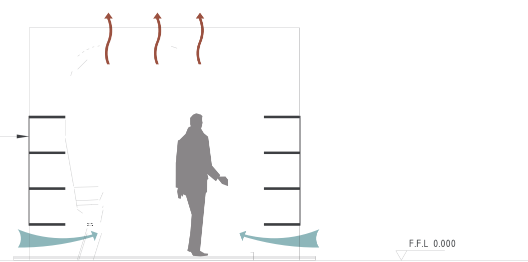
Conclusion

The heat gain from room occupancy is negligible if the length of time in each principle space remains as calculated. In the case that the Installation interior climate becomes uncomfortable the shear panels specified could be allow a higher degree of permeability to allow better movement of air.

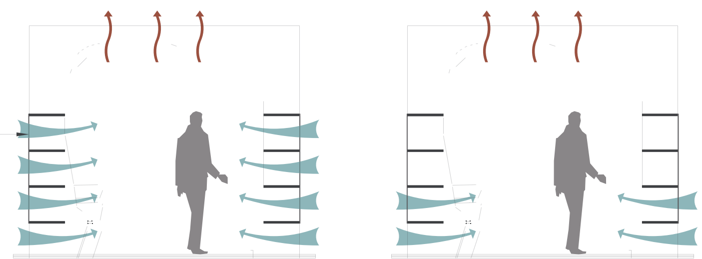


shear panels never to extend
to floor panels- allowing surrounding
cooler air to enter installation



typical section showing
air movement through installation

level of shear panel
permeability used to
establish slight control
over installation interior
temperature



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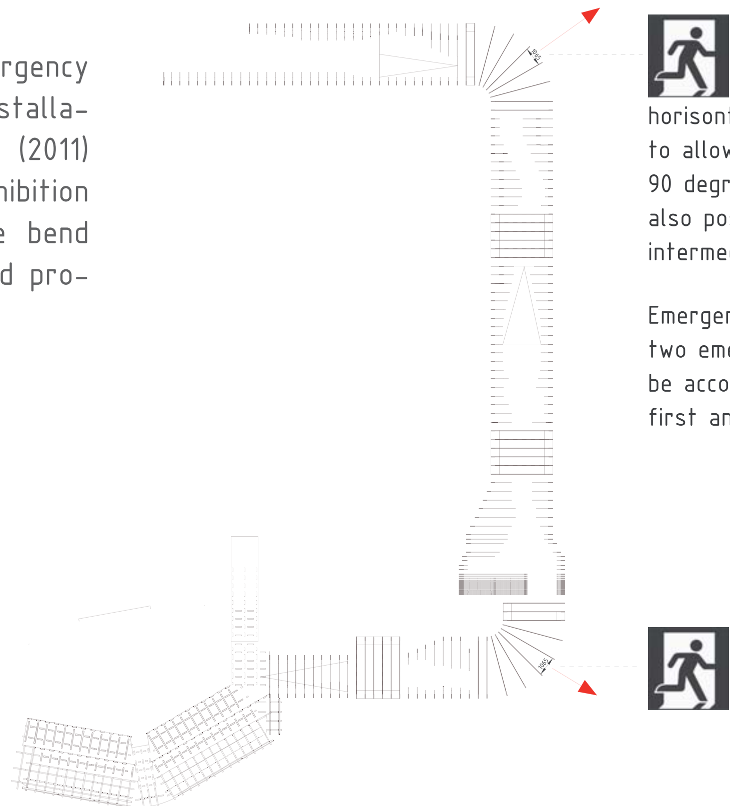
7.10 INSTALLATION EMERGENCY EXITS

The SCC requires an exhibition layout that allows emergency evacuation of all in the venue within five minutes (Annexure B).

To adhere to this requirement two emergency exits should be accommodated in the Installation. During a conversation with Cilliers (2011) a previous employee at Set Squared exhibition designers, it was determined that the bend (45/ 90 deg) intermediate sections could provide a clear 1000mm emergency exit.



horisontal panels to be positioned to allow emergency exit as part of 90 degree intermediate section. also possible as part of 45 degree intermediate section.

Emergency signage & two emergency exits to be accommodated within first and last third of installation

FIGURE 7.13 Emergency signage as part of prototype