

Fig. 7.1_ rendering of museum structure

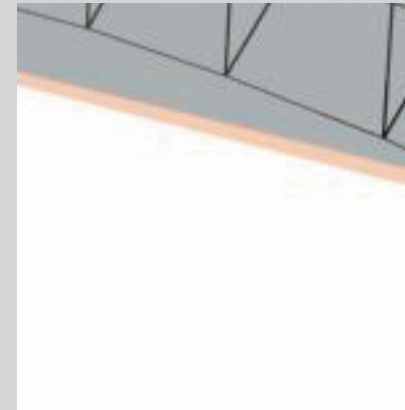


image information:
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of museum structure



[07] [01] MATERIAL STRATEGY

Material choice was strongly influenced by the site, film and building programme.

The context of the site asks for trueness to materials highlighting the site's industrial past. Film as a theme suggests ideas of transparency and layering, whereas programme influenced material choice through climate control, usability and maintenance.

Throughout the project the composite nature of materials are revealed. Very few materials are treated, painted and service elements are mostly exposed; e.g. Service ducting linking the museum spaces become a feature.

Materials used in the Film Centre echo that of the Retort Buildings. Old edifices are enhanced through the use of opposing new materials juxtaposed against existing materials, thus minimises confusion between old and new.

[07] [01] [01] SALVAGED MATERIALS

Re-used salvaged steel members in the Retort buildings are used as structural material in the Film-centre. These members are cast in concrete to ensure a uniform end product. All exposed steel will be new material as specified by the structural engineer.

[07] [01] [02] METAL

Galvanized steel sections are used as main load bearing members and the fastening thereof is limited to bolting. M10 bolts with washers and nuts will be used, unless otherwise specified.

Aluminium sections are used for its material lightness, especially where loads on structures must be minimized. It is important to note that neoprene gaskets must be used between different metal sections. E.g. where aluminium is connected to galvanized mild steel.

All structural steel elements must comply with engineer specifications.

[07] [01] [03] OTHER MATERIALS

Other materials specified include concrete panelling, in situ cast concrete, red brickwork to match the colour of the existing buildings on site, glass and stainless steel wire mesh.

Concrete panelling (cladding) is specified for its adaptability to become a ventilated façade. The cladding system is an easy way to achieve the aesthetics of an exposed concrete wall without the tedious process to get material perfection.

Brickwork echoes the context of the retort buildings and S/S wire mesh and glass gives the project different layers of transparency, exposing parts and hiding others.

Fig. 7.2_ interior of Retort house, indicating re-use of salvaged materials

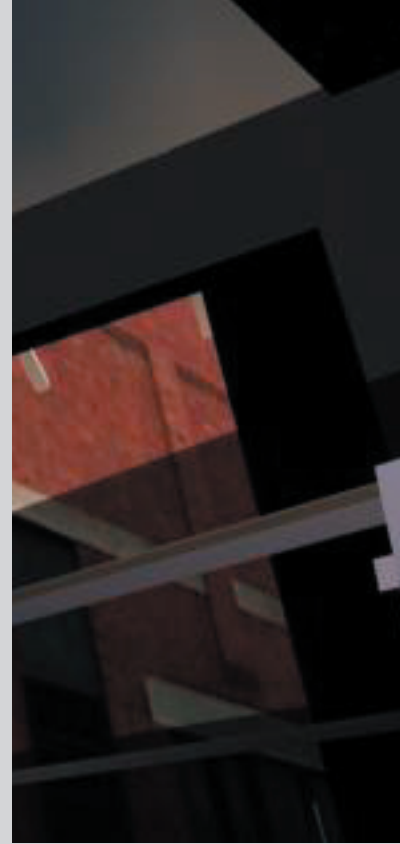


Fig. 7.3_ rendering of link

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[07] [02] ENVIRONMENTAL ISSUES

In the case of the film centre the zero energy band's use is extended by the use of insulating materials, sun screening, glazing, natural ventilation and ventilated facades. When daylight provides adequate lighting, the air is fresh enough, and the temperature is comfortable, no further energy expenditure is required.

[07] [02] [01] SUN CONTROL STRATEGY (GLAZING AND SHADING DEVICES)

Solar heat gain is substantially reduced by orienting the building so that there is a minimum of glass on the east and west facades. As in the case of the Administration wing, glass facades are treated by using M55 double glazed glass.

Solar heat gain and glare within museum spaces and all north facing windows is either controlled by outside vertical screens of sandblasted glass, heat absorbing glass or by the tilting of glass panels. Any method of reducing solar heat gain will also alleviate glare since approximately half of the total radiant energy from the sun is in the wavelength region of visible light.

Heat absorbing glass absorb over 70 per cent of the incident radiation so that transmission to the inside of a building is about 20 per cent when the angle of incidence is small and even less when it is large. The effectiveness of heat absorbing glass may be increased by using it as the outer pane of a double glazed window so that absorbed energy can be more readily dissipated to the outside air than to the room air.

"Solar heat gain through a north facing window can be significantly reduced also by tilting the glass as shown in Figure 7.1. The energy falling on the window in this configuration is the same as would occur if the window were vertical and had a 1.4-foot projecting shade along the lintel. The tilted glass reflects 45 per cent of the radiation when the incident angle is 78 degrees, compared with 23 per cent when the glass is vertical. This difference in reflectivity decreases as the season progresses toward the winter solstice, and in winter the tilted and vertical windows transmit essentially the same amount of solar energy."(STEPHENSON, 1962,41)

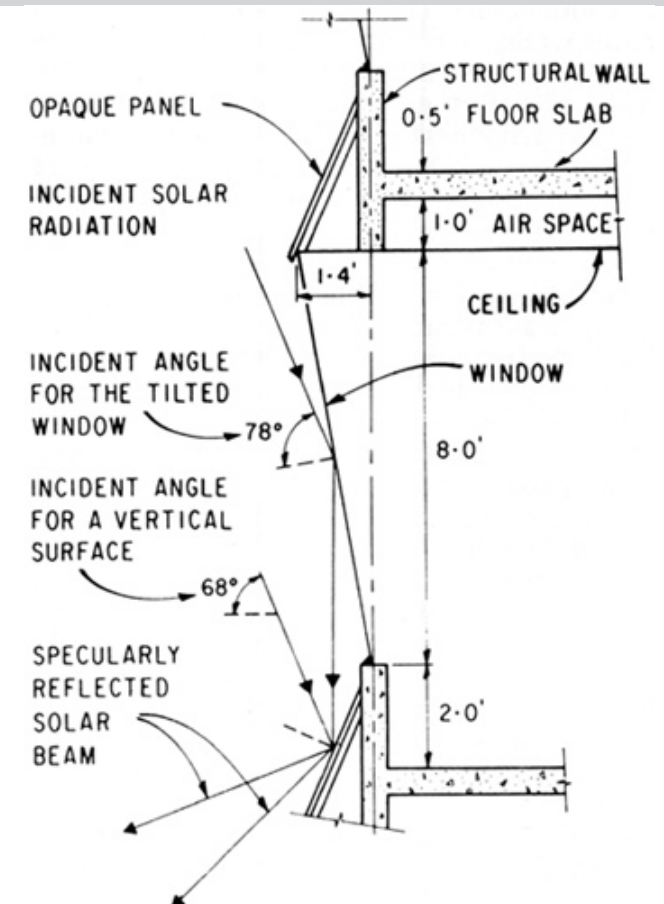


Fig. 7.4_ tilted glazing

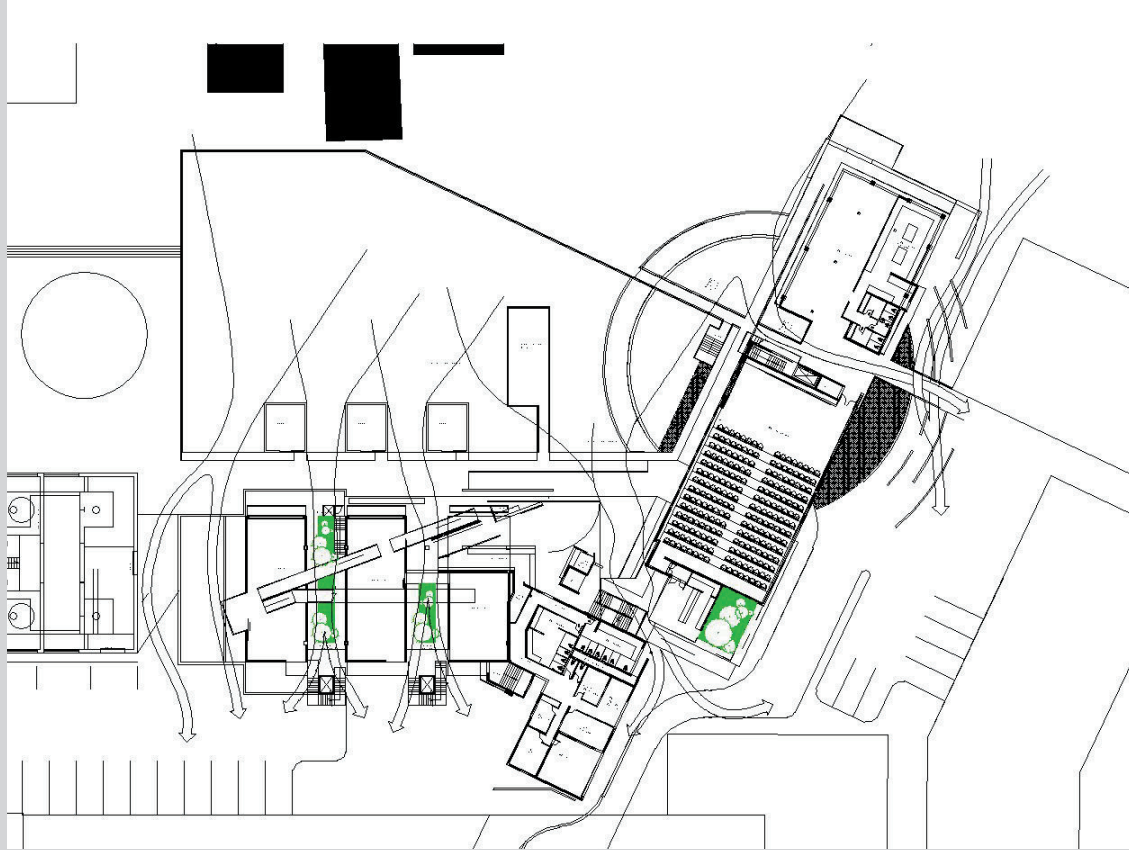


Fig. 7.5_ ventilation strategy on plan

[07] [02] [02] NATURAL VENTILATION STRATEGY

Maximum wind-induced ventilation is created by siting the ridge of a building perpendicular to the summer winds (from the north to north-west) and by keeping the footprint narrow perpendicular to the wind direction. The building's north-south orientation makes it possible for wind to penetrate the void courtyards spaces between the museum boxes and window openings in the office and residential facilities.

The residential block to the south (as introduced in the urban design framework) of the Film centre will act as a windbreak against cold winter winds from the south.

On the western cinema auditorium façade natural ventilation and misters are used to cool the edge of the building during the summer months. The Misters installed on the vertical screens of the façade will act as natural air-conditioners using harvested rainwater.

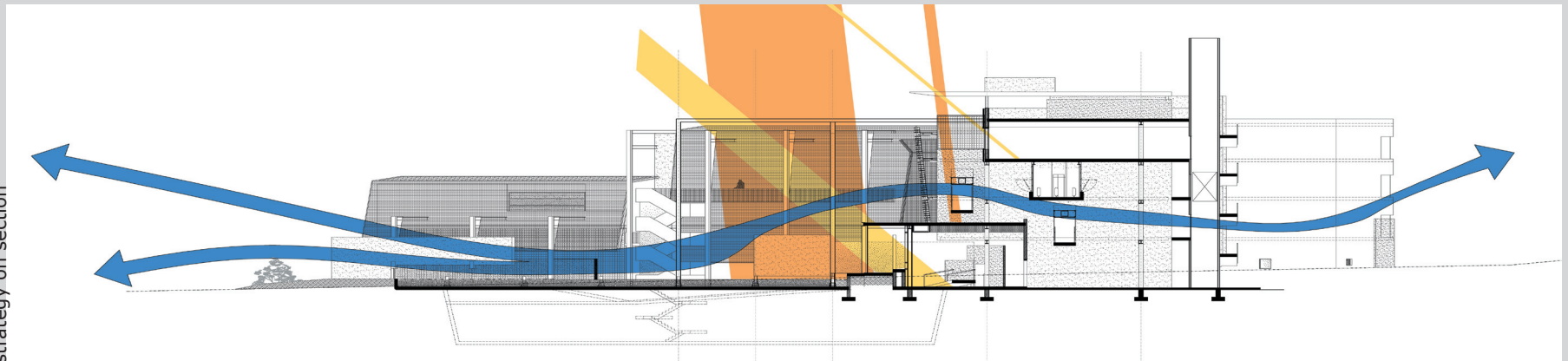
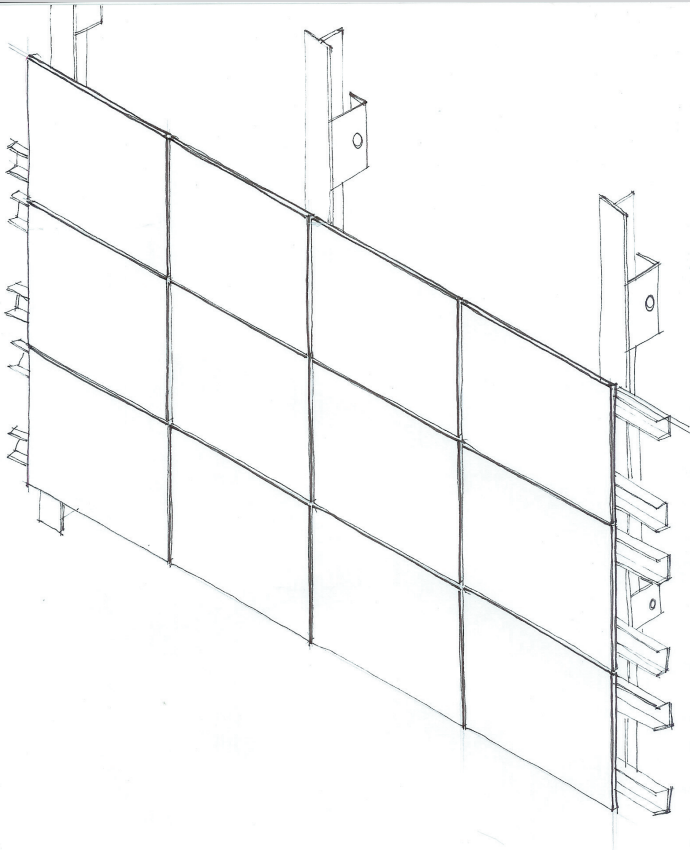


Fig. 7.6_ ventilation and sun control strategy on section

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[07] [02] [03] VENTILATED FACADES

Ventilated walls are introduced in the cinema/restaurant wing as well as at the administration offices, since these areas are exposed to direct east and west heat gain during summer. Ventilated walls is a covering system of pre-cast concrete cladding that makes it possible to lay pre-cast panelling while at the same time increase the thermal performances of the covered surface. The ventilated walls limit heat loss in winter and heat entry in summer and thus use the thermal inertia of materials appropriately and the reflection of incident sunrays.

Fig. 7.7 _ ventilated facade

[07] [02] [04] MECHANICAL VENTILATION STRATEGY

Mechanical ventilation systems will be introduced in the museum spaces, offices and auditoria. The museum need such a system due to internal heat generation from lighting and electronic equipment, the auditoria due to the high concentration of people and the offices due to the length of occupancy during work hours. The design asks for a flexible, adaptable system with strict specifications for the exclusion of mechanical noise. The decision came down to the use of a centralized chilled water fan coil system, with a constant air volume and varying temperatures.

The architectural requirements for this system are the following:

- A chiller room/air-conditioning plant consisting of separate self contained units located in the mechanical equipment room
- 500 mm (height) ducting in ceiling spaces for all conditioned rooms. Air- conditioning ducts run from each of the air- conditioning unit to the various conditioned spaces. (See detail of suspended ducting)

The design resolution is a chiller room, ventilated at 2 sides, placed under the premier cinema, suspended ducting along all ramps connecting the museum spaces and ceiling ducts of 500 mm in all conditioned spaces. A future allocated space is provided for to the south of the premier cinema entrance (basement delivery area) if more chiller rooms are required.

Furthermore the air supply in cinema auditoriums and AV rooms will be of uniform volume at a low velocity, since air interference with projector light may prevent un-even burning and hence changes in light intensity during projections.

The need to address mechanical noise generated by chiller rooms is further dealt with in the Acoustics section of this document.

Fig. 7.8_ connection of structural elements

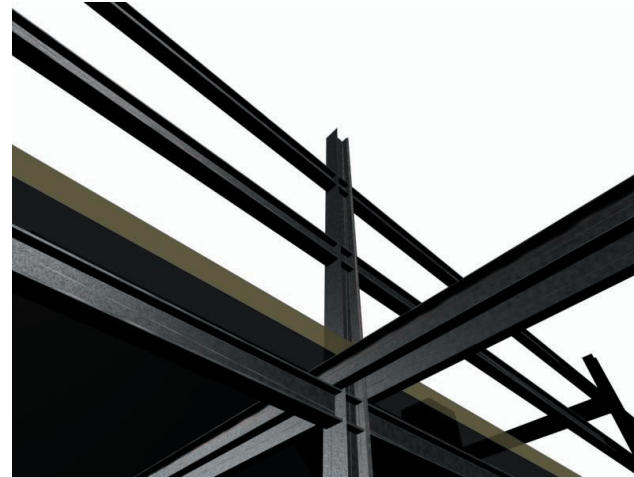
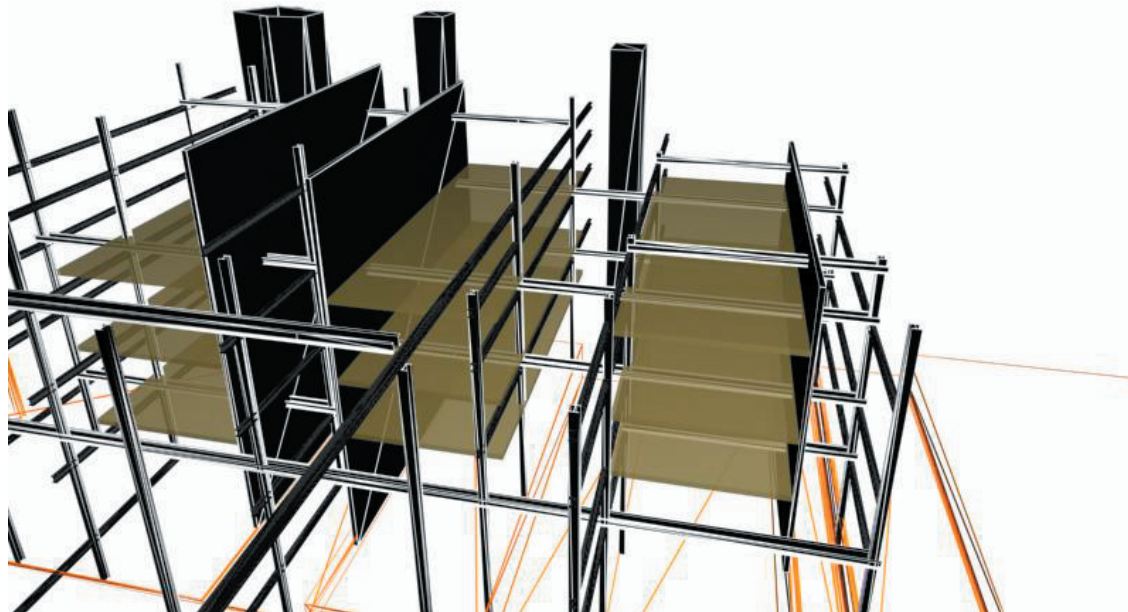


Fig. 7.9_ museum structure



[07] [03] STRUCTURAL SYSTEMS

The structural system involves two primary structural materials; steel and concrete.

In the museum the steel structure forms a double span beam system with c-channels running east-west and I-beams running North-south.

All wall elements function as bracing elements for the steel structure, where the steel transfer compression loads to the ground. Reinforcement in concrete slabs resists tension loads that are present because of material deflection due to gravity.

The concrete floors and wall elements of the cinemas make use of pre-stressed (pre-tensioned) reinforcement to enable lesser material thicknesses.

All concrete slabs and steel member thickness should be according to engineer specifications.

The suspended/umbrella roofs over the water feature is made up of a system of lipped channel purlins and z- extruded branding covered with coated steel and polycarbonate sheeting. This horizontal structure is in turn suspended and kept rigid with a composed I-section steel beam running east-west and treated against downwards wind forces with 19 mm stainless steel cables with turnbuckles. The sheeting used is part galvanised sheeting and part polycarbonate sheeting in places where sun infiltration is required.

[07] [04] SECURITY AND SAFETY
 [07] [04] [01] SECURITY

A dual entrance to the building serving the museum, cinema, and café/library, overcome security issues normally associated with many access points. This however posed problems, since operation of the cinema and café continues after trading hours of the museum. A glass pivot jamb door is introduced at the ground floor entrance, blocking the entrance to the museum during evening performances. The door is composed of a two 10 mm tempered glass skins fixed to galvanised c-channel posts. Two of the cavities are filled with old celluloid, indicating the past history of film, whereas the other transparent panels give glimpses to the museum through the transparent panes.

Where ramps intercept museum boxes, sliding glass panels are provided, operating from an automated computer system. These doors secure the museum exhibitions from intrusion during night time.

Accommodation facilities placed in direct adjacency to the film centre create a 24 hour surveillance of the public spaces around the public square.

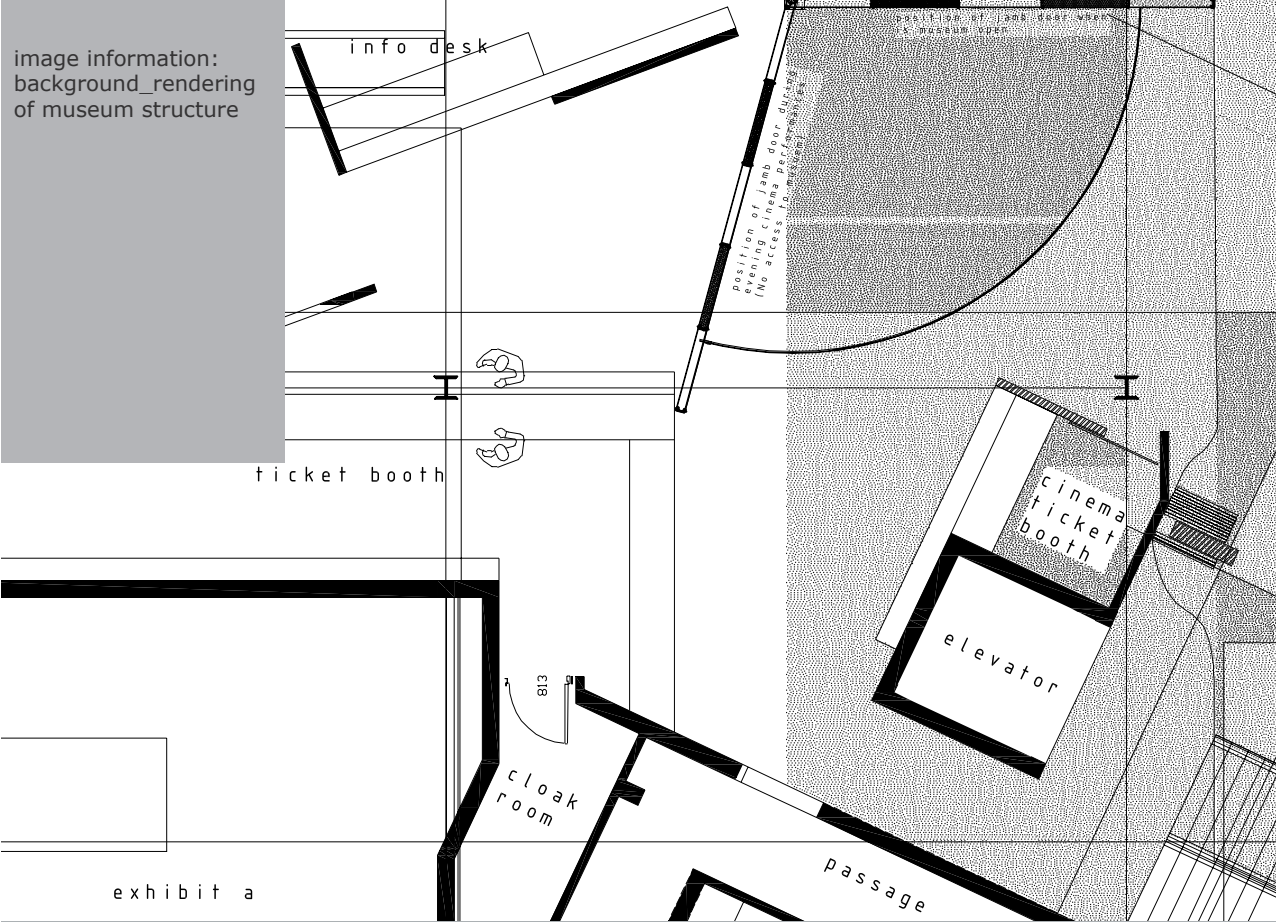


Fig. 7.10_ entrance hall serving the museum, café and cinema

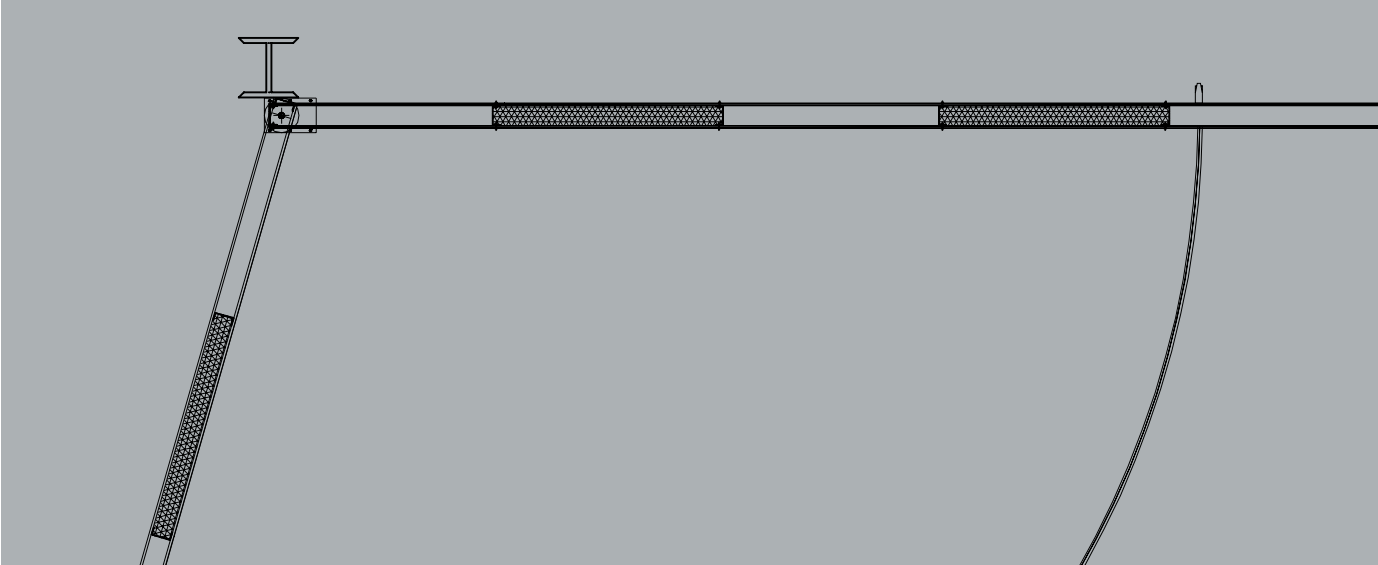


Fig. 7.11_ security jamb door

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[07] [04] [02] SAFETY ALONG WATER FEATURE-NO BALUSTRADE

The elimination of a balustrade along the water edge create opportunity for innovation regarding safety. A 600 mm strip of grating and pebbles is provided at a level of 510 mm below the walkway line of interchange. The grated strip also serves as a gutter for overflow in cases of extreme precipitation.

[07] [04] [03] SITE CONTAMINATION TREATMENT

Since it will take a good part of 50 years to cure and rehabilitate this contaminated soil through a wetland system, a more practical approach was followed. All top soil around the Retort Buildings will be replaced. A geo-textile layer placed between new top soil and contaminated soil will function as a buffer against underlying contamination. The use of suspended walkways is also introduced in places.

The Braamfontein Spruit will be reinstated on a sealed surface above the contaminated material. Furthermore it is suggested to use piles along the Braamfontein Spruit were contamination is severe. All surface parking must be of hard permeable surfaces; hard due to underlying contamination and permeable, to prevent erosion.

Fig. 7.12_ sketch illustrating edge of walkway connecting with water feature

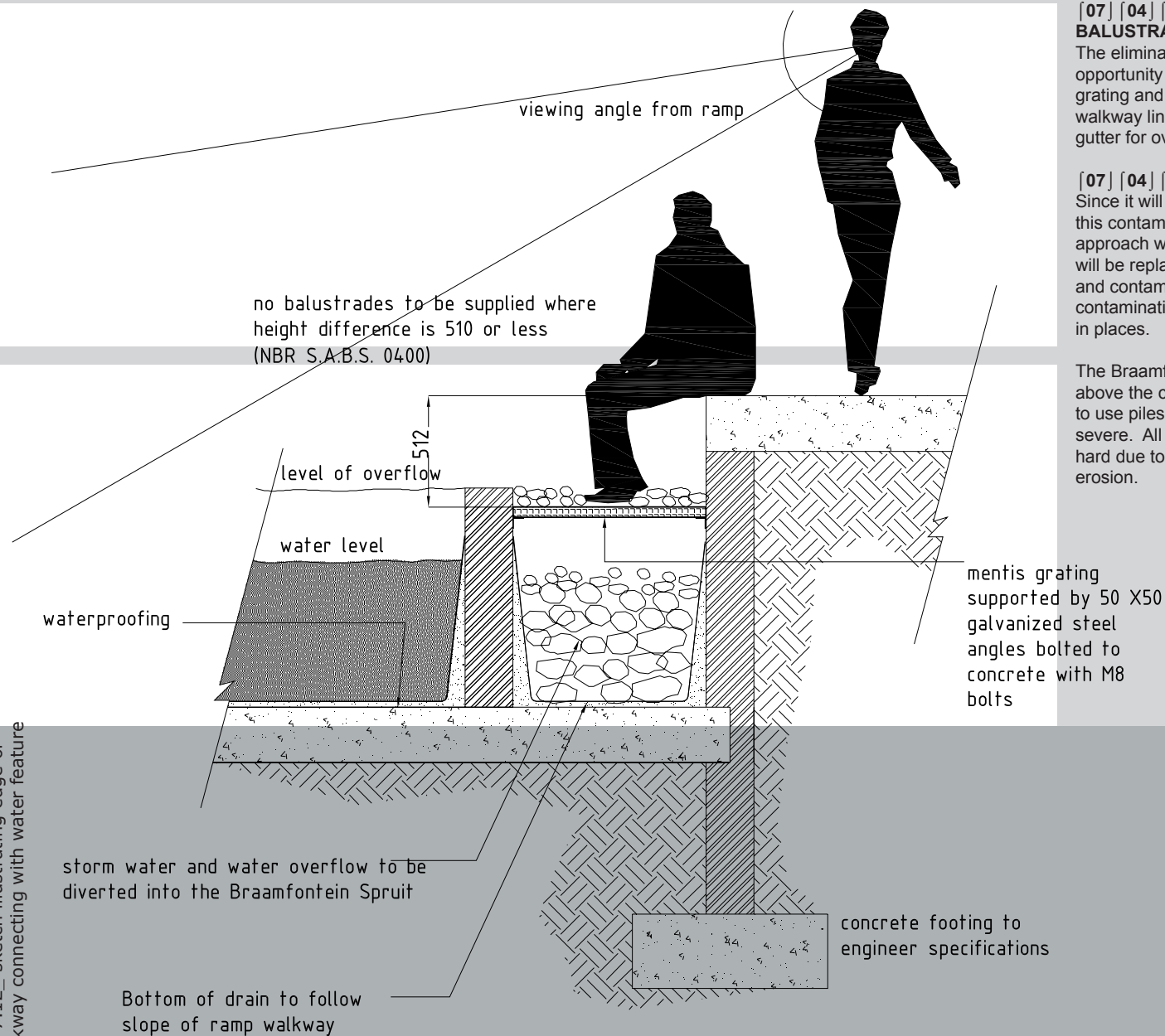


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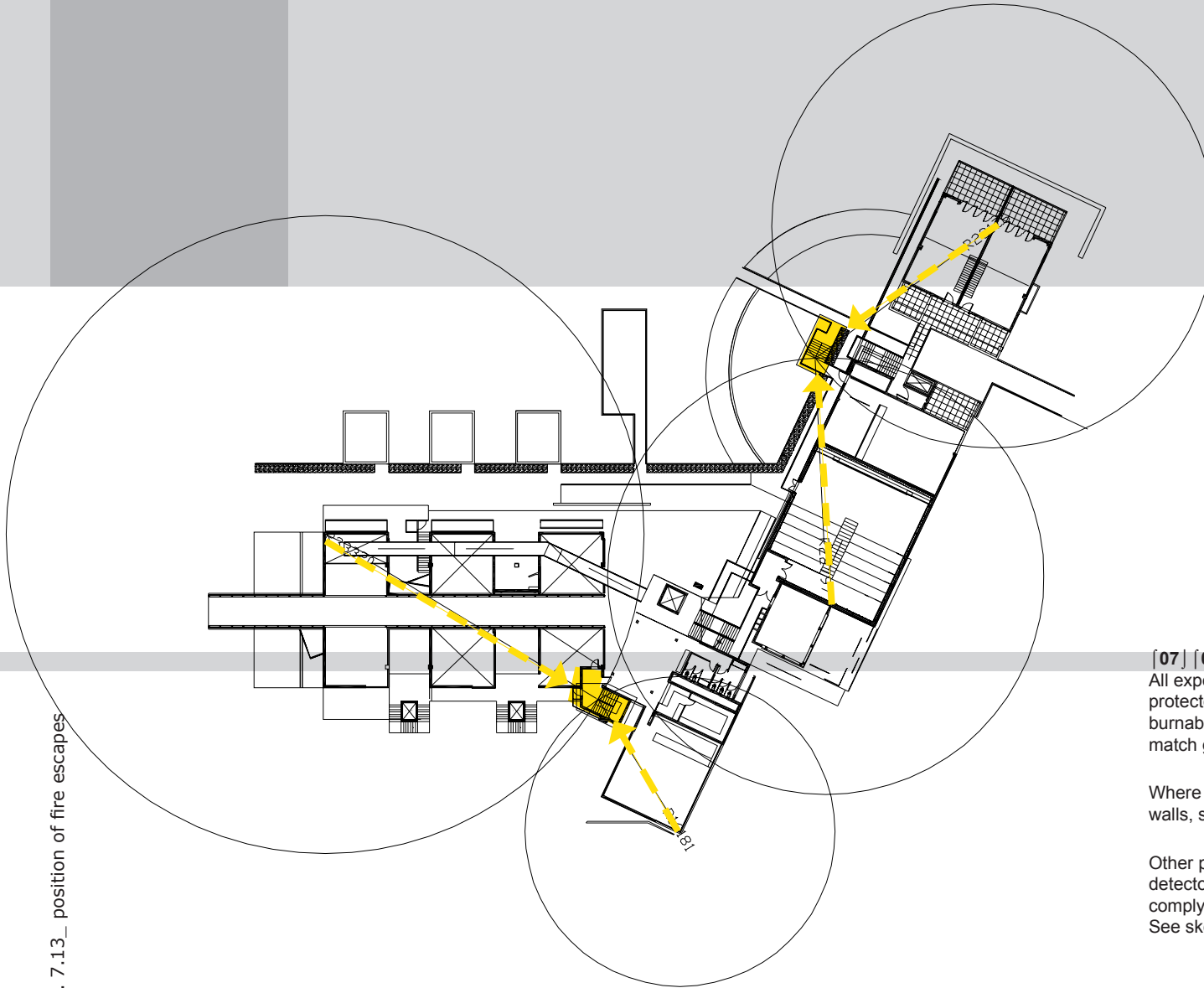


Fig. 7.13_ position of fire escapes

[07] [04] [04] **FIRE MANAGEMENT**

All exposed structural steel in and outside the building are protected by Fire Barrier Intumescent paint and a top coat of non-burnable acrylic paint added to give a finished matt silver colour to match galvanizing and natural anodized aluminium.

Where steel load bearing elements connect with concrete and brick walls, steel will be in-situ cast in concrete.

Other provisions against fire will be sprinkler systems, fire-detectors and alarms, fire extinguishers and fire escapes all to comply with SABS 0400.

See sketch for fire escape layout and distances.

[07] [05] ACOUSTICS

Cinema acoustics include absorption of 'people generate sound' within the auditorium space, reverberation treatment of sound through reflection, and insulation against outside and mechanical noise generated by the air-conditioning plant.

Museum acoustics focus mostly on absorption of noise generated by people visiting the centre and noise generated by overhead air-conditioning ducts.

In the cinema auditoria absorbing materials are placed along all walls and floors, and reflective materials against the ceilings for the best sound effect.

The glass window introduced as an indoor-outdoor connecting feature in the premier cinema is treated accordingly to prevent insulation loss. Instead of using a single layer of glass, better insulation against outside noise is achieved through a cavity glass wall. The air in the cavity (cavity size specified by acoustical engineer) acts as a sound insulator. Furthermore by introducing openings at the top and bottom of the outside glass panel, the glass wall acts as a ventilated façade, forcing hot air to escape at the top opening.

A louver blind system is introduced in the inside to avoid disturbance during daylight performances. The interior skin of the cavity blind will be of a perforated material functioning as a sound absorber.

Absorbing materials in the cinema spaces are of perforated 32 mm plywood, with an absorbing fabric covered glass fibre backing. A cavity is introduced between the glass-fibre and structural wall to improve the cladding's absorbing capabilities. Struts are kept to a minimum.

Acoustisorb will be used as a sound insulator against the ceiling of the air-conditioning plant room to minimize mechanical noise in the cinemas. This material is also introduced against the sharing wall of Apartment 3 and Cinema 2.

Acoustisorb (250 mm thick) is lightweight compressible insulation material manufactured from thermally bonded polyester. The product is made up of flame-resistant grade polyurethane foam in combination with a dense sound barrier layer supported by a non-tear scrim. The surface has a coating of flame-retardant glass-cloth which prevents dust and dirt from entering the foam.

Reflective sound panels in the auditoria are of sandblasted glass suspended from the ceiling by spider fasteners. The glass ceiling also serves as a service duct for light fittings and speakers.

Auditoriums are provided with double door systems, creating entrance lobbies to the cinemas, this insulates auditoriums from outside noise.

[07] [06] RE-USE

[07] [07] [01] WATER RE-USE

The film centre has large roof catchments and impermeable adjacent surfaces which make the design ideal for rainwater harvesting. Rainwater from roofs and hard-scaping will supply surrounding landscapes, water closets and urinals and misters on the western façade of the cinema with grey water.

Harvested water is retained in the main water body on site for further distribution. Water then flow to twin suction filters in the basement (at the loading bay), the filters are supplied with non-return valves. Silt and compounds are discharged to the drain and the filtered water to a second closed retention dam located south-east of the film centre. From there water is dispersed to various grey water-use facilities.

In high rainfall seasons water will overflow into a gutter provided along the main water body and will be discharged into the Braamfontein Spruit.

Other than the various grey water use facilities, the main water body (first retention dam) will also be in demand of harvested rainwater. The water feature will suffer significant water loss due to evaporation because of sun, wind and the water feature's large coverage.

Through a calculation it became apparent that the Film Centre can supply a significant amount of harvested rainwater to the water-feature per annum.

The area of roofs and hard spaces of the film centre is 2302 m²
 The total volume of water to fill the water feature is 980 kilo liter
 An assumption is made that the water feature has an average of 4 mm loss of water level per day
 Δ If the total area of the water feature is 803 m² than a loss of 3,2 m³ is evident per day
 Δ a total loss of 1168 m³ occur per annum

The average precipitation per annum for Johannesburg is assumed @ 700 mm
 Δ 2302 m² x 0,7 m
 = 1611,4 m³
 Δ 1611,4 kl of water can be harvested by the Film centre per annum
 Δ the film centre are able to supply up to 73% of the water loss due to evaporation
 This amount may differ since this is a rough estimate.

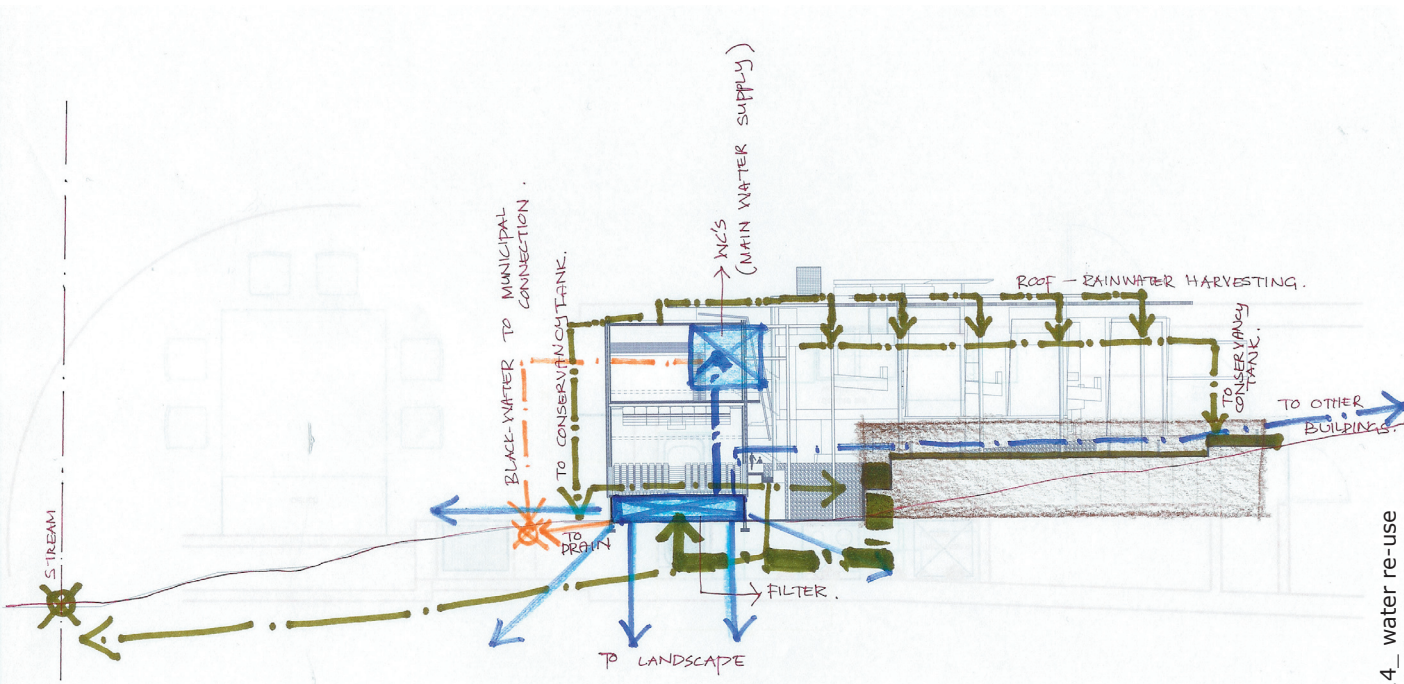


Fig. 7.14_ water re-use

Fig. 7.15_ re-used concrete footing

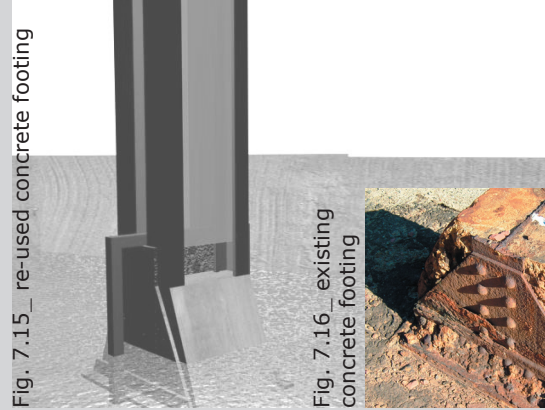


Fig. 7.16_ existing concrete footing

**[07] [06] [02] USE OF EXISTING
CONCRETE FOOTINGS**

Concrete footings situated on the old purification platform are re-used as gas lights. Gas will be supplied from a converted gas line coming from the gas tank reservoirs on site. Gas will be supplied to these lights via a gas conduit line connecting different footings in the water. (See detail)

Fig. 7.17_ connection to
retort house

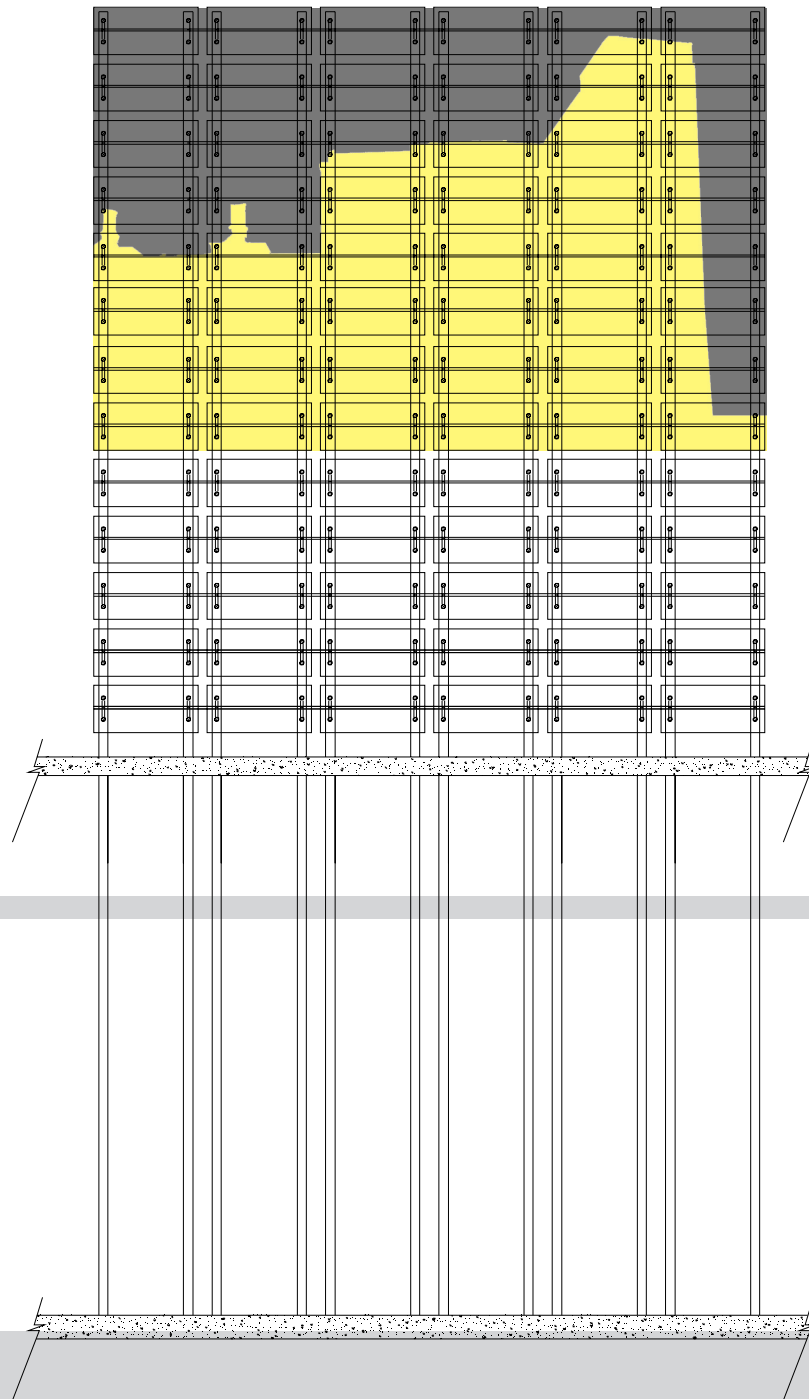


Fig. 7.18_ projection on sandblasted screen

[07] [07] TRANSFORMATION

[07] [07] [01] NIGHT AND DAY TRANSFORMATION

Both the western façade screens and the sandblasted screens of the museum cells transform during day and night.

THE MUSEUM PROJECTION SCREENS

1200 x 600 Sandblasted glass panels are held in place with S/S spider fasteners (supplied by specialist) which are consecutively fixed to 100 diameter galvanised tubing. These panels serve as a background for the display of projected images. Projections are cast from projection boxes located against columns in the water feature.

Projectors are situated in weather resistant boxes. Projectors can be serviced from safety ladders and suspended ramps connecting different projector positions.

The umbrella roof makes it possible to cast images onto the screens during the day, blocking direct sun out from above. The projected images will be a display of the interactive museum spaces in real time, where movement is recorded within the museum, sent to a computer and displayed on the outside. At night time digital videos and films will be projected onto the top part of the composed sandblasted screens. The projected image area will be 6620 in height x 5090 in length, giving a dramatic display of light.

WESTERN FAÇADE STEEL MESH SCREENS

Light fittings installed in the walkway along the western cinema façade generate a display of light and shadow at night time when projected upwards through the S/S wire mesh screens. During the day the movement of the sun cast shadows on these screens giving the façade depth and a sense of transformation.

[07] [07] [02] EVENT

The adaptation of the purification platform into a water feature posed design constraints, in that the top part of the concrete footings could not be converted into water lights due to the depth of submersion of these footings. This however became an opportunity for event. The exiting concrete footings are re-designed to be used as fastening posts for suspended decks (viewing platforms) within the water feature. This enables the square between the retort houses to expand or contract when decks are either assembled or dismantled.

Fig. 7.19_ section indicating projector position

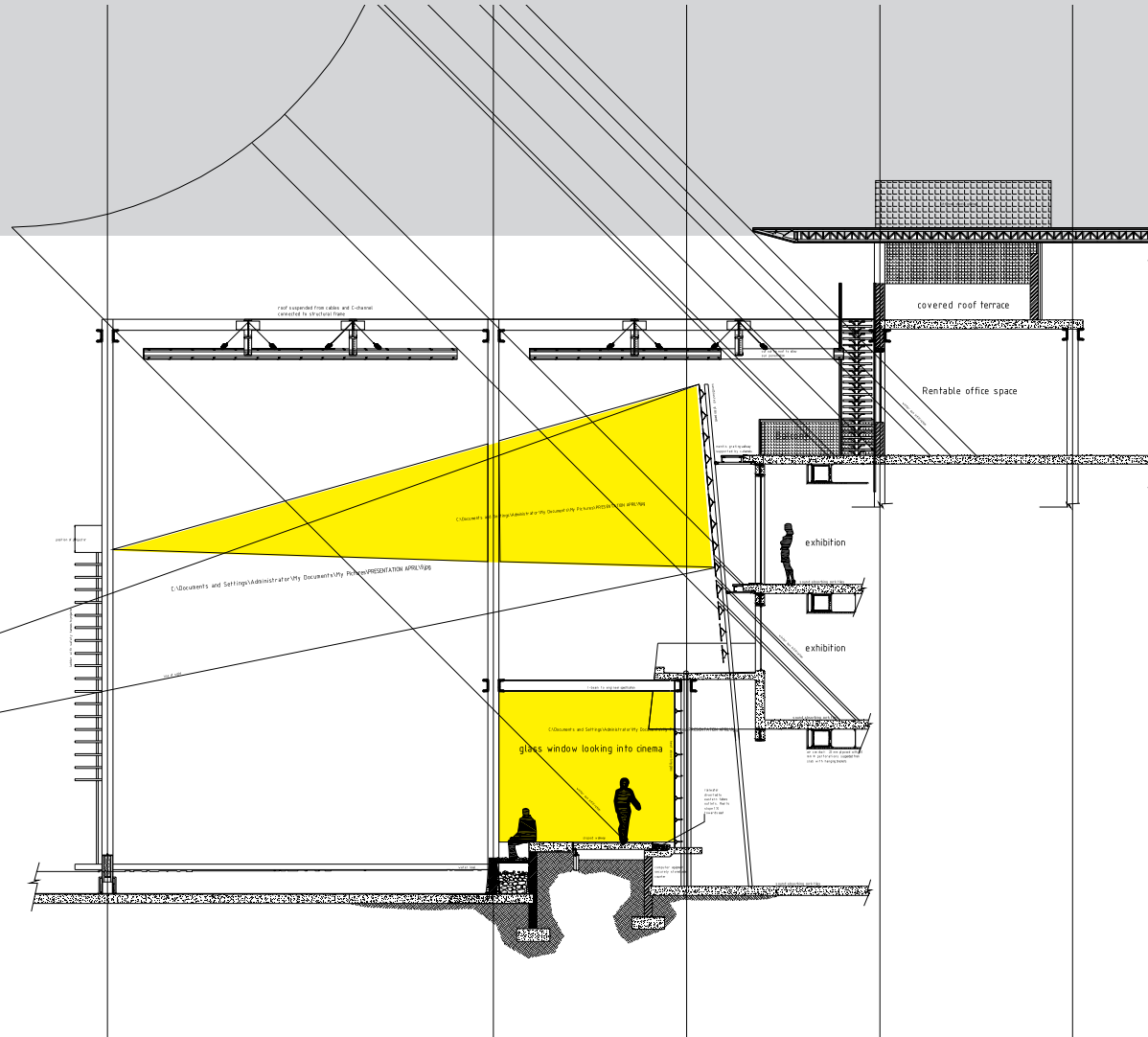


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[07] [08] CONNECTIONS

The Walkways along the museum façade is offset from the museum glass façade to lessen the maintenance of clean pebble strip is introduced along the north façade that serves as a barrier and an element for water discharge. This channel filled with pebbles is sloped with an angle of 1% towards a outlet to the east.

The ramps intersecting museum exhibitions required various technical inquiries, since they connect different museum envelopes. Firstly museum ramps are provided with drain outlets to prevent rainwater from entering the museum exhibit. A recess of minimum 50 mm is proposed where ramps of downwards slope connect with museum entrances. These recesses are supplied with 40 mm grating leveling the ramp surface as well as two 100 diameter drainage outlets supported by a galvanized chain. Two angles of 50x 50 mm are provided to fix the grating to the ramp. The lowest positioned angle is fitted in such a way to allow a 5 mm protrusion above the floor level of the entrance. These protrusions serve as a trigger for the automated door systems.

Air-conditioning and electrical ducting connecting to various museum exhibitions are placed along all ramps at a height above the finished floor level of the ramp. These ducting elements become 'feature' elements revealing the composite nature of the building; they also serve as coverings over the ramps protecting users from rain. The ducts are suspended in interior spaces from the finished floor slabs with S/S cables. Ducts exterior (courtyard) ramps are suspended from I-beams by the external frames of the ducts, instead of cable.

An integral part of the design involves the balustrade design for ramps connecting museum spaces. The balustrades had to be made of transparent material, exposing the movement of people on the ramps contrasting with the solid museum cells. The resolution was tempered glass balustrades supplied with anodized aluminum handrails and posts.

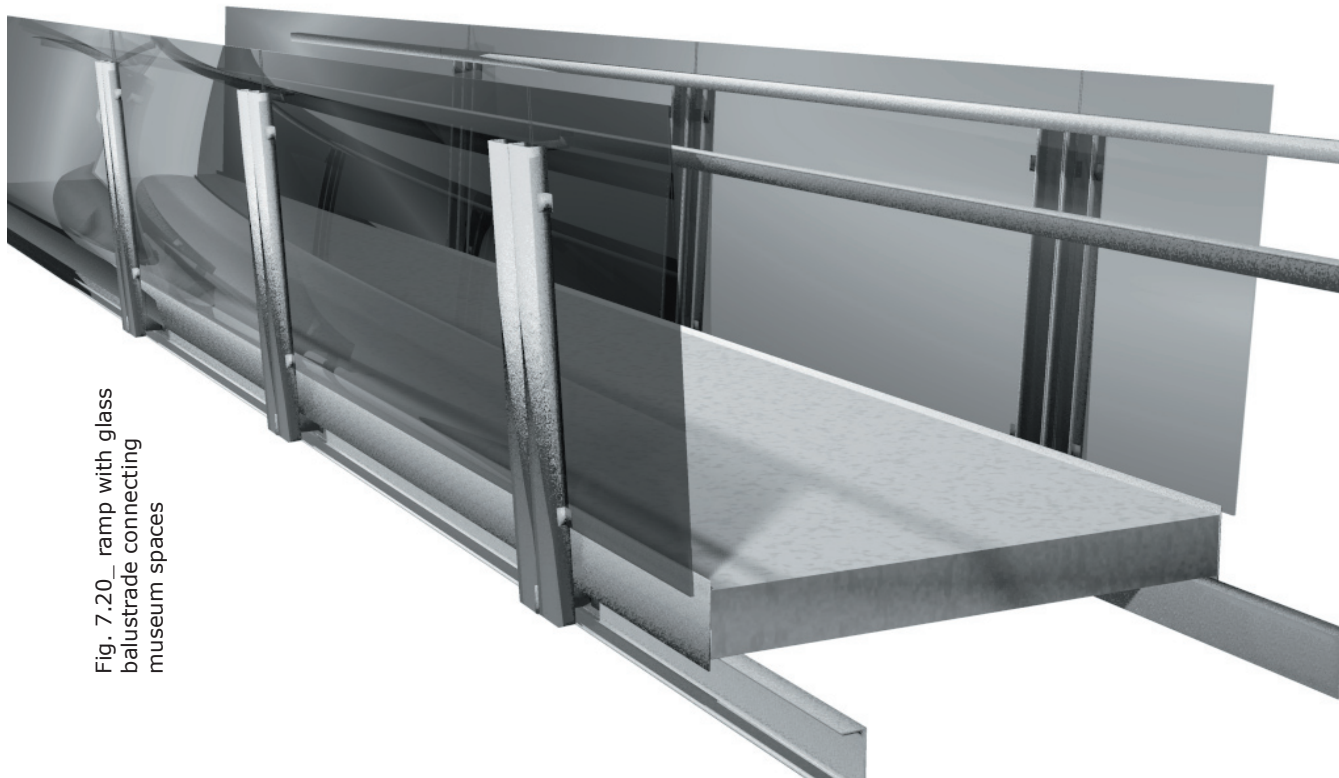


Fig. 7.20_ ramp with glass balustrade connecting museum spaces

