

Fig. 6.1 Space and light: Cape Town Station as in 1873



Fig. 6.2 Paddington Station (by Brunel, 1854), London



Fig. 6.3 St Pancras Station (1866-68, by Barlow),

6. DESIGN PROCESS

6.1 Design concept

The main impact of station architecture, culminating in the development of the supershed, was not only through its bulk, but the sense and sensation of space which these huge, enclosed, uninterrupted volumes imparted on the man in the street. Before their development such volumes would have been associated only with institutional structures. The (re-)creation of similar vast, but yet everyday spaces, with however their own feeling and atmosphere permeating them, arising from the vibrancy of a railway station and its infrastructure, is the concept underlying the design of this museum. It is accepted that most of the display items would be static at the best of times, but it should still impart the feeling that, at the flick of a switch, the whole scene could come alive within the enveloping space.

The freedom of space created is also symbolic of the opening-up of the world by the railways to the average man in the street, by making economic means of transport available to him, providing him with the freedom to travel and discover.

Assisting in recreating the atmosphere of movement through a station, that element uniting the diversity of buildings with their respective functions, the layout of the museum re-enacts, with some slight variations, the progression of a train passenger from the street to the train through the concourse, the route passing directly or in close proximity (similar to that of Pretoria Central station) the restaurant, the luxury train passenger departure lounge, and, somewhat removed from it, the railway administration offices, whilst seeing on the periphery the supportive workshop infrastructure.

Underpinned by architectural theoretician Francis Ching's statement: 'The colour and brilliance of [direct or indirect] sunlight can create a festive atmosphere within the room or a more diffuse daylight can instil within a sombre mood.' (Ching, 1996:171), the structures making up the complex should be filled by light, though in the main with indirect light, to protect the exhibits. The feeling of openness so created adds to the symbolic freedom mentioned afore.

Elements of historic precedent will be incorporated to the extent that it assists in creating a desired ambience or illustrates certain elements, structural or otherwise, resulting from or used in industrial and station architecture in the past.

London

6.2 Design issues

In addition to the aspects arising from the stated concept, the following issues have been identified as issues or topics requiring attention so as to enable the development of an appropriate museum design:

Identification of a suitable site

Criteria for the display of exhibits and operation of trains from site (addressed in 'Appendix 2.1 Site criteria')

Identification of potential sites in or close to Pretoria (addressed in 'Appendix 2.2 Potential sites identified')

Analysis, evaluation and selection of site (addressed in 'Appendix 2.3 Comparison of sites' and '2.4 Conclusion')

Museum and vintage train operations

Principles governing museum design and operation (refer to '4.2 Legislative context: *South African Museums Association: Professional Standards and Transformation Indicators*')
Creating financially viable museums (refer to '4.1.3 Project context: funding sources and proposal')

Principles of station design and requirements for the operation of railways (refer to '4.1.1 Project context: clients and client requirements' and '3.4 Station operation and functioning')

Attraction of visitors people to the museum

Creating spatial experiences for the visitor which recreate those of real stations and their supporting infrastructure

Inclusion of educative facilities to accommodate school classes and similar-sized groups

Ensuring the visibility of the premises (addressed *inter alia* in 'Appendix 2.3 Comparison of sites')

Employing advertising principles and selling techniques to attract visitors

Recreating live atmosphere and ambience of historic and current railway travel

Displaying a representative collection of locomotives, rolling stock and other exhibits

Those visitor-drawing aspects related to the type and approach to the display of exhibits, and the marketing thereof, is seen as the responsibility of the curator and trustees of the museum; the architect must ensure that suitable space is available to realize their ideas (refer also below).

Creating movement and dynamic experiences in an environment of static exhibits:

Involving audiences with exhibits
Providing inter-active experiences
Creating virtual reality experiences (simulators, IMAX-based or other travel films)
Manipulating the senses to invoke associations and atmosphere, e.g. background station noise
Vintage train operations: recreating atmosphere of arrival, departure and movement
Displaying and possibly experiencing technical innovations

The same proviso regarding the relationship between the curator/trustees and the architect as mentioned above apply here, too.

Sustainability of a museum:

Low maintenance materials reducing future running costs
Low operating costs of museum from electricity and water savings

6.3 Basic design determinants

The execution of the design concept, and the addressing of the above issues and meeting the requirements of the accommodation schedule set out under 6.4, required allowing for or incorporation of the following:

As indicated before, and further discussed below and fully set out in Appendix 2, the physical constraints of rail layout and track siting were the main determinants in the positioning of the museum on the site, and furthermore influenced the placing of the various functions of the complex. In addition, to facilitate making the link between the exhibits inside and the real railway world outside, the main frontage of the exhibition hall was aligned parallel to the Pretoria's site-adjacent main railway line. This is line with historical precedent, as the now demolished workshops displayed the same alignment.

A further factor was the length of locomotives and rolling stock items to be accommodated, and the length of train consists made up in the exhibition hall, which influenced the structural grid of the various structures. To enable the moving of locomotives one at a time, a round-house was incorporated, based on historic site precedents. This is discussed in more detail below.

Arising from this was the very significant factor of the scale of the resulting buildings. They can not be anything but large. Historically, stations faced the same problem. However, the analysis of stations in the theoretical investigation revealed that the various functions were occasionally accommodated within one structure, but more generally they consisted of vast complexes comprised of distinct, separate structures (of

different styles and construction methods), each accommodating its respective function, yet linked through the uniting flow of people movement. In some cases, parts such a hotel were totally separate from the main complex. This concept was consciously recreated in the museum complex design, disjointing the various functions and varying the styles and appearances of the component structures, yet uniting them with the flow of visitors between them. The number of separate buildings (exhibition hall, concourse building, luxury train passenger departure lounge, workshop, train platform and round-house, all except the latter visible when approaching the main entrance to the museum), is also intended to install a conceptualization of the multi-functionality of a station complex in the visitor, whilst at the same time lessening the impression of isolation that a single, outsize building placed in an empty brown-field site would call forth.

The large enclosed volumes led to very strong geometries arising, in line with the historic station precedent: rectangular for the exhibition hall, concourse and workshop, and semi-circular for the round-house. Accommodating these functionally and aesthetically pleasing on the site, within the constraints of the track layout and the mentioned solution found to the problem of scale, was a major challenge. Various methods were used to reduce the visual strength and domination of the individual structural components on elevation, such as introduction of the butterfly roof and exterior roof-supporting columns of the exhibition hall, and the round-house wall made up of columns gradually increasing in height. The historic precedent of a tower was also incorporated, providing a focus point of greater height, both assisting visibility from afar and providing a vertical element in an otherwise very horizontally-orientated massing.



Fig. 6.4 Natural light filtering into Leipzig Hauptbahnhof (1903-06, by Reinhardt and Sössenguth), Germany

The introduction of the round-house, with its semi-circular roof, and the exhibition hall's two butterfly roofs – a re-interpretation of a traditional two-bayed, hip-roofed factory shed – also add variety to the roofscape of the complex, important as being visible from the Freedom Park precinct on the summit of Salvokop, to the south.

To improve the sustainability of the structures and to reduce the future running costs of the museum natural light was admitted as much as possible. This is in line with the stated concept of having the interiors light and open, and underlines the feeling of space and spaciousness in the concourse, round-house, workshop, and to a lesser extent in the exhibition hall (due to the sensitivity of many exhibits to direct light) and the luxury train passenger departure lounge, where a fuller sense of enclosure was deemed more appropriate to create the desired, more intimate and yet formal atmosphere.

The complex's positioning with regard to the sun did, however, not facilitate this approach, with some of the component structures' longer elevations facing north-west and north-east, due to their being lined-up with the adjoining railway lines. In these cases, various methods of sun-screening were employed, such as horizontal and vertical louvres, recessed façades and porticoes. However, façades facing south-east were

utilized to the fullest extent possible for the admission of light, contributing to the feeling of spaciousness and lightness which large openings impart. Openings to the north-east were sheltered by horizontal louvres. Alternatively, tinted glass was incorporated in some problematic façades.

Further running cost savings were obtained by utilizing natural ventilation. This approach is based on the precedent of Johannesburg's transport museum (refer to '5.5 Precedents: James Hall Transport Museum'). Ventilation boxes, louvres and opening windows have been provided in the various buildings. Though this should suffice, it would be possible to replace certain of the louvre panels with mechanical extractors or split air-conditioning units at a later point in time. With respect to the exhibition hall, the use of Zinalumen-coated roof sheeting, with an Isoboard layer beneath it, should further contribute towards reducing heat build-up. A full discussion of thermal control is set out under '7.5 Thermal control'.

Rain water run-off of the concourse and round-house buildings is captured for later use in large tanks. Other sustainability aspects influencing the design are set out in '7.6 Sustainability aspects'.

So as to minimize visual interruption of the large enclosed volumes, the structural grid was spaced wide in the exhibition hall, concourse and round-house. The structural grid spacing was also, for the exhibition hall, concourse and workshop dictated by the size of the locomotives and rolling stock to be displayed. Details of the determination thereof are set out under '6.7 Design approach' below. Discussion with engineer Karl von Geyso led to the replacement of downstand concrete-beams supporting the prior's mezzanine level floor slab and the latter two's roofs (the depth of beams having resulted in a too low visual ceiling level) with a steel-beam supported slab and truss-supported roof structures, respectively.

The review of precedents indicated that locomotives displayed outside are vandalized and stripped of their brassware. Furthermore, exposure to the elements resulted in marked signs of deterioration. The *South African Museums Association: Professional Standards and Transformation Indicators* states that all collection pieces should be properly protected against theft and deterioration. Additionally, the replacement of stolen or damaged items costs money, so that in the long-term an initial capital saving in building costs is lost. The display of the exhibits will thus be placed within the museum to be designed and protected to the best extent possible against the elements.

The full separation of the Friends of the Rail-workshop, of the luxury train passenger departure lounge and related office accommodation, the museum administrative function in the old chief engineer's office building, and of model railroad club's premises in the steam hammer shed, permit access to these at times when the museum is closed, providing for a greater measure of flexibility to their users.

Due to the size of the exhibits, the museum is larger than one with a comparative number of small exhibits. The number of visitors would accordingly be spread out over a much larger area. In determining the number of sanitary facilities to be provided, the ratio has prescribed by the *South African National Standard: The application of the National Building Regulations (SANS 10400-A:2003)* were relaxed accordingly.

As the only road access is from the intersection of Skietpoort and Second Street to the museum's south-west, the main entrance and its supporting parking area were orientated to this direction. Furthermore, a direct link between the entrance and the train platform had to be provided, the latter also being in close proximity to the luxury train passenger departure lounge.

The above reflect some of the considerations underlining the design. A more detailed description of the process addressing certain of these design determinants is set out below under '6.5 Design approach'.

6.4 Accommodation schedule

Exhibition hall:	6,618 m ²
Tracks and platforms for display of locomotives and rolling stock:	whereof 3,105 m ²
Luxury train consist	
Main-line passenger train consist	
Suburban passenger train consist	
Goods train consist	
Non-rolling stock exhibition areas of varying size and height, incl. area for locomotive driving simulators	3,513 m ²
Engine round-house:	3,848 m ²
Turntable area	whereof 347 m ²
Bays for 11 locomotives	3,501 m ²
Concourse area:	2,743 m ²
Visitor reception and information area, including ticket selling facilities	whereof 75 m ²
Temporary exhibition area	690 m ²
Restaurant and/or cafeteria, with kitchen, scullery, pantry, freezers, refuse area	710 m ²
Auditoria	189 m ²
Gift shop and store room	63 m ²
Toilet facilities	70 m ²

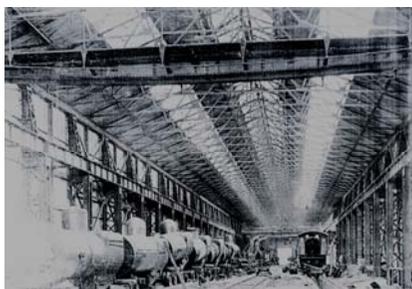


Fig. 6.5 Pretoria's 'new' central workshops

Cleaning material storage areas		6 m ²
Outside restaurant terrace		220 m ²
Luxury train (Rovos Rail/Blue Train) passenger departure lounge building:		920 m ²
Passenger departure/waiting lounge	whereof	230 m ²
Reception and baggage handling facilities		173 m ²
Offices for train operating companies		380 m ²
Warming kitchen		40 m ²
Toilets (passenger and staff)		52 m ²
Workshop:		
Tracks for locomotives and rolling stock		840 m ²
Tooling and machine area	whereof	410 m ²
Offices for Friends of the Rail steam train preservation society		120 m ²
Material stores		80 m ²
Change rooms and toilets		40 m ²
Outside repair yard		286 m ²
Existing Chief Engineer's Office building:		1,313 m ²
Museum administration offices, including safe and boardroom and staff training facilities (alternatively in the concourse auditoria)	whereof	385 m ²
Library, sound library and archives		385 m ²
Storage area for artefacts not on display and quarantine facility for for smaller newly acquired objects		385 m ²
Existing steam hammer shed:		510 m ²
Display facilities for Pretoria Model Railway Club's layout	whereof	255 m ²
Club meeting venue (new mezzanine level)		255 m ²
Outside areas:		
Storage tanks for rain water off-run		about 82,000 litres
Parking area		177 car and 9 bus bays
Garden spaces for picnic area usage		
Train operation-related requirements:		
Workshop and round-house access tracks, sidings, points and signalling		

Coaling bunker and ash pits
Water tanks and water purifier for locomotive water supply
Steam and luxury train siding and platform area, with period pieces (e.g. signalling booth and water tanks) on display (this at curator's discretion)

6.5 Visitor's route through museum

On arriving for a visit, the visitor passes by the museum tower, the exhibition hall and the luxury train passenger departure lounge towards the museum's entrance. The entrance leads into the museum's concourse, in line with historic station precedent. To underpin that this is a railway museum, the approach is along a railway track and the visitor co-uses the train's entrance, with the track continuing through the reception area to the round-house beyond. On having entered, bought an admission ticket and gleaned the necessary information – activities traditionally found in the concourse area of a station, the visitor is faced, across the concourse and a turntable, with the very reason giving rise to the development of railways and origin of stations: that steam engine on wheels, the locomotive. They are arranged in a semi-circle around the turntable. Historically, the round-house would have been at some distance from the station itself: it is for this reason that an interior courtyard flanks either side of the front half of the turntable, symbolizing the original separating distance.

The visitor may decide to proceed to the round-house immediately, or turn right into the area reserved for temporary exhibitions. This may be utilized later to accommodate the growth of permanent exhibition material. Turning left, the visitor would see and proceed down the length of the concourse, past further support functions, similar to those traditionally associated with a station concourse, successively passing the gift shop to the left and the toilet block to the right (set in the farther corner of the mentioned interior courtyard), whilst heading for the restaurant area directly straight ahead. This consists of two vintage dining cars to either side of a number of tables – the visitor would have the choice of either, or of the outside terrace. Looking out, beyond the restaurant area, the historic steam hammer shed becomes visible and can be visited. It is now used for displaying the model railroad club's layout, with their club rooms above.

Alternatively, before reaching the restaurant area, the visitor may turn left, towards the exhibition hall, which is reached through a connecting glass-walled lobby. Here flights of stairs and a lift are located, giving access to either the three auditoria, situate on the concourse's mezzanine level and accentuating the entrance to the lobby just entered, or to the mezzanine level of the exhibition hall, containing smaller exhibits on railway-related subjects and themes. Alternately, the visitor can proceed straight to the exhibition hall's lower level, with its main display of four train consists alongside platforms in the large central shed part, and further space for medium-sized or large display items in the adjoining wings. The

ground floor and mezzanine level are linked by a number of staircases.

Accessible from the long north-eastern side of the hall lies a terrace, overlooking an open space flanked to the right by the steam hammer shed and to the left by the historic chief engineer's office building. The latter building houses the museum's administrative offices, archives and library, and storage and quarantine area for smaller exhibits. Beyond the open space the train activities on Pretoria's main and busiest railway line may be observed, giving an opportunity to see and relate some of the information contained in the exhibits to real life.

The visitor proceeds outside, past a locomotive and carriage repair yard to the workshop itself. Here Friends of the Rail have their offices and undertake repairs on their locomotives and rolling stock. These activities can be observed through windows from flanking walkways. Furthermore, a foot-bridge over the repair tracks provides access to a catwalk, running through the centre of the workshop and permitting visitors to observe the repair activities and the tradesmen executing these. Exhibits on trade careers form part of the exhibits on this catwalk, serving as career orientation for visitors.

On having explored the museum to his satisfaction, the visitor may then retrace his steps to the entrance.

6.6 Envisaged exhibition themes

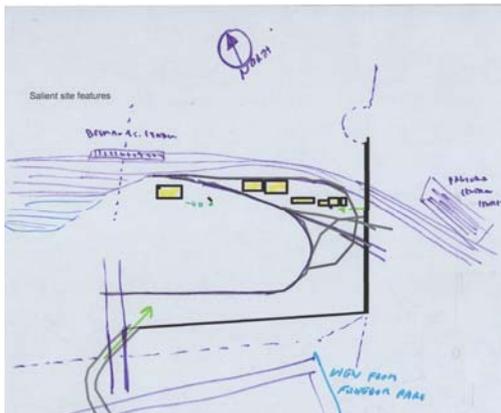
In addition to the display of locomotives, passenger carriages and goods wagons, the following themes were identified with regard to non-rolling stock exhibits:

1. Physics of underlying propulsion systems: steam, electric, diesel
2. Track, switches and crossings: construction, laying and maintenance
3. Rail gauge history
4. Signalling and train operation
5. Salvage equipment and accidents
6. Locomotive operation and driver training (simulators)
7. Civil engineering and surveying
8. Electrical and mechanical engineering
9. Telecommunications and development history
10. Station functions, operations and architecture
11. History of railway development and railway companies
12. Mail train and mail handling

13. Catering services
14. Rolling stock maintenance
15. Freight handling, containerisation and bulk freight services
16. Railway's road transport services
17. Railways and ports
18. Narrow gauge and other railways
19. Gautrain, high speed trains and monorails
20. Railway heritage preservation
21. Employment opportunities on the railways

These themes are exhibited in the various areas of the museum, including the exhibition's mezzanine level, based on an open plan concept and not strictly separated from each other by physical barriers. This gives the curator flexibility in display lay-out, allowing for changing requirements. It also facilitates the easier movement by the visitor from one area of his/her interest to another, as he does not need to return every time to a central aisle from separate display rooms, thereby exposing him/her inadvertently, whilst moving along, to further themes which might not initially have drawn his/her attention.

Exhibit information would be displayed by various means: wall-mounted or loose standing boards, touch screens, audio-visual displays, simulators and other. Two auditoria seating about 56 visitors each (the size of a large school class and the teacher) are available for the display of films or lectures. They may be combined when so desired to provide increased accommodation.



6.7 Detailed design approach

Below is set out the progress through the resolution of some of the issues identified under '6.3 Basic design determinants'.

An initial study of the site, as set out in the context analysis, determined the salient features such as access, views of and out of the site, and existing structures to be incorporated into the design of the museum.

An analysis was made of the functions to be provided by the museum: exhibition and visitor information, educational facilities, entrance and ticket counter, gift shop, steam and luxury train departure and arrival facilities, model railway club premises, administration offices, library, storage facilities for smaller or temporary exhibits, restaurant, kitchen, public toilets and staff facilities. Furthermore workshop facilities are

Fig. 6.6 Site analysis, showing alternatives for museum rail spur

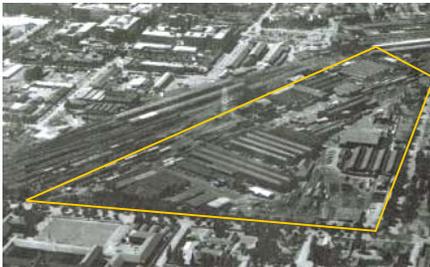


Fig. 6.7 Pretoria workshops site, Salvokop

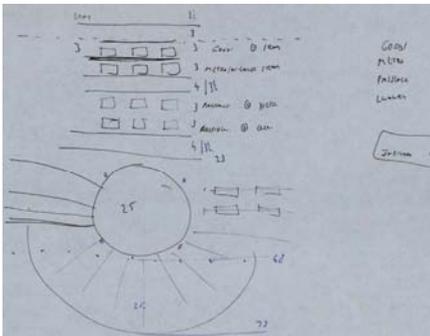
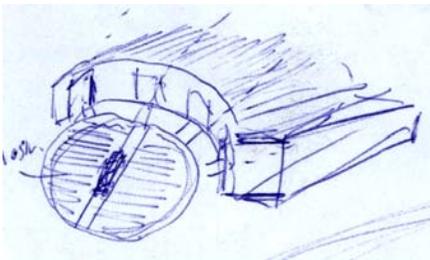


Fig. 6.8 Initial thoughts on rolling stock display layout



required by Friends of the Rail for the restoration of locomotives and carriages. A site for a future conference centre also formed part of the initial concept, to function as an additional fund raiser for the museum.

The exhibits were differentiated into rail (e.g. locomotives, carriages and wagons) and non-rail (e.g. salvage cranes, railway buses, tickets and signalling equipment). The latter vary in size from a ticket or set of crockery to buses, and thus do not all need to be displayed on ground floor level.

The need to safeguard not only the smaller items, but also such large items as the locomotives and carriages from the elements and pilferage determined that all displays should be housed indoors. The need for a large area to be covered for the large exhibits links back to the historical precedent of station sheds, and I decided to recreate the atmosphere of such station sheds to the greatest extent possible, whilst also providing sufficient space for the 'non-rail' exhibits therein. The display of four different train consists would provide the visitor with a good insight into the variety of services provided by the railway: a long-distance passenger train, a suburban passenger train, a goods train, and a train made of luxury or special carriages (such as carriages used in the 1947 Royal Train, by President Kruger or by the De Beer's Company directors). Four trains, albeit of short length, displayed on four parallel tracks will be able to substantially recreate the desired station atmosphere. These tracks need to be linked to the rail network to facilitate their easier transportation to the museum, alleviating the need for lorry transport. – With the average length of a locomotive or a passenger carriage being between fifteen and twenty meters, a platform length of about 90 m was determined as adequate for the display of one locomotive with up to four carriages. – The 'station part' of the museum would fill about half of the width of the exhibition hall; the remainder would be available for large non-rail items, such as salvage cranes, signal gantries and SAR&H road transport busses and trucks.

The exhibition hall would, however, not provide sufficient space for the exhibit of the large number of locomotives available for display, and additional display tracks are thus required. As individual locomotives need to be moved out of the museum on an *ad hoc* basis, e.g. when required to haul Transnet or Friends of the Rail vintage trains, this operation needs to be executed with minimum disruption. Would the locomotives all be parked behind each other, when the one displayed furthest from the access track is required it would necessitate unnecessarily moving all intermediate ones out onto the exterior shunting tracks. A traditional round-house would circumvent this problem. (A 'round-house' is a circular or semi-circular shed-structure built around a turntable. The engine is driven/moved onto the latter, turned around and reversed into the shed; it is in essence a garage for locomotives.) It allows unimpeded access by each and every locomotive, and is thus included in the design as a separate area for locomotive exhibition. The round-house has historic precedent: Pretoria rail yard had two round-houses at the time of the Dutch-owned NZASM, whilst

Fig. 6.9 Conceptual sketch of round-house

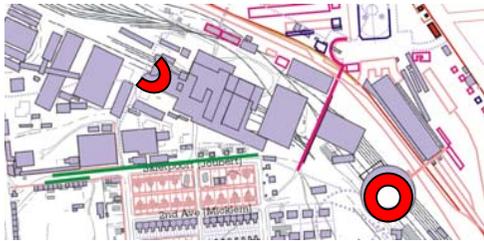


Fig. 6.10 Location of Pretoria's vanished round-houses



Fig. 6.11 Waterval-Onder round-house

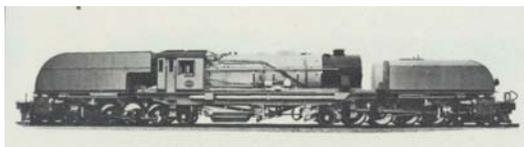
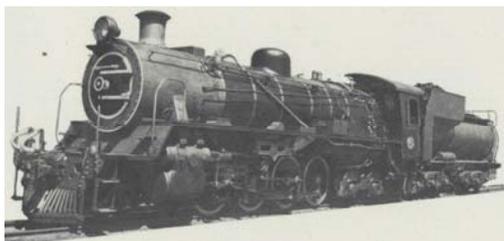


Fig. 6.12 Class GEA Garrett locomotive



others were built at e.g. Waterval-Onder. The inclusion of a round-house would acknowledge the historic links between the railway history of South African and Continental Europe, where round-houses were widely used. A further eleven engines can be displayed by incorporating the round-house. Locomotive movement would be undertaken by a small tractor-like vehicle within the museum. Furthermore, from own observation, a large number of locomotives parked one behind and next to each other on parallel tracks makes for a monotonous display, whereas the round-house locomotive display, focussed on the turntable, makes it more interesting., and illustrates historic mechanical and operational engineering. The pit of the turntable, covered for museum purposes with a revolving deck, can be used for product launches or museum exhibits.

The dimensions of the round-house and turntable were determined by the size of the various locomotives to be displayed. Although they are not all in the possession of either Friends of the Rail or Transnet Heritage Foundation currently, their possible future acquisition is not ruled out, and thus the dimensions of a representative sample of steam locomotives operated by the railways of South Africa were assessed for display track and turntable dimension requirements. The below locomotive dimensions were extracted from Espitalier and Day's *The Locomotive in South Africa* (1989):

Locomotive class	Length (m)	Wheelbase (m)
Class GEA Garratt type	26.95	24.64
Class 18	23.16	20.62
Class 24	22.91	19.89
Class 15F	22.40	20.88
Class 15AR	21.82	19.38
Class 15BR	21.46	19.08
Class 12R	21.08	18.64
Class 16CR	20.42	17.98
Class 14CR	20.37	17.98
Class KM	20.24	17.81
Class GDA	20.09	17.78
Class 10B	19.96	16.84
Class S1	19.56	14.94
Class 5R	19.56	17.02
Class 2 Hendrie A	17.93	15.57

Fig.6.13 Class 24

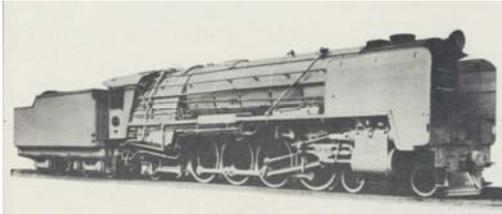


Fig.6.14 Class 15F

Class 1 Hendrie B	17.17	14.96
Class 8X	16.31	14.05
Class A	15.90	13.72
Class 6	15.47	12.73
Class H Reid	15.44	13.11
Class 7	15.27	12.60
Class 4	13.16	11.61

Table 6.1 Locomotive dimensions

Class GEA would necessitate an exceptionally large turning table and exhibition track length, and it was decided to exhibit it and Class 18 on the tracks located in the exhibition hall. The turntable diameter of 21 m accommodates the wheelbase of all other classes. An adjoining walkway breadth of 1 m on either side of the turntable allows for engine overhangs to be swung through, permitting engines of up to 23 m length to be turned. This implies display track length requirement of 23 m. Allocating the outermost display tracks on either side of the round-house 'track fan' to classes 15F and 24, as it is not necessary for visitors to pass to their further side, and providing an additional 0.5 m safety space for engine movement, allows for a visitor passage at the further end of other locomotives, width being freed by their shorter length.

The position of the entrance must be orientated to where the main stream of visitors would be approaching from. This was identified to be from Skietpoort Road (to the south-west), as most South Africans, being largely car orientated, would arrive thereby, and tourists would arrive either by car or by tourist bus. Public transport in the area, once introduced, would be from the same side. Access for pedestrians coming from the pedestrian bridge route (the east) is facilitated around the round-house by pathways through the open land.

The ticket counter and gift shop should be located in close proximity to the entrance/exit, the prior to be easily accessible for the required tickets and information, the latter to attract the custom of departing visitors passing by. Restaurant facilities and public toilets should be located centrally and close to exhibits and the routes of visitors to attract custom, with proximate access to the outside terrace from which trains passing on the main line would be visible. The supporting kitchen must be accessible by delivery vehicles.

The luxury and steam train departure and arrival facilities consist of a platform of carriage height and of sufficient length to serve the calling trains. Due to the limitations imposed by the existing Transnet carriage storage sidings to the west of the site, and the need to minimize the number of crossings over and junctions with Spoornet tracks, insufficient straight track length was available to the north of the site, and I decided to



Fig. 6.15 Pretoria workshops

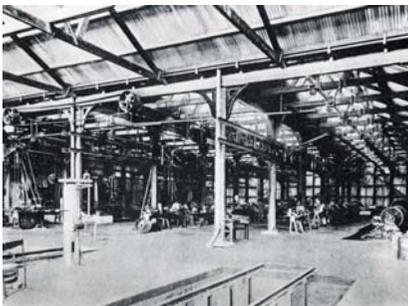


Fig.6.16 Pretoria workshops 1896

fold the track back on itself in a curve, leading around to the east and south of the museum site, and then parallel to and following the embankment on the southern edge of the site. Two short connecting spurs to this alignment enable connection to the Pretoria rail network in both directions. Its diameter of 124m comfortably exceeds the minimum Transnet requirement of 91m, and will, according to the information received from Friends of the Rail members, allow all their locomotives to negotiate the curve. This layout however does necessitate the calling train to reverse into the siding; however, as this is the method of operation currently employed by Friends of the Rail, this is not seen as a problem. – A separate departure lounge and baggage handling facility is incorporated for luxury train passengers, and must be located within a reasonable distance of both the train platform and bus/car parking area. With Rovos Rail selling the ‘colonial experience’, reflected by their colonnaded, high-ceilinged building and Victorian furnishings at their Capital Park site, this requirement was reinterpreted for this design. The floor above the departure area contains offices available for luxury train operators and museum staff.

The two existing structures on the site to be retained (refer context analysis), the old Chief Engineer’s office and the steam hammer shed, would be restored structurally where required, whilst retaining to the greatest extent possible their current appearance. The prior is utilised for the storage of smaller items on the ground floor, the administrative offices on the first floor, and the library on the top floor, this currently being a large open space. The steam hammer shed, being a partly open structure, is made available for usage by the model railway club: a new structure is built within the existing shed, with the glass-enclosed display area at ground floor level and club rooms on the first floor. Existing openings are filled with glass and steel roller-shutters for after-hour protection of the displays.

The required locomotive workshop needs, as indicated by Friends of the Rail’s Nathan Berelowitz and Chris Becker, the laying of three or four parallel tracks. As the individual rolling stock items being moved in and out of the workshop for repair are of much shorter length than a full train consist, less track length is deemed satisfactory. To preclude interference with luxury or steam trains calling at the platform, rail track access to the workshop and required length of shunting track is from the west of the museum (re-laying on the route of track that was removed when the workshop facilities were closed down), and connecting with an existing rail yard spur of Spoornet. It followed logically that track access to the exhibition hall and round-house is from the west, too.

Once these issues had been determined, various combinations of track layout and function interaction were assessed for their viability and functionality (sketches 6.17-20 overleaf).

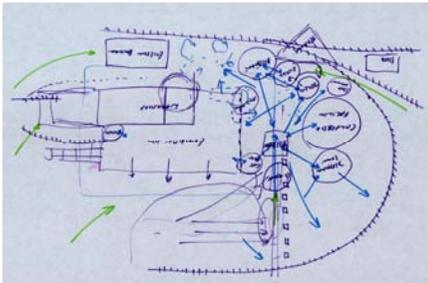
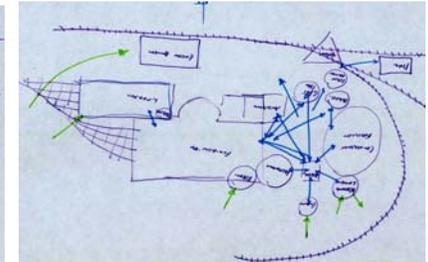
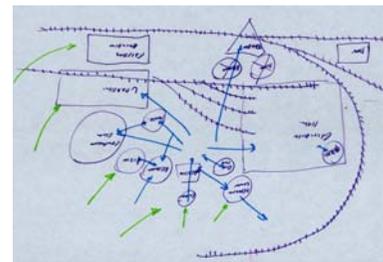
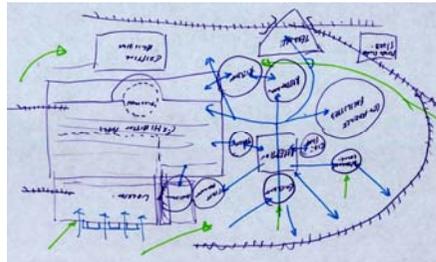


Fig.6.17-20 Track layout and function arrangement alternatives



After these preliminary analyses had been made, approximate shapes were given to the various functions, including the round-house area, and their placing on the site was investigated with regards to accessibility, appearance, visibility, functionality, containment of space and other factors (sketches 6.21-25).

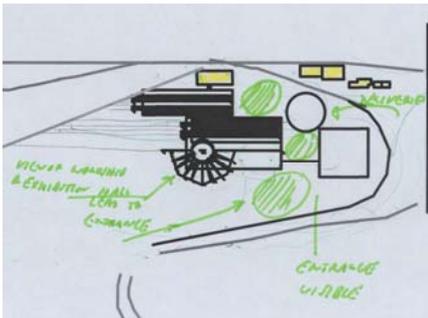
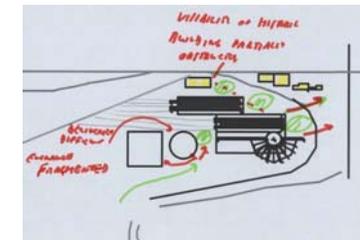
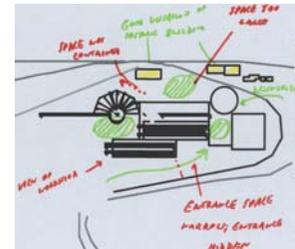
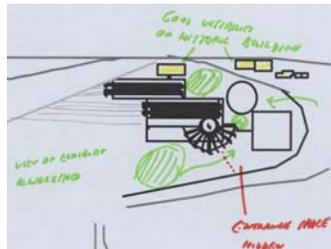


Fig.6.21-24 Shape-giving to and placing of functions



The design as per the middle image (Sketch 6.21) in the margin was considered to be the most effective, the round-house serving as a point of focus, drawing attention to the museum. The circle indicates the restaurant, the square the initially planned conference centre (see below).

The layout of the museum within the framework determined by the organization of the functions was then further refined within this preliminary layout diagram (sketch 6.26).

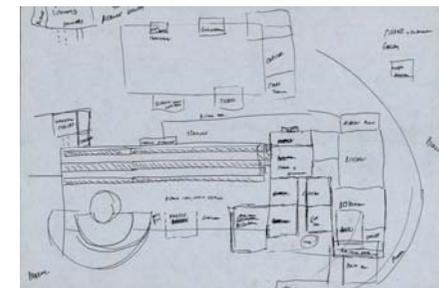
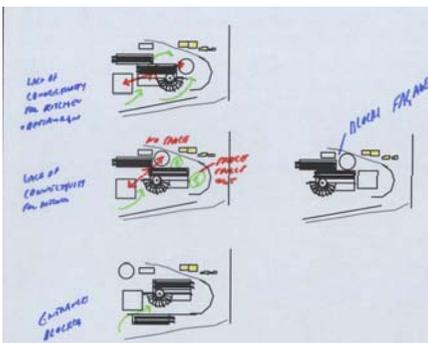


Fig. 6.26 Functional organization

To attract custom to the restaurant, I initially thought of placing two vintage dining cars within an IMAX theatre displaying film footage of scenery along a scenic railway route, and possibly matching it with a gentle vibrating movement generated by hydraulic pumps, so as to recreate an as-near-as-possible dining

Fig.6.25 Further alternatives to above

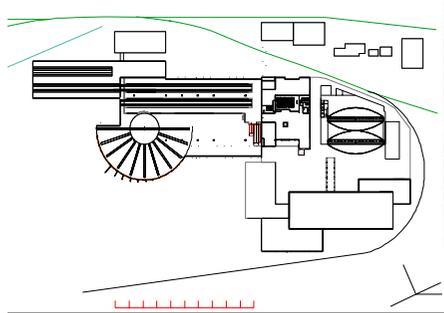


Fig. 6.27 Site plan

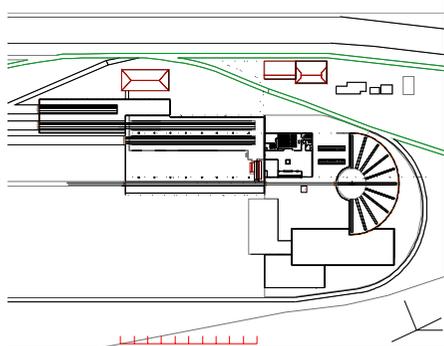
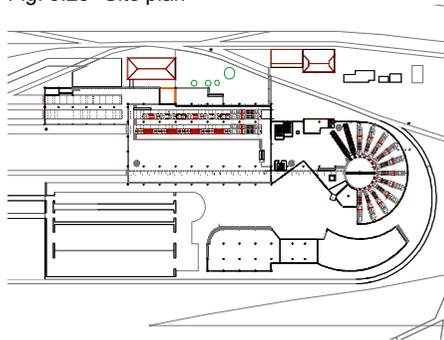


Fig. 6.28 Site plan



car experience. However, to get the full effect, a dome structure would have been required ('Omnimax' technology). With the two dining cars 'in series' being about 40m in total length, the size of the dome became impractical. I also rejected compromising on a 180° 'wrap around' screen on either side of the dining cars due to the very expensive technology required for even this reduced IMAX theatre effect. The alternative of normal film projection technology on a 180° screen is not possible, and to show it on a normal 40m or even two only 20m wide screen on either side of the dining cars (as shown by the two ellipse shapes on the plan to the left) would firstly not achieve the desired effect, and secondly require a very long distance between the projector and the screen. This not only reduces the quality of the scenery film shown, but also creates large lost space areas between the restaurant cars and the screens. The return on the capital investment would be unsatisfactory. I also rejected flat TV-type/LED screens as the effect would be exactly that of having dinner next to the TV: the desired depth between the carriage windows and the scenery considered necessary to create a sense of reality experience for the diner would be missing. The dining car concept was changed to placing them as static displays within the museum, with the kitchen adjacent to them (refer to site plans 6.27 and 6.28).

Furthermore, the round-house was found to be a too prominent and dominating shape in its assigned position. Additionally, opening it up as a visual attraction, with windows or curtain walls, caused major problems with the western afternoon sun on the exhibits. It was then turned and moved to the east, fitting into the curve of the train track and platform. Although now separated from the main exhibition hall, its new location created a second point of destination, increasing circulation past the restaurant area, with the aim of increasing patronage to ensure the latter's commercial viability (refer to site plans 6.27 and 6.28).

Initially the conference centre was placed as a separate, yet integral part of the development. However, its location between the museum proper and the platform adjacent to the train track, where the luxury and steam trains would call, created a visual, functional, thematic and artificial separation of the other two. It furthermore hindered pedestrian access to the museum entrance. An alternative design with less rigid geometric, circle-based shapes, continuing the curve of the surrounding train track, and a triangular-shaped roof linking the exhibition hall and concourse to the round-house, was included in the design, but considered and rejected by the panel performing an interim critique, as organic shapes were considered inappropriate to an effectively industrial setting, and the roof design becoming too strong and complex (refer to site plan 6.29). It was suggested that I revert to a previous design concept, which I duly did.

To address the break in linkage between the museum and the steam and luxury train's platform, I decided to move the conference centre to the far (southern) side of the track, thereby establishing the desired links, as pertinent to the museum as a self-contained entity, also clarifying the function of the different parts of the site. In conjunction with my mentor I decided that, the centre now being without the site as defined by and

Fig. 6.29 Site plan

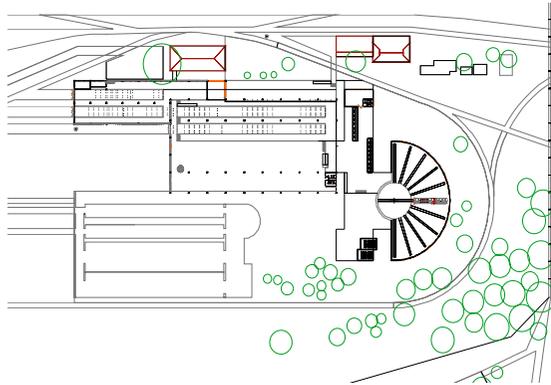


Fig. 6.30 Site plan

contained within the curve of the surrounding track, no attempt would be made to define the foot print or appearance of the conference centre: this would be the responsibility of the architect commissioned therewith, to react upon the museum and its infrastructure, this development being seen as the catalyst for the area. The conference centre being less dependent on flat ground surface, it could occupy the area both below and above the embankment and provide attractive façades both to the museum site and to Skietpoort Street (refer to site plan 6.30).

Simultaneously the round-house was moved so as to fit the curve created by the surrounding curved track more comfortably. The concourse area containing the ticket counter, auditoria, restaurant area and other supporting functions is still used to link the main exhibition hall and round-house. This layout also simplified the roof structure, as the individual 'components' could be roofed separately, joined by links of lesser hierarchy. The sketch to the left reflects this position. – The addition of the luxury train passenger departure lounge, filling the opening between the parking area and the southern end of the concourse building, completed the arrangement of the structures. This design was then further refined upon.

The sheer size of the exhibition hall, workshop shed and round-house could easily result in large and monotonous surfaces. Various ideas on how to prevent this were considered in response. The long walls of the prior were opened up with curtain wall façades (protected against the sun by overhanging or vertical louvres, as appropriate), an overhanging mezzanine level shading the ground floor, with the mezzanine furthermore interrupted by protrusions of a different material. The opening-up also makes the exhibits more visible to the passer-by, thereby advertising the exhibits and attracting his attention and potential patronage. The long workshop walls display bands of brick and opaque poly-carbon IBR, the light-permeability of the latter contributing to the reduction in future electricity consumption charges. The circular outside round-house wall consists of both brick and glass, allowing glimpses of the locomotives on display from, the platform and the pedestrian foot-bridge. The shorter walls provided less of a problem, as the large entrance doors for the train exhibits provide breaks in them.

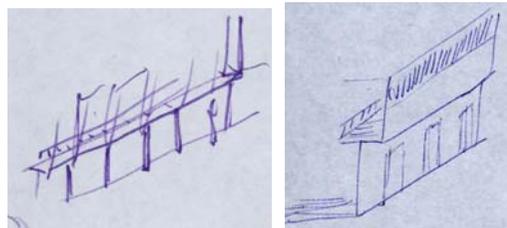
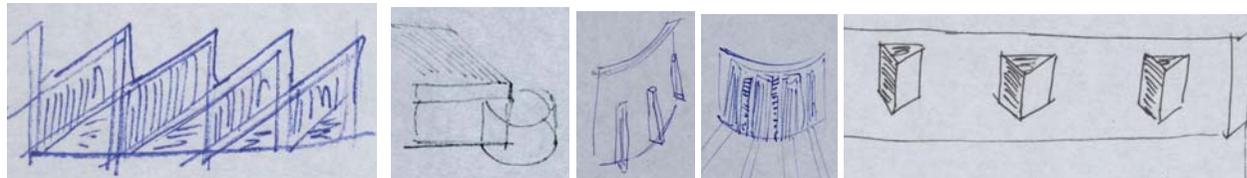


Fig.6.31-37 Potential façade treatments



The size of the above components also influenced the roof design. The exhibition hall in itself is about the size of a rugby field. With the roofs being visible from Freedom Park, they should not appear like a flat

concrete rugby field. They should be of sleek, but not boring shape, and define the areas of various functions happening underneath them. To enforce in the interior view of the roof the concept of the station shed precedent, the centre of the exhibition hall had to form a high ridge. Within this constraint various roof shapes other than a strict geometrical appearance were investigated. However, these would have necessitated the incorporation of turn-outs/switches within the museum to follow the roof shape. With the distance required to have the branching track running parallel to the originating track being 58m from the commencement of the turn out to where a further train could be exhibited, this was not considered to be practical: the exhibition hall would have become even longer. Ultimately, the parallel layout of the tracks in the museum forced a more simple solution, as they dictate that a rectangular area needs to be covered. Various light openings were also considered, but cluttered the roof and detracted from the historic station shed precedent.

I decided to cover the exhibition hall with a double butterfly roof, and to also cover the round-house with a butterfly roof. The roof over the area containing the supporting functions (information counter, restaurant) is a simpler slab structure, linking the prior-mentioned two areas. The workshop would be covered initially by a butterfly roof, but was changed to reflect the roof appearance of the exhibition hall.

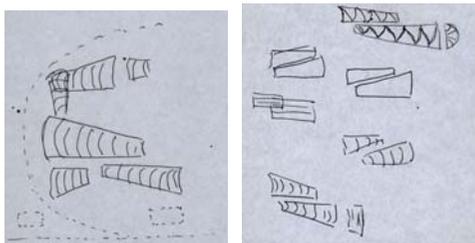


Fig. 6.38-43 Roof shapes investigated

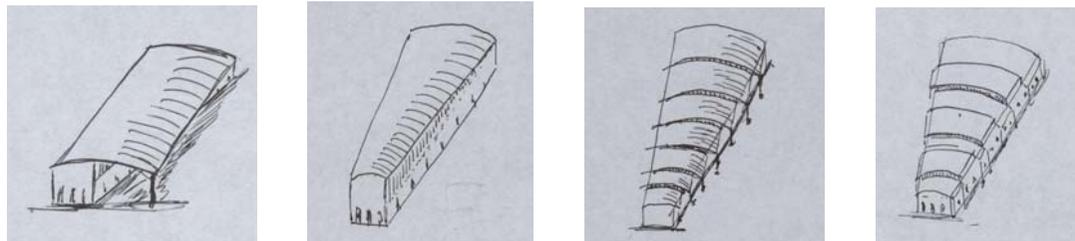


Fig. 6.44 Pretoria central workshops, with western round-house in background, 1896

Initially the exhibition hall's southern butterfly roof was extended over the roof of the supporting function structure, but this lengthening was found to be too heavy, and the roof was shortened. The roof slab over the entrance area was lowered to enable the 'dome' of the round-house roof to be seen behind it. The latter was also raised to accommodate openings permitting natural light to enter.

The choice of materials is largely based on the workshop materials as used in the now demolished Pretoria workshops, also reflecting the industrial heritage of railway architecture – steel, corrugated iron, brick and glass.

To attract visitors other than railway enthusiasts and scholars I initially considered incorporating kinetic

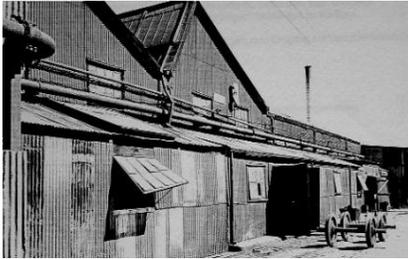


Fig. 6.45 Pretoria workshops

architectural elements in my design, such as an opening roof (possibly similar as that designed by Santiago Calatrava for the Milwaukee Art Museum, Minnesota, USA). However, the construction of such moving elements would be extremely costly, facilitate dust entering the structure, and its ongoing maintenance would require conscientious, diligent, interested, knowledgeable and thus presumably expensive staff. I therefore decided that a simpler solution is more appropriate. Attracting more visitors will thus largely be determined by the quality of exhibits and activities offered: *i.a.* 'driving' locomotive training simulators, riding miniature trains, seeing model railway displays, understanding the physics underlying the propulsion of railways, operating signalling equipment, viewing repair workshop activities with regard to education and career orientation, sighting live main line train operations from the terrace and mezzanine floor, viewing the operation of live steam trains and the calling of luxury trains, and enjoying the quality of the restaurant. 'Experiencing it' should be the key to exhibits, to make them not only interesting and educational, but also entertaining, and thus to attract visitors to the museum.

The above elaborates on the resolution of some the major design decisions faced, and reveals the startling complexity underlying what appears to be only a simple, large structure placed on a brown-field site surrounded by railways.

Fig. 6.46-51 Brownfield site before and after intervention (left and right respectively)



View from north



View from south



View from south-west

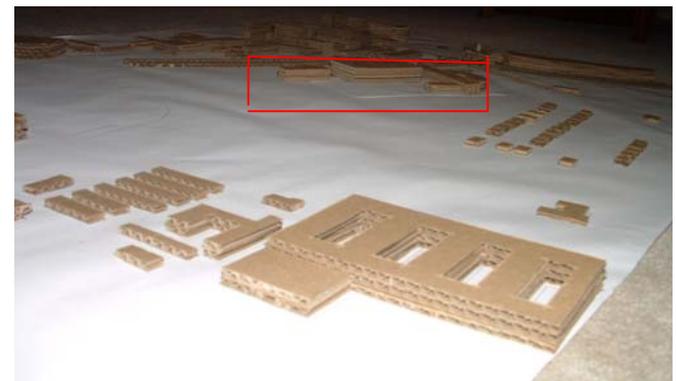


Fig. 6.52-57 Design progress

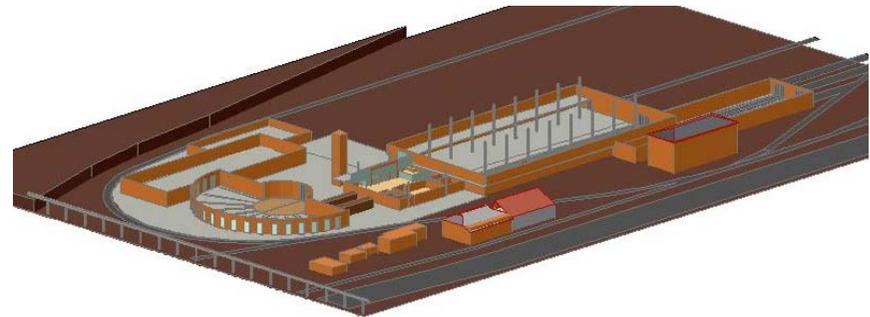
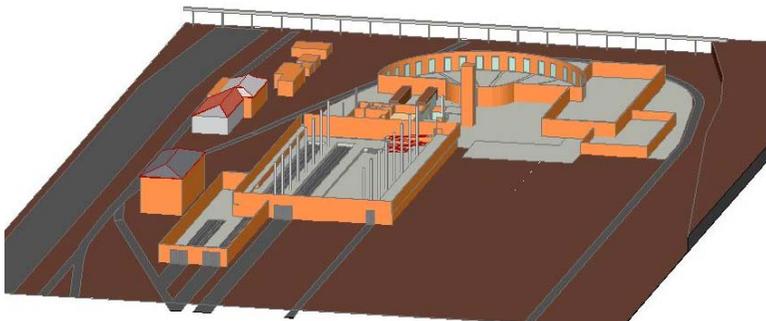
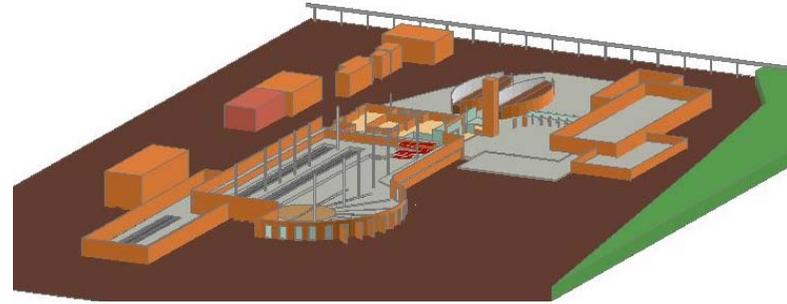
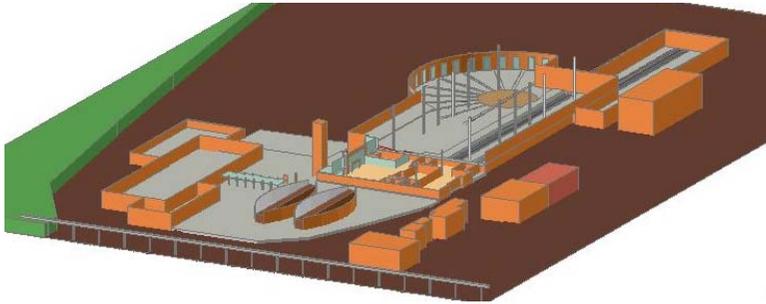
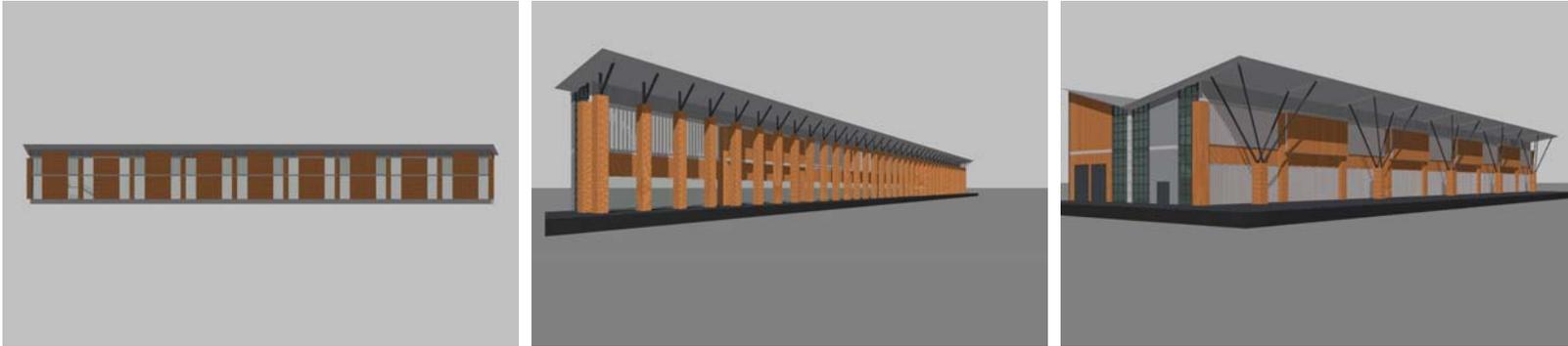
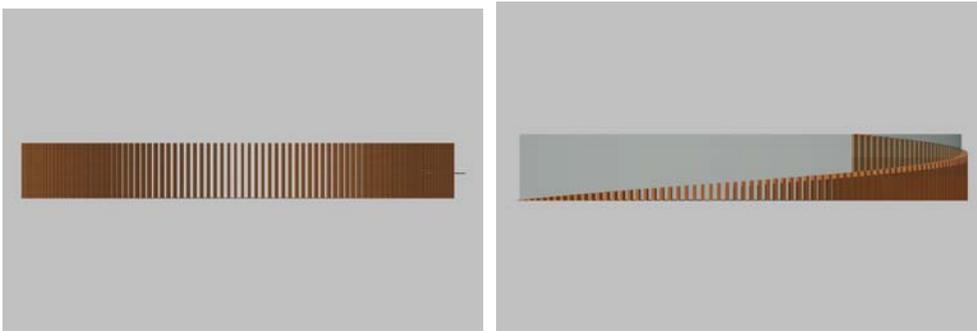


Fig. 6.58-62 Alternative façade treatments



Exhibition hall's south-western façade



Round-house's south eastern façade

Fig. 6.63 Museum complex from west



From left to right: workshop with coal bunker, exhibition hall, concourse building behind tower, luxury train passenger departure lounge, and train platform.

Fig. 6.64-65 Exterior perspectives



North-western façade: Left to right: 'Chief Engineer's Office', exhibition hall, with workshop in front, concourse building with entrance, and departure lounge. Foot-bridge to CBD in background.



North-western façade: Keft to right: Concourse building, with round-house in front, and 'steam hammer shed' to far right