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Fig. A2.28	St. Peter's cathedral (1248-1880), Cologne	Fletcher, 1975:Frontispiece. Pinder, 1955:62

APPENDIX 3. SITE EVALUATION AND CHOICE

Fig. A3.1	Pretoria's railway network	Based on Walton, C. (ed.). 1984:180-181. From: Directorate of Surveys and Mapping of the Department of Community Development.
Fig. A3.2	Location of Bel Ombre (top) and Salvokop (bottom) sites	Based on Walton, C. (ed.). 1984:180-181. From: Directorate of Surveys and Mapping of the Department of Community Development.

APPENDIX 1 BACKGROUND

A1.1 The need for a railway museum in Tshwane

Railways have been a major contributor to the changes perceived in the world since the commencement of the Industrial Revolution. By facilitating land travel, allowing man to travel, and his goods to be transported over great distances within a shorter period than possible on foot or by non-motorised transport, railways have revolutionized society: it has become more mobile, and its labour and products can be made available to a much larger market, enabling the selling of surplus production and thereby stimulating economic activity. Railways have thereby had a major impact on the development of the world. – Historically, in the days before motor transport, land developers regarded the advent of a railway into an undeveloped area as one of the keys to open it up to the world, to integrate it in the wider fabric of society and to make it accessible for economic development and exploitation. Towns situated on railway lines generally grew faster than those not served by it. Mineral wealth was viably exploitable only once a railway link had been established to serve it, enabling machinery to be shipped there and the extracted ores to be sold to the world markets. Agricultural production was encouraged, as the produce of even remote areas could be sold on the market before it spoilt. The population had easier access to places of employment, whilst also being able to travel in relative comfort to holiday destinations they otherwise would never have dreamt of reaching. People became mobile and the economy grew as the world shrank in relative terms of time and distance.

Railways made the same contribution to South Africa, serving as a generator of mobility and wealth. The reasons for local railway construction illuminate their importance to the development of South Africa's society and economy: The first railway was built in 1869 to link Durban city to the harbour facilities at the Point, improving accessibility and shortening the time of transport of goods; the slow ox-wagons dragging over sandy tracks were no longer necessary. Goods shipped by railways were cheaper than those transported by wagon. – The development of the Cape rail network only got off to a proper start when the diamond mines of Kimberley required fast and suitable means of transportation for machinery, provisions and labour. In turn, only when this town became easily accessible did the diamond mines develop into a sustainable long-term industry. The same applies to the Witwatersrand: the construction of the railway from the Boksburg coal fields to the gold mines enabled the more profitable exploitation of both, and only when the Witwatersrand was linked to the ports of Natal and the Cape was their full development possible. The railway lines then encouraged further development in the areas they passed through, whereas areas not served developed much more slowly, if at all. It was for this reason that during the first two decades of the 20th century major branch line construction was undertaken in the rural areas, so as to tap into their

agricultural potential. These lines generally achieved the desired results, the areas so served developing faster than the others. It is only the advent of motor transport as an alternate and more convenient mode of transport (in it being available for immediate use and closer than a train relative to where one is or wants to be, thereby increasing personal mobility even further) which has slowed or halted railway construction, to the extent that many lines are now being closed. Furthermore, due to technological advances, older, unused equipment such as steam locomotives, wooden carriages, cattle wagons, semaphore signals and Morse telegraph apparatus is now being scrapped without examples being retained for the understanding of the past.

Due to the reduced utilization of railways, many people are unaware of the contribution railways have made and can still make towards a country's society and economy, and that they have the potential to once again become a means of mass people and freight transportation. This is seen in many European countries, where the use of railways is actively promoted. Locally, this belief in the future of rail transportation is reflected in the Gautrain project currently being undertaken to connect Johannesburg and Pretoria. A railway museum concentrating not only on the display of historic exhibits could enhance the awareness of modern rail travel's viability and rekindle an interest in its future.

As technical developments in related fields, such as engineering and electronics, improves railway operations, in turn benefiting the development of South Africa, I consider that any railway museum should also concentrate on issues other than the preservation of historic locomotives and rolling stock. Covering a wider field should contribute to the fuller understanding of the mentioned historic and current importance of railways to society and economy. Better understanding of current technical development of railways (not limited to locomotives) would be furthered by preserving other items, such as old signalling equipment and telephone switchboards, for exposure to the audience. In the same vein, the venue should not be a place of preservation only. It should expose the visitor to the wider field of more railway related topics and contribute to their education, not only in history, but also in physics, electronics, economics and sociology. It should therefore not only be focussed exclusively on trains, but also complimentary topics: the scientific principles and processes enabling train running, such as steam propulsion and electricity generation; the development of railways and the activities underlying their working; train operation and traffic control; engineering and electronic communication; professions, trades and technical skills utilized; and the railway's contribution and impact on the world in general and South Africa in particular. It is thus to be a railway science, technology and history museum, using railways as the uniting theme for different points of focus.

The only railway museum in South Africa is Transnet Heritage Foundation's museum in George, on the Cape South Coast, where it serves as a base for the popular Outeniqua Choo-Tjoe vintage steam train excursions. I believe it to be inadequate with regards to exposure, in that it is located far from the greatest

population centre of South Africa (Gauteng province). This makes it inaccessible for most people. – Unfortunately not having visited the George museum myself, I am dependent on reviewing its web-site and the personal feed-back received from friends and acquaintances who have visited it, regarding their opinion in achieving coverage of the abovementioned wider range of topics: I believe it to be fulfilling only some of the aims envisaged above. Its big attraction is the live steam train to Knysna. A museum, located in Tshwane, displaying more of Transnet Heritage Foundation’s rich collection and located in Tshwane is thus justified, in being accessible to more South Africans, potentially contributing to the wider education of more people on a greater variety of topics.



Fig. A1.1 Present Friends of the Rail site, Capital Park, Pretoria



Fig. A2.2 Present Friends of the Rail passenger embarkation facilities

The lack of comprehensive coverage of railway-related themes is consistent with my own experience: train museums (Mulhouse, France; New Delhi, India; Bulawayo, Zimbabwe) are not attractive to people other than the railway enthusiast, few or no other visitors being seen by me when visiting them. (The exception was the National Railway Museum, York, England, which was well-visited.) Due to their nature, exhibits are generally limited to static displays of what the non-rail fan would consider as obscure, obsolete and bulky machinery. Little is done to recreate the experience of rail travel or rail operation. This corroborates the need for a railway museum with a different or additional angle to it. Means will have to be found to entice visitors other than train enthusiasts to the museum, to make it a destination of choice. This may be achieved by providing a facility where exhibits become experiences. Although the quality and variety of exhibits are more the responsibility of the curator, ways of achieving this goal will form part of the design considerations.

One way of enhancing the experience of historic rail travel is by means of running live steam trains, as is done in George. The museum may serve as a base for Friends of the Rail, a Pretoria-based association of steam locomotive fans. Currently the association leases part of Rovos Rail Luxury Train Safaris’ site in Capital Park, where they store, maintain and service their locomotive and rolling stock collection and from where they operate their live steam excursion trips. They have been requested by the landlord to find a new base from which to operate, as Rovos Rail requires additional space for expansion. Friends of the Rail are thus indicated as a main client for the museum, as, similar to the George museum’s activities, the running of live steam trains will provide a draw card for museum visitors. The necessitated relocation of the association is a further impetus and incentive to create a comprehensive railway museum in Tshwane, incorporating their collection and activities with those of Transnet Heritage Foundation. – Further clients who may add to the richness of exhibits and attractions are identified below.

I thus believe there is a need for a museum covering railway-related topics in the City of Tshwane, contributing also to its status as not only a city of culture and museums, but also to it as the capital city of South Africa.

APPENDIX 2 THE HISTORY OF STATION ARCHITECTURE

A2.1 The development of industrial architecture

City passenger stations, gradually increasing in size and volume, initially depended on the progress made in the ability of industrial architecture to supply the structures enclosing the required large spaces and volumes. The industrial architect's knowledge of the construction of such large enclosure arose from the construction of larger factories needed to accommodate the increased number of larger steam-driven machines.

Before the days of steam, in the early Industrial Revolution period, factories were normally designed by the owners themselves, Jones describes the resulting early-Industrial Revolution mill buildings (1770 – 1790) as rectangular in plan, seldom more than 9 m wide (though 14 m were achieved), and rising several storeys in height, though not often more than four (six were achieved). The largest open areas were to be found in plate-glass making factories, due to the desire to make as large panes as possible. However, no efficient alternate light sources bring available, the need for daylight generally limited the width of factories. Dimensions were also dictated by the size of the machines and their need of being close to the waterwheels' driving shafts. Ceilings tended to be low. Entrepreneurs followed local vernacular, but introduced some Palladian features. Lack of ornament was general. The structures were of local stone or brick. In some cases an interior, load-bearing timber frame was used, the outside walls merely being a cladding. (Jones, 1985:16-46.) The interior spaces generally did not contain clear spans, but had columns running through them to support the upper storeys. The first important change made with respect to the future, albeit on a small scale and only where fire-proof structure was insisted upon, was the replacement of the timber-frame structure with cast-iron interior supports, made possible with improved iron-making methods and a growing understanding of civil engineering. (*ibid*:44).

As said, little use was initially made of architects when designing industrial structures. Only when factory owners became rich, achieved social standing and started to live in country houses, did they commence to employ architects, mainly when designing their new residences, but increasingly also using them in the design of new factories. (*ibid*:46). Even when the availability of steam power obviated the need for location next to a stream, and made construction in cities and towns possible, the owner-constructors still fell back on the old precedents of the 'water-power' days.



Fig. A2.1 A late water-powered factory with exceptionally strong Palladian features: Wye Mill (1814-16), Cressbrook, England.



Fig. A2.2 Long, narrow, high structures: Bean Ing or Park Mill (1792-1802), Leeds, England



Fig. A2.3 Platt Bros & Co.'s Hartford New Works (1844-91), Oldham, England

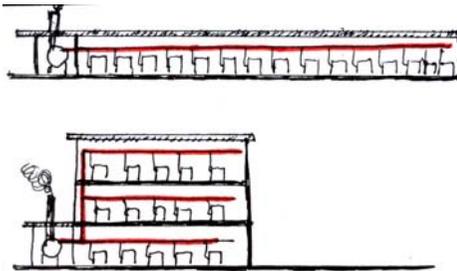


Fig. A2.4 Horizontal vs. vertical drive shafts



Fig. A2.5 The new materials: Cast-iron and glass at York Station (1871-77, by Peachy and Prosser), United Kingdom



Fig. A2.6 Crystal Palace (1850-51, by Paxton), London

Factories were now becoming much larger: the 'unlimited' availability of steam power allowed many more machines to be accommodated in one structure, realizing efficiencies of scale. The structures were increasingly multi-storied, because the inefficiently long horizontal drive shafts from the steam plant to the machines could thereby be shortened, in effect stacking the areas powered by a horizontal drive shaft on top of each other, with a vertical shaft replacing the extended horizontal drive shaft. Increased height was achieved through the increased employment of the cast-iron supporting frame. The building's width was still curtailed by the availability of sufficient day-lighting (although the fitting of gas-lighting, invented 1807, allowed for some increase in depth), factories therefore also becoming longer or arranged around a central square, and sporting many large windows on all floors. A new feature was the engine house and tall chimney attached to the building, replacing the waterwheels of old. Factory structures were now in the main executed in brick and with cast-iron frames: rows of iron columns supported the upper storeys, although the use of load-bearing exterior walls was still predominant. Large spans were still not striven for.

Now, slowly but surely, the importance of consulting engineers was realized and they were employed on an increasing scale, although they were as such not specialized yet and also acted as architects, mechanical engineers, bridge constructors and locomotive builders. Architects, though considered of secondary importance to the engineer, and up to now employed in the design of public structures, palaces, churches and upmarket city and country houses, started to seek industrial work, due to it becoming more and more lucrative. When employed, their designs still employed Palladian principles in the composition of façades, sometimes including Classical details as restrained ornamentation. One example of this is the entrance to Hardwick's Euston station, London (1836-38), boasting a massive gateway supported by fluted Doric columns executed in dressed stone. Factories and warehouses otherwise did not yet significantly contribute to the body of architectural theory. (*ibid*:58-67)

The next phase in industrial architecture was strongly influenced by the increasing application of iron. Cast-iron and the stronger wrought-iron became available in ever greater quantities and at lower costs. Also, advances in foundry, glass production, and engineering knowledge (such as the invention of the flanged beam, cylinder-process produced glass sheets and the design of trusses respectively) made structural innovation possible, including the construction and covering of large single-span arches.

The first extensive application of iron in structures was in market halls and glass houses, where spans up to 30 m were obtained. From this expertise factory roofs, market halls and train-sheds borrowed. Here we find the first indications of the sizes of the future, which were to so profoundly influence cityscape and architecture: The train-shed of the second Lime Street Station, Liverpool (1849-1850, by Richard Turner and Joseph Locke) was spanned by a then unheard-off 46(!) m wide single-span arch. What firmly established the ideas of what could be achieved with iron and glass was Joseph Paxton's Crystal Palace



Fig. A2.7 The clash between the architect and the engineer: the Neo-Gothic St. Pancras Hotel hiding the functional train-shed behind it

(1850-51), through its sheer size (though the naves were only 22 m wide) and the employment of pre-fabricated components. Station architecture culminated in Britain with William Barlow erecting the then world's largest single arched structure, London's St. Pancras station (1863-67), its wrought-iron span being 73 m wide. – Engineers used these new and now abundant materials of the Industrial Revolution not for any aesthetic appeal, but generally only to cover vast sites as cheaply and efficiently as possible: questions of decoration were subsidiary to the engineering issues faced. Interestingly enough, the glass and iron structures were seen as purely utilitarian, even too much so, and were then often masked with stone or brick masonry. Only in the 1890s did it become acceptable to show the iron and steel structures in their own right.

During this period architects were becoming more and more involved with the design of industrial buildings, resulting in these often being finished in the architectural style then predominating, such as Roman-inspired Neo-Classicism, Italian Renaissance and French Empire, with also the first evidence of eclecticism becoming apparent. Some factories and warehouses were starting to display an unheard-off richness of detail and ornament, previously considered inappropriate for such structures, though others remained strictly functional in appearance.

The later Gothic Revival found only limited application in industrial and station architecture. Preference was still given to the Italianate style in the design of factories, and this was to be so for the remainder of the century. It appears that this style was considered more appropriate to the box-like industrial structures than the irregular and 'romantic' Gothic style. – However, Ruskin's philosophy of accepting that all buildings (not only churches, palaces and houses) had merit, made it acceptable for mainstream architects to also consider industrial (and station) design worthy of their attention.



Fig. A2.8 Britain's first reinforced concrete factory (1897-98): Weaver & Co.'s flour mill, Swansea

It is however here where the field of station architecture can be found to diverge from that of industrial architecture. Station architecture had to supply solutions to horizontal expansion, due to the factors outlined under 'Station functioning and operation'. Factory architecture was still impeded by the lack of electric light and electric motors. Accordingly, as stated before, buildings were kept in the main narrow and multi-storied, whereas station sheds covered ever wider spans. Only with the advent of the production-line and the need to accommodate it in vast spaces not interrupted by lines of columns did factory architecture apply those principles already much-used in station architecture.

With regards to station architecture, it became general practice that the design of the train-shed was entrusted to an engineer, whereas the concourse, administration offices and hotel were designed by architects. (Jones, 1985:80-84). This latter development highlights the quandary faced by station architects: whereas the enclosure of the track area is best addressed by a purely functional design, the desire for

'prestige architecture' in and around the other areas does not lend itself easily thereto, resulting in a clash in the style of execution, united only by the continuous flow of passenger movement through both. St. Pancras station illustrates this at best, with an architect-designed, ornate, impressive, Neo-Gothic masonry-finished hotel façade in 'front' hiding the engineer-designed, utilitarian, functional, iron-and-glass train-shed behind it. This will presumably have caused some difficult working relationships, though it would have been one of the first instances where the need of the two professions to work together was illustrated.

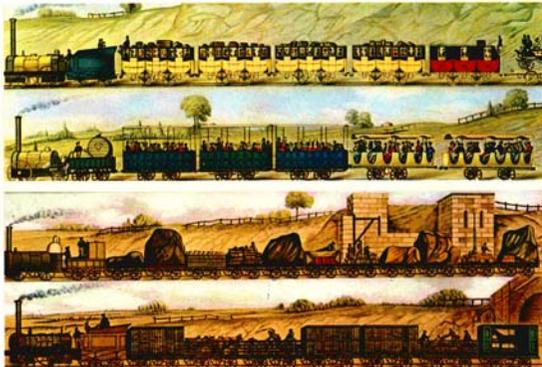


Fig. A2.9 Early passenger and freight trains, Liverpool and Manchester Railway (Aquatint by J. Shaw)

As the peak of British station building was reached in the 1860s, with the principle of the supershed firmly established, further developments in industrial architecture will only be highlighted for the sake of completeness. – Flat roofs, instead of pitched roofs, became popular for factories in the 1880s. These were coated with two layers of asphalt and, when covered with water for the sprinkler system (dammed by the parapet walls forming a tank-like structure), were virtually indestructible. Industrial and station architecture's next major stride, in the 1890s, was the replacement of cast-iron with, at first, wrought iron, and then with lighter and more reliable steel. In the same period the brick arch supported floors in factories were replaced by concrete floors. Where more daylight was needed, north-facing (for the northern hemisphere) saw-tooth roofs were introduced (also in railway workshops). Though using internal steel frames already in the 1890s, in Britain load-bearing outer walls were still required to be incorporated in the design. Only in 1909 was British law changed to allow for the external expression of a steel frame, making load-bearing walls superfluous. The first reinforced concrete structure of the United Kingdom, a flour mill designed by Hennélique and Le Brun, was built in Swansea 1897-98. (Jones, 1985:161-176)

Accommodating the expanding stations was made possible, as stated before, by the availability of improved materials and the advances in knowledge regarding their use: stations thereby achieved the supershed-size needed to fulfil their functions, with the resulting impact on cityscape, architecture and urban planning. The advances required from industrial and station architects can best be assessed by looking at the initial history of station design and the subsequent growth of stations.

A2.2 Early station design

The station is the one building type for which there was absolutely no precedent available when the need for stations arose during the Industrial Revolution. They were the truly novel building type of the era, and solutions to problems encountered were thus truly innovative.

With public railways having originated in England, all being built by private companies, it is logical that the first stations were also constructed there. However, railway station architecture made a slow start, as



Fig. A2.10 Small beginnings: Crown Street Station (1830), Liverpool and Manchester Railway

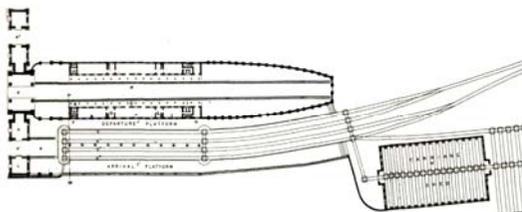


Fig. A2.11 Plan of Euston Station, London, when opened

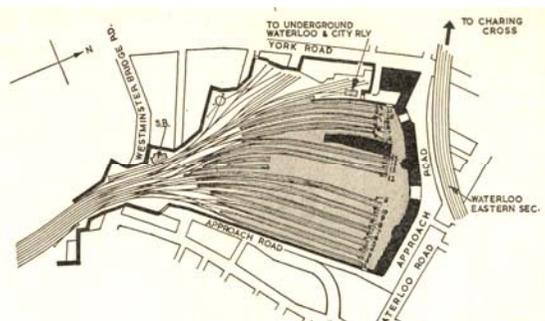


Fig. A2.12 Plan of Waterloo Station, London, in 1958

railway owners were at first concerned in the main with the conveyance of freight. Passengers were seen, at worst, as an unnecessary evil, or, at best, as a source of ancillary income, and thus very little was provided for their comfort. Railways did with time realize that profits were to be made from the conveyance of passengers, and appropriate facilities had therefore to be provided. The first railway line built with the fixed intention of also carrying passengers as part of its business was the Liverpool and Manchester Railway (L&M) company, opened 1830. Some companies only wished to cater for the rich and wealthy: the Great Western Railway (GWR) in England applied this policy so rigorously that initially it did not even provide third class coaches, as the return on investment in providing facilities for low-fare paying passengers was considered too low. The British Parliament actually passed an act in 1844 forcing the then privately operated railway companies to run at least one daily train with third class coaches over each route in both directions!

The very first stations, due to the emphasis on freight rather than passengers, were constructed with economy more in mind than passenger convenience. Platforms were not always provided, nor were enclosed spaces always made available to waiting passengers. Passengers were accommodated occasionally in dilapidated coach sheds or in small, converted goods sheds, as on the Stockton and Darlington Railway (S&D), which had been built as a freight-only operation. The few 'proper' stations existing were in no way outstanding examples of industrial architecture. When assessing the initial economy applied to station structures, it should also be borne in mind that these stations were erected by private companies with only limited capital available, the spending of which was prioritized towards the civil engineering works, locomotives and rolling stock. Also, as stated before, there were no precedents available: designs regarding the anticipated operation of the traffic could only be based on the experience gained from the old posting inns, which to date had handled the stage coach-borne passenger traffic (Carter, 1958:26). Structural reference could only be made to the industrial architecture of pre- and early Industrial Revolution days. – It is however interesting to note that the S&D's 'new' Stockton station of 1836 was already provided with a clock (*ibid*:11), a characteristic 'trade mark' of stations still seen today.

Stations geared towards passenger traffic appeared with the change in emphasis by railway companies towards the acceptance of passengers: the L&M's first Liverpool terminus of 1830 (Crown Street, by George Stephenson, later replaced by Lime Street) accordingly sported two platforms, and these were covered by a shed 9 m wide! This was the first instance of a shed being provided as part of station facilities. London's first local railway station was the 'suburban' London and Greenwich Railway's London Bridge Station, of 1836, covering an area 81 m long by 18 m wide, housing six tracks (*ibid*: 14): its area of 1,458 m² is less than that of a rugby field. In comparison, the first main line station serving London, the London and Birmingham Railway's Euston station (1836-37, by Robert Stephenson), at first covered by a column-supported 13 m span of 61 m length, has expanded through the years to an area of 74,925 m² (including

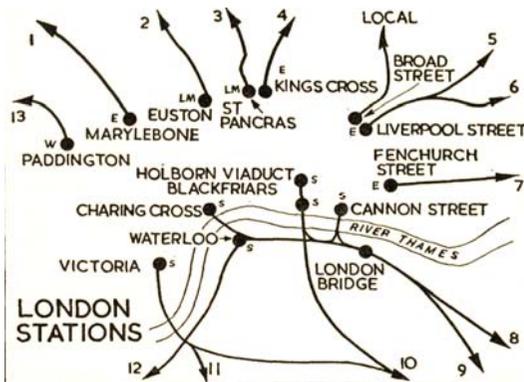


Fig. A2.13 Location of London stations

non-covered track area). London's Victoria station's area has grown to 101,250 m² (*ibid*:14). London's busiest station, Waterloo, handling 1,500 trains daily in 1958, is slightly smaller with 99,225 m². – Locomotives and carriages were initially stored in sidings within the combined passenger and goods stations, with workshops very close by. With time, however, London and other city termini's goods stations, workshops and storage sidings were located more outwards, due to then already more expensive land of the city environs prohibiting further horizontal expansion. – As said before, these early stations were not inspiring architecturally, due to the capital constraints and lack of precedents. The glorious, representative edifices associated with large city stations appeared only later, once the private railway companies had sufficient resources available to allow for their construction.

With non-passenger related functions soon separated out of the city station, it is essentially the development of the passenger station that is of interest. It was deemed necessary to protect the train area from the elements, thereby adding to passenger comfort (and, initially, preventing freight spoilage). Innovative solutions were required to accommodate the expanding requirements of space to be enclosed, in the main, of the station's train area: the key element to the design problem was to create an as large as possible, covered but column-free area, as columns would impede the layout of tracks and train movement, and the flow of passengers to and from them. In addition and if possible, the height of this sheltering structure had to be sufficient to allow for the engine's smoke to draw upwards and to escape through openings in the roof. The new materials available (cast iron, wrought iron and much later steel), combined with increased knowledge of their strengths, enabled the finding of the solution: the supershed.

This provided the necessary uninterrupted, column-free space: it is in essence from the need for expansion of the train area, really only possible in a horizontal direction, that then the vertical expansion followed, due to the structural considerations in achieving the wide spans over said horizontal area. The history of passenger station architecture thus becomes the history of the supershed, and by looking at the prior the development of the latter will be seen.

A2.3 The supershed 'cathedral'

Train-shed sizes increased steadily, leading to the supershed, earlier defined as a structure enclosing a large single volume of space with relatively long spans and without major subdivision by columns or other means. It is characterized by 'modular construction, standardization, mass production, prefabrication, mechanization, lightweight construction, systems integration, rapid site assembly and demountability (Wilkinson, 1991:4).



Fig. A2.14 King's Cross Station (1850-52), London



Fig. A2.15 Train-sheds of King's Cross Station, London

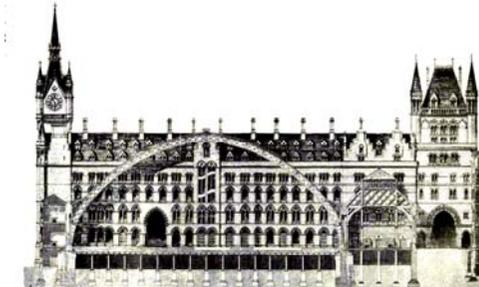


Fig. A2.16 Section of St Pancras Station (1866-68), London, with hotel behind

Though iron-and-glass shed structures were first used as greenhouses, the impetus for their further development was supplied by the railways. (The invention of the single span was actually pre-empted by *inter alia* the Romans, with the Pantheon's dome spanning 43 m, but the skill of building structures of such dimensions was lost during the Middle Ages.) Since the world's first major stations were constructed in the United Kingdom, the history of the station design development, and thus of the supershed, is concerned mainly with that country's stations, but continental European design development will be covered briefly.

A mere twenty years after the small beginnings of 1830, an incredible 46 m wide single-span arch of 114m length covered the area of the second Lime Street Station, Liverpool (1849-1850, by Richard Turner and Joseph Locke). There followed the smaller-span train-sheds of London stations King's Cross (1850-52, by Lewis Cubitt) and the second Paddington (1852-54, by Isambard Brunel and Matthew Wyatt). Birmingham's New Street Station (1850-54, by E.A. Cowper and William Baker) boasted a 64 m span, indicating the vast strides made in engineering expertise within a very short period. In 1866-68 William Barlow and R.M. Ordish designed and erected the then world's largest single arched structure at London's St. Pancras station, the wrought-iron span being 73 m wide and the tie bars being concealed underneath the rail tracks. The use of glass in these structures' roofs filled the interior with light, 'transforming the solemn character of vast halls at one stroke. Light flooded the interior as never before, so that the old distinction of a ceiled room and an unroofed street was dissolved. From this moment on such "room-streets" became a familiar sight in great cities.' (Meeks, 1978:62)

Some of the above and other stations will be discussed in greater detail below, illustrating the progress made in the covering of vast areas:

- The Great Northern Railway (later London and North-Eastern Railway) London terminus, King's Cross Station, being considered then as an unnecessary extravagance by some shareholders, was said to have 'a vista of extraordinary effect' (quoted, without source, by Carter, 1958:42). The two sheds of 22 m height spanned 32 m each; their ironwork was virtually devoid of any ornamentation. This building is clearly functional, the façade clearly reflecting the profile of the sheds beyond. The design was purely and undisguised functionality, Cubitt himself describing it as 'fitness for purpose and the characteristic expression of that purpose' (quoted, without source, by Binney & Hamm, 1984:133). As with the S&D's Darlington station, the clock tower between the two arches serves as a reminder of the importance that time now took on, with even minutes becoming of importance in the punctual running of tight train schedules.
- The Great Western Railway Paddington Station shed was 213 m long and 73 m wide, but made up of a three-bay shed (*ibid*:135), reducing the span of the arches. In contrast to King's Cross, its ironwork



Fig. A2.17 Hamburg *Hauptbahnhof* (1903-06)



Fig. A2.18 Leipzig *Hauptbahnhof* (1906-15), Germany



Fig. A2.19 Station design by Nervi (1943)

sported rich ornamentation of Moorish and Oriental motifs. Its impressive shed structure was hidden by Hardwick's Great Western Hotel (1851-53) built as a totally separate Italianate-style block in front of it.

- The Midland Railway's St Pancras Station's train-shed was only dislodged from its position as the then largest iron-built structure by the 1889 Paris Exhibition's Galerie des Machines. The shed is 209 m long, 73 m wide and 30 m to the point of arch. The clock tower is 68 m high. (Unfortunately 10,000 people were removed from the London suburban slum areas when the station was built, without receiving any compensation, a practice no longer possible.) The adjoining Midland Grand ('St. Pancras') Hotel (1865-1871, by Sir Gilbert Scott) is the biggest neo-Gothic secular building in the United Kingdom (*ibid*:136). Its public rooms could be reached directly from the station.
- The Cheshire Lines Committee Manchester Central Station (early 1880s, presumably by John Fowler) is the second-largest train shed of England, being of 168 m length, 64 m span width and 30 m height. It has now been converted into a conference centre, as the rail operations in Manchester have become more centralized. (*ibid*: 134)
- Regarding continental stations, the first supershed-type structure was the Paris Gare de l'Est (1847-52, by François Duquesnay) with a span of 30 m.
- Germany's Hamburg *Hauptbahnhof*, (1903-06, by Reinhardt and Sössenguth) is continental Europe's widest single-span shed, 72 m wide, and 35 m high. (*ibid*:139-140 and Meeks, 1978:173)
- Another German station, Cologne's *Hauptbahnhof* (1888-94, by Georg Frantzen), unusual in being located in the very city centre, is 255 m long and 92 m wide. (Binney & Hamm, 1984:139)
- Also in Germany, Leipzig *Hauptbahnhof* (1906-15, by Lossow and Kühne) was, when opened, the largest station in the world. Its concourse is 300 m long, and the train shed is made up of six bays of 40 m span. Its covered area is a massive 72,500 m². (*ibid*:137)
- Italy's Milan Central Station (1906-31, by Ulisse Stacchini), is Europe's second-largest station, with a covered area of 66,000 m². It is the last major station in Europe to have a steel-built shed, with five spans of respectively 12 m, 45 m, 73 m, 45 m and 12 m width. (*ibid*:140-141)
- Pier Luigi Nervi designed a precast concrete station hall spanning 200 m in 1943, which would have dwarfed all previous arches, but it was never realized. (Wilkinson, 1991:11)



Fig. A2.20 The superlative concourse: Thirtieth Street Station (1927-34, by Graham, Anderson, Probst and White), Philadelphia



Fig. A2.21 The ubiquitous tower: Dearborn Station (1883-85, by Eidlitz), Chicago

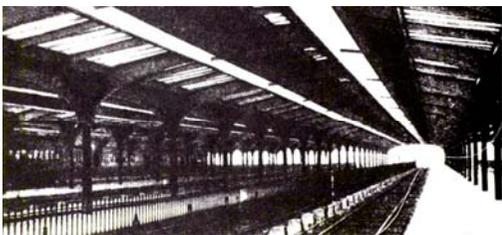


Fig. A2.22 Bush shed, Hoboken station (1904), New York

- In the USA, the first all iron arched train-shed of significance was built at Cleveland, Ohio, USA in 1865-66 by B. Morse with a span of 55 m. (Meeks, 1978:89)
- Developments in the USA culminated with the construction of the world's largest single-span train-shed at Philadelphia's Broad Street station (1981-93, by Wilson and Truscott, additions by Furness and Evans), with three-pinned trussed arches spanning 91 m, with a height of 33 m and a length of 181 m. (Wilkinson, 1991:10 and Meeks, 1978:89 and 103)

The largest station ever built is the second New York Grand Central Station (1903-12), handling 600 trains and 100,000 passengers daily (though some of the older and smaller London and Paris termini exceeded this, handling 1,000 trains and 200,000 passengers a day). Grand Central Station's track area was placed underground over two levels, which then did not call for a large shed. However, its concourse made up for this: 114 m long, 38 m wide and 37 m high. The nearby Pennsylvania Station's concourse height reached a remarkable 46 m. (Meeks, 1978:92)

In looking at the above growth, it should be borne in mind that these large and high sheds were then mostly hidden behind a similarly superlative concourse, office or hotel block or combination thereof, as the 'open display' of the purely functional train-shed was not considered acceptable by many architects, as discussed below under 'Influence of stations on architecture'. As the sheds became larger and higher, these blocks had to grow, too, increasing the bulk of the station complex. This was paired by the afore-mentioned need for prestige and power architecture.

Many stations in Great Britain, continental Europe and North America, including most of the above-mentioned, sported a clock-tower of some shape or other. They often emulated the design of the British Houses of Parliament's 'Big Ben', with its overhanging upper part surmounted by a lantern-sporting, steep, pyramidal roof. (*ibid*:95) The tower became such an integral part of station design that to most people in these areas the word 'station' conjures up the image of a large structure with a tower appended to it.

This increase in railway station size illustrates the lead-up to the zenith of station supershed construction. They did, however, have disadvantages, which led to their demise in the station environment: though providing protection against inclement weather, their ventilation was often insufficient to remove the engine's smoke, discomforting passengers and staff; the sulphur in the coal burnt attacked the cast- and wrought-iron members of the structure, resulting in costly maintenance; and the cost of the sheds themselves were also prohibitive. To reduce the engineering effort and thus costs, the track area was spanned by a number of parallel sheds (bays) of narrower and lower spans. Then the invention of the



Fig. A2.23 Art Deco influences in the now closed Bothaville Station (1930s), Free State



Fig. A2.24 Modernist Verona station (ca. 1950), Italy



Fig. A2.25 Model of International Rail Terminal (1988), Waterloo Station, London

patented Bush-shed sounded the death-knell of large train-sheds: they consisted of a low, sulphur-damage-proof reinforced concrete vault spanning two tracks from the centres of their adjacent platforms and 5 m above the tracks. Being so low, long slots in the vault, now only a few inches above the smoke stack, allowed the engines to discharge their smoke harmlessly into the outside air. They were first used by Lincoln Bush at Hoboken station, New York, in 1904. – Shortly, in turn, they were supplanted by the butterfly shed. This covered only the platforms and provided only incomplete protection against the elements: ‘The public be damned; the company saved money’. (Meeks, 1978:122) – Yet, though supersheds were no longer incorporated in station designs, those built are largely still around (exceptions being Second World War casualties), and their influence on cityscape and architecture can still be assessed today by paying them a visit.

With African weather being more clement than its European counterpart, and with lower comparative traffic volumes, train-sheds are scarce in South Africa, but did form part of the original station designs for Cape Town, Port Elizabeth and Durban. Johannesburg’s Park Station (1895-97) was provided with a cast-iron and glass shed protecting the island-style platform. (The full station building design by Klinkhamer of Amsterdam was never executed due to the political unrest leading up to the Anglo-Boer War. (De Jong, Van der Waal & Heydenrich, 1988:93) Since then, the new Durban and Johannesburg Park stations’ platforms are sheltered by the concourse area above, Pretoria’s has been provided with a saw-tooth roofed steel shed, and Cape Town’s new stations shelters passengers with butterfly-type platform shelters. Port Elizabeth still uses its original train-shed.

Station design moved on with the times, reflecting both the Art Deco and Modernist styles, with extensive use of the new medium of reinforced concrete. However, with the loss of the supershed element from the designs, the passenger support area superseded the track area as the architecturally more dominant one, gaining large and high concourses, whereas the track area was protected only by the aforementioned low butterfly sheds. Current station designs in Europe, mainly, but not limited to suburban routes, follow the latest style trends, showing a mix of concrete, steel, glass and masonry work. Exceptionally, station supersheds are still built: a recent example is that covering the extension of London’s Waterloo Station’s International Rail Terminal (1988, by Nicholas Grimshaw and Associates). The latest shed being built is the new Berlin *Hauptbahnhof*, still in process of completion. Its four tracks are spanned by a shed, its appearance reflecting back on the classic train-shed of iron and glass.

Ironically, while the supershed was replaced in newer designs by the rather insignificant butterfly sheds over the platforms, it was being incorporated in the design of the concourse area. Being of vast sizes, both so as to more easily handle the volume of passengers, and for purposes of prestige, they were covered with massive spans of either cast-iron or concrete to allow for uninterrupted space. New York’s



Fig. A2.26 Galerie des Machines (1889), Paris



Fig. A2.27 St. Paul's (1675-1710), London

Pennsylvania and Grand Central stations are good examples of this, while in South Africa this trend is evidenced in the new Johannesburg and Cape Town station concourses.

For the sake of completeness, the further development of the supershed will be covered briefly. It was greatly employed in the construction of exhibition halls and covered malls. The single-arch spanned space reached its zenith with the Galerie des Machines, designed by Cotamin and Dutert for the 1889 Paris Exhibition: it was 114 m wide (wider than the length of a rugby field), 420 m long and 46 m high. 'It represented the accumulation of constructional experience gained throughout the nineteenth century. It innovated the structural principle of the three-pinned arch, pioneered the use of structural steel and its massive proportions have never really been equalled.' (Wilkinson, 1991:6). This also represented the record for the widest span until 1960. – The need for airship hangars in the early twentieth century saw new applications for the supershed. Then came the need for not only production-line assembly plants, requiring roof-lit wide-span sheds, but also for large aeroplane hangers. During this period the USA took the lead, Europe unfortunately falling behind. The invention of the space frame, cable-supported roofs and cantilevered structures has provided additional alternatives for the construction of supersheds. (*ibid*: ix)

To summarize: The need of stations requiring ever larger areas to facilitate their functions, and mainly those associated with the interaction of the passengers with the trains, led to the development of the supershed, that large and uninterrupted space catering for the horizontal expansion of the train area. The supershed was distinct from, but linked to the also expanding horizontal passenger support area, and often to the vertically expanding administration and hotel structures. The combined structure, expanding both horizontally and vertically and often with a clock tower incorporated in the design, was of a structural size not encountered before the Industrial Revolution. It is not for nothing that these station complexes, due to their area, size and enclosed volume and silhouette, were occasionally referred to as the 'cathedrals of industry'.

It will be interesting to compare the secular cathedrals' dimensions to actual cathedrals.

A2.4 Cathedrals and churches: their dimensions and influence

The comparison of stations and their supersheds to cathedrals is not as incongruous as it may initially seem. Before the advent of the prior the general population could only experience the awe-inspiring volume of vast enclosed space in the cathedrals of the big cities. Palaces and town halls, also being structures which contained large enclosed spaces, were not easily accessible to the everyday man, except in a serving capacity. Station architecture changed all this fundamentally.



Fig. A2.28 St Peter's (1248-1880),
Cologne

A brief look at the statistics of various cathedrals (extracted from Fletcher, 1975) will underline the validity of this comparison based on size:

- St. Peter's, Rome (1506-1626, by Bramante, Sangallo, Giocondo, Raphael, Peruzzi, Michelangelo, della Porta, Fontana, Vignola and Maderna): internal length 183 m, internal width 137 m, external length 213 m, nave width 26 m, vault height 46 m, internal height of cupola 102 m with internal diameter 42 m
- St. Paul's, London (1675-1710, by Sir C. Wren): internal length 141 m, internal width 31 m, internal height of domes surmounting naves 28 m, internal height of large dome 65 m with internal diameter 34 m, area about 6,000 m²
- Hagia Sophia (532-37, by Anthemius of Trallis and Isidore of Miletus): span width 33 m
- Wells cathedral (c.1180-c.1425, *s.n.*): nave width 10 m and vault height 20 m
- Westminster Abbey (960-1745, *i.a.* James, Hawksmoor, R. and W. Vertue): vault height 31 m
- Notre-Dame, Paris (1163-c.1250, begun by Bishop Maurice de Sully): vault height 37 m
- Reims cathedral (1211-90, by *i.a.* Bernard de Soissons): vault height 42 m
- Amiens cathedral (1220-88, by Robert de Luzarches): length 137 m, width 46 m over nave and 4 aisles (not uninterrupted space), nave width 14 m, vault height 43 m
- Chartres cathedral (12th – 16th centuries, *s.n.*): length 134 m, width over choir 46 m, nave width 15 m, vault height 37 m
- Milan cathedral (c.1385-1485, by *i.a.* Amadeo, Dolcebuono and Buzzi), with exception of Seville the largest Medieval cathedral: nave width 17 m, vault height 45 m, internal height of dome 66 m
- St. Peter's cathedral, Cologne, the largest Gothic church of Northern Europe (1248-1880, *s.n.*): length 143 m, width 84 m, nave width 13 m, vault height 46 m, tower height 142 m, area 8,400 m²

Cathedrals were thus both shorter and narrower than the new train-supersheds. Though both nave and towers still exceeded the latter in height, drawing the eye upwards, they were not able to impart the same feeling of space to the perceiver as the stations were able to do: the experience of large space in cathedrals was curtailed by the narrowness of the nave. Having the greater tower height did not affect the experiencing of space, as they are not visible from the interior. The cathedral tower's crowning height on the city silhouette, when compared to a station, was now intimidated by the latter's greater length and bulk. However, with ever higher buildings surrounding both, both have lost on their impact.

APPENDIX 3 SITE EVALUATION AND CHOICE

The location of a railway museum must satisfy. In the main, the client's requirements, which revolve about its visibility and its accessibility by road and rail (should the latter is needed for the running of vintage steam trains), in addition to the accommodation and display of items which are desired to be exhibited. Access by rail, in turn, is dependent on accommodating physical constraints imposed by the site's slopes and gradients which may preclude the laying of the required tracks at acceptable costs, and the proximity of the city's rail network. The factors are set out in greater detail in this appendix, followed by the identification of suitable sites within or on the borders of the Pretoria CBD, their evaluation and a choice of the most suitable site.

A3.1 Site criteria

The site should be situated in an area where it can contribute positively to the enhancement of Tshwane (Pretoria) as a leading city of Africa and as the capital city of South Africa.

It must be suitable to accommodate the functions of the railway museum. As the museum is intended to not only entail the display of static exhibits, but also to serve as a point of departure and arrival for heritage and luxury trains, it must have access to the Tshwane rail network, to be able to function as a station. The site must also comply with the general physical requirements of a station regarding location and linage to existing rail operations.

The existing railway network of Tshwane comprises of a circular or 'ring rail' system around the inner city, the nearer northern suburbs and the nearer and further eastern suburbs. From this line branch off feeder lines to industrial and residential areas on the periphery of the municipal area (Ga-Rankuwa, Soshanguwe and Atteridgeville) and long-distance lines to the south (Johannesburg/Cape Town/Durban), south-west (Magaliesburg/Mafikeng), west (Rustenburg/Thabazimbi), north (Polokwane/Zimbabwe) and east (Nelspruit/Maputo). The southern, western and eastern lines also serve some eastern and southern suburbs (Centurion, Atteridgeville and Mamelodi respectively), whereas the feasibility of introducing a suburban service to Hammanskraal on the northern line to Polokwane is being investigated.



Fig. A3.1 Pretoria's railway network

As stated above, the museum can only incorporate the functions of a vintage steam train and luxury train station if it has access to the rail network being used by the trains serving it: otherwise a train can neither arrive nor go anywhere. Friends of the Rail require access to the Pretoria network's ring line itself (for steam train runs clockwise or anti-clockwise around Pretoria) and its connections to the north (for their destinations of Bela Bela (Warmbaths) and Rooiwal power station), the east (Cullinan) and the south (Johannesburg). Rovos Rail and the Blue Train require access to the same rail connections, but the latter furthermore that the link should be electrified, or easily electrifiable, with overhead catenary, to enable the running of the electric locomotives used to haul the Blue Train.

Within the constraints of the network connection a physical principal largely determines the actual location of a railway station on a railway line (and thus also of a railway museum doubling-up as a station): gravity. Firstly, if a locomotive, rolling stock (carriages and wagons) or a complete train is stationary on level terrain, it cannot roll away, even should the brakes fail. Locating a station on level terrain thus adds to the safety of

rail operations, including shunting. Secondly, it is easier for a locomotive or train to start off on the level, and being able to continue on the level for as far as possible whilst building up speed, than having to start off against the pull of gravity. A 'level' start is more energy efficient and thus economic. If level terrain is not available, it has to be created, resulting in expensive earthworks and increased project costs for the client. Sites have thus to be evaluated as to the availability of sufficient level land and, if such land is not available, the possibility of limiting earthworks to an affordable amount.

The level land must be able to accommodate the length of the heritage or other trains being operated. Heritage trains run by Friends of the Rail consist on average of 10 coaches, plus engine, but Rovos Rail luxury trains may consist of up to 20 coaches. These train consists determine an uninterrupted platform length of between 250 m and 450 m. Rovos Rail, at their current facilities at Capital Park, has only a 100m length platform, with passengers boarding centrally and dispersing to the front and back of the train. This approach is feasible due to the limited number of luxury train travel passengers; however, for Friends of the Rail trains this would be unsatisfactory when running with up to 500 passengers during the Christmas season. The chosen site would thus have to accommodate a 250 m minimum platform length.

Due to the size of the intended locomotive and rolling stock exhibits (a Class GEA Garrett locomotive is just short of 30m) display areas have to be large to accommodate these. It also being more cost efficient to 'drive in' the locomotive and rolling stock displays on rail track (compared to requiring cranes to lift the large and heavy exhibits off and onto flat bed road transport), the display area has to be level and accessible to rail connection. A round-house, allowing operational locomotives individual access to the rail network, by driving from their own bay onto a turntable, to be turned and connected to the link line, obviates the necessity to move other locomotives out of the way, should they be stored in line on parallel tracks. The train display area, displaying per track a train consist made up of a locomotive and some carriages or wagons, would be well served with a number of parallel track lengths linked to the network, facilitating the 'drive in' accessibility. The required distance of 40-55 m end to end of two switches connecting two parallel tracks 3-4 m apart would have to be accommodated in an outside yard area, further impacting the amount of land required.

Furthermore, any commercial or community serving venture: stations should preferably be placed close to where their user client base (passengers or freight shippers) is located with regards to point of origin and point of destination. Similarly, a railway museum should respect the same principle: it should identify where its users (visitors) would be arriving from, and the site must be as easy to find and access, so as to facilitate its user friendliness. This should benefit visitor numbers. This must also consider factors such as safety and savouriness of access routes and parking facilities.

A site close to an existing rail line with train movement seen at short intervals would facilitate relating the exhibits of the museum to what is to be experienced visually in close proximity, and thereby assist in bridging the gap between theory and reality. From a historian's point of view it would lend additional poignancy to the museum if it were situated on or near a site with connections to the early beginnings of Pretoria and its early links to the development of the rail network in South Africa.

In the current circumstances of limited availability of financial resources, a museum must attract visitors: it must advertise itself, it should stimulate the passer-by's interest and entice him inside. Advertising demands good visibility. This can be attained through presence, prominence or individuality of the structure, its exhibits and programmes, or a combination of all these. It should thus be visible from a preferably busy thoroughfare, vantage points and landmarks, albeit at a distance. Easy access is also of importance.

With the museum's client base anticipated to be train and railway enthusiasts, tourists wishing to explore the city of Pretoria's palette of attractions, school classes, restaurant patrons, and conveners and attendees of conferences, exhibitions, product launches, receptions and other events staged on the museum's premises, it is important to assess the potential site with regard to its visibility to and accessibility by these potential users/clients. Proximity to existing tourist attractions would also be off advantage, as it would facilitate the attraction of the drive-by visitor, or could advantageously be incorporated as a stop-over between two destinations of the 'must-see-tourism-agenda'.

Financial sustainability being preferred, it is proposed that the area of which the museum complex will form part should include commercial office space, to be let to third parties for the generation of additional museum funding. The site selected must thus both be able to accommodate the envisaged office space and be acceptable to the business community, thus enhancing its letting potential. Furthermore, the environment must appear attractive and healthy to the future user.

With the South African museum visitor, staff member and office employee generally arriving either by bus or car, land to provide for sufficient parking for the site must be available.

A safe or policeable environment is another prerequisite. Not only the safety of the museum visitor, staff member and office employee is to be ensured, but also that of the displays, as, for example, the 'freelance removal' of all copper and brass elements of locomotives is a favourite and prevalent occupation of South African 'scrap metal' dealers.

In conclusion: Potential sites of enhancement for Tshwane must be assessed for rail access, slopes, area, location, user accessibility, visibility and safety.

A3.2 Potential sites identified

As stated above, the museum is intended to contribute to the enhancement of Tshwane (Pretoria), but the physical constraints identified inherently dictate the need for a sufficiently large tract of level land with rail access to the Pretoria rail network. Such land is only found on the outskirts of the CBD, and only two locations allow for rail access:



Fig. A2.3 Location of Bel Ombre (top) and Salvokop (bottom) sites

1. A site to the north-east of Bel Ombre suburban passenger train station ('Bel Ombre site'): Though on the north-western fringe of the CBD, it is cut-off and isolated from it by factories and workshops, and by it being situated within a return loop of a suburban railway line. To the north of it are the Pretoria sewerage works, whereas to the west is a large electricity substation. 300 m to the east, but not visible from it due to a rise in the land and with access impeded by said return loop, is Paul Kruger Street (a northern gateway to Pretoria and, to its east, the Pretoria Zoo). It is within viewing distance of the Daspoort Ridge to the north.

2. A site to the south of the railway line, south-west of Pretoria Central suburban and long-distance station and south of the Bosman Street suburban passenger train station ('Salvokop site'): It is situated next and parallel to the Bosman Street station and within viewing distance of Central station. The railways' Pretoria workshops were originally located here, but have since been moved to Koedoespoort. The historic structures have nearly all been demolished. A foot-bridge gives direct pedestrian access to the Central station and the CBD, whereas access for vehicles is from the west only, albeit from one of Pretoria's main gateways from the south, Potgieter Street. The site is separated from the Department of Defence headquarters and the adjacent Pretoria's maximum security prison complex to the west by this street. To the north, across the railway line, is the southern periphery of the Tshwane Museum Park area, envisaged as an area of museums within the CBD. It is within viewing distance from Salvokop ridge to the south, on which the new national symbol of Freedom Park has been constructed.

A3.3 Comparison of sites

The assessment of the two sites with regard to the criteria set out before produced the following results:

	Bel Ombre site	Salvokop site
Enhancement of Tshwane	The site is about 300 m from the closest gateway to Pretoria CBD (Paul Kruger Street), but not visible from it, hidden by a knoll. From the south large sheds and workshops preclude visibility. To the west lie extensive sewerage works. To the north is no major road. The Tshwane development frameworks exclude this area, indicating its relative unimportance.	It is visible from Potgieter Street gateway to Pretoria, although visibility is somewhat impaired by the latter being situated partly in a railway underpass cutting. Future office block developments could impair the visibility further. The Tshwane development frameworks earmark this area for development, and a separate (but as yet unimplemented) development plan having been compiled, indicating its importance, with the Freedom Park precinct being in close proximity.



Rail network connectivity	Connection is only in a northern (clockwise) direction to the Pretoria ring line, precluding the running of trains to the south, or the return from there. A connection to the south would entail the additional construction of a lengthy rail link of about 1km, adding to the project costs. The clients require full connectivity.	Connection is available to the ring line in both directions, with only short connecting tracks being required.
Slope of site	The site slopes from the south-east to the north-west, with a height difference of 9 m.	The site is largely level, with a slope to the north of 1m in 150 m.
Slope of train departure track	A level connection to the Bel Ombre line is feasible on land already excavated.	A level connection to the Pretoria ring line is feasible.
Length of platform	A 250 m platform can be accommodated easily.	A 250 m platform can be accommodated easily.
Connectivity to adjacent rail lines	Unless land earmarked for future Spoornet expansion cannot be utilized, the largest available level area lies 2 m above the adjacent rail's level. Major excavation work is required to equalize the exhibition area's height to that of the access rail. The existing levelled Spoornet land is either hidden in a cutting or far removed from the logical placement of the museum building (close to the access road).	A substantial area of the virtually level land lying on the same level as the access rail makes further excavation work unnecessary.



Site access	The site is difficult to find, hidden behind large workshops and/or a land rise, and access is only by means of a dead-end road to the sewerage works, not facilitated by the circuitous routes dictated by the one-way road system of the area.	Access is from a road connecting to one of the main southern access roads to the CBD, and visible from it before entering a railway-underpass cutting. A direct road connection from the CBD to Salvokop has been proposed in the 2006 SDF. A historic connecting foot bridge to the CBD already exists. The site is visible from Salvokop/Freedom Park, Bosman Street Station and Pretoria Central Station.
Visibility of train movements	Out of peak hours, Bel Ombre station is only served by one suburban passenger train about every half hour (own observation)	Rail traffic (shunting, freight, main line and suburban passenger trains) is seen about every 5 minutes (own observation).
Historic railway association	None. Bel Ombre station was completed in 1984 as terminus for the suburban passenger traffic to the north-western suburbs.	The first Pretoria railway workshops and sidings were located on this site. In close proximity are historic houses constructed for railway workers.
Visibility of site	The site is hidden by large factories and workshops. Visibility from the east (Paul Kruger Street and the Pretoria Zoo) is blocked by a rise in the land. The intermediate site may be developed in the future, further reducing visibility. It is visible from Bel Ombre station. Visibility from Daspoort Ridge (school grounds) is not important, as it is not accessible to the general public due to lack of infrastructure.	The site is very visible from the Freedom Park precinct, and is visible to pedestrian and vehicular traffic on Skietpoort Avenue and from Potgieter Street, before the latter enters a cutting. The upper edge of the cutting could furthermore be utilized to attract attention (advertising possibilities). The 2006 SDF indicates a possible development by the Department of Correctional Services on the corner of Potgieter Street and Skietpoort Avenue, which may impair visibility. It is



		furthermore visible from Pretoria Central and Bosman Street stations.
Desirability as location for offices, restaurant or events venue	Situated on a dead-end road leading only to the sewerage works, with no surrounding commercial office space and none envisaged in the Tshwane development frameworks, the desirability as an office location or conference/events venue is doubtful. There are no retail facilities within easy reach.	Situated on a main gateway to Pretoria, with an envisaged direct road and existing pedestrian link to the CBD, and the area being strongly pushed in terms of future development (being the entrance to the Freedom Park precinct), this area could become very desirable as an office location or for the staging of events. There are no retail facilities within easy reach.
Proximity to other tourism attractions	The Pretoria Zoo and Aquarium is about 300 m to the east, but no direct visual or infrastructure connection exists. The aquarium entrance is not well developed. The main entrance to the Zoo is even further east. The development of the intermediate site would further complicate access.	Visible from the Freedom Park precinct and its access routes, as well as from two stations (potential points of arrival) and, though separated by a rail line, from the Museum Park area of the CBD, the link to tourism facilities and attractions is strong. The museum development can further enhance the tourist potential of the area.
Parking	Sufficient land is available.	Sufficient land is available.
Safety of environment	The isolation of the area could facilitate safety, as any person observed would be considered suspect – there being very little other activity in this area. However, isolated spots with tourists or office workers are or could become favourite haunts for muggers.	Its better accessibility, more passing traffic, the presence of residential units, the proximity of the Freedom Park precinct as a prestige development of national importance and the anticipated upliftment of the area should contribute to making this area comparatively safer than the Bel Ombre site.

Health and well-being	The substantial electric sub-station may cause concern about the possible influence of magnetic waves on the health of people constantly in its proximity. The smell of the sewerage works, though generally not noticeable, may cause discomfort on certain days, depending on the strength and direction of the wind.	No potential risks identified.
Client and other comments	When interviewed about various aspects of the project, all parties were appalled at the idea of working in this area: Mr N Berelowitz (Management, Friends of the Rail), Mr Chris Becker (Designer of alternatively proposed Friends of the Rail premises at Hercules yard), Dr R de Jong (Cultmatrix CC), and Prof K Bakker and Mr P Vosloo (both University of Pretoria). Reasons given were <i>i.a.</i> inaccessibility, remoteness from tourism venues and safety concerns.	The mentioned parties all suggested that this site would be a much more desirable location, as addressing the concerns raised regarding the other site.

A3.4 Conclusion

The above analysis shows more points in favour of the Salvokop site. The Bel Ombre site is hampered by its isolation, near-total invisibility and distance from important access routes and other tourist attractions, proximity to sewerage works, and the lack of easy access from a major road. The Salvokop site will benefit from its exposure to train stations and a main road gateway to Pretoria, its proximity to the Salvokop/Freedom Park and Museum Park tourist attractions, and the easier terrain for the running of trains and access of display areas. It will furthermore assist in removing the stigma attached to the area as being the 'Prison corner' and 'Boot camp' of Pretoria (arising from the location, to the west of Potgieter Street, of the Department of Defence's headquarters and the Pretoria C-Max Prison complex).

The desirability of this site is also underpinned by the proposals contained in the *Salvokop Development Framework*: 'It is of great importance that the Chief Engineer's office and the steam hammer mill building... be re-used as actors...Introduction of a 'working rail yard' theme is suitable for this public space – the Friends of the Railway and similar groups would possibly be able to show engines in this space ... - the retention of the rail line for real railway activity in this zone should be actively pursued in the process ahead.' (Cultmatrix CC, 2003:60)

I thus conclude that the Salvokop site is more appropriate for the placing of a railway museum and a departure point for steam heritage and luxury trains.

Fig. 6.66-71 Perspectives



Approach



Entrance and reception area



View of round-house from reception area



Concourse, with gift shop to left, auditoria on mezzanine level, dining car restaurant in background and existing steam hammer shed visible beyond



Lobby to exhibition hall, with staircase and lift to mezzanine level



Exhibition hall, with freight and passenger train display, platform exhibition space, and surrounding mezzanine level

TECHNICAL DOCUMENTATION



Museum complex: View from west: left to right: workshop with coal bunker, exhibition hall, concourse building behind tower, luxury train passenger departure lounge, and platform (own Jpeg)



TECHNICAL DOCUMENTATION

Location plan 1:5000 and site plan 1:500

Ground floor plan 1:500

First floor plan 1:500

Elevations 1:500

Section AA 1:100

Details 1 - 10

Section BB 1:100

Details 11 - 12

Sections CC - HH 1:200

Ground floor plan 1:333 (Scale chosen to fit A0 page)