



## Architectural Perception for Redevelopment of Railway Termini

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**ABSTRACT:** Along the fast paced changing urban scenario in terms of infrastructure, built forms, demographic shifts, social preferences as well as sustainability needs Indian Railways has also been upfront in proposing schemes and possibilities for redevelopment of the existent Railway Stations.

Major railway termini have become hubs of transport network due to their strategic locations in cities. The quasi-urban spaces of their interiors, increasingly serve various non-transport related functions such as retail shops, cafes, restaurants, supermarkets, clinics or even libraries, packed within a multi-layered environment.

The paper is an excerpt of a study intended to understand Appropriate architecture for Redevelopment of a Railway Station as a Transportation Node.

The study covers aspects like encouraging an architectural vision with a focus on efficient movement of passengers in the station premises, convenience of transfers and interchanges with other modes of transportation, customer safety, security, comfort and convenience, while maintaining quality design and a good integration with the contemporary urban fabric.

The society also accepts the need for a more informed and a more appropriate social architecture that responds to local commuter demands, and at the same time, improves the physical conditions of existing railway stations; thus making railways a more acceptable mode of public transport.

**Keywords:** Architecture, commuter preferences, passenger railway station, redevelopment

### I. INTRODUCTION

In their heydays, when railways were the only long haul means of travel, termini were the sole distributing points for all who lived far away, and also acted as the gateways for these cities. Although at present they no longer act as the city's main gateways due to the rise of car and air travel, but most of them still find themselves among the most pivotal sites in the city.

Indian Railways owns and manages one of the largest Railway networks of the world with over 64,000 Route Kilometers and 7,000 stations.

The Indian Railways carries more than 17.5 million passengers every day and some of the major Railway stations handle 100-200 million passengers per annum.

Most of the Railway stations have been built over 100 years ago, and have a limited and aging infrastructure that handles an ever increasing number of passengers.

These Railway stations are located in the middle of the cities and offer enormous potential for re-development and commercial expansion; thus a need to study the various governing factors that need to be taken into

consideration in order to achieve an optimum use of the land resource available.

Rail transport has been rediscovered as an alternative to the congested road system and it has been identified for a need to connect it to other transport infrastructures to optimize people's choices of travel on local, regional and interstate levels.

The transformation of railway terminus, involving system electrification, introduction to the new technologies and newer concepts of station modernization, have further added much complexity and ambiguity to their internal spaces and related structures.

Furthermore, this development incorporates many more social aspects like the

- promotion of sustainable transport and land use;
- the stimulation of local economies;
- the progress on railway technologies especially the metro rail network ;
- the property market cycle; and
- the impact of globalization.

The paper explores the extent to which architecture can contribute to a new image of railway stations in India and thus promote rail as a worthwhile transport system.

Among the many aspects of the issue the paper elaborates on the following

- Identify and analyze the issues which will help to create a better and more comfortable environment on a railway station.
- Assessing what spatial factors promote good levels of 'natural movement' both in and around a terminus buildings.
- An example of CST, Mumbai to understand the need of a Ground study of the terminus areas along with a historical review of its urban evolution explaining the long term interaction between the railway structure and its urban physical surroundings.

There is also a need to deepen the understanding of the behavior of passengers their particular requirements and thus, draw conclusions to identify possible improvements required by a station premises. The study will be useful for decision makers, planners and professionals working with these building typologies.

## II. EVOLUTION OF RAILWAY STATIONS

The study **investigates the origin of railway station buildings** and their characteristic arched sheds that distinguish them as an industrial revolution invention, and also identifies it as a unique typology.

Time has seen an evolution of the station from the Nineteenth Century model of an elegant front building with elaborate brick details coupled with the wide span train shed behind it, through to modern single structure forms.

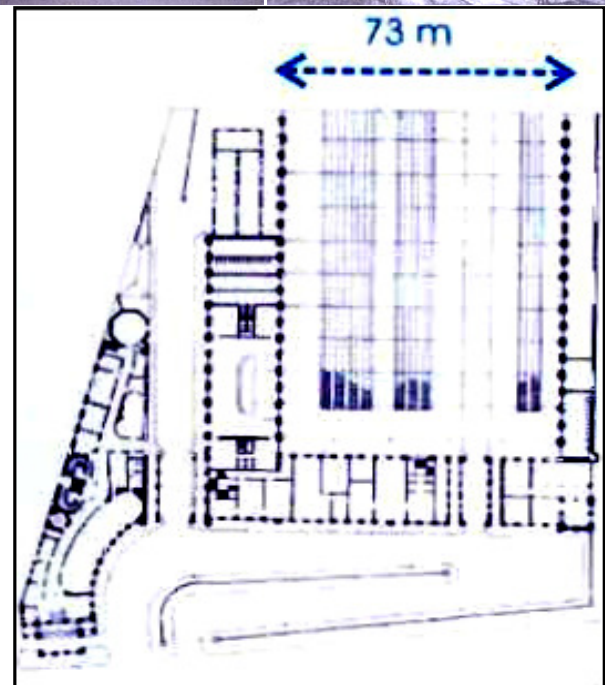
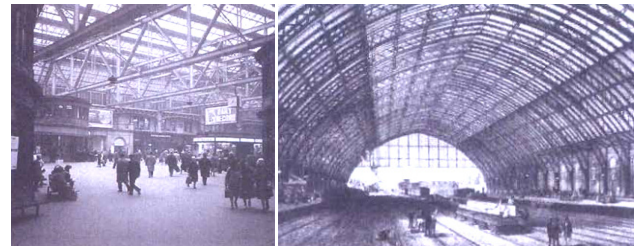
Light, structure and volume have always defined railway architecture and the skillful interplay of these elements gives the station its character.

Because stations have moved from being mono-functional places for rail travel to more complex places with lot of activities going on simultaneously, it is important **to understand the aspects of station design, the design approach and the manuals and standards available as design guidelines.**

The great age of railway station design was initiated in late 19th and early 20<sup>th</sup> centuries. Significant influences appeared in the elaborate classical styles, which originated in France. Examples include Grand Central Terminal in New York City, Main Street Station in Richmond, Virginia, and Union Station in Washington, D.C. Many examples can be seen and found in India too. The Victoria Terminus or the CST Terminus as it is called now is one of the finest examples of the same.

After World War II, the continuous development of railways slowed noticeably.

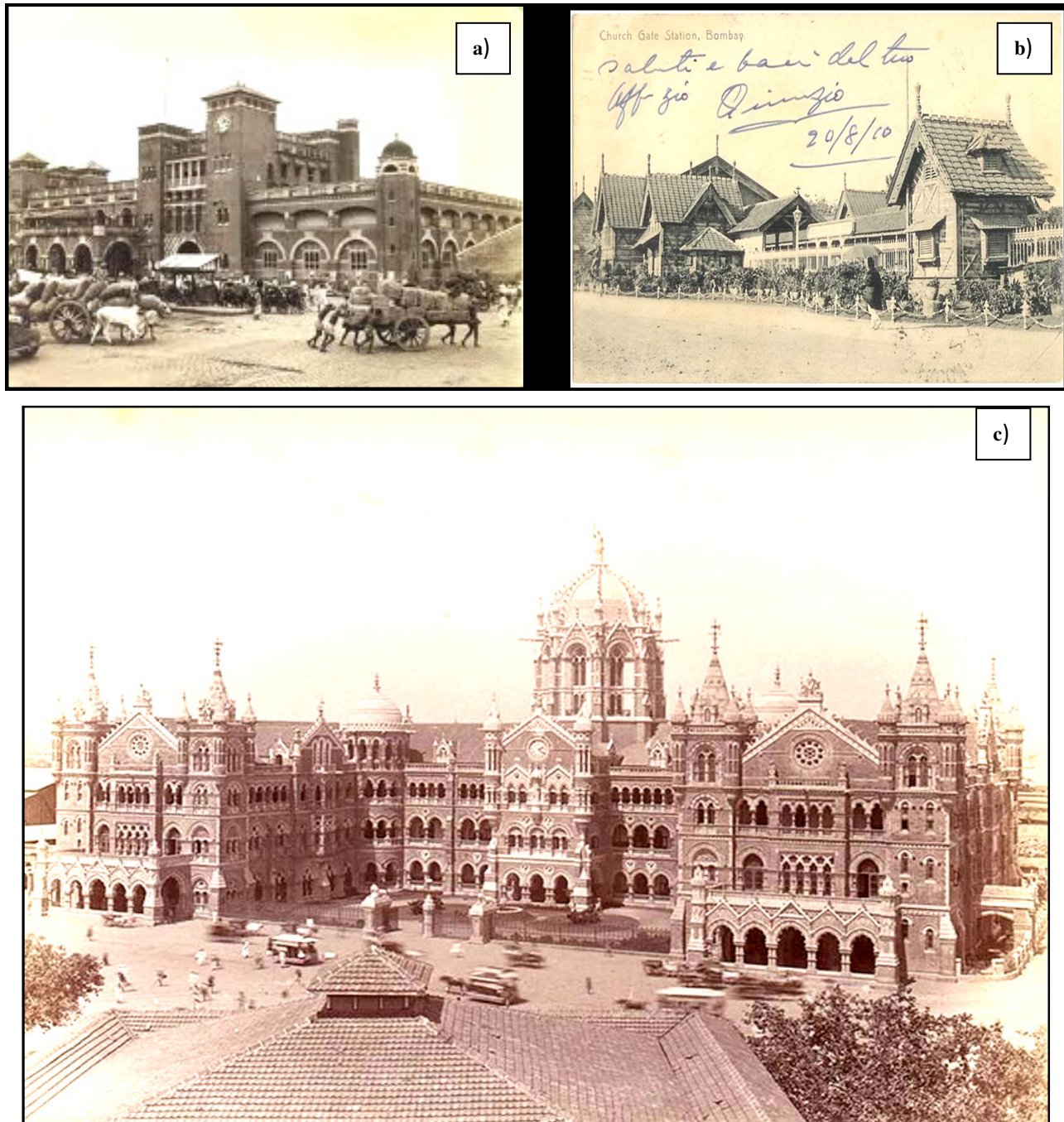
Since rail passenger service in many places started to decline due to the use of automobiles, the growth of bus transport, and the convenience of air travel. Railways were not competitive and many grand stations deteriorated and even closed.



*A View of a hall in Central Station, Glasgow.  
Designed by Rowand Anderson and completed in 1879.  
The different facilities and shops give the station a  
character of an ordinary street in the city.  
Natural lighting through the roof ensures the legibility of  
the space.*

Railway stations entered a new age again in the late 20th century after the introduction of high-speed trains (Binney, 1995; Powell, 1994). As evident throughout the world, many new stations were built, and the old ones were renovated to efficiently serve the system. The revival of the stations was intended to create a continued language in station architecture.

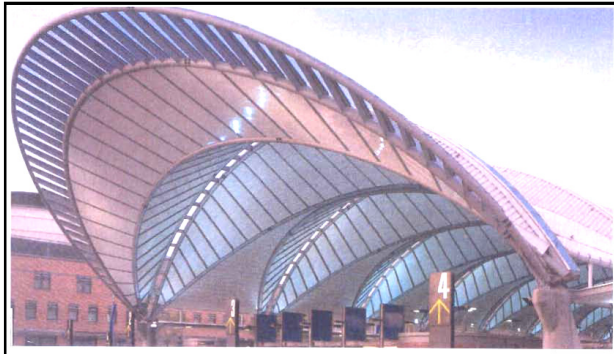




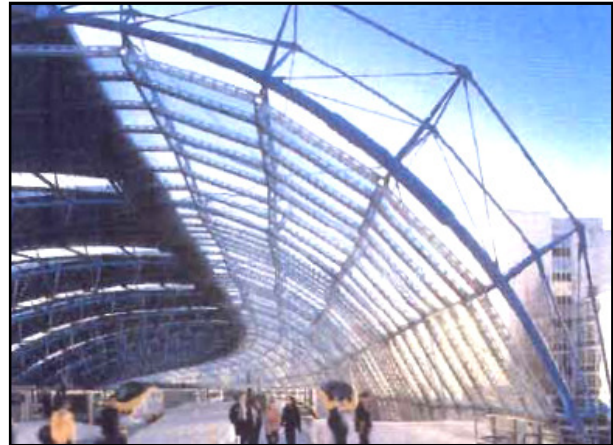
Some examples of Iconic station buildings in India a) Bandra Terminus Station building, Mumbai. b) Churchgate Station building, Mumbai, c) Chhatrapati Shivaji Terminus, Mumbai.

Borrowing from the 19th century architecture, the daring construction of very large spanned train sheds and the use of new materials, such as lightweight steel and glass, become a distinctive feature of 20th century railway architecture also. Once, different transportation modes were unconnected, but in the present scenario there is a

need to move towards an integrated system. Today many railway stations form an interchange between modes of transportation that may include buses, air services, metros, taxi, private cars, and so forth.



**Olympic Park Rail Station**- completed in 1998  
 Location: Sydney, Australia Client: Olympic Co-ordination Authority Architect: Hassell Architects  
 An illustration of the over-sailing canopy above the plaza as a welcoming gesture to commuters.



**Waterloo International Terminal** built in 1994  
 by Nicholas Grimshaw.  
 building demonstrating lightweight steel construction  
 ;articulated structure of the canopy became the architectural expression of the station

The intermodal concept, therefore, needs to be applied to railway stations to reflect a new form of service and to add to the comfort of the commuters.

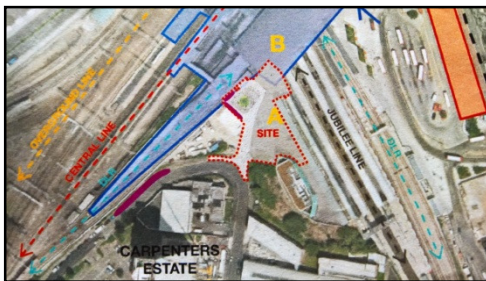
In addition to serving intercity rail lines, the concept emphasizes linkages to other transportation systems, the fast paced life which incorporates lot of daily activities need to be tied up with the transportation, As a consequence, a revived built form for station building needs to be identified.

### III. STATION DESIGN: A Spatial Analysis

There are fundamental principles that have been established in the early examples of successful railway stations. These defined and shaped the station as a unique typology while ensuring that it offered the patrons of the rail service, comfort and convenience in an environment of a fast paced movement of the commuters.

The ideas discussed in this section have been arranged under the following sub-topics:

- Spaces and Activities at a Railway Station
- Railway Stations as Transportation Nodes
- Design Approach
- Qualitative issues of design



**Stratford Station**- completed in 1999  
 Location: London, United Kingdom  
 Client: London underground Architect: Chris Wilkinson Architects  
 The architect's approach in creating a landmark building amplifies the significance of the node as a system that combines form, structure and climatic control elements.  
 This approach ensured the creation of an efficient iconic building.  
 The station was meant to be a catalyst for revitalizing this part of London, and the site is located adjacent to a bus rank and car park, and as such, can be seen as an interchange.



#### IV. SPACES AND ACTIVITIES AT A RAILWAY STATION

The spatial layout of activities at the stations have now gone beyond the technically required main functions incorporating just the movement of trains and the commuters. Many new activities have added to the station premise which can further be segregated as core, transit, peripheral, and administrative areas.

**Core areas** focus on passenger movement.

Conceptually, they can be considered as a circle surrounded by closely related activities and areas that include ticketing, information, baggage handling, reclaiming, and waiting.

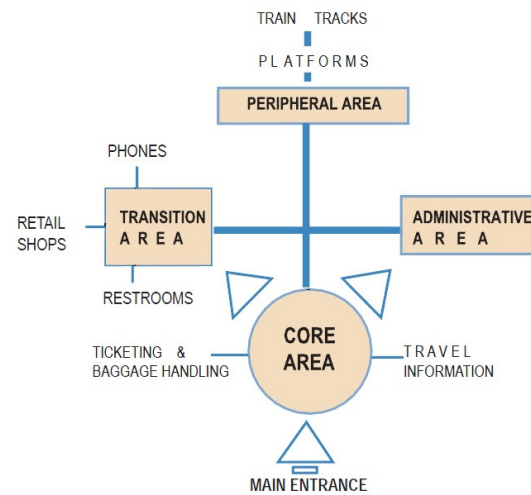
**Transit areas** connect transit facilities to the core areas. They include secondary, but often-essential facilities such as, restrooms, telephones, and commercial spaces.

**Peripheral areas** support circulation outside the main buildings including platforms, tracks, service areas and parking spaces.

**Administrative areas** control both traffic and station management. Found only in some station types that provide complex arrangements for handling a large number of passengers. These areas can be isolated from other facilities or inserted among them.

The four areas described above represent the major physical and functional elements considered necessary in understanding a railway station and, consequently, must be included in its design. The interrelationships

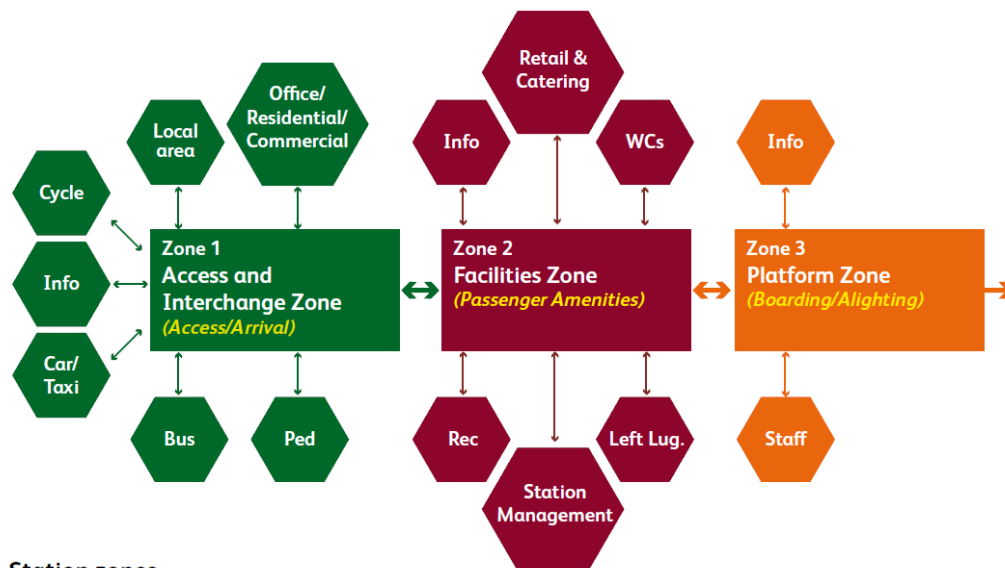
between the four functional areas collectively make an intermodal station.



Segregation of activities on a railway station

The design of a commuter friendly station premise includes more than just the main functions of traditional stations having spaces dedicated for ticket halls, waiting areas, platforms, and trains.

Many supported functions need to be combined with the basic ones in order to adequately meet the diverse needs of the people while in transit.



Station zones

Functional requirements of various zones of a railway station.

	<b>Activities</b>	<b>Area requirement</b>	<b>User</b>	<b>Comments</b>
<b>Core Area</b>	<b>Departing</b> <ul style="list-style-type: none"> <li>- Checking Train schedule</li> <li>- Ticketing</li> <li>- Baggage handling</li> <li>- Fare Collection</li> <li>- Waiting</li> </ul> <b>Arriving</b> <ul style="list-style-type: none"> <li>- Meeting &amp; greeting</li> <li>- Reclaiming baggage</li> </ul>	<b>Main Hall</b> <ul style="list-style-type: none"> <li>- Information</li> <li>- Ticket office</li> <li>- Ticket machine &amp; counter</li> <li>- With baggage check-in</li> </ul> <b>Departure &amp; Arrival hall</b> <ul style="list-style-type: none"> <li>- Automated fare</li> <li>- Choosing next mode of transport</li> <li>- Meeting point or Seating</li> </ul>	<ul style="list-style-type: none"> <li>- Passengers &amp; guests</li> <li>- Staff</li> </ul>	<ul style="list-style-type: none"> <li>- Ticket sales in several forms depending on type and size of stations.</li> <li>- All functions may take place in one open space, i.e., main lobby, ticket hall, etc. or separate areas, but connected.</li> <li>- An arrival hall can normally be the same area as a departure hall.</li> </ul>
<b>Transition Area</b>	<b>Departing, Arriving, Working &amp; Visiting</b> <ul style="list-style-type: none"> <li>- Using public facilities.</li> <li>- Walking to vehicles or waiting around before boarding</li> <li>- Shopping or eating</li> </ul>	<b>Connecting Area or Main Circulation.</b> <ul style="list-style-type: none"> <li>- Public service facilities, i.e., restrooms, public seating &amp; lockers.</li> <li>- Amenities, i.e., shops, restaurants and snack bars.</li> </ul>	<ul style="list-style-type: none"> <li>- All users: Passengers and their guest, staff, and visitors.</li> </ul>	<ul style="list-style-type: none"> <li>- Public facilities are necessary for any type of station.</li> <li>- The variety of amenities depends on the type, size, and concept of stations.</li> </ul>
<b>Peripheral Area</b>	<b>Departing, Arriving, Working</b> <ul style="list-style-type: none"> <li>- Boarding.</li> <li>- Loading and unloading.</li> <li>- Maintenance and technical support.</li> </ul>	<ul style="list-style-type: none"> <li>- Platforms</li> <li>- Tracks</li> <li>- Workshop or vehicle service area</li> <li>- Traffic Signal.</li> </ul>	<ul style="list-style-type: none"> <li>- Passengers.</li> <li>- Staff.</li> </ul>	<ul style="list-style-type: none"> <li>- Numbers of platforms, train tracks and maintenance areas are derived from numbers of passengers a terminal can handle.</li> </ul>
<b>Admin Area</b>	<b>Working &amp; Controlling Traffic System</b> <ul style="list-style-type: none"> <li>- Administrative activities</li> <li>- Controlling traffic system and functions in the stations.</li> </ul>	<ul style="list-style-type: none"> <li>- Management office.</li> <li>- Traffic Controlling and Security office</li> </ul>	<ul style="list-style-type: none"> <li>- Office Staff</li> <li>- Visitors.</li> </ul>	<ul style="list-style-type: none"> <li>- Locations of administrative office may be isolated from other activities or inserted among facilities in every area, but they have to be able to control the system.</li> </ul>

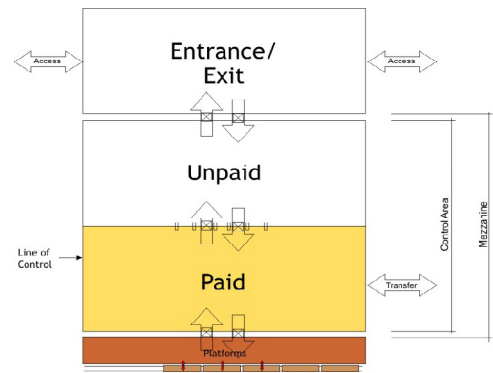
A summary of activities at a station and respective areas required.

To achieve good functional flow among the four areas, and smooth connections in and out of the stations, their physical relationship needs to be linked together.

(i) Additionally, the space capacity must efficiently handle the increasing number of passengers.

(ii) Clear routes to other transport modes and to pedestrian ways should be well designed and safe to use. The width of routes should reflect the functions within the building and the scale of movement.

(iii) Other significant features inside the station building need also to reflect functional hierarchies. Passengers should be able to find their way from entrance to ticket hall, to platform, and to train without obstruction.



Flow diagram of functional elements within railway stations.

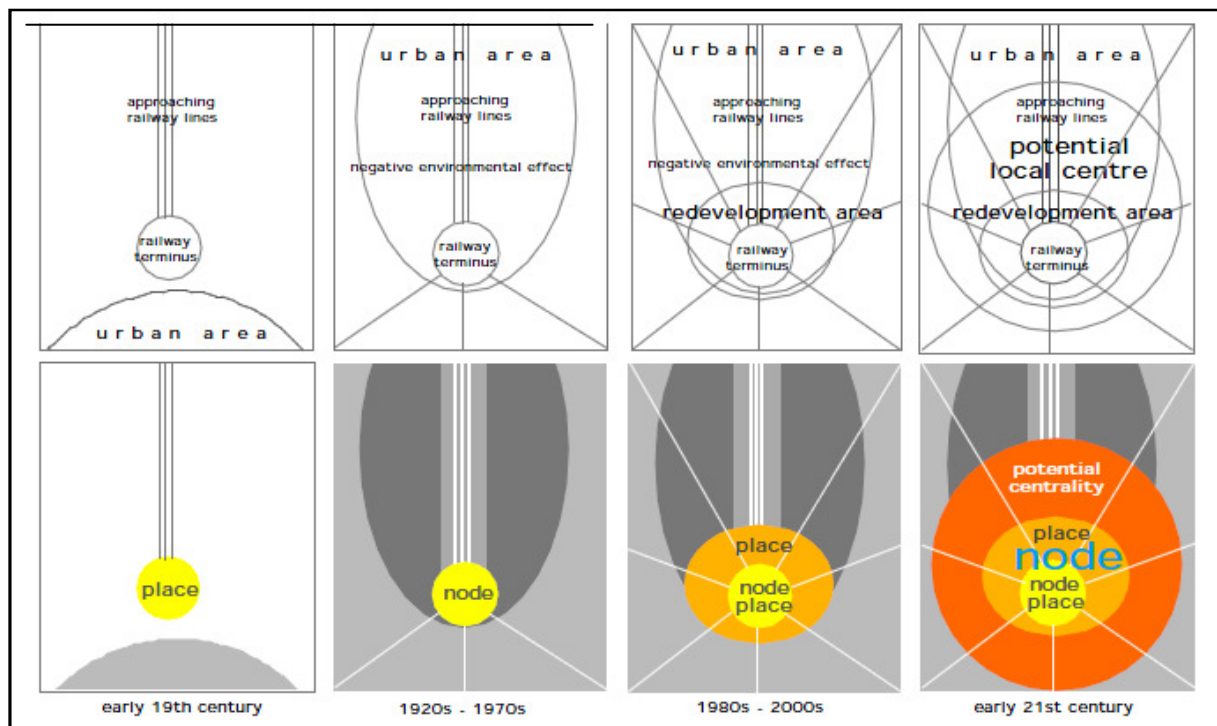
## V. RAILWAY STATION AS A TRANSPORTATION NODE

Nodes are primarily created by the convergence of paths into a focal point. Paths are lines of travel used by people, and nodes therefore become areas of concentration and places where development starts.

Transportation nodes are triggered by the convergence of more than one form of transportation into a point which creates an interchange where the different modes of transport can feed into each other. An example of how a transportation node or interchange works would

be a case where people ride their bicycles from home to board a train at the station. Since there is a break in transportation from the bicycle to the train within a node, this creates a concentration of people in these areas.

Consequently, the concentration of people becomes an opportunity for the development of facilities such as shops, housing and offices that would be useful to the people at these nodes. The meeting point of different paths to form a transportation Node, can therefore initiate a commercial node.



The historical evolution of a railway termini.

### Main Components of a transportation node:

Components that make up a transportation node differ with each specific situation and are based on the type of facilities that the node is planned for. For the purpose of this redevelopment design, the following elements that make up a node should be studied

1. Paths
2. Transportation station
3. Supporting Facilities
4. Public Open Spaces

**1. Paths** are lines used or designed to be used by a viewer to travel between points. These include streets, roads, walkways and railroads (Lynch, 1960). Pedestrian walkways that connect the different modes of transportation are vital in facilitating circulation for pedestrians and the access of the

different facilities within a node. While the walking distance for passengers from their work place or homes to the station should ideally be 1 kilometer (SARCC, 2006), Alexander (1983) suggests that the walking distance between the different modes of transport within a node should be approximately 90metres, with an absolute maximum of 180metres.

**2. Transportation Station** - since a node is a meeting point of different paths and transport modes, stations are provided to cater for the people boarding the vehicles. The railway station, taxi stands as well as the bus terminus make such transitory nodes. Parking for private vehicles can also be placed in this category. Since a taxi stand or a station can have commercial activities within it, the transportation station can become a node of activities on its own.

Hertzberger (1991) sees railway stations as public spaces, and as roofed parts of the city. This idea clearly indicates that stations have to be designed as covered streets, with facilities like shops, which cater for more than just rail travel.

**3. Supporting Facilities** are developments that occur as a result of the transportation stations. These include amenities like housing, office and retail facilities. Since people are less inclined to use deserted interchanges, surrounding transport nodes with mixed use developments including offices and housing keeps the node lively. Railway stations have over the past few years have developed to house diversified functions as they cater for more than just rail travel. This then raised the idea of catering for communities who arrive at the station with no intention to travel, but to visit the restaurants and other commercial facilities which have now started becoming a major part of railway station buildings.

**4. Public Open Spaces** are either squares or parks, and occur in between the buildings or the stations within a node. The square is a key element in a node as it acts as an arrival point for pedestrians and a central point of orientation. The squares should be given definition through buildings that surround it, thereby acting as edges.

In conclusion, a transportation node is made up of different elements which further include different activities, indoor and outdoor spaces, which flow one into the other, and hence the need to look at the different elements as part of the whole node that facilitate easy pedestrian movement within it.

## VI. DESIGN APPROACH

Issues related to Design of Railway Station ought to be studied from whole to part, acknowledging the implicit hierarchy of following three categories/orders, each with their own design considerations:

**1. Transportation Infrastructure On And Around The Site** - Describes the creation of Station volumes through large-scale engineering. Yard alignment, number and size of platforms, size and location of concourses, road networks dissipating the originating/terminating road traffic into the city, capacity of parking, traffic circulation, size of real estate at the station, etc. fall under this category and shall be designed at the primary stage.

**2. Building Structure and its activities** - Building components, such as detailing of concourse space, facilities for passengers, operational offices, staircases, escalators, elevators, passageways, entry, exits, roof, ceilings, walls, modal split of parking, type of real estate, development service ducts, etc. fall under this

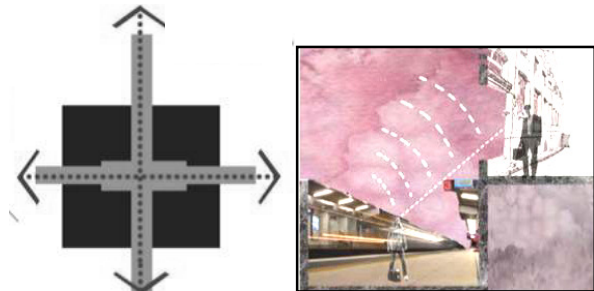
category and shall be designed at the secondary stage as per the profile of passengers using the Station;

**3. Interiors** - Subsidiary products and components layered over secondary elements to activate and animate stations fall under this category. This includes passenger information system, seating, lighting, advertising, handrails, etc. and shall be designed at the tertiary stage for bringing life and animation in the Station space.

## VII. QUALITATIVE ISSUES OF DESIGN

Apart from the above stated quantitative issues the following aspects of station design too add to the quality of the space. Depending on the needs of the station, the design of these spaces has to also include supplementary functions; for instance, integration of light and structure, access for disabled people, and commercial development. It is possible to also see them as an expression of modern technology reflected in their daring structure and use of new materials.

**Integration of Light And Structure.** The structural expression of the station helps achieve the internal circulation by allowing more natural light through the building to aid navigation.



Vision lines connect





**Access for All.** The design of the station ought to meet barrier free requirements throughout the facilities. Accessibility is an issue that concerns everyone. Ross (2000) envisions that disabled people using railway stations are not only people in wheelchairs, but they include blind and partially sighted people, deaf people and those with poor hearing, people with learning disabilities, people with heavy luggage, people with young children, and elderly people.



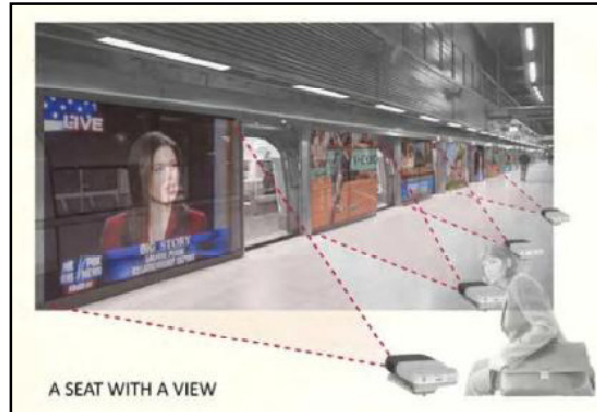
Many stations have similar features—framing, columns and trusses. This has meaning in architecture not only for aesthetic, but for practical reasons as well.

The manipulation of natural light through transparent roofs and walls, blending with artificial light, could provide passengers the clarity of orientation in the building more effectively than internal signs only.

The lines of columns are also important to guide the passengers to their preferred routes.

**Travel Information.** Travel information systems are essential for any station. Up to date and accurate information is always required. It could be displayed in various forms, for example posters, fixed signage, TV monitors and LCD screens. The use of them, however, needs appropriate balance that depends on types and numbers of passengers at each station (Ross, 2000).

In station complexes, information should be provided in appropriate forms, and it needs to give decision points which allow efficient space for passengers to find their ways around the building. Certainly, the displays must be visible in all conditions.



*Display of useful data in printed or electronic format at a central location can help proper movement on the station.*

**Commercial Developments.** Adopting the intermodal concept makes the station more complex. More functions are integrated, and numbers of passengers are increased. The stations appear to be more than people-processors, but can also expedite people's lifestyles. Similar to the design of airport terminals, the trend of the station design is to take full advantage of the time passengers wait around by providing facilities and entertainment. It is evident that many grand stations begin to look like shopping districts that become tourist attractions. Many urban functions are brought inside the stations. It gives the opportunity to bring together restaurants, retail outlets, cafes, offices, currency exchanges, banks, post offices, car rental companies, movie theaters, and so on.



**Advertising and Public Arts.** Advertising and public arts can be used to brighten up the stations. Besides the architecture of the stations that gives exterior appearances and acts as local landmarks, artwork and graphic design inside could help identify the stations and give them an image. The repetition of advertising posters along a distant walkway may entertain the passengers while walking to their trains.



*They may serve the interiors as either backgrounds or focal points.  
An outstanding sculpture or painting at the booking hall or the station concourse may act as a good meeting point.*

### VIII. SCOPE OF FURTHER STUDIES

The relationship between urban needs and patterns of pedestrian movement in the terminus areas, appropriate architectural elements and their proportions; relationship between floor area and the heights and functional elements of buildings could be further areas of study. Other aspects related to socioeconomic or political context of the terminus areas such as ownership rights, management of the premises, etc. can also be taken up for further study. Topics like, the aesthetics involved with the redesigning of a Railway Stations, the issues related to the sustainability aspects

of the site also can be studied as independent subjects or as a further additional studies.

### IX. CONCLUSION

As a general understanding rail has been the most economically viable mode of land transport, which makes it a relevant option for redevelopment. Apart from being affordable, rail is also a safer and much more efficient public transport system. The Indian Railways has introduced Redevelopment guidelines for Railway Stations, which is set to revive rail in India and establish it as a major public transport system. This excerpt is an architect's contribution to a current body of research being assembled by different professionals towards a better railway system and ultimately an improved transportation system in the country. The station environment is a high-paced one, and the architects' challenge is to make a place which facilitates unobstructed movement through the station, whilst not compromising on the quality of the spaces. Architecture can play a role in changing the image of railway stations in India, by creating architecture that better facilitates the function of the station, while ensuring that the environment is inviting to the targeted users. Design principles like the use of natural lighting, linkages and the legibility of the station circulation, as discussed in this study, are one of the main components to be applied in the creation of better station environments. Adopting a technical, strategic redevelopment plan to the railway stations across the country would categorically transform these national assets, make them a preferred commuter choice, provide a financial boost to the country's sustainable and environment friendly mode of transport and thus Enshrine our cardinals.

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