INDIAN RAILWAY
STATIONS DEVELOPMENT
CORPORATION LIMITED

06b

Appendices and Annexures to Guidebook for Conservation of Railway Heritage Assets

Schedule of Appendices and Annexures

This document is a compilation of Appendices and Annexures to 06b: Guidebook for Conservation of Railway Heritage Assets. These appendices and annexures contain sample formats reflecting processes and outputs required from each subtask for preparation of Heritage Assessment Report, Heritage Building Condition Report, Heritage Conservation and Reuse Plan and Heritage Management and Maintenance Plan. The technical consultants/ experts using these Appendices and Annexures may suitably modify these to meet the desired outputs.

Each Appendix and Annexure can only be filled by qualified experts. However, each format also contains notes for project managers and supervisors to verify the outputs provided by Technical Consultants and Experts. Following is the schedule of all Appendices and Annexures in this document:

Appendix I: Inventorying

Format for Inventorying RHA shall be as shown below.

1.0 Identifier

Existing Station Codes shall be used as Unique Identifier.Together with added suffixes, this shall identify the individual features within.

1.1. Name of the Railway Station: *<Name of Station; Current name>, <Erstwhile name, if name has been changed -- with date>*

1.2. Address: *<Name of City>, <Code>*

1.3. Protection System:

1.3.1. **Status:** *<Protected/Unprotected>*

1.3.2. **Gazette Notification No**.: *<Fill as Gazette>*

1.3.3. **List of Laws and Regulations Protecting Resource:**

Table 1: List of Laws and Regulations

S. No.	Field	Where to source it
i.	*<Name of Document > (add rows as needed)*	*<Map No.> (Maps enclosed with documents)*
ii.		
iii.		

1.3.4. **List of Designation:** *<List of Acts, Regulations, Rules>*

1.4. *List of Plans (with corresponding maps) applicable to Station, Station Area and Catchment*

Table 2: List of Plans applicable to RHA

S. No.	Name of Plan	Archiving System
i.	Master Plan	*< Web link of plan inserted here and relevant excerpt to be appended >*
ii.	Development Plan	*< Web link of plan inserted here and relevant excerpt to be appended >*
iii.	Zonal Plan	*< Web link of plan inserted here and relevant excerpt to be appended >*
iv.	Local Area Plan	*< Web link of plan inserted here and relevant excerpt to be appended >*

1.4.1. **List of Maps at City level:**

Table 3: List of Maps at City Level applicable to RHA

S. No.	Name of Plan	Archiving System
i.	Land use	*< Web link of map or hardcopy to be appended >*
ii.	Zonal use	*< Web link of map or hardcopy to be appended >*
iii.	Revenue Map	*< Web link of map or hardcopy to be appended >*
iv.	Eco-region Map	*< Web link of map or hardcopy to be appended >*
v.	Maps showing all RHA in the city	*< Web link of map or hardcopy to be appended >*

2.0 Ownership details of RHA

Table 4: Ownership Details to RHA

S. No.	Parameters Survey Numbers	Owner of Survey Number	Third-Party Use (Tenant/ Lessee/ Licensee/ Encroacher) for each Survey Number	Encroachments (if any)	Litigation (if any)
i.	Survey no. *XX*	*<Full name> <Address> <Survey no. occupied>*	*<Document no.>*	*<Document no.>*	*<Document no.>*
ii.	Survey no. *XX*				

Instructions to fill *Table 4: Ownership Details to RHA:*					
	Survey Number shall be as per that assigned at the local Land Revenue Office.	*Full name and address of the person/agency occupying the assigned survey number.*	*Copies of documents specifying land transfer, Terms of Reference, and Period of tenancy to be appended*	*All encroachments to be marked on the site plan, mentioning Survey boundary and Area of encroachment.*	*Append copy (ies) of litigation.*

Note:

- Add additional rows where needed For each survey number:
- Specify if contiguous with Station Areas or not;
- Specify total acreage of contiguous and non-contiguous parcels;
- Coordinates - Boundary vertices and Centre of contiguous, non-contiguous Station Area, and
- Specify area and Built-Up area

3.0 Chronology of Development

Table 5: Chronology of Development

S. No.	Information	Date/ Year/ Period	Extracts from Archives/ Graphical representation
3.1.	When was the site identified as a Railway station		*<Map no. XX>*
3.2.	Periods of:		
3.2.1.	Construction of the Railway Station Building	*<Initiation> - <Completion>*	*<Map no. XX>*
3.2.2.	Operation of Line/Traffic	*<Date>*	*<Map no. XX>*
3.2.3.	Subsequent extensions/Addition/Removed	*<Date>*	*<Map no. XX>*
i.	*<Name of part >*	*<Date>*	*<Map no. XX>*
ii.	*<Name of part >*	*<Date>*	*<Map no. XX>*
iii.	*<Name of part >*	*<Date>*	*<Map no. XX>*
3.2.4.	Relocation of Railway station and/or its parts	*<Date>*	*<Map no. XX>*
i.	*<Name of part >*	*<Date>*	*<Map no. XX>*
ii.	*<Name of part >*	*<Date>*	*<Map no. XX>*
iii.	*<Name of part >*	*<Date>*	*<Map no. XX>*

Note:

- Indicate validated date. If the date is estimated, mention the basis of estimation. In all other cases, mention the source.
- Add additional rows where needed.

- Append drawing(s) showing
  - How the area, the Railway Station Area, and the Station evolved.
  - Areas of proposed extension and existing land use, site features and siting of Railway station, Station Area and Types of Railway Assets.
- Append multiple drawings/maps where needed.
- This section shall be used to draft the Statement of Significance, inform conducting a Life Cycle Assessment, and in proposing a Master Plan.

4.0 Location and Distribution of RHAs

Provide details for all features within the Station Area

Table 6: Location and Distribution of RHAs

4.1.	**Object ID:**			4.2.i.	**Subtypes:**	
				4.2.ii.	**Species type:**	*<For floral and faunal components, mention the number of type and subtype here, and append a list of details>*
4.3.	**Category:**	*<Moveable>< Immoveable>*		4.4.	**Location:**	*<Coordinate>*
4.5.	**Magnitude:**	*<Area>; <Volume>;*			*<Survey Number>*	*<Any other locational ID attributed>*

4.6 Character Defining Features

Table 7: Chronology of Alterations to Character Defining Features

4.6.1.	**Original CharacterDefining features:**	*<Supportive drawings and photographs indicative of Character Defining features, not limited to Setting, Access, Form, Openings, Projections and recesses, Roof type, Material use, Symmetricity, Colour, et al.> to be appended to this section.* This section shall also be used to fill the Property Development Card (Heritage Card)	
4.6.2.	**Extension/Alteration to Character-defining features:**	*Date(s)/ Year(s)*	*additions - list chronologically + reasons if known*
		Date(s)/ Year(s)	*(planned) restorations - list chronologically + reasons*
		Date(s)/ Year(s)	*(unplanned) repairs, alterations, retrofitting list chronologically + reasons*
		Date(s)/ Year(s)	*demolitions - list chronologically + reasons if known*
		Append drawings showing above-mentioned changes across lifetime	

5.0 Pre-Assessment of Physical Condition

<Fill short description here>

Observations to be validated through the State of Conservation.
Append crossed-referenced drawings and photographs depicting condition.

5.1 Structural deterioration

i.	Signs of existing structural deterioration	
ii.	History of structural deterioration	
iii.	Vulnerabilities to/Potential threats, Risks, and Hazards to structural stability	

5.2 Threats/Disturbances to context

i.	Signs of disturbance	
ii.	History of Threats, Hazards, and Risks	
iii.	Vulnerabilities to/Potential threats, Risks, and Hazards	

5.3 Impact of usage

< Add rows as required>

Table 8: Chronology of Uses

S. No.	Code	Name of function	Use type	Period of use	Impact of Use
i.	*<Insert Code>*	*<Name>*	*<Active/ Inactive/ Not used/ Likely to be discontinued>*	*<From /year> - <To/ Year>*	*<State compatibility based on preliminary survey, and update after detailed survey>*
ii.					

5.4 Degree of Adaptability

<State initial assessment at the beginning of the project, and update it with a thorough survey>

6.0 Parameters of Integrity

To be identified irrespective of physical condition.

Append drawings and supporting photographs to each field.

Use additional sheets to elaborate observations, and summarize in the tabulated format as in Table 9: Summary of Conditions of Integrity.

Table 9: Summary of Conditions of Integrity

		i. Significant	ii. Contributing	iii. Non-Contributing
6.1.	**Historic Structural Integrity**	*Significant - First/Original scheme or phase of construction*	*Later phase of construction by* (a) *The same architect/contractor that complements the original construction techniques, material and/or design schemes.* (b) *The same architect, or any other, that is representative of a period and/or complements the setting.*	*Later phase of construction does not follow Conditions of 6.1.ii (a) or (b), where construction is faulty, and where poor quality material has been used.*
6.2.	**Social Functional Integrity**	*Intended use continues*	*No longer performs intended purpose but in Operational use and/or Associational significance (associated with technology, persons, events, culture, et al).*	*No Associational significance, and is not in use.*
6.3.	**Visual-Aesthetic Integrity**	*First/Original Layout scheme or Phase of construction*	*Later phase of construction but seems as a visual whole as they match in style, form, proportion, symmetry, and/or any other property.*	*Does not complement the whole in form, symmetry, proportion, and/or any other property.*

6.4 Statement of Integrity

<Summarize State of Integrity of RHA.>

7.0 Statement of Significance

State within 500 words and in flowing text only: What makes the RHA as a whole, and its individual part components, important to the overall Railway system – and how it has generated a socio-economic footprint in its context. It shall convey what to appreciate, identify and respond to while designing, thereby complementing Railway HA that may not be formally protected or recognized. Specify how the city and its services benefit, and are benefited, by the RHA and the Railway system.

To convey the importance of Architectural features, Structural systems and Ornamentation, mention specifics of What and How such features are important, and What are its specifications in terms of Proportions, Colour combination, Material usage et al -- and not mere general history or description of features (for example, stating that the building is Indo-Saracenic will be treated as an incomplete description).

8.0 External System References

Existing documents, Graphics, Norms and Supporting information shall be tabulated here for ready reference. An additional field may be added to include open or crowd-sourced information, which may be referred to after validation.

8.1 Regulations and Consultancy reports

Table 10: List of Regulations and Consultancy Reports

S. No.	Field	Name of Document	Where to source it
1.	Legal documents	*<Full name of the Document and Date of publication>*	*<Web link or Location where document can be accessed>*
2.	Regulations		
3.	Guidelines		
4.	Handbooks		
5.	Project/ Consultancy/ Reports (other than Conservation, Maintenance and Management Plans)		
6.	Conservation, Maintenance and Management Plans		
7.	Open or Crowd-Sourced information		

9.0 List of References

Insert sources referred for the purpose of filling this inventory in APA format.

Appendix II: Measured Drawing and Documentation

Below is the Minimum Generic List of Information expected from each set of drawings. The Client may modify, revise, review and add to the list - depending on specifics of the project involved.

Three sets of drawings are expected as deliverables:

i. **First set** Shall comprise recording state of RHA on 'as-is' basis, and are of 3 types:
1. Survey Drawings.
2. A priori state of RHA,
3. Survey of changes across lifetime.

ii. **Second set** Shall comprise recording of:
State of Conservation of RHA.
Impact of changes and continued use to a priori.

iii. **Third set** Shall comprise of:
Proposed Conservation of RHA.
General Arrangement Drawings, Laying-out Instructions, and Specific Working Drawings of Details of Proposals.

All Proposal Drawings shall provide general arrangement of all stages of development. Depending on the type of details involved, Client shall identify the list of details for which additional working drawings has to be prepared by the TC/others.

Structural assessment and proposed details shall be mandatory for all proposals that require changes to the Structural system, Loading pattern, Introduction of New Spaces by extension, division, alteration of any kind to existing spaces, or where Introduction of New Construction affects the afore-mentioned original structure.

Table 11: Instructions for Architectural Drawings

1.	**SITE LEVEL - I**
Recommended scale: Scale to be modified as per extent. Provided in soft/.kmz format and a scaled hard copy.	
Minimum Sheet size: A2	
	The following to be marked either on a satellite (city or regional level) GIS map: Boundaries demarcating Historic Environment and Historic Zone(s). Significant, Contributing and Non-contributing features. Original and prospective network of Assets owned by the Indian Railways and other Agencies that are either associated with, or support, or draw support from the Railway System.
2.	**SITE LEVEL - II**
Recommended scale: 1:500 Depends on the scale of the project: Minimum 1:500 for Catchment Area; and 1:250 or Buildings/Site for a distance of 100metre from the Historic structure.	
Minimum Sheet size: A2	
2.1	**Survey Drawings**
	Total Station Survey Drawings (Raw plan) Catchment Plan: Contour plan drawn at an interval of 0.5m. Revenue boundaries. Boundaries depicting limits of protective designations. Building Roof footprint and landscape features. Existing site and landscape features. Infrastructure layout. Existing routes and access. Contiguous RHA, Contributing and Non-contributing features.

2.2	**Condition Mapping and Condition Assessment Drawings**
	Site Plan marking issues that have direct/indirect impact on the Railway Yard area: Drainage, water logging and other water-related issues. Levelling, change in original site contours. Issues related to location of infrastructure, amenities and facilities. Issues affecting Traffic including physical and visual access to RHA. Usage of areas/abandoned areas within the Yard, and that contiguous to it affecting the RHA. Changed Historic landscape. Risk and Vulnerability Mapping.
2.3	**Proposal Drawings**
	Plan marking the proposal at Site Level: Traffic management plan/Circulation plan. Landscape plan. Drainage plan. Dismantling and Demolition plan (if any). Disaster Management plan.
2.4	**Post Implementation Drawings**
	Any changes from the initial proposal, its impact on the implemented scheme on the RHA and overall area, subsequent changes required for implementing risk assessment and management plans/actions.
3.	**YARD LEVEL**
Recommended scale: 1:250 for all drawings; provide details in 1:100 or 1:50 or as specified.	
Minimum Sheet size: A2	
3.1.	**Survey Drawings**
	Total Railway Station Survey Drawings (Raw plan) **Yard Plan** Drawings marking the following: Original Railway property boundary, site boundary, plot boundary, built features/components. Original Urban design and Public space system. Layout and chronological addition of components and features overlayed on original scheme, Notified areas, Ward plans, or any other boundaries necessary for decision-making. Contours at interval of 0.5m, especially for sites that are subject to flooding. Spatial planning, Circulation, and Multi-modal interchanges. Movement of Goods, Passengers and Services. Land use and Building use, and Surface utilization. Road layout, Landscape features - existing and historic. Drainage features with slope analysis. Infrastructure distribution and Buildings of use/disuse. MEP services. Roof plan, and Finished levels.
3.2.	**Condition Mapping and Condition Assessment Drawings**
	Change in Historical layout/setting or additions/alterations to skyline, leading to loss of Historical significance and visual linkages of the area. Loss of HAs, historical landscape features. Drainage issues. Infrastructure issues. Issues with circulation. Risk assessment of HAs. All issues affecting parameters mentioned in Heritage PDC to be marked here.

3.3.	**Proposal Drawings**
	Drawings marking the proposal at Yard Level: Structure Plan depicting Phases of development. Traffic management plan/Circulation plan. Landscape plan. Drainage Plan. Demolition Plan (if any). Disaster Management Plan. MEP drawings marking the location of the building and any external wiring, location of manholes, manhole schedule with details of inert levels, slope, depth etc.
3.4.	**Post Implementation Drawings**
	Any changes from the initial proposal, its impact on the implemented scheme on the RHA and overall area, subsequent changes required for implementing risk assessment and management plans/actions.
4.	**BUILDING LEVEL**
Recommended scale: 1:250 and 1:100 for all drawings; Details in 1:20 or 1:10 or any other as specified to show details like openings, grills, proposed interventions with direct impact on the Historic fabric -- like in case of Stitching of structural cracks, Addition of structural members (in case required), Replication of Historic patterns etc.	
Minimum Sheet size: A3	
4.1.	**Survey Drawings**
	Original and altered Building Plan, Elevations, Sections and Details *Use separate drawings for each layer of information.* *All information to be shown at least in Plan and Elevation form, unless mentioned otherwise.* *Moveable features and assets to be photographed, and inventoried.* General layout of different levels and Reflected ceiling plans. Additions, alterations, extensions and past conservation or repair work undertaken to original layout and feature. Moveable and Immoveable features, equipment and objects. Interior design scheme including soft furnishing and Building infrastructure. Colour scheme, Building craft details, Texture and Material distribution. Drainage and Sanitation Plan. Vertical and Horizontal movement plans. Structural system and joinery details. Layout of equipment and services of water supply, Fire safety and Energy performance installations. Room-by-room uses and its supporting infrastructure. Advertisement and public outreach system.
4.2.	**Condition Mapping and Condition Assessment Drawings**
	Use separate drawings to depict each Causal effect, and Segregate between causes and symptom. *All information to be shown in Plan, Sectional elevation and Elevation form, and be supported by photographs.* *The maxima-minima depicting seasonal variation in States of Conservation are to be depicted in the drawings, and be marked in corresponding photographs.* *Handbook for Condition Mapping identifies the list of common issues affecting the structures. The given Legend is to be used to map State of Conservation. Change in Legend needs to be approved by the Client.* Recording of active and passive issues affecting State of Conservation. Plan depicting Impact Zone, and Origin of sources of risks and vulnerabilities. Plan depicting Changes proposed in contiguous and adjacent properties (whether detached or attached to the RHA).
4.2.	**Proposal Drawings**

	Proposal Drawings shall also indicate repair work for stabilization, and that required for rendering the facility functional. *The quantum of work indicated shall be per space basis, and shall have to tally with the estimate quoted for repair and maintenance of the RHA.* Plan showing phases of execution of Conservation works. Locations of emergency, regular and special works. Details of proposed structural repairs and upgradation. Details of proposed MEP repair and upgradation -- and shall include automated systems for Fire safety, Energy performance and all other installations for vertical circulation, and access to disability. Specification of materials, finishes and colour schemes. Locations of reversible and irreversible interventions including addition, alteration, alternation, demolition, openings, projections, volume of space, historic features, landscape in plan, elevation, section and details. Location of areas likely to be cordoned off/rendered inaccessible during conservation process and alternative provision. Location of changes/upgradation for proposed continued use/adaptive reuse. Analysis of condition of Structural System to be appended -- where continued use or adaptive reuse require modification of either the architectural or structural system, or both, or if construction of subsurface cavity, excavation, extension, demolition et al is planned -- for the structure or plot adjacent to it. Landscape plan, elevation and section specifying restoration and proposed changes to the Historic landscape, restoration of soft and hard landscape features. Emergency evacuation and Risk Management plan. Any changes needed to the original structure, architecture and ornamentation shall be brought to notice of the Client. *As such, only those use(s) shall be permitted which does not require irreversible changes to the structural, architectural and ornamental systems.*
4.4.	**Post Implementation Drawings**
	As-built drawings (on completion of the project) mapping any changes from the initial proposal, Reasons for deviation(s) and its Impact on the RHA and overall area shall be provided.

Appendix III: Condition Mapping and Assessment

Section 01 Instructions for Condition Mapping and Assessment

For recording/mapping the State of Conservation, refer to an the List of Symptoms (*Table 12: List of (likely) Active and Passive issues affecting RHA)* that are likely to be visible in the RHA. The list is for the purpose of maintaining uniformity of language and consistency in estimated scales of observation. Any specific symptom visible at the site, and absent in the Table, shall be recorded on the drawing, presented with supporting graphics (photos or video), and brought to the notice of the Client for codification.

All observations shall factor the seasonal effect on conditions and, in such cases, the maxima and minima shall be marked and monitored.

The details of all the issues that are marked on the drawings needs to be explained in detail in the corresponding Report.

A. Structural Issues - Foundation, Superstructure (Plinth, floor, roof, exterior walls and columns, staircase, projections, openings, et al), and Building construction methods .

Figure 2: Non-structural crack on roof indicating uneven, heavy load on top – Thiruvananthapuram Railway Station

Figure 1: Settlement crack indicating uneven distribution of load on top, or differential settlement (This structure is in a seismic zone and prone to such defects) – Shimla Railway Station

Figure 4: Deterioration of structural member due to excessive moisture percolation and incorrect repair -- Howrah Railway Station

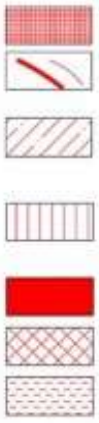
Figure 3: Crack on structural member due to incorrect repair and moisture percolation -- Howrah Railway Station

Table 12: List of (likely) Active and Passive issues affecting RHA

(To be referred for the purpose of Condition Mapping and Assessment)

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
1.	**Structural Issues - Foundation, Superstructure (plinth, and floor, roof, exterior walls and columns, staircase, projections, openings, et al), and Building construction methods (Check Legends)**	
	• Seismic action. • Landslide. • Flooding. • Erosion.	• Bulging — • *Cracks.*** • Dislodgement of material • Distortion (torque, bending moment, warping). -- • Differential settlement (also mark the associated settlement crack). • Case of structural collapse. • Deterioration of structural members (material needs to be specified). ***Note**:* *** Cracks by themselves are not an issue. These are a manifestation of most of the above-mentioned active and passive processes, and occur in different stages of progress.* *Structural cracks shall be marked with a **thicker line** as indicated, whereas superficial cracks to be marked with a thinner line as shown in the Legend for marking.*

Legend for marking:



a. Bulging *(Measure of displacement to be mentioned numerically and the correct alignment marked in 'dash' lines).*

b. Cracks *(Use variance of thickness to convey potency of the crack).*

c. Dislodgement of material *(Measure of displacement to be mentioned numerically, and the correct alignment marked in 'dash' lines).*

d. Distortion (torque, bending moment, warping) *(Mark in 'dash' lines the correct alignment and measure of distortion).*

e. Differential settlement *(Mark the associated settlement crack).*

f. Case of structural collapse.

B. Water related Issues

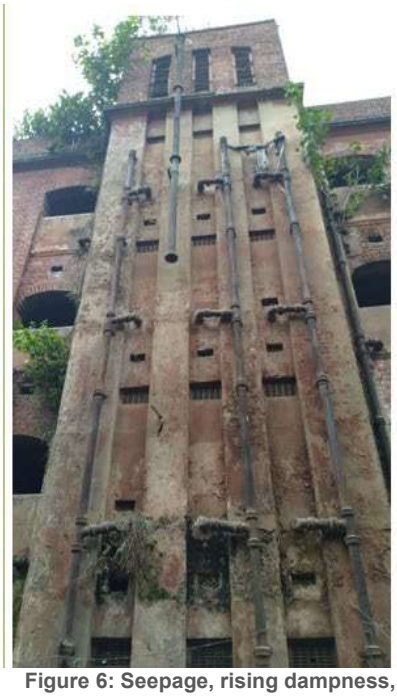


Figure 6: Seepage, rising dampness, trapped moisture due to blocked roof drainage (possible), defective plumbing also encouraging vegetative growth -- Howrah Railway Station

Figure 7: Error in repair, dysfunctional drainage (possible), tear in DPC layer leading to percolation of moisture -- Jodhpur Railway Station

Figure 5: Blocked roof drainage (possible) leading to seepage - Egmore Railway Station

Figure 8: Percolation of moisture leading to timber damage on the roof

Figure 9: Water seepage leading to algae growth and likely leading to structural deterioration

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
2.	**Water-related Issues**	
	• Storm drain systems • Broken canals • Water logging	• Seepage • Rising dampness • Trapped moisture • Water ingress from floor • Blocked roof drainage • Missing waterspouts on roof leading to water to fall on building surface

Legend for marking:

a. Seepage (also mark the source of water).

b. Rising dampness (mark the changing levels across seasons).

c. Trapped moisture.

d. Water ingress from floor.

e. Blocked roof drainage.

f. Missing water spouts on roof leading water to fall on building surface.

C. Issues due to inappropriate intervention

Figure 12: Error in use of new material; Insensitive additions/ alterations – Howrah Railway Station

Figure 11: Error in repair; replacement with incompatible material – Howrah Railway Station

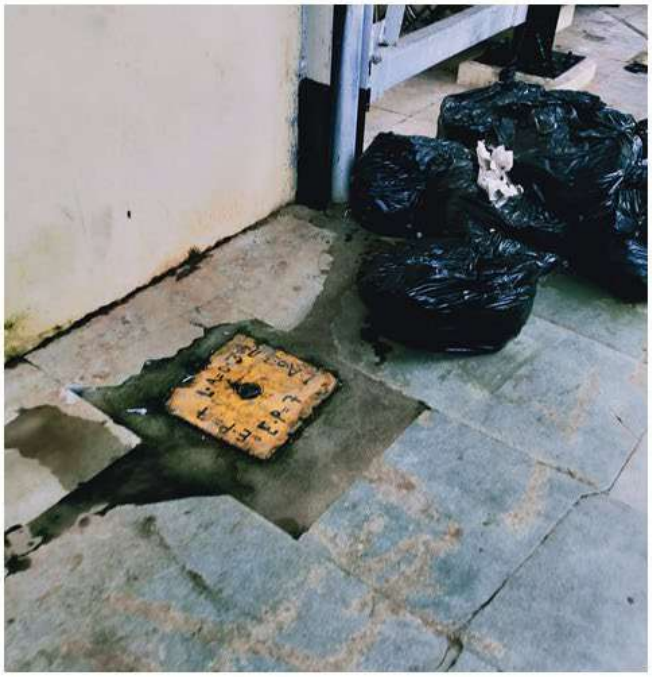


Figure 13: Error in repair of water distribution system – Thiruvananthapuram Railway Station

Figure 14: Error in repair of water distribution system – Howrah Railway Station

Figure 15: Error in use of new material; Rooftops covered with bitumen sheets leading to seepage, and restricts light in platform area – Dehradun Railway Station

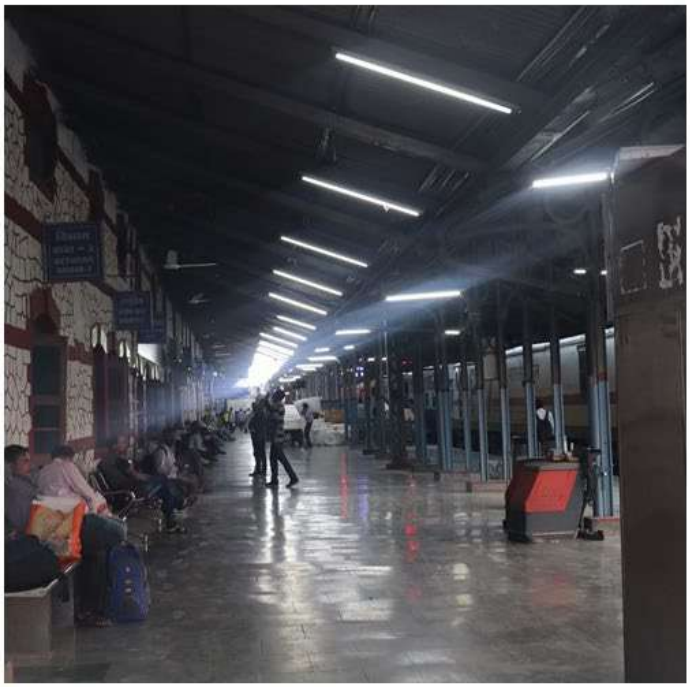


Figure 16: Insensitive and incompatible addition; Error in repair; Error in use of new material – Dehradun Railway Station

Figure 17: Loss of potential public riverfront even after sensitive addition to the historic structure – Howrah Railway Station

Figure 18: Change in use/abandonment of structure, leading to neglect and deterioration – Shimla Railway Station

Figure 19: Error in use of new material; Replacement with incompatible material – Shimla Railway Station

Figure 21: Error in use of new material – Thiruvananthapuram Railway Stationeplacement with incompatible material -- Shimla Railway Station

Figure 20: Replacement with incompatible material -- Shimla Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
3.	**Issues due to inappropriate intervention**	
	• Change in layout: Spatial, landscape	• Error in repair • Error in use of new material • Replacement with incompatible material • Ad hoc perforations • Insensitive additions/alterations • Change in use

Legend for marking:

a. Error in repair

b. Error in use of new material

c. Replacement with incompatible material

d. Ad hoc perforations

e. Insensitive additions/alterations

f. Change in use

D. Issues with building finishes

Figure 23: Blocked openings; Additions/alterations leading to change or loss of original architectural vocabulary; Incorrect placement of infrastructure – Howrah Railway Station

Figure 22: Flaking of plaster due to moisture percolation – Shimla Railway Station

Figure 24: Additions/alterations leading to change or loss of Character Defining features – Dehradun Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
4.	**Issues with building finishes**	
		• Flaking of plaster due to moisture percolation • Algae deposition • Salt Deposition • Missing elements -- Masonry, broken and/or missing floor tiles • Blocked openings • Additions/alterations to the building in the past, leading to change or loss of original architectural vocabulary.

Legend for marking:

a. Flaking of plaster due to moisture ingress

b. Algae deposition

c. Salt Deposition/Efflorescence

d. Missing elements (to be replaced)

e. Blocked openings

f. Additions/alterations leading to change or loss of original architectural vocabulary.

E. Issues due to natural processes

Figure 26: Chipping paint; error in repair – Howrah Railway Station

Figure 27: Cracks on floor due to mechanical injury – Jodhpur Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
5.	**Issues due to natural processes**	
	• Weathering of finished like pavements • Condition of roads due to natural weathering, continuous use	• Weathering of material finishes/surface finishes on floor, walls, ceiling, or roof due to natural weathering, usage etc. • Chipping Paint • Patina • Discoloration.

Legend for marking:

a. Weathering of finishes and surfaces (classify different types of weathering)

b. Chipping Paint

c. Patina

d. Discoloration.

F. Infrastructure Issues

Figure 29: Inappropriate and risky placement of advertisements, covering historic façade – Thiruvananthapuram Railway Station

Figure 30: Ad hoc addition of wires, without accounting for load and impact on structure -- Sealdah Railway Station

Figure 32: Incorrect repair of road and laying of infrastructure -- leading to accumulation of water, garbage and causing inconvenience – Thiruvananthapuram Railway Station

Figure 31: Incorrect repair of road and laying of infrastructure, leading to accumulation of water, garbage and causing inconvenience – Howrah Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
6.	**Infrastructure Issues**	
	• Inappropriate parking • Discontinued pavements • Broken or built upon curbs and gutters • Discontinued or encroached sidewalks • Inappropriate utilities like toilets, water points etc., inappropriate site lighting • Inappropriate signage: location, quantity, material, information, legibility.	• Inappropriate lighting of the site and of the building exterior illumination (fixture/placement of fixture/lux level) • Inappropriate signage: information of the historicity of the building, emergency signage, direction signage (manner of mounting or fixing/ineffective location) • Issues with accessibility: elevators, staircase, travelator), circulation (location of points for vertical movement) • Accessibility for circulation.

Legend for marking:

a. Inappropriate illumination (fixture/placement of fixture/lux level)

b. Inappropriate signage (manner of mounting or fixing/ineffective location)

c. Issues with accessibility (broken ramps)

d. Accessibility for circulation

G. Maintenance related Issues

Figure 34: Unused and neglected rooms reduced to store/garbage dump -- Thiruvananthapuram Railway Station

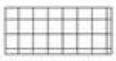
Figure 35: Unused and neglected rooms trap moisture, renders surrounding spaces susceptible to fire and nefarious activity – Howrah Railway Station

Figure 36: Incompatible use allocated to spaces (viz store/garbage dump) – Howrah Railway Station

Figure 37: Mechanical injury to material (broken tiles/broken flooring/ad hoc replacement of glazing with appropriate material) – Thiruvananthapuram Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
7.	**Maintenance related Issue**	
		• Accumulation of dust/garbage. • Incompatible use allocated to spaces (viz. store/garbage dump/unused and closed room like sealing of vaults). • Ad-hoc vertical or horizontal changes (to volume) of rooms and spaces (through partitioning/construction of mezzanine/placement of cupboards). • Mechanical injury to material (broken tiles/broken flooring/ad-hoc replacement of glazing with appropriate material).

Legend for marking:



a. Accumulation of dust/garbage.

b. Incompatible use allocated to spaces (viz store/garbage dump/unused and closed room like sealing of vaults).

c. Ad-hoc vertical or horizontal changes (to volume) of rooms and spaces (through partitioning/construction of mezzanine/placement of cupboards).

d. Mechanical injury to material (broken tiles/broken flooring/ad-hoc replacement of glazing with appropriate material).

H. Landscape related Issues

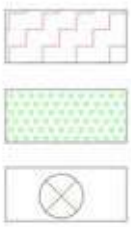
Figure 40: Dysfunctional historic setting due to lack of protection and maintenance -- Thiruvananthapuram Railway Station

Figure 39: Water body reduced to garbage dump leading to environmental pollution -- Thiruvananthapuram Railway Station

Figure 41: Lack of maintenance of natural assets – Dibrugarh Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
8.	**Landscape Issues**	
	• Unsympathetic addition/alteration to historic setting	• Alteration to historic setting • Erroneous plantation/gardening scheme (incorrect species/design articulation) • Lack of protection to trees.

Legend for marking:



a. Alteration to historic setting

b. Erroneous plantation/gardening scheme (incorrect species/design articulation)

c. Lack of protection to trees.

I. Issues related to MEP System

Figure 43: Also impacting ornamental features, lowering user-comfort and aesthetics - Egmore Railway Station

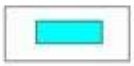
Figure 44: Exposed high-voltage wiring aggravating hazards and adding to non-designed structural load – Thiruvananthapuram Railway Station

Figure 45: Damaged plumbing leading to percolation of moisture into super and sub-structure – Jodhpur Railway Station

Figure 46: Damaged HVAC unit leading to water leakage aggravating hazards – Thiruvananthapuram Railway Station

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
9.	**Issues related to MEP System**	
		• Disused/Defunct/Over HVAC. • Disused/Defunct/Electrical wiring. • Unidentified live wires/older wires. • Overused/Underused/Defunct Emergency equipment. • Overused/Underused/Defunct/Broken/Leaking Water distribution system. • Overused/Under used/Defunct Gas distribution system.

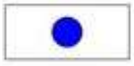
Legend for marking:



a. Disused/Defunct/Over HVAC.

b. Disused/Defunct/Electrical wiring.

c. Unidentified live wires/older wires.



d. Overused/Underused/Defunct Emergency equipment.

e. Overused/Underused/Defunct/Broken/Leaking Water distribution system.

f. Overused/Underused/Defunct Gas distribution system.

J. Issues related to Urban Management

Figure 48: Vending zone causing congestion and hindering normal and emergency movement – Howrah Railway Station Area

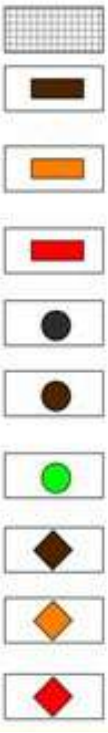
Figure 49: Vending zone causing congestion and hindering normal and emergency movement – Shimla Railway Station Area

Figure 50: Main entry-exit clogged due to congestion obstructing visibility of the historic facade -- Dehradun Railway Station Area

Figure 51: Unorganised traffic movement leading to congestion and conflict -- Howrah Railway Station Area

Sr. No.	Level where the issue is located	
	Catchment and Yard Level	**Building Level**
10.	**Urban Management**	
	• Illegal vending • Erroneous placement of Advertisement, Hoarding, Posters • Erroneous routing of traffic, placement of bus/auto stops • Erroneous location of meeting points and parking areas • Unsafe areas (areas afflicted by nefarious activities) • Defunct/Disused and Unused building and infrastructure • Erroneous placement of streetscaping features • Incompatible new constructions and uses • Obstructed access • Demolition of Heritage Buildings and Features.	

Legend for marking:



a. Illegal vending

b. Erroneous placement of Advertisement, Hoarding, Posters

c. Erroneous routing of traffic, placement of bus/auto stops

d. Erroneous location of meeting points and parking areas

e. Unsafe areas (areas afflicted by nefarious activities)

f. Defunct/Disused and Unused building and infrastructure

g. Erroneous placement of streetscaping features

h. Incompatible new constructions and uses

i. Obstructed access

j. Demolition of Heritage Buildings and Features.

Section 02 Instructions for Photography

1. When photographs are taken with the intention of quantification, issue definition and instructions, it is imperative that the images are distortion free.
2. The photographer shall be mindful of the scope and limitations of the camera box and the lens at hand, and mention this in the report accompanying Documentation.
3. The following basic minimal standards shall be followed to ensure photographs are found technically correct, and hence useable for the purpose of this consultancy:
4. All photographs shall be taken orthogonal to the object.
5. A tilt-shift lens shall be used to take photographs of large surfaces, and the correction due to lens distortion shall not be done via a software other than that meant to convert raw image to jpg, tiff or psd.
6. Photographs taken for objects, details like paintings, clocks, et al shall be accompanied by a colour graph and a graphic scale.
7. Recording larger planes and surfaces, especially where the parts of photographs require to be stitched together, shall be done by inserting markers, indicating points of overlap and a reference grid. The overlap in question shall not be less than 30% in area. Also, the marker used shall be temporary in nature and not stain the surface.
8. Photographs for prints shall be uniformly scaled, and not be printed in less than B5 size.

Appendix IV: Heritage Conservation and Reuse Plan

Outline of a Heritage Conservation and Reuse Plan (HCRP)

The Heritage Conservation and Reuse Plan (HCRP) document shall mean an overarching Vision Document that lays out timebound Recommendation and Actions for evaluations and assessment, Indicators for performance, management and monitoring, and Follow-up actions for the future for the RHA and its complementary network of HA. It shall focus on:

- Continued technically correct restoration, protection, maintenance, continued use and adaptive reuse of RHA and its associated HA.
- Undertaking contextual area-based development of contiguous properties to complement, leverage and highlight all extant HA. This shall include a proposed network component dispersed at the city and/or regional level.
- Managing and raising finance, converging interests, and synergizing with varied stakeholders.

A Heritage Conservation and Reuse Plan (HCRP) shall comprise of four (4) sub-parts:
Section 01: RHA Information Plan
Section 02: RHA Assessment, Repair and Maintenance Plan
Section 03: RHA Protection Plan
Section 04: RHA Management Plan.

Section 01 RHA Information Plan

1.1 Brief Summary of RHA

1.1.1 Values of RHA

i. Brief Summary
Attributes of the RHA, importance of its Historic Environment, and network of RHA. (in 1000 words)

ii. List of drawings and graphics
Appended drawings and related graphics demonstrating distribution of RHA and related HA within the Historic Environment and supporting articulation of attributes. These shall be tallied with the Listing and Inventory.

Table 13: List of Drawings and Photographs

1.	**Architectural Drawing**	
i.		*<Dwg no.>*
ii.		

2.	**Photographs**	
i.		*<Image no.>*
ii.		

1.2 Brief Assessment of State of Conservation

i. Brief Summary

Explanation in not more than 500 words, the State of Conservation and Integrity of RHA and related HA within the Historic Environment.

ii. Vulnerability and Risks

*Provide list of vulnerabilities and risks that affect the RHA and related HA within the Historic Environment. Refer to **Appendix VI: Heritage Impact Assessment.***

Table 14: List of Vulnerabilities and Risks that affect RHA and HA within the Historic Environment

S. No.	Nature of Risk or Vulnerability	Location	Periodicity	Priority level
i.	*<Caption>*	***<**Table 13: List of Drawings and Photographs **>***	*<Indicate frequency or condition of occurrence>*	*<**Appendix VI:** Heritage Impact Assessment>*
ii.				

iii. Key photographs

Provide upto 3 key images per RHA and related HA within Historic Environment showing the State of Conservation.
*Refer to **Section 02: Instructions for Photography***

Table 15: List of Photographs demonstrating State of Conservation

S. No.	Image Title and Date	Image No.
i.	*<Caption; date in DDMMYY>*	*<Image no.>*
ii.		
iii.		

1.3 List of Protective Designation

1.3.1 List of applicable Norms and Regulation

Tabulate information in the format given in Table 16: List of Protected and Unprotected RHA and HA.

Table 16: List of Protected and Unprotected RHA and HA

S. No.	Name of RHA and HA	Protective designation	Remarks
1.	**Protected RHA**		
i.	*<Name of Structure>*	*<List of Laws and Rules applicable>*	*<Indicate how protective designation is implemented>*
ii.			

1.	**Unprotected RHA**		
i.	*<Name of Structure>*	*<List of Laws and Rules applicable>*	
ii.			

1.3.2 Assessment of Protective Designation.

Explanation in not more than 500 words, regarding Effectiveness of the existing protective designation(s).

Appendices to Section 01
Appendix 01: History of RHA and Historic Environment
Appendix 02: Inventory
Appendix 03: Architectural Documentation
Appendix 04: Condition Mapping
Appendix 05: Photographs (Archival and that taken by TC)
Appendix 06: Testimonials and Interviews (*undertaken during site works*).

Section 02: RHA Assessment, Repair and Maintenance Plan

There are three sub-sections to RHA Assessment, Repair and Maintenance Plan, viz.:
2.1 Condition Assessment
2.2 Implementation and Budget Plan
2.3 Inspection, Monitoring, Maintenance and Repair Plan.

2.1 Condition Assessment

This section informs of Drafting Plan, Budget, and Phases of restoration, repair and maintenance work.

2.1.1 Condition Mapping

<Append list of drawings> as per ***Appendix II:Measured Drawing and Documentation****.*

2.1.2 Condition Assessment

Provide evaluation of the State of Integrity of the RHA, HA and the Historic Environment. Depending on the nature of causative agent, the Statement of Evaluation may be explained issue-wise, structure-wise, or parts of structure or landscape that best indicate remediation measures and levels of intervention.
The assessment shall explain the sequence of events/actions that explains a particular negative or positive condition of the RHA. Should a good practice be identified, this needs to be documented/mentioned in the assessment.
The text shall be provided in the format given *Table 17: Assessment of RHA, HA and the Historic Environment*.
The evaluation shall take into note the effect of those mentioned in Appendix II:Measured Drawing and Documentationas well as the impact of error or gaps in plans, programmes, policies, design judgement, et al.
The assessment shall also indicate in Colour Code the probability of issues which can escalate vulnerability and aggravate risks. Refer to **Appendix VI: Heritage Impact Assessment.**

Table 17: Assessment of RHA, HA and the Historic Environment

1.	**Assessment of State of Conservation of Historic Environment**	**Dwg**	**Risk/Vulnerability**
i.	*<Causative agent and its impact explained within 500 words>*	*<Dwg no.>*	
ii.			

2.	**Assessment of State of Conservation of RHA (immoveable)**	**Dwg**	**Risk/Vulnerability**
i.	*<Causative agent and its impact explained within 500 words>*	*<Dwg no.>*	
ii.			

3.	**Assessment of State of Conservation of RHA (moveable)**	**Dwg**	**Risk/Vulnerability**
i.	*<Causative agent and its impact explained within 500 words>*	*<Dwg no.>*	
ii.			

2.2 Implementation and Budget Plan

Implementation Plan (for repair, consolidation, restoration and preservation).

2.2.1 List of deliverables

i. Work Plan (Immediate and Emergency work)

For each item of work identified, factor cost of expertise/special skill required, and indicate special procurement and customized material to be used.
All assumptions made for generating the unit costs to be mentioned in footnotes.
Drawings appended to Table 18: Immediate or Emergency Repairs and Restoration shall be Proposal Drawings -- indicating aspects to monitor and specify locations of patch-test.

Table 18: Immediate or Emergency Repairs and Restoration

I.	**(0-6 months)**				
1.	**Items of work at Yard level**	**Rateper unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
2.	**Items of work at Landscaping-level (immoveable)**	**Rateper unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
3.	**Conservation of RHA (immoveable items)**	**Rateper unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
4.	**Consolidation items for Mothballing (immoveable items)**	**Rateper unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
5.	**Conservation of RHA (moveable items)**	**Rateper unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
	Funds required for Immediate/Emergency repairs and restoration - *<Total in Crore>*				

ii. Work Plan (Medium-term work and Long-term work)

Include cost of Inspection, Maintenance, Monitoring and Supervision of work, Management, Upgradation for safety compliance, inclusions for Smart Technology, et al, and for compatible continued use and/or adaptive reuse.
All assumptions made for generating the unit costs to be mentioned in footnotes.
For each item of work identified, also add cost of expertise/special skill requirement, and indicate material to be used.
Phases of 0-3 years or 3-5 years is indicative, and shall be revised to respond to realities of the Site at hand.

Table 19: Medium-term work

II.	**Medium-term (3-5 years)**				
1.	**Items of Work related Restoration and Maintenance of RHA (immoveable items)**	**Rate per unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
2.	**Items of work at Yard and Landscaping level (immoveable)**	**Rate per unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					

II.	Medium-term (3-5 years)				
3.	**Items of work related to Management (including Training, Skilling, Fund-raising, Networking, Upscaling)**	**Rate per unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					

4.	**Items of Work related to special repairs, Upgrading infrastructure and Upkeep for functionality (immoveable items)**	**Rate per unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					

5.	**Items for Outreach, Interpretation and Presentation (moveable items)**	**Rate per unit**	**Quantity needed**	**Total cost (INR)**	**Drawing no.**
i.	*<Item of work>*	*<rate>*	*<qty>*	*<total cost>*	*<Dwg no.>*
ii.					
	Funds required for Medium-term works - *<Total in Crore>*				

Note: Long-term work to be tabulated as *Table 20: Long-term work*. This table shall be generated by modifying necessary heads of *Table 19: Medium-term work*.

2.3 Inspection, Monitoring, Maintenance and Repair (IMMR) Plan

2.3.1 Proposed Schedule for IMMR

Refer to *Table 59: Format and Schedule for Initial Inspection of Elements at Yard and Layout Plan level, Table 60: Format and Schedule for Initial Inspection of elements at Building and Structural features-level, Table 61: Format and Schedule for Regular Inspection,* ***Error! Reference source not found.****, Table 62: Format and Schedule for Regular Maintenance and Repair* of **Appendix XI: Inspection, Monitoring, Maintenance and Repair (IMMR)** for formats, schedules and instructions applicable to drafting IMMR Plans and cost estimation. Cost for IMMR to be reflected in Sub-section: Implementation and Budget Plan.

The intent of this Plan is to ensure longevity of RHA through continued maintenance and scope for opportunities for skill upgradation, increasing high-skilled jobs and that which can be leveraged from RHA.

Section 03 RHA Protection Plan

The intent of the Protection and Management Plan is to provide a set of guidelines specific to the site. In this case, the protection awarded is through the overall approach of ensuring compatible continuity of use or adaptive reuse. The protection hence shall be instrumentalized by preventing attributes from incorrect interventions -- like repairs, upgradation, replacements, additions, alterations, or any other such action.

***Refer to*:**
1. **03a**: Form Based Codes for Station (Re)development, Property Development (Heritage) Card,
2. **06a:** Working Policy for Railway Heritage Assets
3. **06b:** Guidebook for Conservation of Railway Heritage Assets
   a. **Appendix I:** Inventorying
   b. **Appendix II:** Measured Drawing and Documentation
   c. **Appendix III:**Condition Mapping and Assessment
   d. **Appendix IV:**Heritage Conservation and Reuse Plan
   e. **Appendix V:**Compatible and Adaptive Continued Use and Reuse of RHA
   f. **Appendix VI:** Heritage Impact Assessment
   g. **Appendix XI:** Inspection, Monitoring, Maintenance and Repair (IMMR)

3.1 Assessments and Recommendation of Policy, Programme, Plan and Strategy-level

This section shall be used to appraise existing policies, programs, plans, strategies, regulations, norms, and any instrument that are either a good example, or are affecting the State of Conservation and Integrity of the RHA and its Historic Environs negatively. These shall include macro-economic assessments of Conservation-related documents, Tourism plans, Smart City plans, Transit and transport programmes, Proposed events, Educational programmes, Grants, Skill-building programmes et al that directly or indirectly affect the longevity of RHA.

Table 21: Assessment of Policy and Programmes applicable to RHA, HA and the Historic Environment

S. No.	Document reviewed	Evaluation	Recommended improvements/ Adoption
1.	**Documents affecting Historic Environment**		
i.	*Name of Policy/ Program/ Plan/ Strategy/ Regulations*	*<Evaluation explaining impact -- and basis of recommending changing or adopting it>*	*<Recommended changes/ Adoption>*
ii.			
2.	**Documents affecting RHA**		
i.	*Name of Policy/ Program/ Plan/ Strategy/ Regulations*	*<Evaluation explaining impact -- and basis of recommending changing or adopting it>*	*<Recommended changes/ Adoption>*
ii.			

*Note: Issues pertaining to impact of lack of Protection Measures shall be appended in **Section 02: RHA Assessment, Repair and Maintenance Plan, 2.1.1: Condition Mapping**.*

3.2 Financial requirements for Protection and Management of RHA

This section intends to converge policies, regulations, programmes and strategies – to ensure effective fund utilization for the conservation of RHA and its Historic Environment.
Should changes to existing Plans have financial implications, the assumptions and ballpark estimates for these shall be included here.
The cost shall be added to **Sub-section 2.2-Implementation and Budget Plan** of **Section 02: RHA Assessment, Repair and Maintenance Plan** and indicated as so.
Also Refer to **06c: Background Studies for Working Policy and Guidelines** and **Appendix VIII: List of Financing Systems Supporting Conservation**.

Table 22: Assessment of Fund required for protecting RHA and its Historic Environment

S. No.	Overhead	Source of fund/ Assumption	Fund requirement (INR)
i.	*State overhead for expenditure*	*<State if fund can be sourced by converging existing programs> or <Revenue stream>*	*<State amount needed in CR> References to be provided as a footnote*[1]
ii.			

Section 04 RHA Management Plan

Note: Refer to note with **Section 03: RHA Protection Plan**.

1 References in support of assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.

4.1 Assessments and Recommendation of Existing Management System on RHA and its Historic Environment

This section shall be used to appraise existing management systems, mechanism and approaches that are either good examples, or are affecting the State of Conservation and Integrity of the RHA and its Historic Environs negatively. The assessment shall include

(i) Availability of skills,
(ii) Compatible material and funds for conservation,
(iii) Effect of existing reuse,
(iv) Reuse or disuse on RHA,
(v) Effect of original or new infrastructure,
(vi) Use/disuse of space,
(vii) Construction, addition or extension of the Railway station and its station Area,
(viii) Quality of architecture and material used in an around the station and station area,
(ix) Availability of planned and technically correct interpretation and outreach, et al, that either directly or indirectly affect the longevity of RHA.

Table 23: Assessment and Recommendation of Existing Management of RHA and its Historic Environment

S. No.	Management aspect	Evaluation	Recommended improvements/ Adoption
1.	**Aspects affecting Historic Environment**		
i.	*System, mechanism approach being evaluated*	*<Evaluation explaining impact and basis of recommending changing or adopting it>*	*<Recommended changes/Adoption>*
ii.			
2.	**Aspects affecting RHA**		
i.	*System, mechanism approach being evaluated*	*<Evaluation explaining impact and basis of recommending changing or adopting it>*	*<Recommended changes/Adoption>*
ii.			

***Note**: Issues pertaining to impact of lack of Management Measures shall be appended in **Section 02: RHA Assessment, Repair** and **Maintenance Plan, 2.1.1: Condition Mapping**.*

4.2 Proposed Management System for RHA and its Historic Environment

This section implements the recommendations of *Table 23: Assessment and Recommendation of Existing Management of RHA and its Historic Environment* detailed through Sub-Plans.

4.2.1 Proposals and Recommendations towards Continued Use and Adaptive Reuse

- Assessment of Demand, Degree of Adaptability and Life Cycle Cost shall be undertaken to ascertain compatibility of use specific to RHA. Refer to **Appendix V: Compatible and Adaptive Continued Use and Reuse of RHA and Appendix VI:Heritage Impact Assessment.**
- Provide basis of assumption in identifying demand of uses allocated to RHA.
- IMMR Plan shall be generated and provided as part of **Sub-section 2.3-Inspection, Monitoring, Maintenance and Repair Plan**. of **Section 02: RHA Assessment, Repair and Maintenance Plan**. **Refer to Appendix XI: Inspection, Monitoring, Maintenance and Repair (IMMR).**
- Funds necessary shall be included in **Sub-section 2.2.1-List of deliverables** of **Section 02: RHA Assessment, Repair and Maintenance Plan**.
- Append detailed Architectural Drawings and Specifications of all interventions proposed for Continued Use and Adaptive Reuse**.** Refer to **Appendix II: Measured Drawing and Documentation** for specifications related to drawing standards.

4.2.2 Proposals and recommendations towards development in the Station Area

- Refer to **Document 03a: Form Based Codes for Station (Re)development**, Property Development (Heritage) Card, and **Appendix VI: Heritage Impact Assessment** to propose volume and architectural language of constructions within the Station Area.
- Refer to **Appendix VII: Framework for Heritage Railway Advertisement Policy (HRAP)** to plan for monetizing through advertisement rights.
- Funds necessary shall be included in **Sub-section 2.2.1-List of deliverables** of **Section 02: RHA Assessment, Repair and Maintenance Plan**.

Note: Based on the proposal made, a true to scale mock-up model and/or 3-dimensional renders shall be appended, in addition to Architectural Drawings and specifications.

4.2.3 Proposals and Recommendations towards Outreach, Research and Capacity-Building Plans

- This section shall comprise Plans for three (3) sub-plans detailing schedule and funds needed to run it, its feasibility and proposals for up-scaling it.

i. **Outreach Plan** comprising proposals for interpretation, ways of dissemination and networking with institutes. Refer to **Appendix VII: Framework for Heritage Railway Advertisement Policy (HRAP)**.

Table 24: Outreach Plan

S. No.	Overheads	Descriptions
1.	Name of Programme	
i.	*Type of proposed program.*	*Description of programme, venue, aim and objectives, target groups.*
ii.	*Feasibility.*	*State Assumptions in footnote[2].*
iii.	*Funds required.*	*State all Assumptions behind estimation in footnote[3].* <*State amount needed in INR Cr*> <*State return from investment in INR Cr*>
iv.	*Proposal for upscaling.*	*Timeline for pilot and project phase.*
2.	Name of Programme	
Note: Add additional rows as needed.		

ii. **Research Plan** comprising proposals for content generation for interpretation, outreach, support to Conservation works and networking with institutes.

Table 25: Research Plan

S. No.	Overheads	Descriptions
1.	Name of Programme	
i.	*Type of proposed programme*	*Description of programme, venue, aim and objectives, target groups*
ii.	*Application*	*State application of the research*
iii.	*Funds required*	*State all assumption behind estimation in footnote[4]* <*State amount needed in INR Cr*> <*State return from investment in INR Cr*>
iv.	*Timeline*	*Timeline for research and application*
2.	Name of Programme	

2 References in support of assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.
3 References in support of assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.
4 References in support of assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.

Note: Add additional rows as needed.	

iii. **Capacity-Building Plan** comprising proposals for skill upgradation, technical training to in-house persons and to train others.

Table 26: Capacity-Building Plan

S. No.	Overheads	Descriptions
1.	Name of Programme	
i.	*Type of proposed programme*	*Description of programme, venue, aim and objectives, target groups*
ii.	*Statement of relevance*	*State how the programme will generate a socially relevant skill and its tenure and geography of relevance*
iii.	*Funds required*	*State all Assumptions behind estimation in footnote*[5] *<State amount needed in INR Cr>* *<State return from investment in INR Cr>*
iv.	*Timeline*	*Timeline for the programme*

2.	Name of Programme
Note: Add additional rows as needed.	

Funds necessary shall be included in **Sub-section 2.2.1-List of deliverables, Section 2.2-Implementation and Budget Plan** of **Section 02: RHA Assessment, Repair and Maintenance Plan**.

4.2.4 Proposals and recommendations towards Fund raising and management, and Expenditure Plan

- This section shall identify fund requirement, propose revenue streams and an Expenditure Plan supporting conservation, protection and management of RHA and HA in its Historic Environment.
- *Table 27: Fund required for managing RHA and its Historic Environment* below shall be used to provide Source of fund and its management, Factor expenses from **Sections 4.1: Assessments and Recommendation of Existing Management System on RHA and its Historic Environment** and **Section 4.2: Proposed Management System for RHA and its Historic Environment** and include Staffing requirements.
- The cost shall be added to **Sub-section 2.2.1-List of deliverables, Section 2.2-Implementation and Budget Plan** of **Section 02: RHA Assessment, Repair and Maintenance Plan** and indicated as so.
- Refer to **Document 06c: Background Studies for Working Policy and Guidelines** and **Appendix VIII: List of Financing Systems Supporting Conservation.**

Table 27: Fund required for managing RHA and its Historic Environment

S. No.	Overhead	Source of fund/ Assumption	Fund requirement (INR)
i.	*State overhead for expenditure*	*<State if fund can be sourced by converging existing programmes> or <Revenue stream>*	*<State amount needed in INR Cr> References to be provided as a footnote*[6]
ii.			

5 References in support of Assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.
6 References in support of Assumptions shall be provided here in APA format as Footnotes. These assumptions shall be based on market surveys done as part of this exercise in the city. Comparable cases may be allowed on merit of the case chosen.

Appendix V: Compatible and Adaptive Continued Use and Reuse of RHA

These are guidelines that define compatible and adaptive to continued use or reuse of RHA or HA. It shall be applicable to the RHA within the Project Area, Heritage Area and Historic Environment. The goal is to ensure longevity, retention of significant features and components, and complements the active use of the station and station area.

***Note**: Lessons learnt from case studies, the European experience of Adaptive Reuse of Heritage, and upgradation of Historic Stations and Station areas, show that there has been a move from the 'culture of loss' to a 'culture of profit'. On one hand, this attitude has benefited a few -- boosting localized socio-economic development, forged new alliances between government, institutions, entrepreneurs and the public and improved design and spatial planning practices. On the other, it has increased commercialization and subversion of values, created disparities, alienated, displaced local communities and destroyed Heritage.*
Additionally, the European Union has been experimenting, for some decades, with different models of Heritage preservation and continuity through use. Their experience cautions Asset Owners and Managers to refrain from referring to case studies as a solution, or a guide to Adaptive Reuse. This is because projects that are widely advertised are one-off cases. These are neither representative of all adaptive reuse projects in a country, nor an outcome of the norms or regulations.
These are heavily dependent on professional judgement, project budget and availability of technological support. Therefore, those in the helm of deciding adaptive reuse, especially change existing to a new use, must take into account the impact on structural, architectural and ornamental systems due to reversible or irreversible changed volume or nature of infrastructure, the loss due to an altered identity including distortion of historical facts and financial implications of a changed use.
The stages proposed are to streamline and monitor the effect of decision-making on the RHA. The evaluation of the effect of applying this process shall then be used to update/rectify the Guidelines itself and recalibrate apprehended impacts. At this point, the regulation proposed is a conservative one -- to prevent any damage to the RHA when these norms are being introduced. ***Therefore, it shall be mandatory to document decisions taken at each stage, thereon compare with expected outcome, and inform the Working Policy document and Guidebook.***

Principles of Adaptation

Compatible and Adaptative use and reuse, in principle, shall:

- Intend to preserve the intactness of existing RHA and require minimal changes.
- Follow Avoided Impacts Approach.
- Retain the values of RHA.
- Be sustainable.
- Include community.
- Be inclusive of buildings and their association of all era and historicity.
- Fuel a larger territorial economic, social development processes.

There are four (4) steps to ensuring identification of Compatible and Adaptive use and Reuse, namely:

Table 28: Steps in identifying Compatibility and Adaptiveness

S. No.	Steps	Intent	Output
1.	Qualifying 'compatibility' and 'adaptiveness'	Provides preconditions to identify a class of use for the immediate zone, spaces and features at a macro-level.	**Output 01**
2.	Conducting Need Assessment	The sub-class and its corresponding features shall then be further qualified and validated through Need Assessment.	**Output 02**
3.	Planning Level of Changes	Specific options generated via Need Assessment studies shall be evaluated for the impact i.e., level of change that a new function or upgraded existing function shall bear and the effect of upgradation on the RHA.	**Output 03**

S. No.	Steps	Intent	Output
4.	Life Cycle Assessment (LCA)	Prior to deciding on a continuing with existing use or proposing adaptive reuse or planning to modify, alter, demolish any part of RHA and new building proposed in its stead, Life Cycle Assessment (LCA; includes embedded, operational and transportation energy) shall be mandatory.The option that bears least impact that be considered for implementation.	**Final plan** See **Appendix IX: White paper on Strategies for carbon abatement through Conservation of Railway Heritage Assets**

Step 01: Qualifying Compatibility and Adaptiveness

*Note: **Table 29: Guidelines to Define Compatibility and Adaptiveness** shall be used while discussing planning for the entire Land-parcel to arrive at an integrative use for the RHA. This shall consider the Historic Environment and the context of the RHA.*
*The decisions and options of uses of this stage shall be referred to as **OUTPUT 01** and undergo Need Assessment studies.*

Table 29: Guidelines to Define Compatibility and Adaptiveness

Permitted	Not permitted
1. **Guidelines**	
ii. Carrying capacity (in terms of load on structure, infrastructure and standards related to safety and security) is not breached. iii. Where proposed use requires only reversible transformation/intervention. iv. Continuity of designed functions and requiring minimal changes in the form of introduction of infrastructure, upholding design intent and spirit, are socially relevant, and do not alter significant or Character Defining features. v. Where about 50% to 60% of volume of space continue with original function. vi. Uses that encourage public access, visits, and participation with or without specified timing. vii. Maximum speculative infrastructure that can be installed without altering the building's integrity. viii. Overall design and individual units shall permit efficient control of the ambient conditions (MEP, lighting, acoustics, etc.). ix. Restoration and upgradation shall be such that it can be adapted at reasonable expense and without changes to structural and non-structural members to accommodate future uses. x. Upgradations proposed shall be mindful of simplicity, efficiency, and the state-of-the-art contextual solutions.	i. Where use or by-product from use is polluting or hazardous for HA and occupants. ii. Requires use of flame or any combustible material for allocated use. iii. Requires irreversible modifications with or without demolition of significant or character-defining features. iv. Reduces or denies public access to facility. v. Reduces space and access for scheduled inspection and maintenance. vi. Reduces life cycle and degree of adaptability. vii. Allocated use violates existing norms and rules applied to the HA or that contiguous to it. viii. Fire-fighting measures that require water (or wet) systems and other than inert gas systems. ix. Where use requires additional punctures or loss of significant features. x. Any use where the construction would cause vibrations beyond designed limits.
1.1. **Railways related** 1.1.1. **Active uses**	
i. Offices where no more than 10% space is dedicated to storage. ii. Canteens, restaurants, or cafeteria that shall not require fire or creating of flames. iii. Short or long-haul stays. iv. Waiting areas. v. Infotainment units.	i. Wet or Dry long-term storage. ii. CCTV Room, Electrical Rooms, Equipment storage. iii. MEP or HVAC control rooms. iv. Space for storage of man or animals. v. Any use where construction would cause vibrations beyond designed limits.

Permitted	Not permitted
vi. Regeneration of original design of exhibition hall/hotel/school/conservation lab/hospital/restaurants/shopping arcade.	
1.1.2. **Passive uses**	
i. Period rooms purely for demonstration purpose. ii. Show windows. iii. Shelters, sheds or covers.	i. Any use where construction would cause vibrations beyond designed limits.
1.2. **Not related to railways function (operational and non-operational)** 1.2.1. **Active uses**	
i. Short-term entertainment spaces including those for performances. ii. Training centres with skill exhibition and induction facilities, including cottage or handicraft design centres that do not require fire. iii. Museums, exhibition areas and galleries. iv. Reading rooms or city archives without storage. v. Tourist information facilities. vi. Day care centres. vii. Services related to sewage and water works, waste management systems, electric power, communications, and oil and gas pipelines, if designed for the function. viii. Transit and transportation corridors and facilities such as automobiles, walking, truck, cycling, bus, rapid transit, 3-wheelers.	i. Factories or manufacturing units, unless designed specifically for that purpose. ii. Any use where construction would cause vibrations beyond designed limits.
1.3. **Passive uses**	
i. Kiosks or temporary vending area. ii. Street furniture. iii. Information centres/panels	i. Any use where construction would cause vibrations beyond designed limits.

Step 02: Need for Assessment Studies

__OUTPUT 01__ shall be vetted for its genuine need to ensure that Conservation and Upgradation proposed to be undertaken is required, and hence shall be both -- relevant for the project lifecycle and value addition. It shall hence scope from among the options generated from Output 01, and assess the Level of Changes needed per option, generating Output 02. Copies of the filled __Table 30: Need Assessment__ shall be appended to the Conservation Plan.

Table 30: Need Assessment

Steps	Action to be taken
Step 01:	Identification of needs in the catchment area/locality:
	• Direct requirements of Indian Railways (IR). • Support facilities augmenting IR works. • Public uses based on community requirements.
Step 02:	Identification of actors and their views about possible/future uses.
	Actors include owners, users, local communities and experts.
Step 03:	Shortlist needs/uses by evaluating the impact of proposal. Refer to **Appendix VI**: Heritage Impact Assessment. *Note: In the case that a building and part thereof is neglected, unused or abandoned, it is desired that the whole is adapted to suit a new use. The use chosen shall be compatible with utilization of the zone, and not just contiguous structures and spaces.*
Step 04:	Establishing the Degree of Adaptability - Based on the indicators given below, Building and Site adaptability (functional, technical/structural, economic, environmental) shall be measured for each of the proposed use: i. Reduced disturbances (potential) - (Acoustic, visual, vibration, traffic/crowding). ii. Surplus of space on site. iii. Ease of access/to structure(s). iv. Sufficient/Surplus floor area/Usable space. v. High floor to ceiling measure. vi. Minimal obstructions. vii. Customizability of interior space/Modularity. viii. Good/More than sufficient access within the building (Horizontal and Vertical access). ix. Possibility of additions without impacting the significance (in case of historic buildings). x. Rejectable (independently accessible) building parts -- for ease of selling/renting to third parties. xi. Presence of independent, demountable, replaceable construction components. xii. Large/Surplus of load bearing capacity. xiii. Customizability/Controllability of services. xiv. Surplus of services shafts. xv. High Daylight factor. xvi. Fire resistance. ○ Land use/Zoning compliance with respect to catchment area. ○ Stakeholder consensus. *Note: The above are generic optimum determinants. Additional determinants based on proposed use shall follow the Guidelines of __Table 30: Need Assessment,__ undergo Need Assessment, and assess the impact of planned Level of Changes. Also refer to __Appendix VI: Heritage Impact Assessment.__*
Step 05:	Conclusion depicting List of prospective uses (**Output 02**)

Step 03: Planning Level(s) of Change(s)

Based on Output 02 and measure of adaptability, RHA may require upgradation to suit the new use(s). The Level(s) of Change(s) may range from minimal -- adaptation(s) where the existing building and its various layers are protected, stabilized, repaired, modified or reconstructed/replaced -- to high impact change, i.e., demolition. To measure the impact of proposed Level(s) of Change(s), each proposal shall be evaluated for its compatibility

*and adaptiveness to the RHA as per **Table 31: Measurement of the Degree of Adaption, Level(s) of Change(s) and Preliminary Impact** and shall comply with the results from assessment(s) using Avoided Impact(s) Approach -- and copies of the filled **Table 31: Measurement of the Degree of Adaption, Level(s) of Change(s) and Preliminary Impact** shall be appended to **Appendix IV**: **Heritage Conservation and Reuse Plan.***

Table 31: Measurement of the Degree of Adaption, Level(s) of Change(s) and Preliminary Impact

Impact	Action	Adaptation				
		Movable objects	Interior space	Services	Structural system	Envelope
Option 01	*<Name of proposal under evaluation>*					
Low	Retain, Protect, Maintain					
Medium (low)	Stabilize, Repairs					
Medium (high)	Part-replacement, Reject/Remove obsolete items					
High	Reconstruct, Total replacement					
Option 02	*<Name of proposal under evaluation>*					
Low	Retain, Protect, Maintain					
Medium (low)	Stabilize, Repairs					
Medium (high)	Part-replacement, Reject/Remove obsolete items					
High	Reconstruct, Total replacement					

Refer to **Annexure 01:** Parameters to assess Degree of Adaption and **Appendix VI: Heritage Impact Assessment.**

Annexure 01: Parameters to assess Degree of Adaption

Based on the shortlisted uses (Output 02) and Measure of Adaptability, RHA has to be upgraded to suit the new uses. Depending on the Structural and Functional requirements of the proposed use, the Degree of Change of the RHA can range from Minimal to Drastic, as explained in the *Table 32: Table of Degree of Adaption*.

Table 32: Table of Degree of Adaption

Type of Change	Notes
Degree of Change – Minimal (*Low to Medium Impact*)	
Adaptation	This is the **most desired degree of change** where the RHA and its existing layers consisting of building envelope, structural system, interior space, movable objects, services et al. are protected, stabilized and repaired. Depending on the structural and functional factors of the RHA, some or all of these layers may be upgraded.
Adaptation + Vertical or Lateral Addition	Where RHA does not meet the functional requirements of the proposed use, it may be expanded horizontally or vertically (air rights) to suit the space requirements.
Adaptation + Part Demolition	Where a part of the RHA: • has collapsed or is in ruins, and no evidence of its architecture exists (in the form of drawings, photographs, descriptions etc), and • is an environmental hazard; then such parts shall be dismantled, and the remaining shall be consolidated and adapted to suit the new use with or without extensions.
Degree of Change – Drastic (*Medium to High Impact*)	
Adaptation + Part Demolition + Vertical or Lateral Addition	Where a part of the RHA: • has collapsed or is in ruins, and no evidence of its architecture exists (in the form of drawings, photographs, descriptions etc), and • is an environmental hazard; Then such parts shall be demolished and the remaining portion be adapted to suit the new use. If the remaining portion of the RHA does not meet the functional requirements of the proposed use, it may be expanded horizontally or vertically (air rights) to suit the requirements.
Degree of Change -- Very Drastic (*High Impact*)	
Complete Demolition	In circumstances where the RHA has completely collapsed or is in ruins, and no evidence (in the form of drawings, photographs, descriptions et al) of its architecture exists, or the existence of the RHA is an environmental hazard, then it may be dismantled.

Note: In cases where whole or parts of buildings are dismantled, materials shall be salvaged and re-used in-situ to the maximum extent possible -- and if disposed off shall be a factor to environmental impact.
Vertical addition as air rights may be undertaken only if it is structurally viable, and if the Character Defining features are unimpacted.
*Refer to **Appendix VI: Heritage Impact Assessment** for the given Colour Codes indicating acceptance of a proposal.*

Appendix VI: Heritage Impact Assessment

Heritage Impact Assessment comprises the Toolkit and Outline of Report to be submitted for the purpose of establishing Compatible and Adaptive Use and Reuse, Heritage Impact Assessment (HIA) Report, Risk Assessment Report, and Disaster Management Plan. Findings from the assessments shall be included in the Conservation Plan and its various Sub-Plans, to establish IMMR schedule, and funds needed for it. Refer to ***Appendix IV**: **Heritage Conservation and Reuse Plan.***
The same tool shall be used to assess active and passive processes that render aggravate risks to the point of disaster. All observations made shall be documented in drawings with corresponding notes in the drawing and/or as a report and with supporting evidence, not limited to photographs.
Specifications of Documentation shall be as per Appendix II: Measured Drawing and Documentation.
Note: A complete set of documentation and information on proposed project whose impact shall be assessed, shall be made available officially to the TC/Agency(ies) conducting HIA and Risk Assessment and Disaster Management.
Refer to ***Annexure 02: Grading Impact, Vulnerability And Risk**.*

Outline for HIA, Risk Assessment and Disaster Management Report

The report shall include the following information drafted in the given sequence:

i. Client's brief:

ii. Executive Summary:
<State in 500 words a Summary of Impacts from the Process or Development -- and proposed Way Forward>

iii. Acknowledgment:
<Optional section; State in 500 words >

iv. List of Abbreviations:

Table 33: List of Abbreviations

S. No.	Abbreviation	Term
i.	*<Name>*	*< Explain designation/role>*
ii.		
iii.		

<Note: List to be in Alphabetical order>

v. Terms and Definitions:

Table 34: List of Terms and Definitions

S. No.	Term	Definition
i.	*<Name>*	*< Definition>*
ii.		
iii.		

<Note: List to be in Alphabetical order>

vi. Table of Contents
<Insert Table of Content here. Section Parts, its corresponding Sub-Parts and a list of Tables and Figures to be included here. Tables and figures shall include respective numbers and captions>

Section 01 Introduction

1.1 Name of the railway station:

<Name of Station; Current name>,
<Erstwhile name, if name has been changed with date>

1.2 The date of the HIA report:

<DD/MM/YY>

1.3 Team responsible for and involved in preparing the HIA report:

Table 35: List of Organization, Agencies and Consultants involved in HIA

S. No.	Name of entity	Role	Contact details
i.	*<Name>*	*< Explain designation/ role>*	*< Postal address; email address of key contact >*
ii.			
iii.			
iv.			

1.4 Client:

Table 36: List of Client and Contact details

Name of client	Contact details
<Name>	*< Postal address; email address of key contact >*

1.4 Statement on Third Party Vetting:

<State whether the report, or parts of it, has been externally assessed or peer reviewed. Client may choose to do so independently, or commission a preparer to undertake the same>
Append Certificate on Third-Party's letterhead endorsing or recording observations as ***Annexure 02: Grading Impact, Vulnerability And Risk****.*

1.5 Scope of assessment:

The scope or work shall clarify the process that shall be followed to undertake assessment. It shall include the agreed calendar between all stakeholders and the development programme, and include all relevant parties affecting/affected by the project whose impact is being reviewed.

1.6 Reference documents

Table 37: List of Key References for HIA

1.	**Normative and Regulative Documents**
i.	*<Name>*
ii.	*<Name>*
2.	**Technical documents**
i.	*<Name>*
ii.	*<Name>*

Section 02 Assessment and Situation Analysis

2.1 Data Analysis

Table 38: Data Analysis

S. No.	Data source	Evaluation	Extract
1.	**Data from Documents/Desktop sources including Technical documents** *<This section shall also include Case studies, Best practices, Technical norms, Recommendations, or Lack of it, et al>*		
i.	*<Name of documents. All documents apprised here to be entered in Table 38: Data Analysis, (S.No. 2) below.*	*< State >*	*<Annexure>* *Annex excerpts of reference document*
ii.			
2.	**Regulative and normative documents** *< Use this section to undertake Policy level appraisals, Plans, Programmes, Regulations, Norms, Changes in funding documents, et al >*		
i.	*< State >*	*< State >*	*<Annexure>*
ii.	*< State >*		
3.	**Data from field work** *< Use this section to undertake on-site appraisals >*		
i.		*< State >*	*<Appendix>* *Append complete set of Drawings, Condition assessment, Images, Field interviews and observations.*
ii.			

2.2 Situation Analysis

*<This section shall be based on **2.2.1 Physical Impact**.>*

***Note**: For World Heritage Properties, the impact shall be measured against the Statement of Authenticity and Integrity, as defined in the Operational Guidelines for the Implementation of the World Heritage Convention. Standard procedures including what is mentioned in the corresponding Management Plan of the World Heritage Site, and response/observations to 'Statement of Conservation' (SoC) Report or World Heritage Committee procedures shall be followed.*
*Refer to **Annexure 02: Grading Impact, Vulnerability And Risk.***

Assessment and evaluation of overall impact of the proposed changes shall include a description of the direct or indirect impacts, including physical impacts, visual impact, or noise, on individual Heritage attributes, assets or elements and associations, and overall. These shall be discussed in the following **Sections 2.2.1 Physical Impact, 2.2.2 Fiscal Impact, 2.2.3 Socio-Economic Impact.**

2.2.1 Physical Impact

Table 39: Assessment and Evaluation of Physical Impacts

Physical Impact: *Includes visual changes of immediate surrounding that diminishes values, or makes it difficult to see (affects visibility)*					
S. No.	**Cause**	**Description/ Reason for impact**	**Level of Impact[7]**		
			High (H)	**Medium (M)**	**Low (L)**
01	Change of features of the structure				
	Area name				
	Area name				
02	Change of features of the site/surroundings				
	Area name				
	Area name				
03	Introduction of new elements that affect visibility, pollution levels, dust				
	Area name				
	Area name				
04	Lack of maintenance aggravates vulnerability including structural deterioration and risks (viz. fire, localized flood, vibration)				
	Area name				
	Area name				

***Note**: Add rows and aspects of Physical Impacts as required, based on case at hand.*
The same format shall be used for Risk Assessment and Disaster Management Plan.

2.2.2 Fiscal Impact

Table 40: Assessment and Evaluation of Fiscal Impacts

Fiscal Harm: *Change in sources of funds available for its Conservation, Repair and Maintenance - and human resources.*					
S. No.	**Cause**	**Description/ Reason for Impact**	**Level of Impact[8]**		
			High (H)	**Medium (M)**	**Low (L)**
01	Budget cut				
02	Lack of quality assurance				
03	Change to dependent (market insensitive and risky) transformation				

***Note**: Add rows and aspects of Fiscal Impacts as required, based on case at hand.*
The same format shall be used for Risk Assessment and Disaster Management Plan.

[7] *Refer to* Annexure 02: **Grading Impact, Vulnerability And Risk**
[8] *Refer to* Annexure 02: **Grading Impact, Vulnerability And Risk**

2.2.3 Socio-Economic Impact

Table 41: Assessment and Evaluation of Socio-Economic Impacts

Social and Economic Harm: Social harm to the point of demolition. Rendered obsolete to the point of social forgetting, and limits the HA to its full potential as a valid entity to boost future growth.					
S. No.	**Cause**	**Description/ Reason for impact**	**Level of Impact**		
			High (H)	**Medium (M)**	**Low (L)**
01	Lack of access				
02	Broken Window Syndrome				
03	Lack of pro-conservation attitude				
04	Quality of Life, liveability index				

***Note**: Add rows and aspects of Social and Economic Impacts as required based on case at hand. The same format shall be used for Risk Assessment and Disaster Management Plan.*

2.3 Summary of Findings

This section summarizes the Findings from **Section 2.2: Situation Analysis**, and indicates the most and least potent impacts affecting RHA.
Classify Impacts as vulnerabilities and risks, and based on its periodicity of occurrence, these shall further bear either high, medium or low impact. The range that qualified high, medium and low shall be established through this section. Refer to **Annexure 02: Grading Impact, Vulnerability And Risk**.

Note: The same format is a sample, and shall be updated as per conclusions from **Section 2.3: Summary of Findings** and also be applicable to Risk Assessment, and may be cited as so.

Table 42: Summary of Assessments and Evaluations

S. No.	**Impacts Identification (Description)**	**Risk to** *< Add parameters in addition to those mentioned below >*					
		Significance	**Built fabric**	**User safety**	**Legal mandates**	**Existing management**	**Existing and potential Stakeholders**
1.	New construction in close proximity to the Heritage structure	H	H	M	L	L	L
2.	*<Add impacts identified from Section 2.3: Summary of Findings>*						

Section 03 Recommendations and Proposals

All recommendations and mitigation measures are to be classified based on their priorities, as graded in **Annexure 02: Grading Impact, Vulnerability And Risk**. All recommendations to be provided with mitigation plans specifying Phased actions, Timelines, Indicators for monitoring, working drawings -- with details of Specific upgradation, Retrofitting, Installations et al (Refer to **Appendix II: Measured Drawing and Documentation**), Budget, Skills and Manpower requirement, Additional control measures, IMMR protocols and Follow-up measures, and a Contingency action. A Contingency Plan or alternative shall not be accepted for projects impacting Significance of RHA. Under such circumstances, it shall be mandatory to rework the initial proposal itself.

Recommended actions shall indicate the intent behind it viz:

Avoid - Eliminate the threat by eliminating the cause.	**Mitigate -** Identify ways to reduce the probability or the impact of the risk.	**Appoint -** Make a party responsible for the risk management – and that may include insuring, outsourcing, etc.	**Train –** Assessing in-house skills and proposing specific training, handholding or increasing team-strength.

3.1 Priority 01 and 02 Actions plan

Table 43: Proposals for Priority 01 and 02 Actions

S. No.	Recommended action *< State Option 01 as the recommended actions to follow. Contingency Plan, if any shall be marked Option 02 >*	Dwg. no	Timeline	Team and Control measures	Budget
01A.	***Option 01:*** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR/Cr>*
ii.					
iii.					
01B.	**Option 02:** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR/Cr>*
ii.					
iii.					

***Note**: Add rows as required.*
The same format shall be used for Risk Assessment and Disaster Management Plan.

3.2 Priority 03 Actions

Table 44: Proposals for Priority 03 Actions

S. No.	Recommended action *< State Option 01 as the recommended actions to follow. Contingency Plan shall be mandatory and be marked Option 02 >*	Dwg. no	Timeline	Team and Support	Budget
01A.	***Option 01:*** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR Cr>*
ii.					
01B.	***Option 02:*** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR Cr>*
ii.					

S. No.	Recommended action *< State Option 01 as the recommended actions to follow. Contingency Plan shall be mandatory and be marked Option 02 >*	Dwg. no	Timeline	Team and Support	Budget

***Note**: Add rows as required.*
The same format shall be used for Risk Assessment and Disaster Management Plan

3.3 Priority 04 Actions

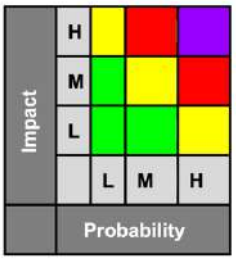
Table 45: Proposals for Priority 04 Actions

S. No.	Recommended action *< State Option 01 as the recommended actions to follow. Contingency Plan shall be mandatory and be marked Option 02 >*	Dwg. no	Timeline	Team and Support	Budget
01A.	***Option 01:*** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR Cr>*
ii.					
01B.	***Option 02:*** *<Impact from **Table 42: Summary of Assessments and Evaluations**>*				
i.	*List Actions and Recommendations in sequence*	*<Append dwg showing recommended changes >*	*Include schedules*	*State Team Strength and Qualification*	*<INR Cr>*
ii.					

***Note**: Add rows as required.*
The same format shall be used for Risk Assessment and Disaster Management Plan

Annexure 02: Grading Impact, Vulnerability And Risk

The probability and impact of occurrence of each impact, and vulnerability and risk, shall be assessed, mapped in drawings, and be depicted as below:

1. Correlation between Impact and Probability		
High (H)	*Risk that has the potential to greatly impact project cost, project schedule or performance* *Greater than <70%> probability of occurrence*	 The above correlations are Colour Codes indicating the Level of Risks and Priority of Response.
High - Medium (H-M)		
Medium (M)	*Risk that has the potential to slightly impact project cost, project schedule or performance* *Between <30%> and <70%> probability of occurrence*	
Medium-Low (M-L)		
Low (L)	*Risk that has relatively little impact on cost, schedule, or performance* *Below <30%> probability of occurrence*	

2. Correlation between Grading of Impacts, and Risks with Priority of Actions		
Code	***Priority***	***Actions/Response***
High (H)	**Priority 1**	• Shall include a Plan for Response, Mitigation and a Contingency Plan -- in case the initial instructions do not suffice. • It shall be mandatory to regularly check all Control Measures involved, and conduct periodic drills to ensure preparedness. • Shall have a dedicated team on-site, and one on standby as a part of the response system.
High - Medium (H-M)	**Priority 2**	
Medium (M)	**Priority 3**	• Shall include a Plan for Response, Mitigation, and a Routine for ensuring efficiency of Control Measures. • Shall have an on-site team as a part of the response system. This level of risk may not require a standby team.
Medium-Low (M-L) and Low (L)	**Priority 4**	• Mitigated through regular IMMR and Conservation routine. • The maintenance team may be trained to mitigate this level of risk, and may be used as an opportunity to build skills necessary to respond to higher levels of risks.

Appendix VII: Framework for Heritage Railway Advertisement Policy (HRAP)

1.0 Regulatory Framework

- The Policy for signage, advertisement and hoardings for Heritage Railway Stations shall have to be formulated through due consultation, adopted, and enforced by Indian Railways. For brevity, it would be referred as “Heritage Railway Advertisement Policy (HRAP)”.
- The HRAP may be notified under the provision of Indian Railway Act 1989 (Amended 2005)/ Railway Land Development Authority (RLDA) Act.
- IRSDC/ RLDA may set up a vertical for approval of signage and advertisement schemes under the HRAP.

2.0 Policy Intent

- To conserve Railway Heritage while exploring means of Non-Fare Box Revenue through innovative advertising, signage, and hoardings.
- To introduce new Non-Intrusive and Smart Technology of advertisements and signage.
- To ensure that Historic frontage remains the highlight.
- To protect and maintain Historic signage.

3.0 Policy Objectives

- Character defining features of Railway Heritage Assets shall not be covered/hidden/obstructed.
- Conserve Historic signage as a part of character of the RHA.
- Encourage use of designated places for advertisement as per original Station designs and discourage use of Historic surfaces for the same. Avoid any kind of perforations/clamping on Historic surfaces.
- Encourage use of innovative electronic projections/digital installations for advertisements.
- Wiring shall go through designated areas as per original schemes of the Assets. No perforated or exposed wiring shall be allowed on other surfaces.

4.0 Types of Signage and Respective Priorities

Table 46: Types of Signages

Types of Signage	Description	Priorities	Possible Exceptions
Wayfinding, Crowd management and Evacuation.	These shall include all types of signage within or outside Station Premises, which guide passengers and other visitors to move towards the looked-for areas.	Visibility and Legibility	Exceptions can be made, if all other means of installation are unworkable.
Identifications for building, zone, room, kiosk, spaces, etc.	These shall include all types of signs for buildings, rooms within buildings and spaces. It shall not include the signs for shops or other business entities.	Legibility	NA
Business Identification signs	These shall include all types of signs for business entities operating or functional in and around stations	Visibility	NA
Advertisements/Hoardings	These shall include all types of signage meant only for monetization and no other use.	Monetization	NA

5.0 Conservation of Historic Signage

- Historic signage is a special form of ephemeral or non-permanent Heritage, and shall be considered as a Character Defining feature. It narrates the story of a HA through its content and associations with people, events, products, services et al. It shall hence be considered as an exploratory service, and a part of the general aesthetics of a Historic Station.
- In Historic Stations and Station Areas, the existing signage, its design, font, icon, colour, material, fixtures, and allied conventions concerning it shall be preserved. The text/content may be updated from time-to-time, as required, following the same conventions.

- Within the Historic Station and Station Area, the original form of signage shall be preserved and continued. Whereas its attaché, extension or newer areas contiguous to it shall have a design that has evolved from the original scheme -- in terms of size, scale, design, colour, et al of the Historic Building. Often features or details of the building shall suggest a motif for new signs.
- Where the original text or relocation of signage causes confusion, the Historic object may be donated for educational purposes -- like a local museum, preservation organization or other accountable group.
- Where a Historic signage is being re-attached or replaced, or a new signage is being attached to the Historic Building, safety of the material and pedestrian/user shall be the priority. To ensure this, fittings shall penetrate mortar joints and not the brick/ stone -- and its load shall be distributed and be within the designed threshold limits.

5.1 Development Control Guidelines

- Outdoor advertising shall be consistent with Land Use objectives outlined in the Layout Plans or Property Development Cards (PDCs).
- Outdoor advertising shall be allowed within and around Heritage Railway Stations. For Heritage Stations, the controls shall be prepared by the Technical Consultant preparing the Station master plans, while adhering to the HRAP.
- Outdoor advertising with strong halogen lights shall not be allowed in environmentally sensitive areas, other Heritage areas, natural or other conservation areas, open spaces, waterways, residential areas (except mixed residential and business areas), scenic protection areas, or national parks lying within Railway Land.
- Advertising structures shall not dominate or protrude significantly above the skyline -- or compromise significant scenic views, or views that add to the character of the area.
- Advertising structures shall not diminish the aesthetic quality of the significant Heritage area.
- The design of advertising structures shall be reviewed with respect to context where it is proposed to be installed. It shall neither obstruct, obscure nor cast shadows on the Station Building or adjacent structures.
- Signage shall be used to enhance the visual landscape (e.g., to screen unsightly aspects of a landscape, industrial sites, or infrastructure such as rail lines or power lines temporarily. Such signages shall be temporary, and dismantled to ensure actual resolution of the problem at hand).
- To reduce signage clutter, the following measures are recommended:
    - Discourage multiple advertising signages on a single block of land, structure, or building.
    - If there is advertising clutter, the overall number of individual signages on the site shall be organized and reduced in number and scale. Replacing many small signages with a larger single signage is advantageous, if the overall advertising display area does not obstruct the display of the Historic frontage.

5.2 Design Assessment Criteria

5.2.1 Character of the Area:

i. Is the proposal **compatible with the existing or desired future character** of the area or locality, where it is proposed to be located?
ii. Is the proposal **consistent with a particular theme** for outdoor advertising in the area or locality?

5.2.2 Special areas:

i. Does the proposal **detract from the amenity or visual quality** of any environmentally sensitive areas, **Heritage areas**, natural or other Conservation areas, open space areas, waterways, rural landscapes, or residential areas?

5.2.3 Views and vistas:

i. Does the proposal obscure or compromise important views?
ii. Does the proposal dominate the skyline and reduce the quality of vista?
iii. Does the proposal respect the viewing rights of other advertisers?

5.2.4 Streetscape, Setting, or Landscape:

i. Are the **scale, proportion, and form** of the proposal appropriate for the streetscape, setting, or landscape?
ii. Does the proposal contribute to the **visual interest** of the streetscape, setting, or landscape?
iii. Does the proposal **reduce clutter** by rationalizing and simplifying existing advertising?
iv. Does the proposal **screen unsightliness**?

v. Does the proposal **protrude above buildings, structures, or tree canopies** in the area or locality?
vi. Does the proposal require ongoing **vegetation management?**

5.2.5 Site and Building:

i. Is the proposal **compatible with the scale, proportion, and other characteristics** of the site or building, or both, on which the proposed signage is to be located?
ii. Does the proposal **respect important features** of the site or building, or both?
iii. Does the proposal **show innovation and imagination in its relationship to the site** or building, or both?

5.2.6 Associated devices and Logos with advertisements and advertising structures:

i. Have any **safety** devices, platforms, lighting devices, or logos been designed as an integral part of the signage or structure on which it is to be displayed?

5.2.7 Illumination:

i. Would illumination result in **unacceptable glare**?
ii. Would illumination affect **safety for pedestrians, vehicles, or aircraft**?
iii. Would illumination **detract from the amenity** of any residence or other form of accommodation?
iv. Can the **intensity of the illumination be adjusted**, if necessary?
v. Is the illumination subject to a curfew?

5.2.8 Safety:

i. Would the proposal reduce the safety of any **public road**?
ii. Would the proposal reduce the safety for **pedestrians or bicyclists**?
iii. Would the proposal reduce the safety for **pedestrians, particularly children**, by obscuring sight lines from public areas?

5.3 Revenue Generation and Public Benefit

- The Public Benefit Test is an assessment of how the passengers and end users could benefit from the deployment of a proposed advertising sign.
- The public benefit, which can be in the form of a monetary or an in-kind contribution, is to be negotiated between the Consent Authority and the Applicant.
- Both monetary and in-kind contributions must be linked to improvements in passenger amenities, services, and facilities (e.g., improved safety, comfort, transportation, etc.).

Appendix VIII: List of Financing Systems Supporting Conservation

***NOTE**: Globally, there are several systems of Finance that have been evolved and tested for enabling continuity of HAs. Below is a compilation of such systems that could be a point of reference to evolve one for RHA. It may be noted that the below enlisted systems are not exhaustive, will evolve over time and are to be considered in consultation with its respective support systems like Town Planning, Urban Development, Mobility Policies, Housing and Social development, Education and Skill-Building et al. The following are hence for the purpose of reference and is to be modified before applying for RHA.*

1. **The Malraux Act** (France) aims to reduce taxes on the amount paid for the restoration of Heritage properties:
    a. 30% for buildings that are in a 'Preserved sector'.
    b. 22% for buildings located in a 'Heritage Protection Area'.

2. The amount of work for the calculation of the tax reduction in Malraux 2017 law is retained within the annual limit of € 100,000.

3. In the United Kingdom, exemption from Inheritance Tax known as **'Heritage Relief'** can be claimed where the transfer involves qualifying Heritage Assets, including Historic Buildings. Exemption is also available where qualifying Heritage Assets are transferred into an approved trust fund established for maintenance purposes. Exemptions depend upon certain undertakings -- such as limited public access (e.g.,. open at least One Day per year), and a **maintenance agreement**.

4. In West Germany, Heritage properties are **taxed at 40%** of their value, or at **0%** in some cases, with the level of abatement dependent on the cost of maintenance and the level of public access provided.

5. In France, owners receive a **50% tax credit** for maintenance and restoration expenditure.

6. In Turkey, Heritage properties are **completely exempt** from property taxes.

7. The Netherlands Department of Conservation (RDMZ) provides property owners with **as-of-right grants** towards maintenance and restoration, with the contribution varying between **20% and 70% of cost**, depending on the circumstances. The Scheme is substantially funded at approximately 80 million Guilders per year.

8. In Salzburg and Graz, Austria, local laws establish **protection zones in the town centres**, within which landlords have an automatic entitlement to **grant assistance** from the Historic Town Centre Preservation Fund.

9. In Denmark, every owner of a Listed Building has an equal right to benefit from the grant system, with the grants calculated according to the owner's additional expenses over and above the normal cost of maintenance and repair of non-listed buildings. A benchmark rate of **'decay per year'** has been developed for the various types of Heritage Buildings. Grants are calculated accordingly, ranging from **20-50%** of the full cost of repair.

10. The proactive policy operated by the Danish Historic Houses Owners Association (BYFO), encompassing income tax relief (subsidized decay per annum figure), is designed to encourage systematic maintenance of Architectural Heritage by private owners to forestall decay -- and provides evidence that public support for regular maintenance negates the necessity for, in the long-term, large-scale publicly funded repair projects.

11. Protected Heritage structures in Belgium, Denmark, France, Germany, Italy, Netherlands, Spain, UK, USA and Canada may be entitled to either an **exemption, abatement or freeze from property tax** usually raised at municipal (local) government level.

12. Belgium, France, Italy, and The Netherlands charges a **reduced rate of VAT** for dwellings, which greatly reduces the cost of works on Architectural Heritage Buildings in residential use.

13. In Nova Scotia, the provincial government provides a **rebate of 53% on sales tax** paid on the purchase of building supplies for Heritage Conservation projects.

14. The City of Toronto offers two Heritage incentive programmes to assist owners of eligible Heritage properties with the cost of Conservation work:

a. The **Heritage Grant Programme** provides **funds of up to 50% of the estimated cost of eligible work** (some maximum limits apply) to residential or tax-exempt Heritage properties. It assists property owners repair and retain defining Heritage attributes, including masonry, windows, doors, wood detailing, and slate roofs.
b. The **Heritage Tax Rebate Programme** provides a **rebate of 50%** of the cost of eligible work up to **40% of annual taxes** paid to commercial and industrial Heritage property.

15. Legislation in most Australian States and Territories provides for the **Revaluation of Listed Heritage properties** based on actual use, rather than 'highest and best' use. This may lead to reduced land tax assessments.

16. Using money raised through the National Lottery, the **Heritage Lottery Fund (HLF)** gives grants to sustain and transform the UK's Heritage -- committing around £375m to invest each year towards Heritage projects.

17. **Transfer of Development Rights (TDR)** is a zoning technique used to permanently protect land with Conservation Value' (such as farmland, community open space, or other natural or cultural resources) -- by redirecting development that would otherwise occur on this land (the sending area), to an area planned to accommodate growth and development (the receiving area).
    a. TDR programmes financially compensates landowners for choosing not to develop some or all of their land in a special area (like a historic area).
    b. These landowners are given an option, under municipal zoning, to legally sever the development rights from their land -- and sell these rights to another landowner or a real estate developer for use at a different location.
    c. The land from which the development rights have been severed is permanently protected through a Conservation Easement or a Restrictive Covenant.

18. The Association for Industrial Archaeology (UK) awards restoration grants up to £20,000 that include transportation projects such as canals, Railways, Railway locomotive and maritime vessels.

19. **Jaipur Heritage Regulation** enables the provision of TDR. It also provides tax rebates for listed Heritage Buildings to preserve its Heritage state, with allowed internal changes and due repairs/sensitive adaptive reuse, by the Urban Development Tax Authority/Department for residential/commercial properties.

20. Case Studies for Financial Incentives/Management of Heritage.

21. The Department for Culture, Media and Sport (2004) has recommended relief against income tax for the maintenance of Historic Buildings that are open to the public.

22. A considerable number of European countries have a maintenance-focused grants system for individual owners of Listed Buildings, providing necessary and welcome fiscal breaks. Holland has a range of incentives such as low interest loans and tax breaks for maintaining Heritage property.

23. Other European countries have incentives, including maintenance grants, rate rebates and standardized, subsidized building inspection. For example, in 2005, The Netherlands introduced Monumentenwacht, and reduced VAT from 19% to 6% for maintenance works. The Monumentenwacht initiative has succeeded in increasing annual inspections and maintenance for all 51,000 Listed Buildings in The Netherlands from 24% in 2005 to 30% in 2007.

Appendix IX: White paper on Strategies for carbon abatement through Conservation of Railway Heritage Assets

This Appendix comprises the mechanism for calculating the reduction of GHG emmissions through Conservation. Following is the structure of the Appendix:

Background studies and research

Section 9.1: Background: This section introduces this assignment.
Section 9.2: Approach: This section explains the approach adopted for creating the Carben Abatement Strategy.
Section 9.3: Methodology: This sections details out the methodology adopted and emerging discourse in involving heritage to reduce GHG emission as part of the Carbon Abatement Strategy.

Findings

Section 9.4: Estimation of GHG emissions from Construction/ Restoration Projects: This sections is a calculator for collecting relevant data, calculate GHG emissions from Railway Redevelopment Projects (with special focus on heritage). It also comprises the additional works necessary to evolve this calculator into a robust framework.
Section 9.5: Way forward: This section mentions the key benefits of the conduting the additional steps for evolution of the calculator as mentioned in section 10.4

Supporting Information

Annexure 03: Case examples of similar approaches for Carbon Abatement in Heritage Areas
Annexure 04: Comparison between regulations, norms, and certification systems for achieving energy efficiency
Annexure 05: Tools to measure Embodied Carbon
Annexure 06: Valuation and its relation with Life Cycle Assessment Calculation
Annexure 07: Table of Stakeholder and subcategories for Social Life Cycle Assessment
Annexure 08: Case Study: Penang Shophouses of Malaysia
Annexure 09: Total Economic Value (TEV)

Section 9.1: Background

In 2019, it was reported that the construction sector contributes to atleast 36% of Greenhouse Gas (GHG) emission globally and has been sharply increasing since the last decade[9] (Global Alliance for Buildings and Construction, International Energy Agency and the United Nations 2019). With growing urbanization there has also been an exponential increase in urban population, demand for housing stock (in cities) and the number of people employed in construction sector. Mapping the combined effect of these individually complex and interdependent web of processes by international agencies, intergovernmental bodies, and government of countries unanimously point to adverse (and irreversible) impact it bears on our ecosystem, health and safety of existing and future generation and accelerates the rate of climate change.

One of the means of addressing this challenge (of providing housing and necessary infrastructure for services while controlling carbon footprint) is by maintaining existing building stock and up-grading it to meet energy efficiency standards. When projects of conservation, maintenance, continued use and adaptive reuse of historic buildings were scoped for its potentials to reduce carbon footprint, it was found to significantly reduce it (as embodied carbon is much lower as compared to new constructions) and bear positive externalities. Demolition phase of buildings (including demolition, waste transportation and waste treatment) alone can contribute to about 2–5% of the total GHG emissions depending on the types of waste treatment. (Yim, et al. 2018). In addition to this, in the last decade, a number of projects in the European Union and Australia have focused on identifying means of increasing the effectiveness of this approach in order to reduce emission and also to test strategies, identify enabler, educate supporting sectors and encourage transitioning to sustainable development. From new technology, material, smart building systems to developing toolkits, technical standards, trials of alternate building materials and capacity building, the consciousness towards a sustainable future has manifested into several actions, ideas, incentives and acknowledgements that are in various stages of implementation and acceptance.

[9] For subtropical countries and cities like Hong Kong, buildings can contribute to almost 60% of final energy consumption (Yim, et al. 2018).

Now, while raw data posits reusing, recycling, retrofitting, upgrading and upcycling historic (or any existing) buildings as a possible solution to meet Sustainable Development Goals (SDGs), the actual success of such projects depend significantly on attitude change and willingness to participate and partner in the process and hence affects every choices en-mass. What is also important to note is that to develop any strategy, assess realistic benefits and prevent leakage in the system, a large dataset is essential, that is a combination of quantitative (embodied carbon, emission-based data, disposal of construction waste) and qualitative (social life cycle, social acceptance, nature and rate of participation in conservation et al) data. The latter shall have to be sourced not only from the building-level project, but also from its surrounding as its performance shall depend on landuse, mobility, access to the historic building through assigned use, green cover, associations et al. Furthermore, the progress and benefits from transitioning to a sustainable development requires a robust macroeconomic framework within which conservation and continued use of resources, industry (and market) support and cross-subsidies can be planned. Simple calculations based on hedonistic assumptions is likely to misconstrue the importance and benefits from conservation of heritage assets.

For IRSDC, this may be an opportunity to lead and benefit from the transitioning to a sustainable development and steering this format of growth in Indian cities. Having a bulk of Railway historic assets that require comparably similar upgradation and maintenance, it is in a commanding position to set the industry standards, create a market for green technology and products, create and absorb skills[10] and drive circular business concepts. In this phase of the project, a framework has been developed to calculate emissions averted through conservation of RHA (Railway Heritage Asset) and compare it with a new development, if proposed in its place. It requires testing for finetuning its fields and outputs. Additionally, having studied projects of similar objectives, we have also proposed collection of data to compute other inputs that determine what could make sustainable development projects successful.

Section 9.2: Approach

There were four steps for undertaking this study. Step one is identify the complete scope of work and analyse the scope and limitations within which abatement of carbon emission can be quantified. Step two is an extension of the first, where a more critical appraisal is done of selected literature after scoping and selecting relevant cases and concepts. The third step involves generalisation and extraction of fields and parameters necessary to development the outputs. This stage requires input from real-time feed from actual project to make the outputs effective and project specific. Step four involves calculating the social value of carbon or that of carbon abatement undertaken as a part of Total Enterprise Value (TEV) exercise based on the above studies.

Section 9.3: Methodology

Table 47: Methodology

Step 01: Background Research	• Study of emergence of the concepts and consciousness behind reducing carbon emission. • Identification of systems and tools dedicated for or applied to built heritage to harness its potentials in order to meet goals of reduced carbon emission.
Step 02: Literature Survey	• Survey of cases where historic building or a cluster has been conserved and upgraded to meet emission goals by using the systems identified in Step 01. • Collation of observations from case studies to identify the effectiveness and conditions within which such systems give desired results. • Limitations and flaws of such systems in achieving desired results.
Step 03: Extraction of details	• Extraction of parameters to be considered in designing tools to assess emission in historic buildings. • Identification of types of assessments to be undertaken. • Identification of types of incentives and their efficiency in achieving results.

[10] A key factor in the successful transition towards a greener economy, shall enable workers to move easily from sectors where employment would drop (example, fossil-fuel industries), to sectors such as renewable energy industries where job opportunities are rapidly rising (Srivastava and Jha 2016).

Step 04: Outputs	• System to calculate emission from conservation in comparison to new development. • Guidelines for collecting data to compute inputs from Site and (Asset) Management.

9.3.1 Step 01 and 02: Background Research and Literature Survey

From a list of case studies and papers consulted, a number of determinants (Refer *Table 48: Parameters to study for data collection at Building, Site and Management level*) have been identified that contribute in reducing carbon emission in historic building stock. Several studies have shown that a viable alternative to demolition may be to rehabilitate the heritage building stock, upgrade the infrastructure in the core, and improve service provision to local businesses and households. Historic urban centres are usually interconnected networks of local creative industries that supply cultural goods and services both to the resident population and to visitors, including tourists (Throsby, Heritage Economics: Coming to Terms with Value and Valuation 2019). Rehabilitation of the core provides a stimulus to these industries, generating incomes and employment for local people and businesses. Moreover, the cultural capital assets, both tangible and intangible, are important in maintaining the social and cultural fabric of the community (Steinberg, Conservation and Rehabilitation of Urban Heritage in Developing Countries 1996).

I. Parameters to be included to compute energy efficiency

a. Before initiating any energy-efficiency interventions in a heritage buildings, it is essential to develop clearly articulated notions of their architectural and cultural values. Sufficiently, full understanding of their inherent values is crucial for the development of methods that can improve their energy efficiency while preserving their qualities.
b. Some key parameters to study for effective energy efficiency and carbon savings are:

Table 48: Parameters to study for data collection at Building, Site and Management level

Parameters at:		
i. Building level	**ii. Site level**	**iii. Management level[11]**
• Character and significance of the building • Local climate, orientation, and exposure • Current energy performance of the building envelope • Hygrothermal behaviour of building fabric • Condition of the building • How well the services perform • Levels of energy use related to occupancy and human behaviour • User requirements, aspirations and aims	• Land use and land over • Compactness and density of the settlement/zone • Mobility and transit system • Construction waste disposal system	• Quality of maintenance • Availability of trained human resources • Availability of funds and willingness to pay for correct implementation • Access to raw material • Range of community dependency (including employment, social aspiration, corruption, migration/ gentrification) • Availability of and access to technology (and cost appropriate options) • Commitments to sustainability

c. There are several calculators, tools and assumptions used to calculate the embodied carbon. When the tools and their respective assumptions were studied and compared, it was noted that each toolkit is context specific and is extremely sensitive to the approach and method of valuation applied. Refer to **Annexure 05: Tools to measure Embodied Carbon** and **Annexure 06: Valuation and its relation with Life Cycle Assessment Calculation.**

[11] The Management level parameters adapts from the Social Life Cycle Assessment fields identified in UNEP/ SETAC Life Cycle Initiative and are proposals to be included in the measuring sustainability of a conservation project. (Refer to **Annexure 07: Table of Stakeholder and subcategories for Social Life Cycle Assessment**.

II. Learnings from Research and Case Studies

a. General observations

i. Investigation of economic perspectives on cultural heritage and of the economic values tied up in conservation practice are important to strengthen conservation practice and advance the understanding of conservation's role in contemporary society (Getty Conservation Institute 1998).
ii. Heritage goods have an inherently public nature - because many objects and structures of cultural heritage have the character of public goods, markets fail to realize their full value, and hence, a nonmarket arrangement of some kind or another is required. Cultural heritage is a public good in that no one can be excluded from enjoying it, and everyone can enjoy it at the same time (Getty Conservation Institute 1998).
iii. The management of natural capital can be understood within the paradigm of ecologically sustainable development, where economic, social, and environmental values are interpreted within a holistic system (World Commission on Environment and Development 1987, Costanza and Herman, Natural Capital and Sustainable Development 1992).
iv. Expenditure on heritage conservation of RHAs are an investment project, and therefore amenable to ex-ante or ex-post evaluation using investment appraisal methodologies such as cost-benefit analysis and life cycle assessments (Throsby, Heritage Economics: Coming to Terms with Value and Valuation 2019). Monetary valuation[12] is applied in cost benefit analysis to enable the cross-comparison between different impacts and/or with other economic costs and benefits. For this reason, monetary valuation has a great potential to be applied also in Life Cycle Assessment (LCA)[13], especially in the weighting phase (Pizzol, Weidema, et al., Monetary valuation in Life Cycle Assessment: A Review 2015). Different methods for economic valuation have different strengths and weaknesses that make them differently suited for valuation of specific goods or impacts. Thus, not one method is generally recommendable for LCA, but rather a careful combination of methods is required (Pizzol, Weidema, et al., Monetary valuation in Life Cycle Assessment: A Review 2015).
v. Achieving a truly energy-efficient building requires consideration of the total amount of energy used over the building's life cycle. LCA of heritage is an important tool to understand the full carbon impact and helps in identification of opportunities to influence the footprint and thus, creating programmes of learning around how to reduce carbon throughout the lifecycle.
vi. Reducing embodied carbon does not necessarily cost the client more, as long as it is considered at the very start of the project (UK Green Building Council 2015).
vii. Reusing existing building structures and envelopes, maintaining thermal comfort indoors, and recycling furniture/building finishes, amongst other things, can bring more income to heritage building owners (Cabeza, Gracia and Pisello 2018).
viii. Investing in regular and timely maintenance optimises building performance and increases the benefits (and reduces the technical risks) of any additional energy efficiency improvements[14]. By dealing with faults before they develop into major defects, the need for larger, more costly and invasive programmes of repair and conservation treatment will frequently be averted (Historic England 2018).
ix. Energy performance of building services: The efficiency, control and management of building engineering services – heating and cooling, hot water supply and lighting, and equipment and appliances – are key factors affecting energy use. Assessments should identify fuel sources and the type, size, age and condition of all the energy-consuming services and equipment (Department of Energy, United States of America 2015).
x. Traditional materials can perform better in lifecycle terms than highly manufactured modern solutions but research on more materials in diverse contexts is needed (Wise, et al. 2019).
xi. Often, heritage structures are in good condition, and smaller retrofit interventions are often better in lifecycle terms than more intrusive interventions (Wise, et al. 2019).
xii. Environmentally conscious user behaviour can significantly affect operational carbon in heritage buildings, with almost 50% less energy. Some additional attention for changing the behaviour such as

[12] Monetary valuation is the practice of converting measures of social and biophysical impacts into monetary units and is used to determine the economic value of non-market goods, i.e., goods for which no market exists (Pizzol, Weidema, et al., Monetary valuation in Life Cycle Assessment: A Review 2015) .
[13] Life Cycle Assessment, also known as Life Cycle Analysis, eco-balance, and cradle-to-grave analysis, is a technique to assess environmental impacts associated with all the stages of a product's life from cradle-to-grave, is the comprehensive examination of a product's environmental and economic aspects and potential impacts throughout its lifetime, including raw material extraction, transportation, manufacturing, use and disposal.
[14] The thermal resistance of porous building materials reduces when they are damp, and building defects, such as leaking gutters and defective drains that allow moisture to accumulate, will reduce thermal performance. Uncontrolled air infiltration through cracks and poorly maintained doors and windows contributes further to heat loss.

using energy saving lights bulbs, using timer for bulbs in the areas like stairs and turning off lights when leaving a room can reduce energy consumption by up to 20%.

b. Case-specific observations

Also see Annexure 03: ***Case examples of similar approaches for Carbon Abatement in Heritage Areas***.

i. Study on the restoration of the fortress of Uncastillo, **Spain** using the CH-LCM Model framework shows that the life cycle approach is considered an effective method for improving innovative managerial practices towards the sustainability, preservation, and restoration of Cultural Heritage by assessing the environmental impact, the financial and economic feasibility and the implementation of an engagement strategy for the stakeholders (Blundo, Ferrari and Hoyo, et al. 2018).
ii. Studies on **Malaysian** heritage retrofitting (Penang shophouses) indicates that mechanical ventilation is not crucial in tropical climates and reduction of indoor air temperature can be achieved by passive thermal retrofitting. As is typical in tropical climates, heritage buildings have relatively high thermal mass due to their thick walls and large openings. Use of passive thermal retrofitting vastly reduces the building's energy demand. (Refer to **Annexure 08:Case Study: Penang Shophouses of Malaysia**)
iii. In the case of a **Belgian** heritage retrofitting, LCA studies indicate that a retrofit package is 57% better in lifecycle carbon terms than demolish and rebuild.
iv. LCA of **Norwegian** heritage, comparing the net climate benefits from the refurbishment of a residential building from the 1930s with the construction of a new building in accordance with modern building codes, shows a 67% reduction of total GHG emissions over a 60-year period of analysis.[15]
v. For a heritage **Portuguese** building located in Lisbon, where real refurbishment is compared with hypothetical demolition, followed by complete reconstruction on the same site, studies showed that re-use could be 4%-46% better and result in almost 13% savings.
vi. For a 1975 multifamily house in **Germany**, results show that a high level retrofit to a building constructed in 1975 was 15% better than a new construction built to 2016 German standards.

c. Comparative study of norms and regulations applied in approaching energy efficient upgradation of historic buildings

Refer to Annexure 04: ***Comparison between regulations, norms, and certification systems for achieving energy efficiency***.

Much like the ongoing efforts of experimenting with transit-oriented development, compact and mixed-use area-based (re)development and cities, adoption of non-conventional sources of energy in the last five years, there has been tests (cases) involving historic building stocks to develop approaches for such buildings of different era, type and uses. From a sample survey of systems devised for historic assets to render it emission-friendly and to enumerate the benefits garnered in the process, two such cases were identified. These include the English Heritage (also incorporating the European Union Emission Trading System (EU ETS)) and The National Park Services. In addition to this, the Technical Note: Building services—Upgrades and installation Australia Department of Environment and Heritage Protection system, which is comparatively recent, had been combines both, the European and the North American standards, and adds to it a system of biodiversity offset, which offers a means to balance the impact of development and is slightly different from the carbon currency and trading mechanism[16]. We have however studied the offset mechanism, to prospect a possible tool where the remediation shall be prospected for within the same project area.

For tropical and humid climates similar to India, Malaysian standards of Green Building Index (GBI) was studied. The GBI Rating tool is specially designed for tropical climate that not only considers Malaysia's environmental and development context, and cultural and social needs, but also ensures new buildings remain relevant in the future and existing buildings are refurbished and upgraded to improve the overall quality of building stock. Additionally, India's Green Rating tools such as Indian Green Building Council (IGBC), and The Associated Chambers of Commerce and Industry of India (ASSOCHAM) GEM Rating Systems were also studied and analysed. While the IGBC Rating is specifically tailored for Railway Stations, and ASSOCHAM's *Principle No. 26 - Activities for Corporate Social Responsibility* encourages *"Protection of national heritage, art and culture including restoration of buildings and sites of historical importance"*, both rating systems are not specifically tailor-

[15] For the new building, it takes more than 50 years for the initial emissions from construction to be outweighed by the effects of lower in-use energy consumption.
[16]Any trading mechanism that involves parties who are not within the same bio-geographical region or where one may purchase the ability to develop at the cost of another has been met with just criticism)

made for heritage. RHAs are endowed with architectural, technological, aesthetical and urban history-related values and thus, require its own tailor-made assessment tools and rating systems.

d. Limitations observed

i. With refurbishment and retrofit projects, front loaded capital expenditure is high.
ii. Initial conditions for microclimatic regime modelling may differ. There is a need for individual solution for each building as there are no 'one-size-fits-all' solutions for making energy and carbon savings
iii. Extra care is required when using and comparing results from published LCAs, that might be both partial and short sighted, due to the current limitation of these tools.
iv. Several of these LCA studies only measure initial embodied carbon and do not consider operational carbon or material lifespans.
v. Only looking at operational carbon is an issue because a full lifecycle picture is not developed, making assessments of benefits problematic.
vi. To achieve the most effective reduction of carbon emissions and the costs of reducing them, not only it is important to refurbish historic buildings, but it's vital to achieve this at a quick pace.
vii. It is also important that the sample size of such refurbishment and retrofitting is large, i.e. carried out for a larger number of buildings, otherwise the total reduction of carbon emissions is significantly less.
viii. The construction sector in India is the second largest economic activity after agriculture and provides employment to about 33 million people, of which the bulk is constituted of unskilled workers (82.5%), skilled workers constitute about 10% and rest is constituted by engineers, technicians, foremen and clerical staff (ICRA Management Consulting Services Limited (IMaCS) n.d.). Any change in this sector needs to factor for the cost of skill transition. The existing LCA approach does not account for this overhead, although it significantly affects the carbon footprint. Thus, it becomes imperative for India to develop its own approach towards LCA by factoring the dependency of a huge population of the construction sector.

9.3.2 Step 03: Extraction of details and designing a way forward for RHA in reducing carbon emission

In India, as of yet, there are no norms, regulations or guidelines or large dataset based on studies on the effect of conservation or upgradation of a single or a cluster of historic buildings, in *reducing emission*. There is also very little consolidated data[17] from Indian case studies on performance of historic buildings after transitioning to clean energy as well. Therefore, the assessment criteria of the Indian Green Building Certification (IGBC) to rate Indian Railway Stations have been studied as these have been used for building type of interest. It may be noted that the IGBC at this point does not differentiate between historic and non-historic stations or buildings[18]. However, as the system is gaining acceptance, the parameters of the certification may be modified to develop one that is applicable to the RHAs.

The valuation of historic buildings must be based on TEV (Refer to **Annexure 09: Total Economic Value (TEV)**), where reduction in emission by the building envelope is only one of its benefits. While theoretically the continued use of a building is a *pro-green* choice, it is materialised only when owners and managers (are willing to) invest in necessary transitions and upgradation, implement technically correct maintenance, adopt energy efficient appliances and smart systems, and consume the building and energy judiciously. Therefore, it is not enough to track the emission averted by conserving the shell alone but is important to compute both net and gross effect and efficiency of the combination of enablers that facilitate achieving aspired results. It is imperative that assumptions made in choosing (a combination of) methods in developing a methodology (or a toolkit) for calculating and projecting benefits or for evaluating progress from sustainable choices, be based on contextual realities, and be tailored to conditions of railways historic resources[19].

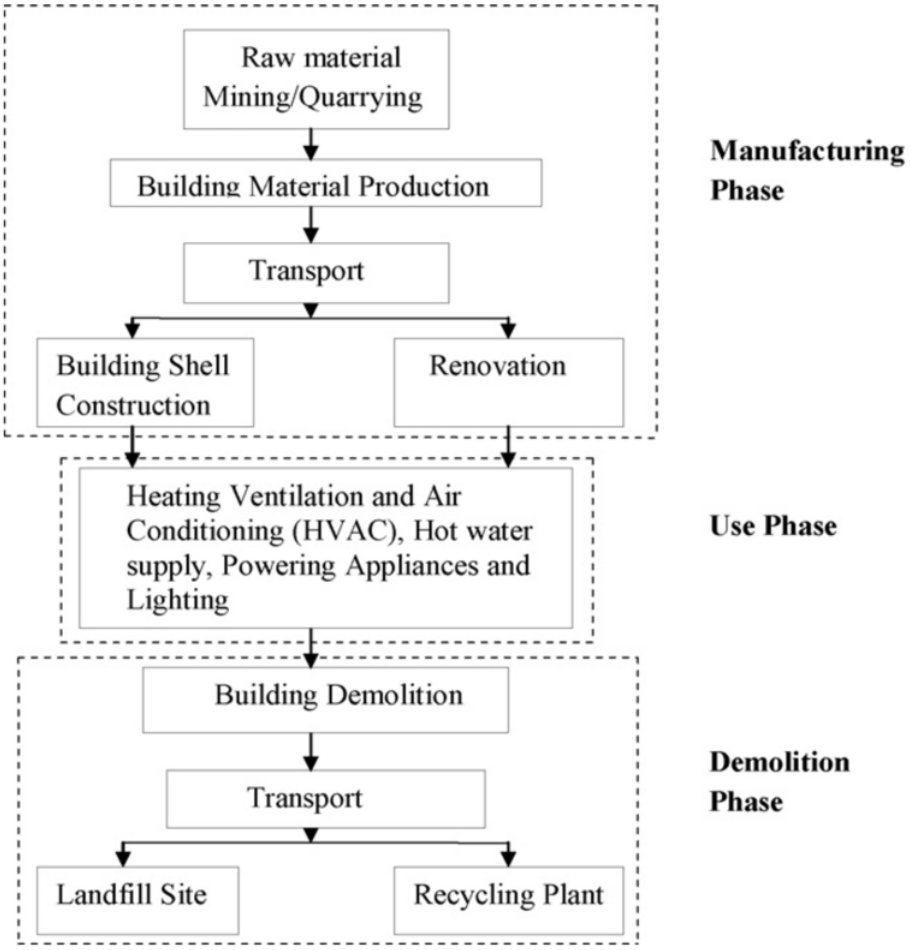
Natural resources are generally subjected to a more conservative approach, focusing more on its preservation, compared to man-made resources such as the RHA. A sustainable future of the latter necessarily includes upgradation and retrofitting, technically sound maintenance, and continued engagement with society through compatible use. These fundamental differences determine the limits of change and use, intervention (including the nature of upgradation and maintenance necessary), expectations, timeline, capacity et al, and even the approach to project conceptualisation. Further, it also determines the way resources are valued and how the

[17]Endeavours like the Creative Cities Network, World Heritage Cities Network and even inscriptions on the World Heritage List are now focusing on meeting Sustainable Development Goals, including those of reducing emissions, with cultural resources as a tool. However, the cumulative or figures from individual test cases are yet to be computed for it to be used as references.
[18] There is a rating system for upgrading existing buildings in the IGBC, ASSOCHAM Gem and in the CPWD Guidelines for Sustainable Habitats, March 2014, MoHUA, Govt. of India.
[19] Most methods used to evaluate benefits from sustainable initiatives largely borrow from project experiences involving natural resources, ecosystem services and environmental impact assessment. While cultural and natural resources have seemingly similar needs of protections, these cannot be generalized where railways are historic resources.

gross benefit of a sustainable approach is projected and calculated. For example, without a RHA specific computation of TEV, it will neither be possible to identify positive externalities borne due to it, nor develop models of revenue-share and may undervalue potentials of the assets.

One of the tools that is being widely applied to calculate benefits of cutting back from GHG emission from conservation of historic building stock is Life Cycle Assessment (LCA) (See *Figure 52: System boundaries for LCA Analysis* (Blundo, Ferrari and Riccardi, et al. 2014). However, comparing cases or emulating methods or even expecting comparable results is premature, as results of LCA depend on system boundaries, functional units and methodological choices. Further, LCA has more widely been biased towards assessing environmental impacts, whereas in the case of RHA, equal focus is necessary for social impacts. The tool (being quantity driven) does not account for factoring the impact of the quality of management, organisational strength, quality of craftsmanship and maintenance work, financial support et al that are critical for the health of RHA to perform as per designed value. Furthermore, the fact that maintenance jobs created through conservation could alleviate community from poverty and through it support abatement of emission, is also not factored for calculation.

Figure 52: System boundaries for LCA Analysis

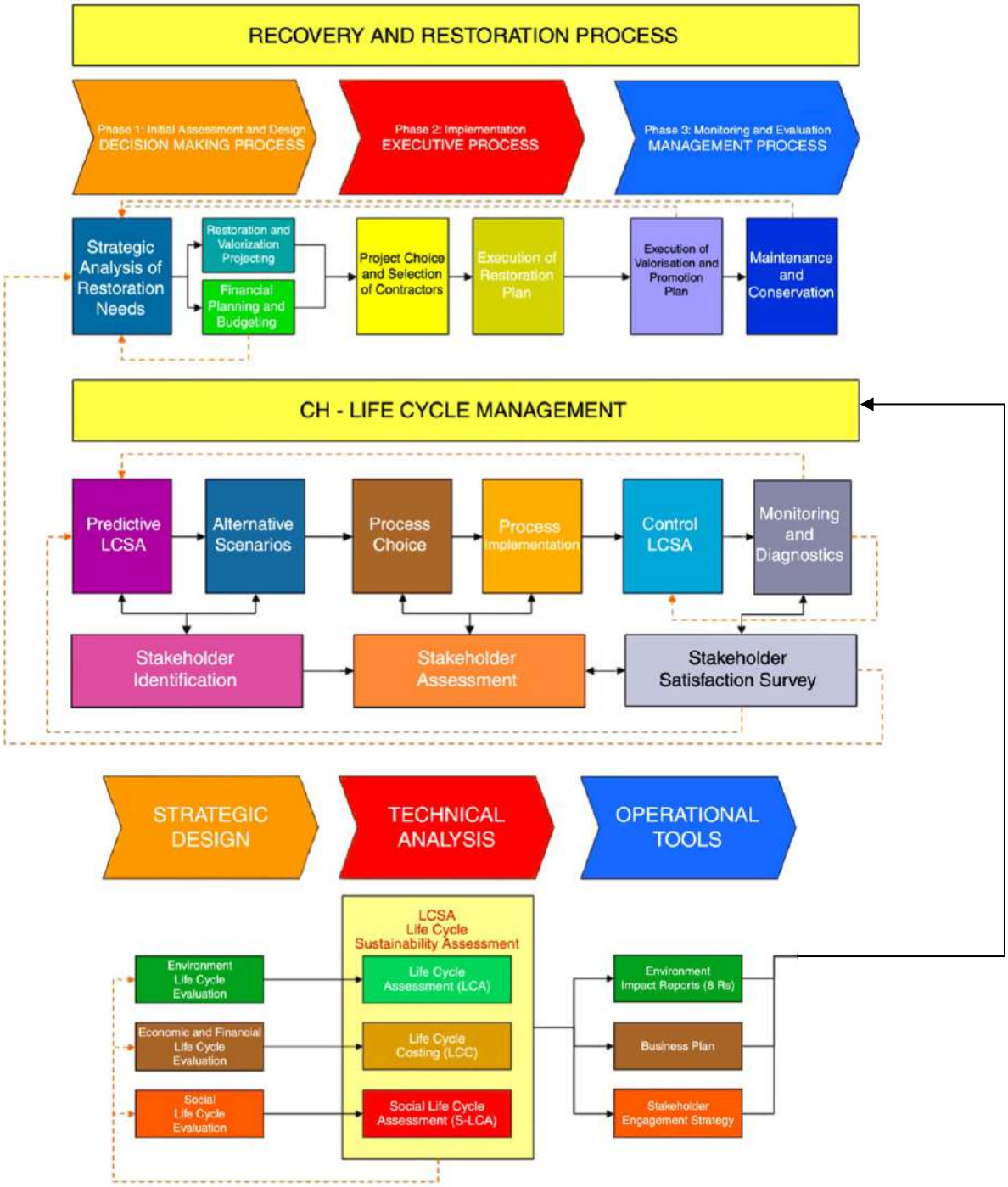


An exception to this is the EU Life Fortune Project, where a research was conducted to develop a framework for Cultural Heritage Life Cycle Management (CH-LCM) to overcome the shortcoming of LCA. Its aim is to support decision-makers by automating the processes required to manage the lifecycle of materials and processes in line with sustainability goals while accounting for technical and human resource dependencies. Developed based on the principles of circularity and based on literature review[20] and feedback from restoration and conservation projects in Italy, this model recognises heritage and conservation projects as a dynamic and non-deterministic complex system. The empirical validation and modelling of the conceptual protocol of the CH-LCM is being tested

[20] One of key reference points is the UNEP/ SETAC Life Cycle Initiative, which derives its fundamentals from Klo¨pffer`s conceptual formula where Life Cycle Sustainability Assessment (LCSA) = Life Cycle Assessment (LCA) (calculate Environmental dimensions) + Life Cycle Cost (LCC) (calculate Economic dimensions) + Social- Life Cycle Assessment (S-LCA) (calculate Social and Cultural dimensions). The importance of the latter is the inclusion of culture-nature interactions, which change the LCA substantially.

through case studies in the next phase (in ongoing stage). The proposed model from the EU Life Fortune Project is as *Figure 53: Proposed model from the EU Life Fortune Project*.

Figure 53: Proposed model from the EU Life Fortune Project



9.3.3 Step 04: Developing Outputs

Based on the study conducted, it has been proposed that calculating social value of carbon or that of carbon abatement can only be done correctly if it is undertaken as a part of TEV exercise, that factors all dependent factors' and not as a standalone evaluation. As this computation is:

1) data sensitive and requires large datasets,
2) sensitive to method and approaches of valuation,
3) sensitive to stakeholder interest and participation,

4) dependent on the boundary conditions and limitations.

Therefore, it is essential to simulate the (proposed) frameworks with data collected from actual cases and not with proxy values.

Leveraging from lessons learnt from ongoing case studies, it is judicious that this simulation may be done in atleast three (3) phases. To start this process, a systematic documentation is to be done of diversity of materials used in original construction in response to different contextual conditions, geography (and climate), socio-conomic conditions and use. The sample size should not only be diverse but large enough to generate a schedule of approved materials that are compatible with the original construction, be maintenance-friendly and that meet emission standards (and be compared to modern material or general alternatives used). This shall be the first task based on which the three-phased simulation may be undertaken.:

i. Phase 01 will focus on finetuning the fields for data collection by embedding this task through first three Key Deliverables. It may be noted that this will not require a change in contract documents as site-based data collection is a mandated duty of the Technical Consultant. It may require appending an additional list (which may also serve as a checklist) to **Appendix II: Measured Drawing and Documentation** for the Technical Consultant to note that these are compulsory fields of information. The fields of information will include the units of material needed for conservation and to calculate based on template provided in *Table 49: Estimation of GHG emissions from Construction/ Restoration Projects* and collect data to provide information on parameters identified in *Table 48: Parameters to study for data collection at Building, Site and Management level*.

ii. Phase 02 will focus on finetuning the fields of data to be collected and thumb rules to combine methods to effectively evaluate expected values. Through this simulation, it would be possible to generate a customised calculator to assess projects of similar intents which includes area based (physical and social) data capture. Additionally, this stage should also help in generating a project monitoring dashboard and a training system for facility managers.

Phase 03 will focus on convergences and stimulation of allied sectors. As in this phase, the number of station and station area on which the assessment tool applied may be increased, it will also be possible to factor the feedback and improve on the dashboard.

Section 9.4: Estimation of GHG emissions from Construction/ Restoration Projects

Table 49: Estimation of GHG emissions from Construction/ Restoration Projects below has been prepared as a sample calculator with the help of proxy data to quantify emission from a conservation project and compare it with a new construction of similar volume, if it were to be built by demolition of the existing structure. The proxy data needs to be replaced with actual quantities, specifics of the material and the distance through which the material must travel for conservation to identify actual benefits accrued[21].

Table 49: Estimation of GHG emissions from Construction/ Restoration Projects

S. No.	Material	Unit	Emission/ unit[22]	Consumption	
				New Construction	Restoration of Heritage Structure
1	Stainless Steel bars	kg	5.457	18915	13241
2	Alcohol	kg	0.828	36.5	22
3	Aluminium	kg	0.622	134	54
4	Bricks	kg	0.327	162056	64822

[21] Data from projects undertaken by IRSDC could not be fed at this point to simulate the table as projects have not reached the given stage of output. In the subsequent projects, IRSDC may include this within its scope of work in KD 03 and to determine which project option may be selected.
[22] Data for emission unit has been collated from - (Kibert 2016) (Shams, Mahmud and Al-Amin 2011) (Tirth, et al. 2019)

S. No.	Material	Unit	Emission/ unit[22]	Consumption	
				New Construction	Restoration of Heritage Structure
5	Cement	kg	0.967	23913	2391
6	Ceramic	kg	0.78	1875	1125
7	Concrete	kg	0.159	433703	173481
8	Cooking Oil	kg	3.07	54	27
9	Copper Pipes	kg	3.02	28.5	3
10	Diesel	kg	3.17	855	86
11	Electric Wires	kg	2.84	159	32
12	Electricity	kWh	0.7898	647	65
13	Fugitive Discharge	kg BOD	0.03	84	25
14	Glass	kg	1.735	964.5	579
15	Granite	kg	0.04	55.5	39
16	Gravel	kg	0.00241	19864	3973
17	Lighting Fixtures	set	35.65	24	5
18	LPG	kg	3.27	48.75	24
19	Marble	kg	0.436	318.8	128
20	mosaic	kg	0.238	531	372
21	Perlite	kg	0.995	131	66
22	Plasterboard	sheet	11.35	21	13
23	Plastic Pipes	m	0.4	105	21
24	Plywood	kg	0.61	157.5	16
25	Polyurethane	kg	4.31	46	5
26	PVC Pipes	kg	3.23	111	78
27	Tiles	m^2	18.33	401	241
28	Timber plates	m^3	583	39	27
29	Water	Liter	0.42	16295	11407
30	Weilding rod	kg	20.5	17	12
Total Emission				**2,95,145**	**1,52,048**

Carbon Emission from transportation of debris	
Total Debris (tonnes)	5,45,272
Distance (km)	30
Truck GCV (tonnes)	12
Payload (tonnes)	8
Diesel consumed/km (litre avg for load/empty trips)	0.5
Emission per litre (kg/litre)	2.67
Well to take emissions (This needs more work)	30%
Carbon Emission ($kgCO_2$/ton-km)	0.234
Total Emission/tCO_2	**3,822**

Total Emission for New Construction/tCO_2	**2,98,966**
Total Emission for Restoration/tCO_2	**1,52,048**
Difference in emissions/tCO_2	**1,46,919**
Social Cost of Carbon Rs./ton	1,085
Total (In INR Crore)	**16**

Note: Adjusting for PPP, in 2016, the SCC works out to Rs. 850 assuming a 3% rate of discount (Kumar, et al. 2018) (Interagency Working Group on Social Cost of Greenhouse Gases, United States Government 2016).

Year	SCC
2016	850
2021	1085/tCO_2
Rate of Inflation	5%

The value of emissions provided in the table are to be treated as a baseline. Emissions are to be calculated on a project basis so as to ensure minimum deviation from the baseline established.

Section 9.5: Way-forward

Considering that redevelopment of railway stations is a country-wide exercise, whose (built) footprints are likely to vary from case-to-case, the proposed phased study becomes an important respository at many levels. It is an opportunity to test a context specific model for sustainable development and simultaneously the means to create an internal market for such transitions. The facts and figures from this test can encourage industry participation, especially in production of new materials that increases the lifespan of historic and new buildngs while meeting standards of emission. Further, it boosts large-scale conservation, retention and resue of historic buildings to meet requriements of housing and other functions in brownfield sites and urbanizing areas. The project hence is an important tool to demonstrate how to evolve through a circular (develop by reusing, upgrading and upcycling existing resources and build based on it) approach.

In addition to the aforementioned applications, graduating to sustainable technology and approach is often perceived as expensive and at cross-purposes to development. To tide over initial resilience and to choose the effective wayforward, several test cases are necessary to resolve technological and policy-level issues but also to deduce and devise strategies to amortise cost of transition. Besides data on material, the mandate of railways redevelopment project is such that it can provide realtime statistics in support of the combined effect of different projects implemented at a site that are all aimed at sustainability. As most studies emphasize on context-specificity for robust policy making and implementation, this may be our (for India) opportunity to not only test but enumerate the net effect and cost of sustainable development.

Annexure 03: Case examples of similar approaches for Carbon Abatement in Heritage Areas

Table 50: Summary from Case Studies

Scope	Limitations
Case 01: Retrofitting a Belgian heritage Office Building (1934)	
LCA tool used to compare the retrofitting of a public building built in Brussels in 1934 with its complete demolition and reconstruction, through two environmental impacts, the global warming potential and the energy consumption. The study concluded that **a retrofit package was 57% better in lifecycle carbon terms than demolish and rebuild.**	
Most studies dealing with the refurbishment of buildings only compare the environmental gains in comparison with the initial building, and not with a new equivalent construction.	Extra care is required when using and comparing results from published LCAs, which might be both partial and short sighted, due to the current limitation of these tools.
Source: (Marique and Rossi 2018)	
Case 02: Significance of EoL (End-of-Life stage) on a timber building carbon LCA	
The ten storey Forte building in Melbourne is the world's tallest timber residential building. The **EoL scenario for timber after demolition is 50% incineration (with energy recovery), and 50% landfill disposal** - a conservative approach since landfilling rates of timber in the UK are declining and recycling of timber is also commonplace.	
Energy and Carbon studies of timber construction products need to carefully consider the possible and likely EoL scenarios, as they have a significant impact on the total life cycle impacts. This also applies when doing an energy and Carbon LCA study of a whole building, even if it is not a predominantly 'timber' building.	The case study only considers the life cycle carbon impacts of the structural timber in the building, omitting the impacts from all other components in the building, including foundations, finishes and cladding.
Source: (Symons, Moncaster and Symons 2013)	
Case 03: Assessing a 1975 multi-family house in Germany using a 50-year lifespan	
The assessment included: an existing 1975 house with no refurbishment; the existing 1975 house with medium refurbishment (corresponding to a standard between kfW70 – kfW1001); an advanced refurbishment to passive house standards; and a newly constructed 2016 building with kfW70 standard. Results show that **a high level retrofit to a building constructed in 1975 was 15% better than a new construction** built to 2016 German standards.	
Results showed that an advanced refurbishment (excluding sunk costs) had the fewest emissions (1.42 million kgCO2e); followed by new build to 2016 standards (1.66million kgCO2e); then a medium refurbishment excluding sunk costs (1.70 million kgCO2e); followed by doing nothing (3.14 million kgCO2e).	Refurbishment strategies have to be significant renovations, rather than smaller retrofits.
Source: (Baker and Moncaster 2018)	
Case 04: Valuing carbon in pre-1919 residential buildings in UK	
In England, domestic buildings built before 1900 account for 17% of the entire residential building stock, with those built between 1900 and the end of the First World War representing a further 5%. Following scenarios were assumed, where Scenario I is base case: • Scenario I: There is no refurbishment or demolition of pre-1919 residential building. • Scenario II: 50% is refurbished in a 10 years period, starting in 2021. • Scenario III: 15% is refurbished in a 10 years period, starting in 2021. • Scenario IV: 25% is refurbished in a 25 years period, starting in 2019.	
Compared to refurbishing a traditional Victorian terrace, **a new building of the same size produces up to 13 times more embodied carbon.** By thoughtfully adapting an old building in the right way **CO_2 emissions could be reduced by more than 60%.**	To achieve most effective reduction of carbon emissions and the costs of reducing them, not only it is important to refurbish historic buildings, but it's vital to achieve this at a quick pace.
Source: (Dorpalen 2019)	
Case 05: LCA and LCC case study for a heritage Portuguese building	

Scope	Limitations
The study for a heritage Portuguese building located in Lisbon, where real refurbishment is compared with hypothetical demolition, followed by complete reconstruction on the same site, respecting the same architecture, constraints and demands, and using reinforced concrete and clay brick walls.	
Study showed that **re-use could be 4%-46% better** in a Portuguese context and a **13% savings** because of extensive structural support requirements due to seismic activity.	the case-study gains were not as high as commonly suggested, mainly because of the massive use of structural steel and shotcrete required for the seismic and structural strengthening of the ancient building.
Source: (Ferreira, Pinheiro and Brito 2015)	
Case 06: King's Cross Station, UK	
The redevelopment of King's Cross Station in UK not only includes expansion of the station building to accommodate growing traffic, but also incorporating energy efficiency alongside social and cultural diversity, and sustainable buildings together with green transport. Lifecycle carbon footprint assessment, including assessing occupier behaviour, was undertaken to understand the full carbon impact of King's Cross.	
• Orientation, solar shading, and use of thermal mass for cooling and passive ventilation systems. • Water-saving and recycling technologies • Roofs planted with allotments, gardens and lawns. • Over 40% of the development is public space and more than 400 trees have been planted. • Office buildings designed to achieve environmental performance 40% greater than required regulations. • Power and heat generated via combined heat and power (CHP) engines - no need for conventional boilers. • Waste from public areas and buildings channelled through – direct recycling, food waste and mixed waste which goes to incineration for energy. • **Reducing embodied carbon does not necessarily cost the client more as long as it is considered at the very start of the project.**	• The new development has resulted in gentrification of the site. • Public consultation process was limited, leading to marginalising of the local community. • Parts of development scheme are still being completed and a more comprehensive assessment taking account of wider lifestyle patterns and travel behaviour should be undertaken.
Source: (King's Cross Central Limited Partnership 2016-17) (Adelfio, Hamiduddin and Miedema 2020)	
Case 07: Church of SS. Michele e Gaetano, Florence (Italy)	
In Italy, the church of St. Francis in San Giovanni in Persiceto, Italy has been converted into an auditorium, concert hall, and/or exhibition hall.	
• Active double-glazed covering in the roof • Solution perfectly integrated in the given historical constraints and also ensured high internal comfort conditions • **System allows the reduction of high heat loads and controls the incident solar radiation**	• The proposed HVAC plant does not use renewable source of energy - use of renewable energy are required today for all new plant systems in Italy.
Source: (Cabeza, Gracia and Pisello 2018)	
Case 08: Penang Shop House, Malaysia (UNESCO World Heritage Site)[23]	
The Penang heritage shophouse; a sample of a 'Southern Chinese' Eclectic Style building, is a southwest-oriented building and has been carefully restored and re-adapted for the use of a restaurant in the year 2005 by its owner. As is typical in Penang heritage shophouses, this unit has relatively high thermal mass as its thick walls are constructed of clay bricks.	
• The Penang shop houses can remain cooler than modern buildings, regulating the indoor air temperature and reducing the peak temperature. Although the use of mechanical ventilation was not	Relative humidity is suggested to be kept within 30% to 60%, according to ASHRAE guidelines. However, due to the building being naturally ventilated, the Penang heritage shophouse can only maintain relative humidity within the range of 64% to 75%;

[23] On the 7th of July 2008, the city of George Town in the state of Penang, Malaysia was inscribed as a World Heritage Site by UNESCO. According to the 'outstanding universal values' (OUV) assessment, it is said that George Town represented a 'Melting Pot of Multicultural Architecture and Townscape'.

Scope	Limitations
seen as essential, the aid of electric fans may improve the indoor air conditions. • Use of passive thermal performance of the building to reduce energy demand. • Replacement of the terracotta roof tiles, the granite flooring in the air well area, iron staircase, and wooden louvre window shutters • **Resulted in reduction of the peak temperature**	achieved with the construction of its thick brick walls. Measures would have to be taken to reduce the humidity levels even further.
Source: (Cabeza, Gracia and Pisello 2018) (Omar and Syed-Fadzil 2011)	
Case 09: Zinger House, Saint-Petersburg, Russia	
In the period from 1800 to 1860 in Saint-Petersburg was built mostly with brick buildings along the perimeter of allotments with founding one or several courtyards. An existing low solar exposure and daylight level regarding the lower floors of building wings, which normally form a secluded yard, give causes for concern. Poor natural airing is dramatized by parking construction inside courtyards creating a bad practice.	
• Reconstruction of courtyard spaces into atriums • Improvement of the quality of courtyards • Improve of daylight performance and of airing • **Resulted in reduction of power consumption** • **Increase of commercial attractiveness and socialization**	• Initial conditions for microclimatic regime modelling with reference to secluded courtyards can differ - need for individual solution for each building. • Natural microclimate in secluded courtyards directly depends on external atmospheric conditions (sun and wind), and modelling should be implemented on a monthly basis.
Source: (Cabeza, Gracia and Pisello 2018) (Murgul 2015)	
Case 10: Real Albergo De Poveri, Italy	
The Real Albergo de Poveri in Napoli was built in the second half of 18th century. It was transformed, modified, partly demolished, and occupied un- lawfully, until 1980 when a strong earthquake caused collapses and severe damages. The rehabilitation project aimed to reach high energy performance levels and to follow sustainability criteria, and maximum use of daylight was a priority.	
• Opaque PV roof is more convenient than a semi-transparent PV roof, for aesthetic, energy production, and thermal comfort. Semi-transparent roof causes very low increase of daylight, but cause dazzling and overheating during the summer season. • Maximum use of daylight aims to reduce energy demand for lighting, but overheating and glare phenomena must be avoided. • Indoor comfort is achieved by means of natural ventilation and massive walls. • Renewable energy systems are integrated in the roof without altering the building's aesthetic. • **Resulted in high energy performance, suitable sustainability criteria, and maximum use of daylight**	• The building is only one half of the original project. • Opaque PV roofing might help in the climatic conditions of Italy, however, its effective use in the Indian context is yet to studied.
Source: (Cabeza, Gracia and Pisello 2018) (Bellia, et al. 2015)	
Case 11: LCA studies for Traditional Building Materials for energy efficiency	
Traditional materials can perform better in lifecycle terms than highly manufactured modern solutions but research on more materials in diverse contexts is needed. Studies on embodied carbon of maintenance and repair identifies the importance of considering the durability and recurrent embodied carbon of different repair options as well as their initial embodied carbon.	
• Studies in China and Malaysia assessing the lifecycle carbon of building frame materials, concluding that wood is significantly better than concrete and brick and slightly better than steel. • Examination of hemp-lime walls in UK context concluded that they can have negative embodied carbon due to the potential for carbon sequestration. • A study of different grouting mortars in a Spanish heritage building identified that hydrated lime grout is	• Several of these LCA studies only measure initial embodied carbon and do not consider operational carbon or material lifespans. • Only looking at operational carbon is an issue because a full lifecycle picture is not developed, making assessments of benefits problematic. • A lack of studies on the maintenance of wooden components and elements such as windows which

Scope	Limitations
better than cement in embodied carbon and structural terms in a repair context. • Importance of embodied carbon and the benefits of durability are identified when examining roof paint maintenance on Malaysian heritage buildings.	conservation organisations identify as having high heritage value.
Source: (Wise, et al. 2019)	
Case 12: Refurbishing a historic dwelling, Villa Dammen in Moss, Norway	
Villa Dammen, built in 1936, represents a common type of building from the 1920s/1930s with cultural heritage significance connected mainly to its visual appearance, shape and materiality. The study was carried out as a comparative assessment, where the refurbished building was compared to a scenario with no refurbishment and another scenario where the existing building was demolished and replaced by a new house complying with then current Norwegian energy-efficiency requirements (TEK10).	
• The results show that the refurbishment of Villa Dammen causes a reduction in total GHG emissions over 60 years of approximately 295 tonnes CO2-eq, amounting to a 67% reduction, compared to the scenario without refurbishment. • Consumption of construction materials during refurbishment causes some emissions, but these are dwarfed in magnitude by a 70% decrease in emissions from energy use.	Over 60 years, net life cycle emissions for the new construction scenario are only some 8% lower than for the refurbished Villa Dammen scenario.
Source: (Berg and Fuglseth 2018)	

Annexure 04: Comparison between regulations, norms, and certification systems for achieving energy efficiency

Table 51: Comparison summary between various regulatory frameworks

	Parameters	IGBC norm	Historic England	Australia Department of Environment and Heritage Protection	National Park Services	Malaysia
1	**Is it specifically tailored for Historic Buildings?**	No; Tailored for Railway Stations	Yes	Yes	Yes	Yes; (eligible for both new construction and existing stock)
2	**Building Management**	Y	Y	Y	Y	Y
3	**Building components (Shading, Roof, Openings, Floor, Wall (material and finish))**					
3.I.	Ventilation systems	Y	Y	N	Y	N
3.II.	Roof	Y	N	Y	Y	N
3.III.	Wall	Y	N	N	N	N
3.IV.	Sustainable Station Facility (SSF)	Y	N	N	N	N
4	**Building Services (mechanised) (viz HVAC, Artificial Illumination, Electrical Equipment, MEP, Solar/Alternate/Clean and Renewable energy panel) Anything to do with passenger comfort**					
4.I.	HVAC, Pumps, Motors, Appliances	Y	Y	Y	N	N
4.II.	Lighting (artificial)	Y	Y	Y	N	N
4.III.	Fan	Y	N	Y	N	N
4.IV.	Electricity	Y	N	Y	N	N
4.V.	Plumbing	Y	N	Y	N	N
4.VI.	Telecommunications	N	N	Y	N	N
4.VII.	Solar panels, antennae and satellite dishes/ Adding alternate sources of Energy	Y	N	Y	Y	N
4.VIII.	Removing services	N	N	Y	N	N
4.IX.	Health, Hygiene and Sanitation (HHS)	Y	N	N	N	N
4.X.	Passenger Amenities	Y	N	N	N	N
4.XI.	Materials and Resources (MR)	N	N	N	N	Y
5	**Natural resource Systems (Day light management, Passive energy management, Water management, run off management, rainwater harvesting)**					
5.I.	Lighting (natural)	Y	Y	N	N	N
5.II.	Energy Efficiency	Y	N	N	N	Y
5.III.	Enhanced Indoor Air Quality (EQ)	Y	N	N	N	Y
5.IV.	Water Efficiency (WE)	Y	N	N	N	Y
5.V.	Smart and Green Initiatives (SGI)	Y	N	N	N	N
5.VI.	Solid Waste Management	Y	N	N	N	N
5.VII.	Sustainable Site Planning and Management (SM)	Y	N	N	N	Y

6	**Asset Management (Behavioural change through facilitation/ enforcement/education, innovation)**					
6.I.	Operations and Maintenance	Y	N	N	N	N
6.II.	Tobacco Smoke Control	Y	N	N	N	N
6.III.	Innovation and Development (ID)	Y	N	N	N	Y
7	**Systems of Evaluation**					
7.I.	Systems of acknowledgement	Y	Y	N	Y	Y
7.II.	Tools of evaluation	Y	Y	N	Y	Y
7.III.	Assumed 'life' cycle of an existing asset (Length of life cycle (reference period or time before which a major intervention such as refurbishment may be required))	Y	Y	N	Y	N

Table 52: Comparison between various regulatory frameworks

IGBC norm	Historic England	Australia Department of Environment and Heritage Protection	National Park Services	Malaysia
1. Is it specifically tailored for Historic Buildings?				
No; Tailored for Railway Stations	Yes	Yes	Yes	Yes; (eligible for both new construction and existing stock)
2. Building Management				
Operational savings through: • Reduction in electrical energy consumption towards non-traction up to 40% • Water consumption reduction for station applications up to 30% • Effective Waste management during operation of station • Improved station facility management • Opportunity to increase environmental awareness among all Indian Railways staff	1. Character and significance of the building 2. Local climate, orientation and exposure 3. Current energy performance of the building envelope 4. Hygrothermal behaviour of building fabric 5. The condition of the building 6. How well services perform 7. Levels of energy use related to occupancy and human behaviour 8. User requirements, aspirations and aims	When installing new services or upgrading existing services: • minimise the visual impact of components • use minimal and reversible fixings • locate visible components discreetly • choose the least damaging route for services • minimise cutting and drilling	Retrofit measures to historic buildings should be limited to those that achieve at least reasonable energy savings, at reasonable costs, with the least impact on the character of the building. <u>Requires Minimal Alteration</u> • Reduce air leakage • Add attic insulation • Install storm windows • Insulate basements and crawlspaces. • Seal and insulate ducts and pipes • Weather strip doors and add storm doors.	The GBI Rating Tool is developed specifically for the Malaysian tropical climate, environmental and development context, and cultural and social needs. It was created to: • Define green buildings by establishing a common language and standard of measurement. • Transform the built environment to reduce negative environmental impacts. • Promote integrated, whole-building designs that provide a better environment for all. • Ensure new buildings remain

			• Add awnings and shading devices where appropriate. <u>Requires More Alteration</u> • Add interior vestibules • Replace windows • Add insulation to wood-frame walls • Add insulation to masonry walls • Install cool roofs and green roofs.	relevant in the future and existing buildings are refurbished and upgraded to improve the overall quality of building stock. • Recognise and reward environmental leadership.

3. Building components (Shading, Roof, Openings, Floor, Wall (material and finish))

I. Ventilation systems

IGBC norm	Historic England	National Park Services
For Naturally Ventilated Rooms: (2 Points) Demonstrate that the ratio of openable area (windows, doors, ventilators) to the carpet area is: • At least 8% in all regularly occupied spaces in station. • At least 10% in all regularly occupied spaces in station.	a. What is the natural ventilation? Is it controllable (for example by opening or closing windows)? b. Are there any artificial ventilation systems? If so, how and when do they operate? c. In each space, is the ventilation inadequate or excessive? d. What are the control systems for natural and artificial ventilation? Are they easy for occupants to understand and use?	Operable windows, interior courtyards, clerestories, skylights, rooftop ventilators, cupolas, and other features that provide natural ventilation and light can reduce energy consumption. Whenever these devices can be used to provide natural ventilation and light, they save energy by reducing the need to use mechanical systems and interior artificial lighting. Reducing air leakage (infiltration and exfiltration): Leakage of air into a building can account for 5 to 40 percent of space-conditioning costs, which can be one of the largest operational costs for buildings. Adding weatherstripping to doors and windows, sealing open cracks and joints at the base of walls and around windows and doors, sealing off recessed lighting fixtures from above, and sealing the intersection of walls and attic, will substantially reduce air leakage.

I. Roof

IGBC norm	Australia Department of Environment and Heritage Protection	National Park Services
Roof Areas: (1 points for 50%, 2 points for 75% of exposed roof area) Use material with high solar reflective index (SRI) value (or) vegetation (or) a combination, to cover at least 50% of the exposed roof areas: • Minimum SRI value of 78 for Low-sloped roof (Slope: < 2:12) • Minimum SRI value of 29 for Steep-sloped roof (Slope: >	Roof vents (reduces the build-up of heat in a building may be installed: • to concealed roofs • in parts of the roof that are not prominent (e.g., parts not seen from the street) Do not insert new roof vents in: • prominent positions on a roof • roofs where the character of the roof is significant	<u>Installing cool roofs and green roofs:</u> Cool roofs include reflective metal roofs, light-coloured or white roofs, and fiberglass shingles that have a coating of reflective crystals. All of these roofing materials reflect the sun's radiation away from the building, which lessens heat gain, resulting in a reduction of the cooling load. Cool and green roofs are appropriate for use on historic buildings only when they are compatible with their architectural character, such as flat roofs with no visibility. If a historic building has a slate roof, for example, removing the slate to install a metal roof is not a compatible treatment. A <u>green roof</u> consists of a thin layer of vegetation planted over a waterproofing system or in trays installed on top of an existing flat or slightly sloped

2:12) and Maximum SRI of 64. (OR) • Develop vegetation/ green roof/ solar PVs to cover at least 50% on the Exposed Station Roof Areas	• slate or terracotta tiled roofs.	roof. Green roofs are primarily beneficial in urban contexts to reduce the heat island effect in cities and to control storm water run-off. A green roof is compatible on a historic building only if the plantings are not visible above the roofline as seen from below. Adding attic or roof insulation: Heat loss and gain caused by increased interior/exterior temperature differentials primarily due to the stack effect and solar radiation are greatest at the top of a building. Therefore, reducing heat transfer through the roof or attic should be one of the highest priorities in reducing energy consumption.

II. Wall

IGBC norm

Useful materials for the external insulation include:
- Hemp-lime composites
- Mineral wool
- Wood-fibre panels

Suitable moisture-permeable finishes include:
- Lime renders
- Rain-screen cladding (tile hanging etc) with lapped joints

III. Sustainable Station Facility (SSF)

IGBC norm

- Passenger Amenities at Railway Station
- Universal Access
- Access to Railway Station
- Green Cover at Station
- Heat Island Reduction – Roof and Non-Roof
- Outdoor Light Pollution Reduction
- Station - Operations and Maintenance

4. Building Services (mechanised) (viz HVAC, Artificial Illumination, Electrical Equipment, MEP, Solar/Alternate/Clean and Renewable energy panel) Anything to do with passenger comfort

I. HVAC, Pumps, Motors, Appliances

IGBC norm	Historic England	Australia Department of Environment and Heritage Protection
Energy Efficiency in Appliances and Equipment (1 point) Demonstrate atleast 50% of computers/ monitors/ printers used in station office and booking office with Energy Star rating or equivalent program. Energy Efficient Air-conditioners (1 point) Demonstrate all unitary air-conditioners with minimum BEE 3-star rating or equivalent. Heating Systems (1 Point) Stations having more than 150 Heating Degree days (HDD18) shall consider setting up heating systems with a minimum COP of 2.5 (EER of 8.53). Energy Efficient Pumps and Motors (1 point) Demonstrate all pumps and motors with minimum BEE 3-star rating or equivalent.	Determine the original arrangements (if any) for cooling the building, including: a. solar protection (awnings, blinds etc) b. windows and other ventilation (is cross-flow possible?) c. built-in systems such as fans and heating, ventilation and air conditioning (HVAC) d. free-standing systems such as table fans e. what is still present, and what condition it is in	Maximum care to be taken to minimise physical and visual damage associated with installing new or upgraded air conditioning and ventilation systems. Window air conditioners: The installation of window air conditioners is not approved under General Exemption. This work damages the significant fabric of the building. Split-system air conditioning: The upgrading of existing split-system air conditioning may be undertaken where components: • are not located on prominent elevations (e.g., main or side elevations seen from the street) • do not cover significant fabric (e.g., decorative friezes or plaster work) • do not allow a build-up of moisture that could damage significant fabric • do not remove significant fabric (use minimal fixings that are reversible); and • are run discreetly, such as ducting.

	Determine the current arrangements: a. What systems are used (both built-in and free standing)? b. How are they used? c. How effective are they for the building users?	Ducted air conditioning: When upgrading existing ducted air conditioning, components must be: • in existing ducts, chases or shafts • in non-significant underfloor or ceiling spaces where the system does not have a visual impact on the important character of the interior spaces • in less visible areas (e.g., basements, car parks, secondary areas) • on less important elevations (e.g., rear elevations not seen from the street) • connecting to existing vents.
II. Lighting (artificial)		
Energy Efficient Lighting Fixtures (2 points) Demonstrate at least 50% of the lighting fixtures installed in the station non traction areas are having LED lamps. Points are awarded as below: • 1 point will be awarded if 50 % of the total lighting fixtures are LED lamps • 2 Points will be awarded if 75% and above of the total lighting fixtures are LED lamps Lighting Controls (1 point) All non-emergency exterior and common area lighting such as façade, pathways, landscaping, surface and covered parking, street lighting, staircases should have at least one of the following: • Daylight sensor • Occupancy/ Motion sensor • Timer Outdoor Lighting: Upward Lighting: (1 Point) Provide exterior lighting such that no external light fixture emits more than 5% of the total initial designed fixture lumens, at an angle of 90 degrees or higher from nadir (straight down). LED Fixtures: (1 Point) Demonstrate 50% of the lighting fixtures installed in the station exterior areas are having LED lamps.	Are lighting levels satisfactory, poor, or excessive? Assess the artificial lighting a. What are the types and numbers of fittings, and the energy ratings of the lamps? b. How and when is artificial lighting used? Is it used when daylight would be an effective alternative? c. How is it controlled: at point of use, or centrally? If the latter, what are the allowable settings?	Historic lighting levels were much lower than current expectations and older buildings often have a minimal number of fittings. A balance needs to be struck between user needs and what is required to keep the special characteristics of a place. When installing new lighting: • retain significant early fittings and switches • wire within existing cavities and conduits • minimise cutting and drilling for new wiring • minimise visual impact of fittings • do not fix to significant fabric • use minimal fixings • ensure fixings are reversible Upgrading should not mean abandonment of visually important fittings, switches and exposed cabling. Older switches can be re-used by incorporating microcircuit switching and cotton insulated cable is still available. Where original fittings no longer exist and there is insufficient photographic or documentary evidence to reconstruct them, it is better to install an appropriate contemporary fitting rather than an off the-shelf recreated one. Exterior floodlighting (if used), should be used in a subtle manner and should not attach to the building—fix to freestanding poles or around the building flush with the ground.
III. Fan		
IGBC norm		**Australia Department of Environment and Heritage Protection**
Demonstrate at least 50% of fans in the stations with minimum BEE 3-star rating or equivalent.		Ceiling and wall-mounted fans may be installed where: • fixing to existing mounts • fixing to non-significant fabric Do not attach fans to: • significant original or fragile fabric • decorative finishes • fretwork vents in ceilings
IV. Electricity		

IGBC norm	Australia Department of Environment and Heritage Protection
Energy Monitoring: 1. Demonstrate sub-metering for and identify trends (energy monitoring) for the following energy use applications in stations, as applicable: (3 points): • Lighting • Elevators and escalators • HVAC equipment and systems • Onsite renewable energy systems • Power back-up systems (Generator sets) 2. Demonstrate that the building management system is in place to control and monitor the above-mentioned systems, as applicable. (1 point) 3. Carry out comprehensive energy audits once in three years and explore opportunities for Improvement (1 point)	Upgrading the electricity in the building will probably involve rewiring and new wiring, overhauling existing power points and switches, and installing new power points and switches. Under General Exemption, rewiring, installing new power boards and circuit breakers, and overhauling existing points and switches, may be undertaken. Installation of new wiring, points and switches may be undertaken if the wiring is concealed and original fittings are retained. Wiring should be concealed in existing cavities or conduits. The points and switches should be installed with minimal fixings that are reversible and not fixed into fragile fabric, joinery, trim or on decorative finishes.

V. Plumbing

IGBC norm	Australia Department of Environment and Heritage Protection
Demonstrate that potable drinking water is available at all platforms for passengers, through piped water supply (or) through tube-wells with hand pumps (or) mobile or stationary water containers (In case, piped water supply is technically and economically not feasible) Ensure implementation of the following measures at the station: • Safe drinking water unit/ storage facility at Station • Each platform should have provision of at least 2 taps per coach (As per IR Works Manual: Chapter 4: 403 Minimum Essential Amenities Passenger Amenities, Stations and Yards) • Quality of water to meet the prescribed standards as per IS 10500: 2012 (Indian Standard for Drinking Water as per BIS specifications) • Periodic check on quality of water and report by a competent authority from Indian Railways	Under General Exemption new plumbing should be concealed in existing cavities, sub-floors and ceiling spaces. New fixtures may be installed in kitchens, bathrooms, laundries and laboratories, for example, where the existing fixtures are not original or important. Water filters, heaters and coolers may be installed and should be fitted without damaging significant fabric.

VI. Telecommunications

Australia Department of Environment and Heritage Protection
Where possible install wiring and cabling in existing cavities, sub-floors or ceiling spaces. Locate connection points discreetly. Minimise wiring and fixing and choose the least damaging routes with minimum cutting or drilling. Fixings should be minimal and reversible. Consider wireless connections to minimise wiring and fixing of components.

VII. Solar panels, antennae and satellite dishes/ Adding alternate sources of Energy

IGBC norm	Australia Department of Environment and Heritage Protection	National Park Services
On-site Renewable Energy Demonstrate onsite renewable energy generation for at least 1.25% of total energy consumption of the station for non-traction areas. Implement any of the following RE systems at station premise for the credit compliance: • Solar photovoltaics • Electricity generation from solid waste ○ Bio-energy technologies	Under General Exemption solar panels, antennae and satellite dishes may be installed on parts of the roof that are not prominent (e.g. parts not seen from the street). Contact the department if you wish to install these devices in the following locations: • on prominent positions on a roof • roofs where the character of the roof is significant (e.g., steeply pitched prominent roof to a church) • slate or terracotta tiled roofs Solar panels should be:	Active solar devices, such as solar heat collectors and photovoltaic systems, can be added to historic buildings to decrease reliance on grid-source fossil-fuel powered electricity. Adding this technology to historic buildings, however, must be done in a manner that has a minimal impact on historic roofing materials and preserves their character by placing them in locations with limited or no visibility, i.e., on flat roofs at a low angle or on a secondary roof slope. Geothermal Energy: They can reduce the amount of energy consumption

○ Mini wind turbines *(The list is illustrative and does not include all renewable energy systems)* Solar Water Heating • Demonstrate the use of solar water heating systems in place of electric geysers to meet at least 25% of the hot water requirement of canteen and restaurants within the station premise • If 25% of the hot water requirement is met from solar water heating systems (1 point) • If 50% of the hot water requirement is met from solar water heating systems (2 points)	• located on roof plane's of the dwelling not visible from the street and sited below the ridge • located on sheds, carports, garages or pergolas, where possible or • where there is no roof plane's of the dwelling that meet the above criteria, panels on a side roof may be supportable where they are: ○ well setback from the street and preferably screened by a neighbouring structure or building ○ a small percentage of the overall roof plane ○ located as far as practical on the lower part of the roof ○ arranged neatly in a symmetrical group with a margin of visible roof edge around the group.	and emissions considerably, compared to the air exchange systems or electric resistance heating of conventional HVAC systems. They require less equipment space, have fewer moving parts, provide better zone space conditioning, and maintain better internal humidity levels. Geothermal heat pumps are also quieter because they do not require external air compressors. Despite higher installation costs, geothermal systems offer long-term operational savings and adaptability that may make them a worthwhile investment in some historic buildings. Wind Energy: For historic properties in rural areas, where wind power has been utilized historically, installation of a wind mill or turbine may be suitable to the historic setting and cost effective. Before choosing to install wind-powered equipment, the potential benefit and the impact on the historic character of the building, the site and surrounding historic district must be analyzed.
VIII. Removing services		
Australia Department of Environment and Heritage Protection		
• When reviewing your services consider removing extraneous parts that are not important to the place, such as unused air conditioners, redundant ducting, and pipe work, antennae and aerials that are no longer in use. • Repair any damage that installation and removal of these components inflicts on the building. • Original components should be retained and repaired to continue operating where possible.		
IX. Health, Hygiene and Sanitation (HHS)		
IGBC norm		
• Tobacco Smoke Control* • Safe Drinking Water Facility* • Fresh Air Ventilation • Solid Waste Management Plan • Plastic-free Environment • Enhanced Indoor Air Quality • Daylighting • Station Housekeeping Plan		
X. Passenger Amenities		
IGBC norm		

- Platforms with lighting fixtures and level of illumination (lux level)
- Firmly fixed waiting chairs/ benches on each platform
- Waiting Rooms/ Halls with lighting fixtures, ventilation and well-maintained facilities
- Cloak Room
- Booking Office with seating and lighting
- Toilets (for Male and Female) at least at main platforms (1st and last platform) with daily maintenance plan
- Retiring Rooms
- Emergency medical care facilities
- Foot-Over-Bridges or Sub-ways
- Elevators and Escalators
- Mobile charging points on every platform
- Trolley Based System for Luggage Assistants
- Pickup and drop-off points for vehicles
- Snack Kiosks and Drinking water points on each platform

XI. Materials and Resources (MR)

Malaysia

Promote the use of environmental- friendly materials sourced from sustainable sources and recycling. Implement proper construction and waste management with storage, collection and re-use of recyclables and construction formwork and waste.

- Material Reuse
- Recycled Content Material
- Regional Material
- Sustainable Timber
- Construction Waste Management

5. Natural resource Systems (Day light management, Passive energy management, Water management, run off management, rainwater harvesting)

I. Lighting (natural)

IGBC norm	Historic England
If 50 % of the occupied areas are day-lit in the station (1 point) If 75 % of the occupied areas are day-lit in the station (2 points) Demonstrate through daylight illuminance measurement that at least 50% of the regularly occupied spaces in the station achieve daylight illuminance levels for a minimum of 110 Lux. Measurements shall be taken at floor level at 9 am, 12 noon, and 3 pm, on a 10 feet square grid. To how compliance, consider the average of the measurements taken at 9 am, 12 noon, and 3 pm.	Are lighting levels satisfactory, poor, or excessive? <u>Assess the natural daylighting of the space:</u> a. How was this originally controlled (blinds, shutters, awnings)? b. What is present, and what condition is it in? c. Are issues such as glare and solar gain restricting use? d. Are furnishings arranged to make the best use of the natural lighting?

II. Energy Efficiency

IGBC norm	Malaysia
• Enhanced Energy Performance: Non-Traction • On site Renewable Energy • Energy Monitoring • Solar Water Heating	Improve energy consumption by optimising building orientation, minimising solar heat gain through the building envelope, harvesting natural lighting, adopting the best practices in building services including use of renewable energy, and ensuring proper energy, and ensuring proper testing, commissioning and sustainable regular maintenance. Points awarded on the basis of: • OTTV • Roof U-Value (Heavyweight) • Roof U-Value (Lightweight) • RTTV • BAS I/O points • Renewable Energy (RE) • BEI (Building Energy Intensity) with RE • BEI (Building Energy Intensity) without RE • PUE (Power Usage Effectiveness) **For Data Centre

III. Enhanced Indoor Air Quality (EQ)

IGBC norm	Malaysia
Carbon dioxide Monitoring and Control (2 point) • For Air-Conditioned Spaces: Demonstrate that the station has installed CO2 sensors and a control system to maintain a differential CO2 level of 530 ppm in all regularly occupied areas. For densely occupied areas, have in place CO2 sensors at the breathing zone levels with monitoring systems. • For Naturally Ventilated Spaces: For each regularly occupied area in the station, demonstrate that the ratio of openable area to the carpet area is atleast 12%. Isolation of Polluting Equipment and Systems (1 point) • Isolate areas exposed to hazardous gases or chemicals (such as UPS room, printer rooms, chemical storage rooms, janitor rooms) from regularly occupied areas through design measures like exhaust system, self-closing door, deck-to-deck partition / hard ceiling. Use of Certified Green Products (1 point) • Have a policy in place which mandates the use of certified green products during renovation, operation and maintenance of the station building. • Utilize the products and materials having minimal health impacts i.e., products having very low VOC Content, formaldehydes, aldehydes etc. • Use paints and coatings (including primers) with low or ultralow VOC content • Use adhesives in the interior work, which does not exceed the VOC limits. • Use Composite wood/ Agri-fibre materials with no added urea-formaldehyde resins. • New wood furniture items such as work stations, chairs, tables, cabinets, etc., with low emissions.	Achieve good indoor environmental performance in indoor air quality, acoustic, visual and thermal comfort. These will involve the use of low volatile organic compound materials, application of quality air filtration, proper control of air temperature, movement and humidity. • Daylight • External Views
IV. Water Efficiency (WE)	
IGBC norm	**Malaysia**
By adopting this rating programme, stations can save potable water to the extent of 30 - 50%. Water Efficient Fixtures • Demonstrate at least 50% of the plumbing fixtures installed in the station are efficient and whose flow rates are within the prescribed criteria of uniform plumbing code. Reduction in Water consumption for Coach Washing (1 Point) • Demonstrate at least 10% of water requirement for coach washing is sourced through use of treated waste water (OR) use of harvested rainwater (OR) use of Automatic coach washing plants. Reduction in water consumption for Laundry Applications (1 Point) Demonstrate at least 10% of water requirement for cleaning of linen is sourced through use of treated waste water (OR) use of harvested rainwater (OR) use of mechanised laundry systems. Rainwater Capture/ Recharge: (1 - 2 Points) Design rainwater harvesting system to capture at least 'one-day rainfall' runoff volume from roof and non-roof areas. Use of Harvested Rainwater: (2 Points) Use captured rainwater for at least 15% of the total water required for landscaping, flushing and station cleaning applications. Waste Water Treatment 1. Have on-site treatment systems (or) community wastewater treatment system to treat at least 50% of waste water generated at the station, to the quality standards* suitable for safe disposal into water bodies / suitable for reuse. (2 points) 2. Demonstrate that station authority shall conduct periodic assessment of the wastewater treatment plant to check the operations and maintenance of the facility (1 point) 3. Conduct periodic tests of the inlet and outlet parameters (BOD, COD and PH) every month as per Central (or) State Pollution Control Board guidelines. (1 point) Waste Water Reuse 1. Demonstrate the use of treated waste water from on-site treatment systems OR community wastewater treatment system for following applications within the station premise, thereby reducing at least 10% of total potable water requirement.	Rainwater harvesting, water recycling and water-efficient fittings. • Rain Water Harvested • Recycle Water Harvested • Potable Water Saving from Sanitary Fitting
V. Smart and Green Initiatives (SGI)	
IGBC norm	

Smart Passenger Services:
Wi-fi facility at station 8 Pharmacy and Medical Facility, Multi lingual e-Ticketing portal 9 Prepaid Cab Facility, Automatic ticket vending machine, Hotel Facility at Station, CCTV surveillance for safety, Shopping Area at Station, Portable structures with bio toilets for senior citizens at platforms, Food Court at Station, Smart Card Ticketing, Tourism Information and Booking Centre, Laptop Charging station with seating facility, Touch screen information kiosk

Green Outreach and Awareness:
Demonstrate implementation of green awareness initiatives at station:

- Install Green Information Signage (printed or digital) at various locations highlighting the key green features implemented in the station
- Conduct Green Awareness campaigns on Environment Day, Earth Day, Green Building Week, etc.,
- A Digital display of green impacts (in terms of reduction in energy consumption, renewable energy generation and water savings) at entrance/ prominent location of the station.

Green Railway Station Committee:
The station shall constitute a formal committee 'Green Railway Station Committee' for regular monitoring of implemented green features at railway station (1 point) (AND)
The committee shall convene a meeting every two months to discuss on: (1 point)

- Operation and maintenance of existing green features at station
- New green initiatives for the Railway Station.

VI. Solid Waste Management

IGBC norm

Demonstrate an ongoing solid waste collection and disposal system at station to include both organic and recyclable waste:
Segregation (3 points)

- Provide 2 separate bins for collection of food waste (organic) and recyclable waste (plastic and paper) at every platform at an interval of 100m.
- Have provision of a central waste collection area in station premise with separate bins for dry waste (paper, plastic, cardboard, metal, glass), wet waste (garden and food waste) and hazardous waste (e-waste like batteries, lamps)
- Maintenance Plan for keeping the centralised waste collection area free from insects and mosquitos. Reuse/ Recycling (2 points)
- Station authority shall have a contract in place with recyclers for diverting paper and plastic waste for recycling.
- Have an organic waste management system in place within the station premise Environment friendly Disposal (1 point)
- Dispose the hazardous waste as per Hazardous Waste Management Guidelines of Ministry of Environment and Forest (MoEF), Government of India.

VII. Sustainable Site Planning and Management (SM)

IGBC norm	Malaysia
• If the Ministry of Environment and Forest (MoEF) or local authorities prescribe ban on use of plastic bags, then the station complex shall comply with the respective criteria. • Conduct Periodic supervision to check the plastic litter at station premise (and) Organise awareness programme about adverse effects of 'plastic use' periodically (OR) Demonstrate the following measures at station premise: • Install permanent signage (or) play digital messages on screens at all the railway platforms to create awareness on adverse environmental impacts of plastic bags. • Conduct Periodic supervision to check the plastic litter at station premise (and) Organise awareness programme about adverse effects of 'plastic use' periodically	Selecting appropriate sites with planned access to public transportation, community services, open spaces and landscaping. Avoiding and conserving environmentally sensitive areas through the development of existing sites and brownfields. Implementing proper construction management storm water management and reducing the strain on existing infrastructure capacity. • Environment Management • QLASSIC SCORE • Industrialised Building System • Greenspace and Water Bodies • Composting

6. Asset Management (Behavioural change through facilitation/enforcement/education, innovation)

IGBC norm

I. Operations and Maintenance

- Have in place an in-house team at the railway station to handle the operation and maintenance (O&M) for Housekeeping, Water supply and Maintenance of Plumbing Systems, Electrical Systems, Mechanical Equipment, Solid waste management, as applicable
- Have a feedback mechanism in place to receive feedback from the passengers and take the corrective actions based on feedback (OR)
- Maintenance Contract with External Agency (2 Point)
- Have an annual maintenance contract with external agency for the O&M of all building systems (energy, water and waste) and housekeeping.
- Have a feedback mechanism in place to receive feedback from the passengers and take the corrective actions based on feedback.

II. Tobacco Smoke Control

Demonstrate that smoking is prohibited in the station complex, and is in accordance with the regulations of Ministry of Health and Family Welfare, Government of India.
Install NO SMOKING signage at following locations in the station premise:

- All platforms
- Booking Office
- Waiting Halls
- Retiring Rooms (AND)
- Prohibit sale of tobacco products in the station premise

I. Innovation and Development (ID)

IGBC norm	Malaysia
Innovation Identify the intent of proposed innovation credit, proposed requirement for implementation options, and proposed documentation to demonstrate implementation, and the design approach used to meet the required measures. (Or) Exemplary performance: The station is eligible for exemplary performance, if the implemented measures greatly exceed the credit requirements of the Green Railway Station rating system. IGBC Accredited Professional At least one principal participant of the station team shall be an IGBC Accredited Professional (IGBC AP)	Innovative design and initiatives that meet the objectives of the GBI • Concrete Usage Index (CUI) • LED Facade Lighting • Advance Air Filtration • Bioswales • Central Conveyance System (waste or material handling) • Central Vacuum System • Charging Station for Hybrid or Electric Car • Co-generation / Tri-generation • Condensate Water Recovery • Desiccant Heat Recovery Wheel • Electrochromic Glazed Façade • External Shading Devices • Heat Pipe Technology • Herb Garden • Industrialised Building System • Light Pipes • Mixed Mode/Low Energy Ventilation System • On-site Composting Facility / Composting Bins • Vertical Green Wall system • Thermal / PCM / Thermal Mass Storage System • Regenerative Lift • Solar Thermal Cooling • Self-cleaning Façade • T5 Lamps / Efficient Lighting

7. Systems of Evaluation

I. Systems of acknowledgement

IGBC norm	Historic England	National Park Services	Malaysia
Certification system based on site inspection.	Life Cycle Assessment (LCA)	• Value Analysis (VA) • Choosing by Advantages (CBA) • Life Cycle Cost Analysis (LCCA)	The GBI rating system is accredited by the GBI Accreditation Panel (GBIAP), an independent committee consisting of senior professionals who will certify and award the GBI rating to qualified projects.

II. Tools of evaluation

IGBC norm	Historic England	National Park Services	Malaysia

Performance is assessed through user assessment and feedback.	Life Cycle Assessment to be conducted using the following calculators: a. Inventory of Carbon and Energy (ICE) database (Circular Ecology, 2019)* b. Green Guide (BRE Group, 2019) c. WRAP Embodied Carbon database (WRAP, 2019a; WRAP, 2019b) (The above methods are selected on the basis of availability if data and ease of access, for example freeware were chosen over paid calculator software)	Assessments to be done by combining outputs from the below mentioned calculations: • Value Analysis (VA) • Choosing by Advantages (CBA) • Life Cycle Cost Analysis (LCCA) In addition to the abovementioned methods, Risk Model Template is used to assess feasibility of the investment.	• Energy Efficiency (EE) • Indoor Environmental Quality (EQ) • Sustainable Site Planning and Management (SM) • Materials and Resources (MR) • Water Efficiency (WE) Innovation (IE)

III. Assumed 'life' cycle of an existing asset (Length of life cycle (reference period or time before which a major intervention such as refurbishment may be required))

IGBC norm	Historic England	National Park Services
Assumed Life cycle 60 years (Based on CPWD)	60 yearz	30 years

Annexure 05: Tools to measure Embodied Carbon

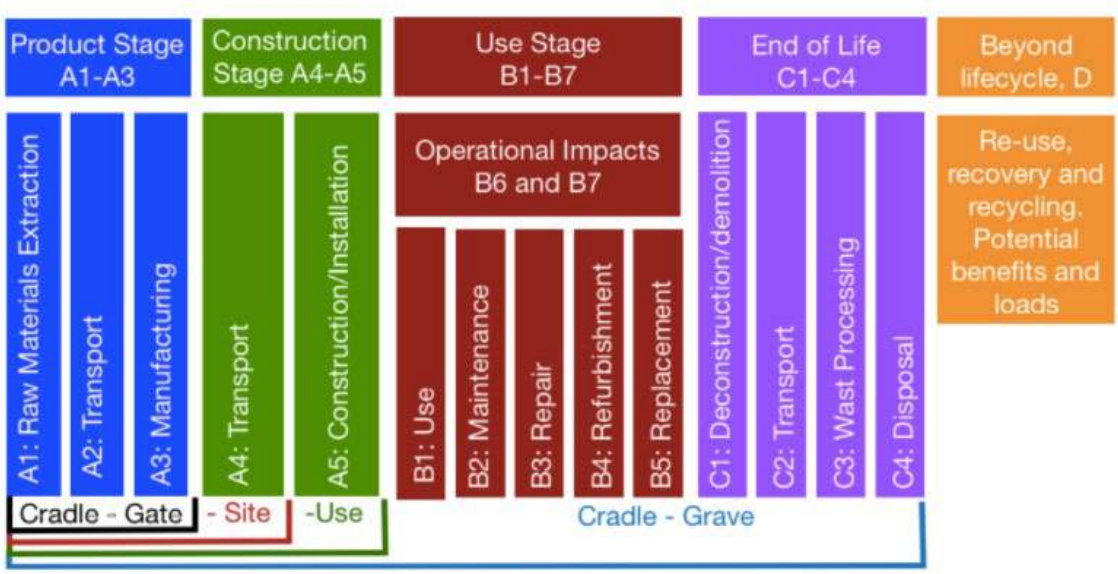
5.1 LCA European Standards - CEN TC350

- The European Committee for Standardization (CEN) was mandated in 2004 for the development of horizontal standardised methods (i.e., applicable to all construction products and building types) for the assessment of the integrated environmental performance of buildings. CEN/TC 350 covers sustainability by looking at the three aspects of Environmental, Social and Economic performance, and at the different levels of construction product/component, building and through framework documents which set out the approach.
- EN 15804, is a standard providing the common rules for type III environmental declarations which can be used by EPD schemes across Europe as a consistent method for providing the core environmental information on construction products which can then be used with data for other products to evaluate the building. This new standard will ensure that comparable environmental information is generated wherever a product is manufactured or used and it is hoped that this core information can be transferred from scheme to scheme across Europe, minimising barriers to trade.

Table 53: Limitations and Advantages to CEN Model

Limitations	Advantage
Although EN 15804 fixes the information that must be provided, it does not imply any particular layout for the EPD, so EPD from different schemes will still probably look very different from each other.	Although EN 15804 fixes the information that must be provided, it does not imply any particular layout for the EPD, so EPD from different schemes will still probably look very different from each other.

Figure 54: Lifecycle stages relating to buildings adapted from EN 15978



A1-A3 are ‘cradle-to-gate’ impacts, A4 is the impact of transportation of the product to its site and A5 is the impact from the construction processes associated with the product. B1 relates to the use of the product (which is not relevant to EE and EC). B2-B5 are the impacts from any maintenance, repair, replacement and refurbishment for the product. C1-4 cover impacts associated with the removal of the product from the building at end of life, right through waste processing until it reaches an ‘end-of-waste’ state, as defined in the standards.

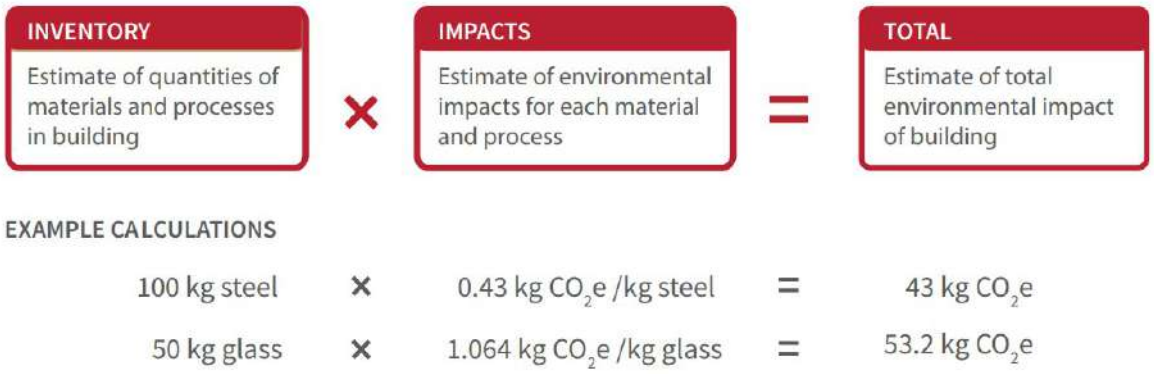
5.2 Life Cycle Analysis (LCA)

Constructing a building and using it for many years produces long-lasting impacts on human health and the environment. LCA is the rapidly evolving science of illuminating these impacts in terms of their quality, severity,

and duration. It tracks emissions, that are substances released into the air, water, or soil[24]. Databases known as **Life Cycle Inventories (LCIs)** report these emissions for different processes that contribute to the creation of a material or product. Different LCIs reflect differences in regional practices and manufacturing processes.

In a LCA of a building, all of the material and process quantities are gathered into a body of information known as the inventory and multiplied with the appropriate impacts for each material or process. The overall results are summed to obtain the overall environmental impacts of a building.

Figure 55: Simple example of LCA calculation process



The results of a LCA can illuminate which parts of a building have particularly high environmental impacts. This type of *hot-spot analysis* can help the design team achieve a more environmentally conscious design. In simple words, LCA helps designers evaluate the environmental consequences of different designs by comparing buildings, materials, or assemblies.

While the goals and context of each LCA study may differ, the approach follows a specific format for accuracy and credibility. In case of USA, this is established through guidelines set by the International Organization for Standardization (ISO:2010).

5.3 Equer software

The Equer software performs yearly simulations of a building life cycle, in order to provide mechanical, energy and architectural engineers or architects with environmental indicators (e.g., global warming, acidification and eutrophication potentials, and exhaust of natural resources).
The life cycle simulation tool EQUER is based upon a building model structured in objects, this structure being compatible with the thermal simulation tool COMFIE. The LCA methodology has been chosen for accounting environmental impacts during the different phases, like fabrication of materials, construction, utilisation, renovation and demolition.

- **Type of Tool:** Simulation Tool
- **Country where the tool is in use:** France
- **Input of the tool:** Building geometry, material characteristics, internal loads and schedules, climate, heating and cooling equipment characteristics. Water consumption, waste generation and transport issues may be taken into account, depending on the goal of the study. Readable, structured input file should be generated by PLEIADES user interface and ALCYONE 2-3D modeller (PC Windows).
- **Output of the tool:** Formatted result (spreadsheet compatible tables and graphs), 12 environmental indicators (greenhouse gases, primary energy and water consumption, waste etc.).
- **Strengths:** Links with an energy simulation tool and a user-friendly interface (PLEIADES) allows a more global assessment. Life cycle simulation reduces the risk of errors when taking renovation into account. Focusing on the envelope allows for use by architects.

[24] LCA can assess many environmental impacts, but Global Warming Potential (GWP) is often the focus of LCA studies. Embodied carbon commonly refers to the GWP attributed to materials and energy used in the construction and maintenance of buildings. Operating carbon refers to the GWP attributed to operation and use of the building.

5.4 Athena Sustainable Materials Institute's Impact Estimator

In North America, the Athena Impact Estimator for Buildings is the only free software tool that is designed to evaluate whole buildings and assemblies based on internationally recognized LCA methodology. Impact Estimator puts the environment on equal footing with other more traditional design criteria at the conceptual stage of a project. It is capable of modeling 95% of the building stock in North America, using the best available data.
The Estimator takes into account the environmental impacts of:

- Material manufacturing, including resource extraction and recycled content
- Related transportation
- On-site construction
- Regional variation in energy use, transportation and other factors
- Building type and assumed lifespan
- Maintenance and replacement effects
- Demolition and disposal

The first step is to enter required information such as geographic location (the user selects the most representative North American city), building life and whether it's owner occupied or a rental property (this affects maintenance and replacement schedules), and, if desired, annual operating energy values by energy form. Pre-set dialogue boxes prompt users to describe the different assemblies — by requesting the width, span and live load of a floor assembly, for example — that together form a conceptual building design.
The Impact Estimator then instantly provides cradle-to-grave implications in terms of:

- Global Warming Potential
- Acidification Potential
- Human Health Respiratory Effects Potential
- Ozone Depletion Potential
- Photochemical Smog Potential
- Eutrophication Potential
- Fossil Fuel Consumption

5.5 Embodied Carbon in Construction Calculator

The Embodied Carbon in Construction Calculator (EC3) tool, is tool that allows benchmarking, assessment and reductions in embodied carbon, focused on the upfront supply chain emissions of construction materials. This tool utilizes building material quantities from construction estimates and/or BIM models and a robust database of digital, third-party verified Environmental Product Declarations (EPDs). Powered by this data, the EC3 tool can be implemented in both the design and procurement phases of a construction project to look at a project's overall embodied carbon emissions, enabling the specification and procurement of the low carbon options.

The EC3 tool also allows owners, green building certification programs and policymakers to assess supply chain data in order to create EPD requirements, and set embodied carbon limits and reductions, at the construction material and project scale. The tool and its subsequent effect on the industry is driving demand for low-carbon solutions and incentivizing construction materials manufacturers and suppliers to invest in disclosure, transparency and material innovations that reduce the carbon emissions of their products.

Annexure 06: Valuation and its relation with Life Cycle Assessment Calculation

Table 54: Approach and method of valuation

Approach	*Principle*	*Method*	*Definition*
Observed Preferences	Determining willingness to pay in an existing market for a good	**Market price**	A monetary valuation method where the marginal value of a good is identified on the basis of its market price.
Revealed preferences	Determining willingness to pay in surrogate markets		A monetary valuation method where the marginal value of a non-market good is identified on the basis of the market price of a surrogate good, i.e. a market good whose price is indirectly affected by changes in availability of the non-market good
		Averting behaviour	A revealed preference valuation method where the marginal value of a non-market good is identified on the basis of the expenses actually made for market goods that are required to prevent or offset the change in availability of the non-market good
		Travel cost	A revealed preference valuation method where the marginal value of a site is identified on the basis of the expenses made by individuals to travel and visiting the site
		Hedonic pricing	A revealed preference valuation method where the availability of a non-market good is one of the multiple attributes reflected in the total price of a market good.
Stated preferences	Determining willingness to pay in hypothetical markets or trade-off situations		A monetary valuation method where the marginal value of a non-market good is identified on the basis of the preferences expressed in response to hypothetical trade-off questions
		Contingent valuation	A stated preference valuation method where the marginal value of a non-market good is identified from the stated willingness to pay or accept compensation for a specified change in the availability of the good
		Conjoint analysis: Choice experiment	A stated preference valuation method where the marginal value of the individual attributes of a non-market good is identified on the basis of stated choices between alternative goods with different availability of the same attributes and different total price
Budget constraint	Determining willingness to pay for an additional Quality-Adjusted Life Year in a hypothetical situation without externalities	**Budget constraint**	A monetary valuation method where the marginal value of a Quality-Adjusted Life Year is identified on the basis of the potential economic production per capita per year
Abatement cost[1]	Determining potential cost for the marginal abatement or replacement activity	**Abatement cost**	A cost estimation method where the change in availability of a non-market good is assessed in terms of the potential costs of the marginal counter-balancing change (replacement) or marginal measure that prevents the change

[1] Most often the abatement cost is determined at a specified (policy-determined) target level. Methods using mitigation, avoidance, reduction, control, restoration, or replacement costs instead of abatement cost are conceptually analogous since the same potential cost approach is applied. This is in contrast to the Averting cost method, where it is the actual preventive or offsetting expenses that are measured.

Table 55: Relation of Approach and method of valuation on calculating Life Cycle Assessment

Methods	*Application areas*	*Strengths and Weaknesses*	*LCA impact categories for which the method is recommended*
Market price method	Valuation of impacts on resources and man-made products with a market price, e.g. human resources (market price = gross wages), and natural resources (market price = rent paid for right to exploit the resource); impacts that reduce production capacity (e.g. overexploitation of an abiotic resource), measured as lost value added from the extraction (market price of product minus extraction costs); impacts that reduce value of a resource or yield of an extraction (e.g. the impacts of pollution on buildings or crop yields), valued as market price of the lost product..	Avoids the uncertainty related to indirect measurement (market price is a direct and actual expression of preferences). Limited to public goods for which a market exists. Accounts only for the use value of the goods. Market prices may themselves be influenced by externalities. Market prices may be geographically specific and may fluctuate due to short-term scarcities.	Midpoints impacts on resource depletion (water, metal, fossil).
Averting Behaviour	Valuation of reductions in goods availability, where the loss is relatively immediate and directly avoidable by individual protective expenditure. Examples: acceptance of wage reductions to avoid jobs with specific occupational hazards; expenditures for protection against noise, burglary, unsafe drinking water (expenditures for water filter), accidents (air bag), soil erosion (expenditures for wind breaks or contouring), or degradation of specific local elements of cultural and natural heritage.	Observes actual behaviour. Stronger when averting behaviour can be related directly to the good to be valued. Accounts only for use value. Weaknesses according to Nijkamp et al. (2008) and Boardman et al (2006): difficult to isolate averting behaviour from other explanatory variables (Omitted variable problem, e.g. wage depends not only on risk but also on age and education); risk-seeking people self - select themselves for risky jobs (Self-selection bias); concepts of fairness and responsibility may influence averting behaviour; individuals make multiple averting expenditures for the same risk or impact; secondary benefits of an averting expenditure are not accounted for (e.g., if the sound insulation also reduces heat loss); assumes full information (e.g. on risk levels), which is seldom satisfied.	None, since in most cases the averting behaviour will not cover all aspects of the values of typical LCA midpoint and endpoint impact categories.
Travel Cost	Valuation of public recreational sites (natural parks, historical sites) and communication in the tourism sector.	Observes actual behaviour. Appropriate when object of valuation is full utility of a specific site. Probable endogenous bias: people decide to travel to a place because it is close and not because of its value (Boardman et al 2006).	Midpoint impacts on cultural or natural heritage, but only if the LCA is very site-specific. .
Hedonic Pricing	Valuation of air, water, and soil pollution at local scale and in general directly observable impacts affecting use value. Examples: differences in house prices used to value the nuisance from odour, noise, light, or crime. Differences in wages used to value job-related nuisances such as psychological and ergonomic stress.	Observes actual behaviour. Considers multiple variables (multivariate regression model), thus more flexible and informative outside of a specific context. Captures use values, e.g. for recreation, but not more abstract nature values and health aspects. Requires existence of appropriate surrogate market. Assumes full information, a condition that is often not satisfied (e.g., on the risk or existing level of pollution) (Boardman et al. 2006).	Midpoint impacts on acidification, eutrophication, plus nuisances of odour, noise, light, and crime, but only if separated by health impacts.
Contingent Valuation	Best suited for well-specified, concrete goods for which it is possible to imagine that a market could actually be implemented (e.g., "safe drinking water") or specific ecosystem services. Used to determine WTP for gains in life expectancy achievable by air pollution reductions under realistic policy scenarios.	Can be used for the valuation of goods for which appropriate actual or surrogate markets do not exist. Since interviewees are explicitly and directly asked about their WTP, good questionnaire design and administration are necessary to avoid cognitive stress, to avoid potential biases in the selection of respondents, and to take the budget constraint into account. For complex, multi-dimensional, or complex endpoints (e.g. biodiversity), the market situation may be too difficult to depict for respondents (Nijkamp et al. 2008; Boardman et al, 2006).	None, since the method is appropriate for simple issues where an explicit price for the whole good is valuated, whereas impact categories not recommended for methods above are more complex and with many variables.
Conjoint Analysis / Choice experiment	All non-markets goods can be included in a choice experiment. The method is used in marketing (e.g. to identify the WTP for different attributes of a market good)	Measures partial utility instead of total utility, as it distinguishes multiple attributes of a non-market good. Measures trade-offs between these attributes and does not ask respondents to state directly monetary values. However, the total utility of a good may not be equal to the sum of its parts. Also, a choice experiment is relatively complex to design and administer and may have the same potential biases as contingent valuation (Pearce and Ozdemiroglu, 2002). The method has its strength when applied to more complex endpoints, as these can be described via their specific/concrete attributes (Pearce and Ozdemiroglu, 2002).	All midpoint impact categories not recommended under the methods above, and also endpoint categories such as human and ecosystem health (high level of abstraction).
Budget constraint	Only valuation of human wellbeing expressed in QALY.	Accounts explicitly for the budget constraint, which lowers the uncertainty on the valuation. However, the method is only applicable specifically to the value of human wellbeing (expressed in QALY). Does not rely on revealed nor stated WTP, but rather infers WTP from the accounting balance principle (what is earned must be spent). The uncertainty depends on the data used to calculate the potential economic production per capita. Unclear whether the accounting balance principle is sufficient argument for inferring WTP from "ability to pay".	Human wellbeing (endpoint impact category) expressed in QALY.
Abatement cost	Economic value of emissions/damages related to the cost of (technical) measures that should be taken elsewhere in society to mitigate/abate/reduce/avoid/restore the emissions/damages, either fully (total abatement) or partly (political target).	The method is based on a quite intuitive concept and can be used to assess policy targets. The main limitation of the method is that it does not value utility losses (damages), i.e. it is not WTP-based, or only partly (by reflecting political rather than individual WTP). Therefore, it does not refer to a social optimum.	None, since (values from) WTP methods are available that better express damage cost.

Annexure 07: Table of Stakeholder and subcategories for Social Life Cycle Assessment

Table 56: Table of stakeholder and subcategories devised from UNEP/ SETAC Life Cycle Initiative project for Social Life Cycle Assessment

Stakeholder categories	Subcategories
Employees	1. Freedom of association and collective bargaining
	2. Child labor
	3. Working hours
	4. Forced Labor
	5. Equal opportunities/discrimination
	6. Health and safety
	7. Fair salary
	8. Social benefit/social security
Local community	1. Access to material resources
	2. Access to immaterial resources
	3. Delocalization and migration
	4. Cultural heritage
	5. Safe and healthy living conditions
	6. Respect of indigenous right
	7. Communities engagement
	8. Local employment
	9. Secure living condition
Society	1. Public commitments to sustainability issues
	2. Contribution to economic development
	3. Prevention and mitigation of amending conflict
	4. Technology development
	5. Corruption
Consumer	1. Health and safety
	2. Feedback mechanism
	3. Consumer privacy
	4. Transparency
	5. End of life responsibility
Value chain actors not including consumers	1. Fair competition
	2. Promoting social responsibility
	3. Supplier relationship
	4. Respect of intellectual property rights

Source (UNEP and SETAC 2009a, b, Arcese et al. 2013)

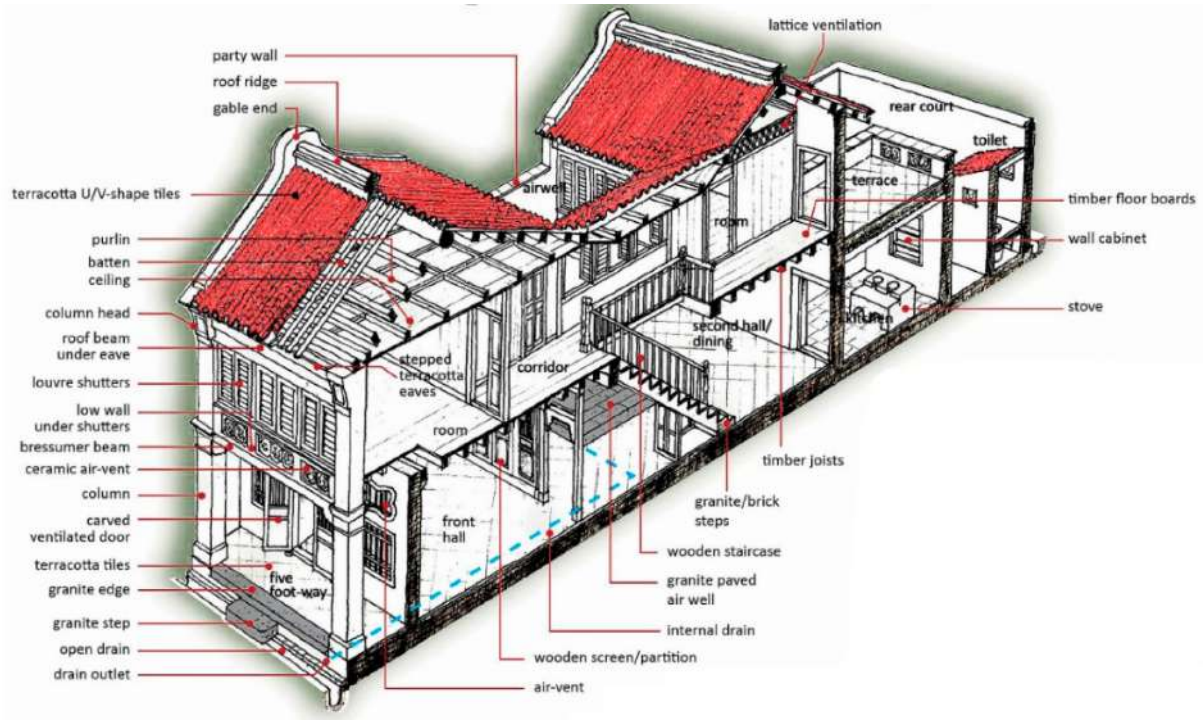
Annexure 08: Case Study: Penang Shophouses of Malaysia

8.1 Introduction

Many of Penang's Shophouses were built in the 19th and 20th century, corresponding with the arrival of tradesmen from Southern China. There are around 7000 units in Penang alone. These heritage shophouses in Penang can be categorized either in the Early 'Penang' Style (1790s - 1850s), 'Southern Chinese' Eclectic Style (1840s - 1900s), Early 'Straits' Eclectic Style (1890s - 1910s), Late 'Straits' Eclectic Style (1910s -1940s), Art Deco Style (1930s -1960s) or Early Modernism Style (1950s -1970s). These buildings typically stand at two storeys high. The lower floor serves as commercial space for trading whereas the upper floor usually serves as the tenants' residence. Shophouses were built in rows, which formed the streets and town grid. Typical building materials found in these buildings are clay bricks, granite, plaster and timber.

The original design of the Penang Heritage Shophouses is suggested to be influenced not only by the prevalent colonial and Chinese influence of the time, but also by the hot and humid character of Penang's local climate. Therefore, as well as having key design elements such as arches and stylized columns, most of the original shophouses have large openings, louvered doors and sheltered pedestrian walkways (also called five footway); all part of an integrated design that responds to the need of solar shading and passive cooling. Other features such as jack-roofs and air wells are also be found in some of the buildings. Unlike contemporary buildings of the same type, the Heritage Shophouses possess various architectural features that would theoretically allow it to keep cool during the day.

Figure 56: Features of a Shophouse "Southern Chinese" Eclectic Style (Cabeza, Gracia and Pisello 2018)



8.2 Assessment of Passive Thermal Performance for a Penang Heritage Shop house

The study discusses the thermal performance of the shop house that uses passive cooling (Omar and Syed-Fadzil 2011). Aspects that are looked at are the overall design of the buildings as well as recorded thermal data collected during the pilot study.

8.2.1 Observations

The daily indoor temperature readings peaked late in the afternoon, even then, was almost 2°C lesser than outdoor peak temperature. At night, the temperature was maintained with little fluctuations in its pattern. This is due to heat radiating inwards from the walls that has high thermal mass. Relative humidity indoors was considerably stable at the level of 62% to 75%. Relative humidity is suggested to be kept within 30% to 60%, according to ASHRAE guidelines. However, due to the building being naturally ventilated, the Penang Heritage Shophouse can only maintain relative humidity within the range of 64% to 75%; achieved with the construction

of its thick brick walls. Humidity levels in such masonry buildings are regulated by the walls that absorbs moisture in its pores. The main contributing factor that may have affected the reduced peak temperature within the Penang Heritage Shophouse is its four (4) metres high ceiling on the lower level. Compared to a contemporary terrace house, the Heritage Shophouse's ceiling is higher by at least one (1) metre. This allows stack ventilation to occur more efficiently.

8.2.2 Conclusions

- The studied Penang Heritage Shophouse has to an extent, succeeded in regulating its indoor air temperature and reducing its peak temperature readings without the use of mechanical ventilation devices.
- Indoor relative humidity was also significantly moderated with significant reduction during peak readings.
- However, with the aid of devices such as electric fans, improved indoor thermal conditions such as increased air movement and/or lower air temperature may be achieved.
- The Heritage Shophouse must also be kept to its intended design that encourages natural ventilation, in order for it to function efficiently and minimize the building's cooling load.

8.3 Sustainable Building Assessment of Colonial Shophouses after Adaptive Reuse in Kuala Lumpur

The research focuses on two case studies in a strategic and historical location of Jalan Sultan, Kuala Lumpur (Cabeza, Gracia and Pisello 2018). These two buildings have significant historical value, a similar history and are both located on the same street.

- **Building A** is a three storey Neo Classical building and was built in 1927. It originally served as the Selangor and Federal Territory Grocer's Guild. The ground floor of this building functioned as a commercial area, while the first and second floors served for private use in the past.
- **Building B** is a double storey Strait Eclectic Colonial shophouse and was built around 1900. This shophouse has undergone a large-scale renovation whereby three floors were added to the back of the original structure to become a budget hotel.

At the initial stage, interviews and physical surveys were done to determine the context of this study. The authors of this research then used a triangulation method through indoor environmental condition assessment, measurements of indoor environmental conditions and occupant survey to determine the indoor building performance after the adaptation.

8.3.1 Observations

Figure 57: Observations from Sustainable Building Assessment of Colonial Shophouses

Criteria	Building A	Building B
Indoor Environmental Assessment	Mechanical ventilation such as fans are used to ventilate the interior public spaces such as the café, lobby, kitchen and even the corridor Air-conditioners are only operated during the afternoon period in the café Natural ventilation and fans are used in other parts of the day to reduce the operational cost.	All spaces are entirely air-conditioned Only has openings on the front and back facades. Side openings are not provided on the wall of the additional floors. During the adaptive reuse renovation, the courtyard area was fully covered with new suspended floors.
Indoor temperature, relative humidity and air velocity	Indoor air temperature fluctuated in a range between 30.04 °C–32.43 °C, due to reliance on fans for ventilation. Relative Humidity ranged between 55–70% that is slightly above the requirement for comfort condition. Air Velocity meets the requirement of comfort	Stable at around 27 °C due to fully air-conditioned space Relative Humidity ranged between 55–70% that is slightly above the requirement for comfort condition. Air Velocity was below the requirement of comfort

Criteria	Building A	Building B
Indoor Daylighting	More functional openings that were maintained, and provides sufficient level of daylight The original French windows, louvers, and railings were preserved to promote natural light to the interior. In order to prevent glare, blinds were provided for occupants to adjust according to their preferences in the hotel rooms. The corridor was designed with a skylight to bring in natural light to indoor spaces. The courtyard at the mezzanine floor also allowed more natural light to the interior. Artificial lights were only used in public areas, especially at the ground floor to provide sufficient lighting conditions for the guests. Higher light intensity	Inadequate amount of openings, plus the deep building plan causes the interior of this building to have a low level of natural light Indoor spaces have fewer openings, as the building is hemmed in on both sides Depends entirely on artificial lights as the structural adaptation of the building is not well-designed. Natural daylight is unable to reach the interiors that cause the building to use more energy for lighting. Fluorescent troffers are used on the staircase area while parabolic louver fluorescent troffer and fluorescent light can be noticed along the corridor and rooms. Lower light intensity
Materials and Resources	Sustainable design approach Recycled building materials and furniture were used, in addition to maintaining old floor tiles creating a cozy atmosphere Wall plaster was removed to create a rustic and raw effect in the front door café Practices waste sorting, collecting, quantifying, monitoring and recycling No water efficiency measures such as water recycling, rainwater harvesting and dual flush cisterns at the toilets	Original roof structure was demolished and a new structure was built directly on the top of this shophouse New materials were used in the construction, while parts of the original structure were demolished to build the additional structure. No particular recycling plans or strategies No water efficiency measures such as water recycling, rainwater harvesting and dual flush cisterns at the toilets
Result	**Building A performed better than Building B in terms of its indoor environmental condition and functionality.** **Building A outperformed Building B in all sections of the indoor environmental assessment.**	
Occupants' Behaviour (ventilation)	60% of the respondents agreed to the use of fans, while 40% agreed to the use of natural ventilation to ventilate the interior in the morning 40% of the respondents believed that air-conditioning is preferable in the afternoon Most respondents preferred fans and natural ventilation as the main type of ventilation	Respondents preferred to use air-conditioning all day long
Occupants' Behaviour (day lighting)	55% of respondents preferred natural daylight in the morning 90% of respondents preferred natural daylight in the afternoon 40% of respondents preferred the use of natural daylight in the evening	All respondents preferred the use of artificial lights in the morning and evening 60% of the respondents preferred the use of day-lighting during afternoon
Result:	**Most of Building A occupants were more satisfied with the indoor environmental conditions in terms of air quality and ventilation.** **Occupants at Building B were not convinced with indoor ventilation and lighting when there is no artificial lighting and air-conditioning.**	

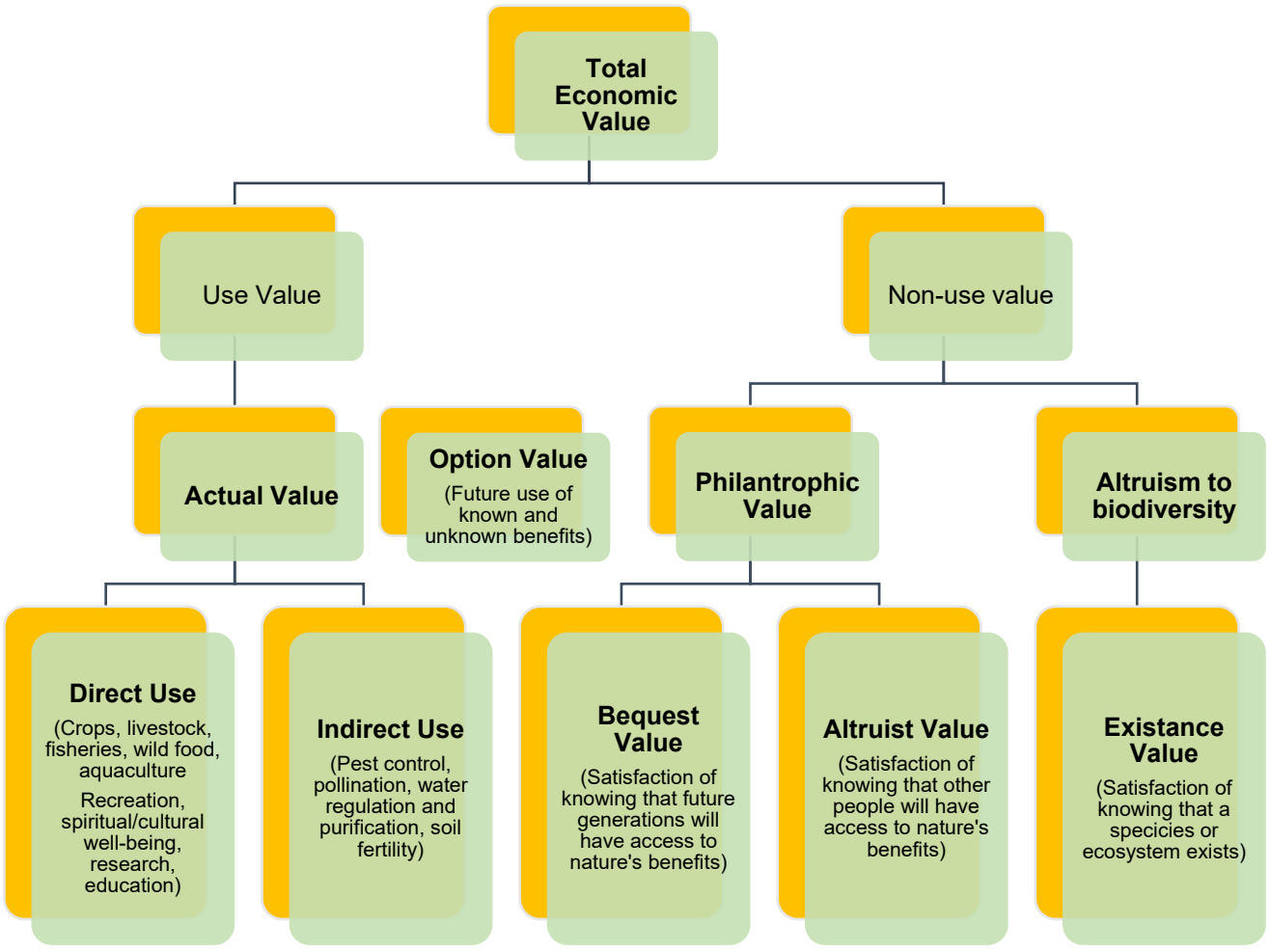
8.3.2 Conclusions

- Due to careful consideration during the design stage of an adaptive reuse renovation, Building A performs well after being renovated with a new usage - enables private heritage building owners in sustaining their incomes while changing the usage of their buildings to meet the current demand to accommodate the growing tourism sector.
- Reusing existing building structures and envelopes, maintaining thermal comfort indoors, and recycling furniture/building finishes, amongst other things, can bring more income to heritage building owners, which is definitely in-line with the principle of sustainability.

Annexure 09: Total Economic Value (TEV)

The Total Economic Value (TEV) of a non-market good is defined as the sum of its use and non-use values (Turner, Pearce and Bateman 1994). The former is instrumental and includes both direct and indirect use values; the latter is intrinsic and includes both existence and bequest values. Natural resources (e.g., biomass, water) typically provide a direct instrumental utility to society, whereas ecosystem functions (e.g., carbon storage, flood control) provide an indirect one. Individuals may also value the pure existence of a non-market good without using it, its value for future generations, or for others (altruism). An "option" value can also be identified (either instrumental or intrinsic), an example being the value of genetic biodiversity for future medical purposes (Bachmann 2011, Pizzol, et al. 2015).

Figure 58: Total Economic Value (TEV)



- *Economic value* - can be defined using methods of economic analysis and is expressible in monetary terms - can be divided correspond to three identifiable ways in which individuals experience heritage - use, non-use, or as a beneficial externality (Throsby 2019).
- *Use value* accrues through the direct consumption of heritage services. It may be experienced, for example, through the ownership of a RHA, or the enjoyment of the services of the RHA. Such values are reflected in market processes, and can be observed in various financial transactions.
- *Non-use* or *passive use values, also categorised into* existence, option, and bequest values, are experienced by individuals but are not reflected in market processes, since they are derived from attributes of cultural heritage classifiable as public goods. These sources of value give rise to demand for the conservation of heritage expressible as individual willingness to pay. For example, purchase of railway and platform tickets.
- The third type of value of cultural heritage experienced by individuals entails both use and non-use characteristics - it derives from the fact that heritage may generate *positive spill overs*, or *externalities*. For

example, passengers of CSMT may enjoy the sight and interiors while in transit. In principle the economic value of such a benefit could be estimated, although in practice it seldom is.

Appendix X: Checklist Interventions in and around World Heritage Properties

This checklist enlists steps to be taken and lists information to be provided while planning for projects within, adjacent to or those which have an impact on a World Heritage Property (WHP).
The WHP may either be inscribed on the World Heritage or the Tentative List and the project site may be located within or adjacent to the Buffer Zone, or Property limits as identified in the Nomination Dossier or in the Tentative List document, or that which is finally adopted vide any boundary modifications by the World Heritage Committee.

***NOTE**: It is mandatory to abide by the clauses/ decisions contained in the updated Operational Guidelines of the World Heritage Convention'72 and any other commitments made by the State Party to the World Heritage Committee through Management Plan (as a part of Nomination Dossier or that submitted later), State of Conservation Reports, Periodic Reporting Process or over any other official correspondence exchanged between the World Heritage Centre and the State Party.*
World Heritage Property (WHP) shall imply both railway and non-railway heritage and that which is inscribed on the World Heritage List or on the Tentative List or is perceived to be a potential site that is yet to be entered into the Tentative List.

Additional document to be referred to:

1. *Operational Guidelines of the World Heritage Convention'72*
2. *Nomination Dossier of the respective World Heritage Property*
3. *Management Plan submitted either as a part or after submission of Nomination Dossier*
4. *Correspondences/ Commitments between State Party and World Heritage Centre*
5. *State of Conservation reports submitted to World Heritage Centre*
6. *Periodic Reporting reports submitted to World Heritage Centre*
7. *Correspondences/ decisions taken for its protection and management*

Instructions for applying the Checklist:
a. Instructions for the Client

- *Mark with '**x**' for those deliverables not received.*
- *Mark with a tick mark '✓' on those received.*

1.1. Name of the Railway Station:
1.2. Address:
1.3. Protection System:
1.3.1. **Status:**
1.3.2. **Gazette Notification No.**:
1.3.3. **UNESCO Notification No.**:

Table 57: Checklist for Interventions in and around World Heritage Property

S. No.	Components / Details of The Deliverable	Communication Details	Tick (✓) If included	Reference and Comments
Inclusions in KD01 *Section comprises extracts of information informing boundary conditions and compliances pertaining to a World Heritage Property. These are commitments made by the State Party to World Heritage Committee and are to be filed for individual Properties.*				
	List of Drawings and information in it			
i.	Extent of World Heritage Property Boundary(ies) (Map 01) *Extract the same Map of the WHP Boundary as submitted (and where applicable, updated) by the State Party*			<Ref> <Comments>
ii.	Extent of Buffer Zone boundary(ies) (Map 01) *Extract the same Map of the Buffer Zone Boundary as submitted (and where applicable, updated) by the State Party*			<Ref> <Comments>
iii.	Location of the proposed Project, WHP (ies) and Buffer Zone(s) Boundary(ies) (Map 02) *Indicate on a map, the footprint(s) of the proposed project, the WHP and Buffer Zone Boundary*			<Ref> <Comments>
iv.	Other details to be provided on Site Plan (Map 03)			
a	*Area to be excavated*			<Ref> <Comments>
b	*Area to be used for storage of construction material, malba, machines*			<Ref> <Comments>
c	*Area / route designated for movement of heavy vehicles*			<Ref> <Comments>
d	*Area where heavy machineries and/or that induces vibration shall be used*			<Ref> <Comments>
v.	Excerpt from the relevant version of the Operational Guidelines on			
a	*Clauses on modification of WHP or within World Heritage Area* *Indicate on basis of self-assessment of the scheme at hand whether it qualifies as Minor or Significant modifications to the Boundary.*			<Ref> <Comments>
b	*Clauses on modification within and in the proximity of the Buffer Zone*			<Ref> <Comments>
c	*Correspondence concerning Buffer (zone) modification* *(In case of NO such correspondence, mark as 'X')*			<Ref> <Comments>
d	*Observations on State of Conservation and factors affecting the property*			<Ref> <Comments>
e	*Observations on Periodic Reporting*			<Ref> <Comments>
f	*Recommendations of the Advisory Bodies since the time of inscription*			<Ref> <Comments>
g	*Any other communication pertaining to World Heritage Status with World Heritage Centre / Advisory Bodies*			<Ref> <Comments>

	Highlight any communication regarding vulnerabilities and pressures on Property			
h	*Any other communication pertaining to World Heritage Status central or state government bodies, departments or committees (such as with Advisory Committee for World Heritage Matters)*			<Ref> <Comments>
vi.	*Other compliances/ Information*			
a	*List of applicable local norms, laws and byelaws*			<Ref> <Comments>
b	*List of applicable plans, schemes and programs (viz Master Plans, Zonal or Local Area Development Plan, or Transport or Infrastructure Plans et al)*			<Ref> <Comments>
c	*List of Committees, Organizations, Agency or a Third-Party body with a shared mandate in protection, conservation and or management of the World Heritage Property*			<Ref> <Comments>
2.	**Excerpts or copy(ies) of information on Protection and Management**			
i.	Statement of Integrity *Highlight vulnerabilities with respect to the conditions of integrity as specified in the Nomination Dossier, Advisory body recommendations, and State of Conservation Report (Retrospective SOUV), if applicable.*			<Ref> <Comments>
ii.	Statement of Authenticity *Highlight vulnerabilities with respect to the conditions of authenticity as specified in the Nomination Dossier, Advisory body recommendations, and State of Conservation Report (Retrospective SOUV), if applicable.*			<Ref> <Comments>
iii.	Description of WHP Boundary *Highlight any information provided in the description of the Property Boundary(ies) regarding the role played by the extent of the boundary in protection and management of the attributes.*			<Ref> <Comments>
iv.	Description of Buffer Zone boundary(ies) *Highlight any information provided in the description of the Buffer Zone Boundary(ies) regarding the role played by the extent of the boundary in protection and management of the attributes.*			<Ref> <Comments>
v.	Excerpts on State of Conservation of the WHP *Attach excerpts of the chapter verbatim.*			<Ref> <Comments>
vi.	Excerpts of Factors Affecting the WHP as mentioned in the Nomination Dossier or Tentative List *Attach excerpts of the chapter verbatim and additionally, prepare a list of all the factors affecting the Property.*			<Ref> <Comments>
vii.	Excerpts of section on Management and Monitoring of the WHP as mentioned in the Nomination Dossier or Tentative List, specifying the following information:			
a	*Management of Key indicators* *(Specify timelines and specific action)*			<Ref> <Comments>
b	*Monitoring of Key indicators* *(Specify timelines for monitoring specific indicators)*			<Ref> <Comments>
Inclusions in KD02				
3.	**Situation analysis and Assessments of the proposed project**			
i.	Updated (as-built) Documentation *(Shall be endorsed by the Officer in-charge responsible for reporting the State of Conservation of*			<Ref> <Comments>

	the WHP or Owner where the Property is on Tentative List)			
ii.	Updated and endorsed Condition Assessment *(Shall be endorsed by the Officer in-charge responsible for reporting the State of Conservation of the WHP or Owner where the Property is on Tentative List)*			<Ref> <*Comments*>
iii.	Heritage Impact Assessment *All the above-mentioned deliverables shall follow the Heritage Building Condition Report (HBCR) of 06b: Guidebook for Conservation of Railway Heritage Assets and not be undertaken any more than 6 (six) months prior to its submission.* *Note: The above three documents shall be treated as a declaration of the state of conservation, limits of acceptable change and safety of the structure and its part components. It will determine the boundary conditions for conceptualizing any in-fill development or construction within the impact area.*			<Ref> <*Comments*>
Inclusions in KD03				
4.	**Inclusions in Final proposals**			
i.	Heritage Conservation and Reuse Plan (HCRP) with Mitigation strategies *(Appendix IV: Heritage Conservation and Reuse Plan and Appendix VI: Heritage Impact Assessment)*			<Ref> <*Comments*>
ii.	Compliance with Degree of Adaptability and Life Cycle Assessment *(Appendix V: Compatible and Adaptive Continued Use and Reuse of RHA)*			<Ref> <*Comments*>
iii.	Inspection, Maintenance, Monitoring and Repair strategies (*Appendix XI: Inspection, Monitoring, Maintenance and Repair (IMMR)*)			<Ref> <*Comments*>
iv.	Information package for Periodic Reporting and State of Conservation Report *The format and content for the Periodic Reporting is as per the relevant Operational Guidelines for the World Heritage Convention'72 (refer annex 7).* *The format and content for the State of Conservation Report is as per the relevant Operational Guidelines for the World Heritage Convention'72 (refer annex 13).* *The same may be referred to by the Authority responsible for reporting.*			<Ref> <*Comments*>

Annexure 10: Sample Checklist filled for Chhatrapati Shivaji Terminal, World Heritage Property

1.1. Name of the Railway Station - Chhatrapati Shivaji Terminal, 1996, Victoria Terminus, 1888
1.2. Address: Dhobi Talao, Chhatrapati Shivaji Terminus Area, Fort, Mumbai, Maharashtra, 400001
1.3. Protection System:
- 1.3.1. **Status:** Protected
- 1.3.2. **Gazette Notification No.**: Sr. No.121 (1995)
- 1.3.3. **UNESCO Notification No.**: 945rev (2004)

Table 58: Checklist for Chhatrapati Shivaji Terminal, World Heritage Property

S. No.	Components / Details of the Deliverable	Communication Details	Tick (✓) If included	Reference / Comments
Inclusions in KD01 *Section comprises extracts of information informing boundary conditions and compliances pertaining to a World Heritage Property. These are commitments made by the State Party to World Heritage Committee and are to be filed for individual Properties.*				
2.	**List of Drawings and information in it**			
i.	Extent of World Heritage Property Boundary(ies) (Map 01) *Extract the same Map of the WHP Boundary as submitted (and where applicable, updated) by the State Party*		✓	Nomination file 945rev, 2004 *Highlight property boundary and buffer zone*
ii.	Extent of Buffer Zone Boundary(ies) (Map 01) *Extract the same Map of the Buffer Zone Boundary as submitted (and where applicable, updated) by the State Party*		✓	Map of the inscribed property and buffer zone submitted by the World Heritage Centre *Highlight property boundary and buffer zone*
iii.	Location of the proposed Project, WHP (ies) and Buffer Zone(s) Boundary(ies) (Map 02) *Indicate on a map, the footprint(s) of the proposed project, the WHP and Buffer Zone Boundary*		✓	1. 945rev-map, 2003 (Map of the Inscribed property and buffer zone) 2. Proposed Development drawing *This map has been prepared as a sample for reference by overlaying AECOM's proposed development drawing (provided by IRSDC) and Inscription Map.*
iv.	Other details to be provided on Site Plan (Map 03)			
a	*Area to be excavated*		x	<*Ref*> ***Not provided***
b	*Area to be used for storage of construction material, malba, machines*		x	<*Ref*> ***Not provided***
c	*Area / route designated for movement of heavy vehicles*		x	<*Ref*> ***Not provided***
d	*Area where heavy machineries and/or that induces vibration shall be used*		x	<*Ref*> ***Not provided***
v.	Excerpt from the relevant version of the Operational Guidelines on			
a	*Clauses on modification of WHP or within World Heritage Area* *Indicate on basis of self-assessment of the scheme at hand whether it qualifies as Minor or Significant modifications to the Boundary.*		✓	The Operational Guidelines for the Implementation of the World Heritage Convention (2019) *As mentioned in the Operational Guidelines, 2019*
b	*Clauses on modification within and in the proximity of the Buffer Zone*		✓	The Operational Guidelines for the Implementation of the World Heritage Convention (2019) *As mentioned in the Operational Guidelines, 2019*
				WHC-12/36.COM/19

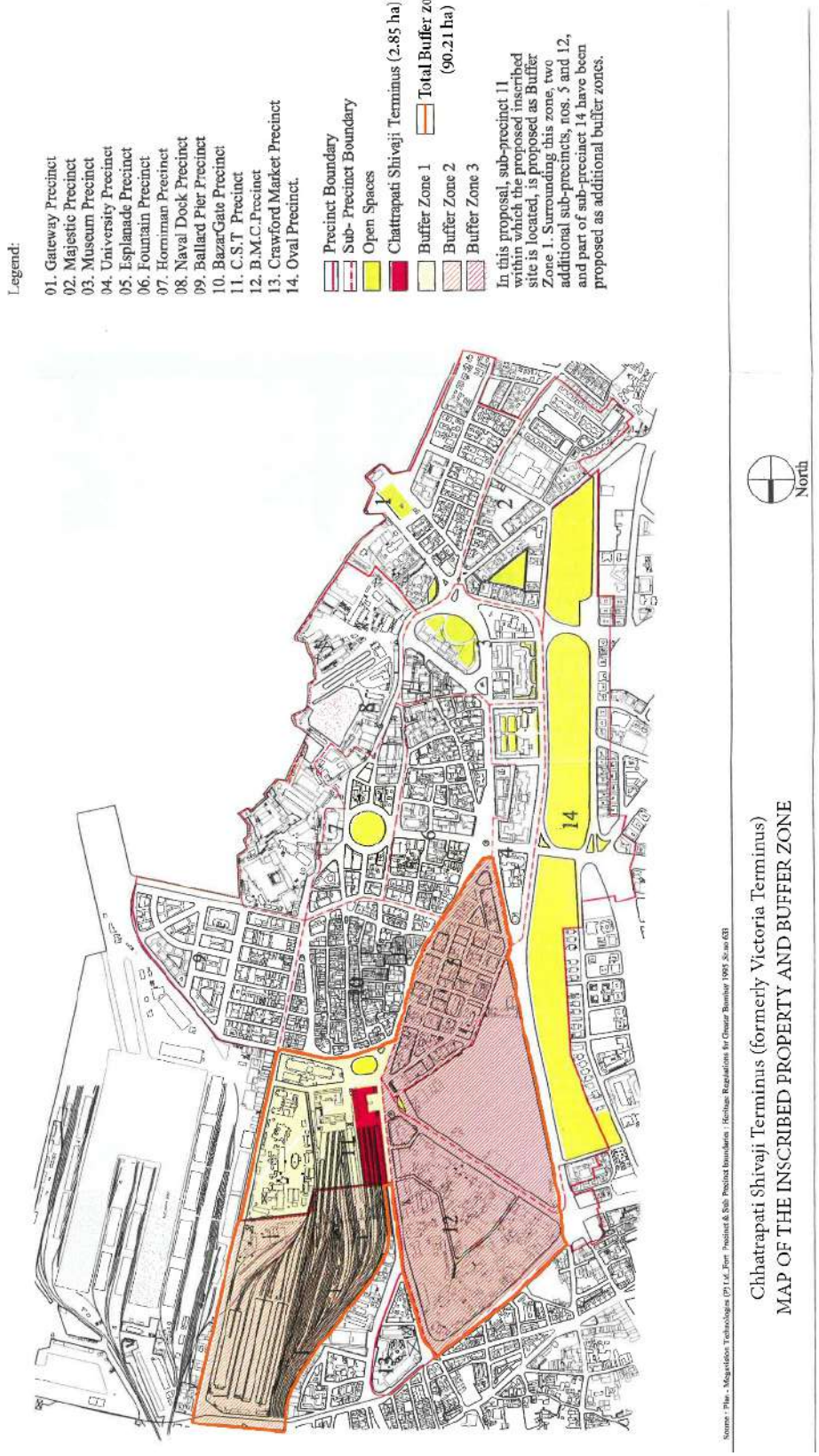
S. No.	Components / Details of the Deliverable	Communication Details	Tick (✓) If included	Reference Comments
c	*Correspondence concerning Buffer (zone) modification* *(In case of NO such correspondence, mark as 'X')*		✓	*The minor boundary modification of the Chhatrapati Shivaji Terminus (formerly Victoria Terminus), India, was withdrawn at the request of the State Party. (Discussed in WH Committee meeting 2012)*
d	*Observations on State of Conservation and factors affecting the property*		✓	The Operational Guidelines for the Implementation of the World Heritage Convention (2019) *As mentioned in the Operational Guidelines, 2019*
e	*Observations on Periodic Reporting*		✓	The Operational Guidelines for the Implementation of the World Heritage Convention (2019) *As mentioned in the Operational Guidelines, 2019*
f	*Recommendations of the Advisory Bodies since the time of inscription*		✓	Advisory Body Evaluation (ICOMOS), 2004 *As mentioned in the Advisory Body Evaluation (ICOMOS), 2004*
g	*Any other communication pertaining to World Heritage Status with World Heritage Centre / Advisory Bodies* *Highlight any communication regarding vulnerabilities and pressures on Property*		✓	**1.i.** 28COM 14B.34 - Nominations of Cultural Properties to the World Heritage List (Chhatrapati Shivaji Terminus) **1.ii.** 36COM 8B.56 - Cultural Properties - Examination of minor boundary modifications - Chhatrapati Shivaji Terminus (India) **1.iii.** 37COM 8E - Adoption of retrospective Statements of Outstanding Universal Value **2.i.** Enquiry from World Heritage Centre regarding Newspaper Report (CLT/WHC/APA/FJ/NH/20/120) **2.ii.** Reference Newspaper clipping attached to letter in 2.i. **3.** Response to letter in Document 2.i. and 2.ii. • ***2004:*** *Chhatrapati Shivaji Terminus inscribed on the World Heritage List in 2004.* • ***2012:*** *Minor boundary withdrawn at the request of the State Party.* • ***2013:*** *Adoption of retrospective Statements of Outstanding Universal Value.* • ***2020:*** *Enquiry from World Heritage Centre regarding Newspaper Report and it's response by IRSDC.*
h	*Any other communication pertaining to World Heritage Status central or state government bodies, departments or committees (such as with Advisory Committee for World Heritage Matters)*		***x***	The Operational Guidelines for the Implementation of the World Heritage Convention (2019) *Not Submitted*
vi.	*Other compliances/ Information*			
a	*List of applicable local norms, laws and byelaws*		✓	Links provided on page 28-29 of this document. *Compiled from Nomination Dossier file (2014) and desktop research*
b	*List of applicable plans, schemes and programs (viz Master Plans, Zonal or Local Area Development Plan, or Transport or Infrastructure Plans et al)*		✓	Links provided on page 30 of this document. *Compiled from Nomination Dossier file (2004) and desktop research*

S. No.	Components / Details of the Deliverable	Communication Details	Tick (✓) If included	Reference / Comments
c	*List of Committees, Organizations, Agency or a Third-Party body with a shared mandate in protection, conservation and or management of the World Heritage Property*		✓	*Compiled from Nomination Dossier file (2004) and desktop research*
2.	**Excerpts or copy(ies) of information on Protection and Management**			
i.	Statement of Integrity *Highlight vulnerabilities with respect to the conditions of integrity as specified in the Nomination Dossier, Advisory body recommendations, and State of Conservation Report (Retrospective SOUV), if applicable.*			a. Nomination file 945rev, 2004 b. Advisory Body Evaluation (ICOMOS), 2004 c. Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)
a			✓	*As mentioned in the Nomination Dossier file 945rev, 2004*
b			✓	*As mentioned in the Advisory Body Evaluation (ICOMOS), 2004*
c			✓	*As mentioned in the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)*
ii.	Statement of Authenticity *Highlight vulnerabilities with respect to the conditions of authenticity as specified in the Nomination Dossier, Advisory body recommendations, and State of Conservation Report (Retrospective SOUV), if applicable.*			a. Nomination file 945rev, 2004 b. Advisory Body Evaluation (ICOMOS), 2004 c. Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)
a			✓	*As mentioned in the Nomination Dossier file 945rev, 2004*
b			✓	*As mentioned in the Advisory Body Evaluation (ICOMOS), 2004*
c			✓	*As mentioned in the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)*
iii.	Description of WHP Boundary *Highlight any information provided in the description of the Property Boundary(ies) regarding the role played by the extent of the boundary in protection and management of the attributes.*			a. Nomination file 945rev, 2004 b. Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)
a			✓	*As mentioned in the Nomination Dossier file 945rev, 2004*
b			✓	*As mentioned in the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)*
iv.	Description of Buffer Zone boundary(ies) *Highlight any information provided in the description of the Buffer Zone Boundary(ies) regarding the role played by the extent of the boundary in protection and management of the attributes.*			a. Nomination file 945rev, 2004 b. Advisory Body Evaluation (ICOMOS), 2004 c. Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)
a			✓	*As mentioned in the Nomination Dossier file 945rev, 2004)*
b			✓	*As mentioned in the Advisory Body Evaluation (ICOMOS), 2004*

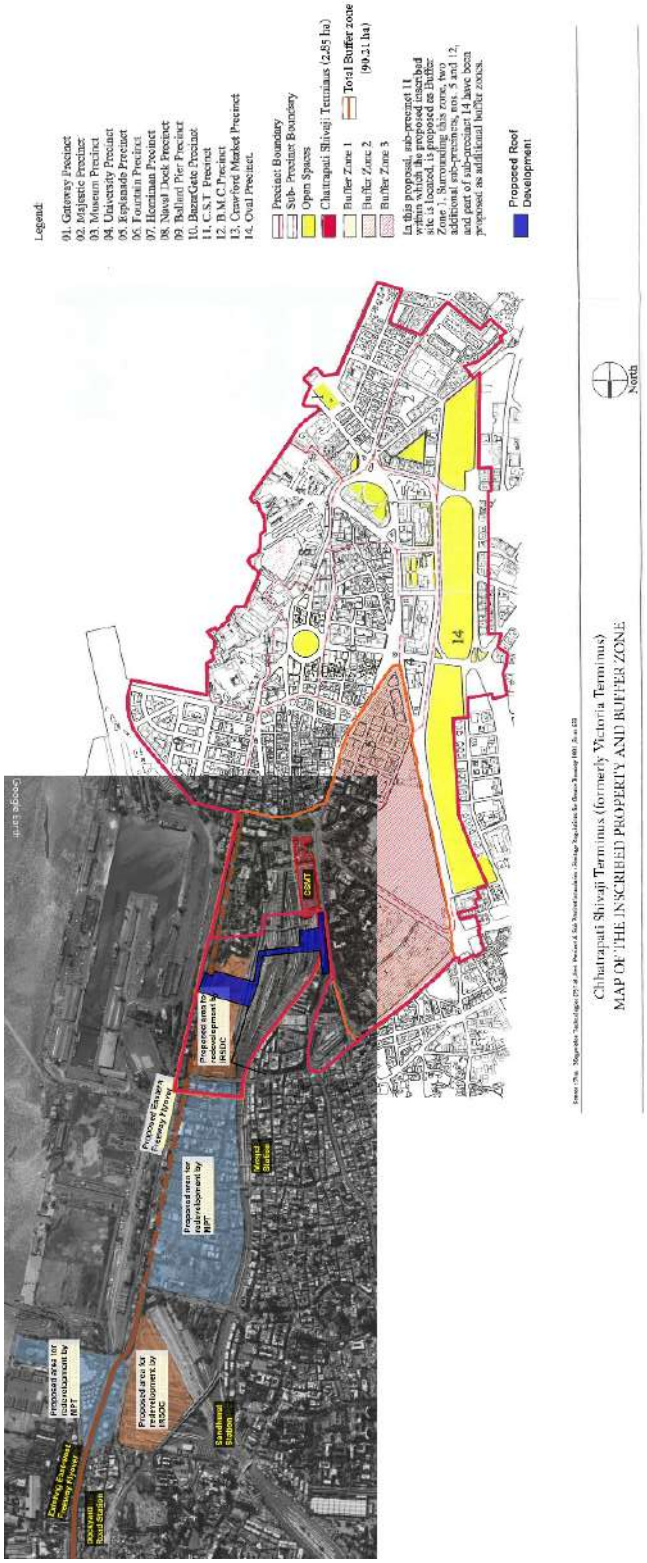
S. No.	Components / Details of the Deliverable	Communication Details	Tick (✓) If included	Reference / Comments
c			✓	*As mentioned in the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)*
v.	Excerpts on State of Conservation of the WHP *Attach excerpts of the chapter verbatim.*			a. Nomination file 945rev, 2004 b. Advisory Body Evaluation (ICOMOS), 2004 c. Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)
a			✓	*As mentioned in the Nomination Dossier file 945rev, 2004*
b			✓	*As mentioned in the Advisory Body Evaluation (ICOMOS), 2004*
c			✓	*As mentioned in the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)*
vi.	Excerpts of Factors Affecting the WHP as mentioned in the Nomination Dossier *Attach excerpts of the chapter verbatim and additionally, prepare a list of all the factors affecting the Property.*			Nomination file 945rev, 2004
			✓	*As mentioned in the Nomination Dossier file 945rev, 2004*
vii.	Excerpts of section on Management and Monitoring of the WHP as mentioned in the Nomination Dossier, specifying the following information:			
a	*Management of Key indicators* *(Specify timelines and specific action)*		✓	Nomination file 945rev, 2004 *As mentioned in the Nomination Dossier file 945rev, 2004*
b	*Monitoring of Key indicators* *(Specify timelines for monitoring specific indicators)*		✓	Nomination file 945rev, 2004 *As mentioned in the Nomination Dossier file 945rev, 2004*
Inclusions in KD02				
3.	**Situation analysis and Assessments of the proposed project**			
i.	Updated (as-built) Documentation *(Shall be endorsed by the Officer in-charge responsible for reporting the State of Conservation of the WHP or Owner where the Property is on Tentative List)*		x	<*Ref*> ***None.*** *Last updated Documentation was undertaken in 2013 for the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site (Retrospective SOUV) and is not prior to 6 months of the present proposal.*
ii.	Updated and endorsed Condition Assessment *(Shall be endorsed by the Officer in-charge responsible for reporting the State of Conservation of the WHP or Owner where the Property is on Tentative List)*		x	<*Ref*> ***None.*** *Last updated Condition Assessment was undertaken in 2013 for the Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site (Retrospective SOUV) and is not prior to 6 months of the present proposal.*
iii.	Heritage Impact Assessment *All the above-mentioned deliverables shall follow the Heritage Building Condition Report (HBCR) of 06b: Guidebook for Conservation of*		x	<*Ref*> ***None*** *Last updated Heritage Impact Assessment was undertaken in 2013 for the Report on*

S. No.	Components / Details of the Deliverable	Communication Details	Tick (✓) If included	Reference / Comments
	Railway Heritage Assets and not be undertaken any more than 6 (six) months prior to its submission. *Note: The above three documents shall be treated as a declaration of the state of conservation, limits of acceptable change and safety of the structure and its part components. It will determine the boundary conditions for conceptualizing any in-fill development or construction within the impact area.*			*State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site (Retrospective SOUV) and is not prior to 6 months of the present proposal.*
Inclusions in KD03				
4.	**Inclusions in Final proposals**			
i.	Heritage Conservation and Reuse Plan (HCRP) with Mitigation strategies *(Appendix IV: Heritage Conservation and Reuse Plan and Appendix VI: Heritage Impact Assessment)*		***x***	<*Ref*> *None*
ii.	Compliance with Degree of Adaptability and Life Cycle Assessment *(Appendix V: Compatible and Adaptive Continued Use and Reuse of RHA)*		***x***	<*Ref*> *None*
iii.	Inspection, Maintenance, Monitoring and Repair strategies *(Appendix XI: Inspection, Monitoring, Maintenance and Repair (IMMR))*		***x***	<*Ref*> *None*
iv.	Information package for Periodic Reporting and State of Conservation Report *The format and content for the Periodic Reporting is as per the relevant Operational Guidelines for the World Heritage Convention'72 (refer annex 7).* *The format and content for the State of Conservation Report is as per the relevant Operational Guidelines for the World Heritage Convention'72 (refer annex 13).* *The same may be referred to by the Authority responsible for reporting.*		***x***	<*Ref*> *None*

1. i. Extent of World Heritage Property boundaries (Map 01)
ii. Extent of Buffer Zone boundary(ies)



1. iii. Location of the proposed Project, World Heritage Property(ies) and Buffer Zone(s) Boundary(ies) (Map 2)



Disclaimer: Base Map that of necessary extent showing World Heritage Property, Buffer Zone(s), Project area and likely impact area to be drafted by consultant. This map has been prepared as a sample and without the information on Impact Area. Impact Area shall be generated by the consultant in keeping with results of Heritage Impact Assessment and Property Management Plan.

1. v. Excerpt from the relevant version of the Operational Guidelines on:

a. Clauses on modification of WHP or within World Heritage Area
b. Clauses on modification within and in the proximity of the Buffer Zone

III.I Modifications to the boundaries, to the criteria used to justify inscription or to the name of a World Heritage property

Minor modifications to the boundaries

163. A minor modification is one which does not have a significant impact on the extent of the property nor affects its Outstanding Universal Value.

164. If a State Party wishes to request a minor modification to the boundaries of a property already on the World Heritage List, it must be prepared in compliance with the format of Annex 11 and must be received by **1 February**[10] by the Committee through the Secretariat, which will seek the evaluation of the relevant Advisory Bodies on whether this can be considered a minor modification or not. The Secretariat shall then submit the Advisory Bodies' evaluation to the World Heritage Committee. The Committee may approve such a modification, or it may consider that the modification to the boundary is sufficiently significant as to constitute a significant boundary modification of the property, in which case the procedure for new nominations will apply. Decision 39 COM 11

Significant modifications to the boundaries

165. If a State Party wishes to significantly modify the boundary of a property already on the World Heritage List, the State Party shall submit this proposal as if it were a new nomination (including the requirement to be previously included on the Tentative List – see paragraph 63 and 65). This re-nomination shall be presented by **1 February**[11] and will be evaluated in the full year and a half cycle of evaluation according to the procedures and timetable outlined in paragraph 168. This provision applies to extensions, as well as reductions. Decision 39 COM 11

Modifications to the criteria used to justify inscription on the World Heritage List

166. Where a State Party wishes to have the property inscribed under additional, fewer or different criteria other than those used for the original inscription, it shall submit this request as if it were a new nomination (including the requirement to be previously included on the Tentative List – see paragraphs 63 and 65). This re-nomination must be received by **1 February**[12] and will be evaluated in the full year and a half cycle of evaluation according to the procedures and timetable outlined in paragraph 168. Properties recommended will only be evaluated under the new criteria and will remain on the World Heritage List even if unsuccessful in having additional criteria recognized. Decision 39 COM 11

167. A State Party [13]may request that the Committee authorize a modification to the name of a property already inscribed on the World Heritage List. A request for a modification to the name shall be received by the Secretariat **at least 3 months prior to the meeting of the Committee**.

[10] If 1 February falls on a weekend, the nomination must be received by 17h00 GMT the preceding Friday.
[11] If 1 February falls on a weekend, the nomination must be received by 17h00 GMT the preceding Friday.
[12] If 1 February falls on a weekend, the nomination must be received by 17h00 GMT the preceding Friday.
[13] In case of transnational/transboundary properties, any modification will need the agreement of all States Parties concerned.

Operational Guidelines for the Implementation of the World Heritage Convention 45

United Nations Educational, Scientific and Cultural Organization · World Heritage Convention

MODIFICATIONS TO WORLD HERITAGE PROPERTIES

MINOR MODIFICATIONS TO THE BOUNDARIES OF WORLD HERITAGE PROPERTIES

Boundary modifications should serve better identification of World Heritage properties and enhance protection of their Outstanding Universal Value.

A proposal for a minor boundary modification, submitted by the State Party concerned, is subject to the review of the relevant Advisory Body(ies) and to the approval of the World Heritage Committee.

A proposal for a minor boundary modification can be approved, not approved, or referred by the World Heritage Committee.

Documentation requested

1) **Area of the property (in hectares)**: please indicate a) the area of the property as inscribed and b) the area of the property as proposed to be modified (or the area of the proposed buffer zone). (Note that reductions can be considered as minor modifications only under exceptional circumstances).

2) **Description of the modification**: please provide a written description of the proposed change to the boundary of the property (or a written description of the proposed buffer zone).

3) **Justification for the modification**: please provide a brief summary of the reasons why the boundaries of the property should be modified (or why a buffer zone is needed), with particular emphasis on how such modification will improve the conservation and/or protection of the property.

4) **Contribution to the maintenance of the Outstanding Universal Value**: please indicate how the proposed change (or the proposed buffer zone) will contribute to the maintenance of the Outstanding Universal Value of the property.

5) **Implications for legal protection**: please indicate the implications of the proposed change for the legal protection of the property. In the case of a proposed addition, or of the creation of a buffer zone, please provide information on the legal protection in place for the area to be added and a copy of relevant laws and regulations.

6) **Implications for management arrangements**: please indicate the implications of the proposed change for the management arrangements of the property. In the case of a proposed addition, or of the creation of a buffer zone, please provide information on the management arrangements in place for the area to be added.

7) **Maps**: please submit two maps, one clearly showing both delimitations of the property (original and proposed revision) and the other showing only the proposed revision. In the case of the creation of a buffer zone, please submit a map showing both the inscribed property and the proposed buffer zone.

   Please make sure that the maps:

   - are either topographic or cadastral;
   - are presented at a scale which is appropriate to the size in hectares of the property and sufficient to clearly show the detail of the current boundary and the proposed changes (and, in any case, the largest available and practical scale);
   - have the title and the legend/key in English or French (if this is not possible, please attach a translation);

- mark the boundaries of the property (current and proposed revision) through a clearly visible line that can be distinguished from other features on the maps;
- bear a clearly labeled coordinate grid (or coordinate ticks);
- clearly refer (in the title and in the legend) to the boundary of the World Heritage property (and to the buffer zone of the World Heritage property, if applicable). Please clearly distinguish the boundary of the World Heritage property from any other protected area boundaries.

8) **Additional information**: In the case of a proposed addition, please submit some photographs of the area to be added that provide information on its key values and conditions of authenticity/integrity.

Any other relevant document can be submitted such as thematic maps (e.g. vegetation maps), summaries of scientific information concerning the values of the area to be added (e.g. species lists), and supporting bibliographies.

The above-mentioned documentation should be submitted in English or French in two identical copies (three for mixed properties). An electronic version (the maps in formats such as .jpg, .tif, .pdf) should also be submitted.

Deadline

1 February[28] of the year in which the approval of the Committee is requested.

[28] If 1 February falls on a weekend, the nomination must be received by 17h00 GMT the preceding Friday

1. v. Excerpt from the relevant version of the Operational Guidelines on:

c. Correspondence concerning Buffer (zone) modification

Decision: 36 COM 8B.56

The minor boundary modification of the **Chhatrapati Shivaji Terminus (formerly Victoria Terminus)**, **India**, was withdrawn at the request of the State Party.

1. v. Excerpt from the relevant version of the Operational Guidelines on:

d. Observations on State of Conservation and factors affecting the property

IV PROCESS FOR MONITORING THE STATE OF CONSERVATION OF WORLD HERITAGE PROPERTIES

IV.A Reactive Monitoring

Definition of Reactive Monitoring

169. Reactive Monitoring is the reporting by the Secretariat, other sectors of UNESCO and the Advisory Bodies to the Committee on the state of conservation of specific World Heritage properties that are under threat. To this end, the States Parties shall submit specific reports and impact studies each time exceptional circumstances occur or work is undertaken which may have an impact on the Outstanding Universal Value of the property or its state of conservation.

Decision 39 COM 11

Reactive Monitoring is also foreseen in reference to properties inscribed, or to be inscribed, on the List of World Heritage in Danger as set out in paragraphs 177-191. Reactive Monitoring is also foreseen in the procedures for the eventual deletion of properties from the World Heritage List as set out in paragraphs 192-198.

These reports shall be submitted to the World Heritage Committee through the Secretariat, using the standard format in Annex 13, in English or French:

a) by 1 December of the year preceding the examination of the property by the Committee, for the properties inscribed on the World Heritage List,

b) by 1 February of the year of examination of the property by the Committee, for the properties inscribed on the List of World Heritage in Danger, and for specific cases of utmost urgency.

Objective of Reactive Monitoring

170. When adopting the process of Reactive Monitoring, the Committee was particularly concerned that all possible measures should be taken to prevent the deletion of any property from the List and was ready to offer technical cooperation as far as possible to States Parties in this connection.

Article 4 of the Convention:

"Each State Party to this Convention recognizes that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage referred to in Articles 1 and 2 and situated on its territory, belongs primarily to that State...".

171. The Committee recommends that States Parties cooperate with the Advisory Bodies which have been asked by the Committee to carry out monitoring and reporting on its behalf on the progress of work undertaken for the preservation of properties inscribed on the World Heritage List.

Information received from States Parties and/or other sources

172. The World Heritage Committee invites the States Parties to the *Convention* to inform the Committee, through the Secretariat, of their intention to undertake or to authorize in an area protected under the *Convention* major restorations or new constructions which may affect the Outstanding Universal Value of the property. Notice should be given as soon as possible (for instance, before drafting basic documents for specific projects) and before making any decisions that would be difficult to reverse, so that the Committee may assist in seeking appropriate solutions to ensure that the Outstanding Universal Value of the property is fully preserved.

173. The World Heritage Committee requests that reports of missions to review the state of conservation of the World Heritage properties include: Decision 27 COM 7B.106

a) an indication of threats or significant improvement in the conservation of the property since the last report to the World Heritage Committee;

b) any follow-up to previous decisions of the World Heritage Committee on the state of conservation of the property;

c) information on any threat or damage to or loss of Outstanding Universal Value, integrity and/or authenticity for which the property was inscribed on the World Heritage List.

174. When the Secretariat receives information that a property inscribed has seriously deteriorated, or that the necessary corrective measures have not been taken within the time proposed, from a source other than the State Party concerned, it will, as far as possible, verify the source and the contents of the information in consultation with the State Party concerned and request its comments.

Decision by the World Heritage Committee

175. The Secretariat will request the relevant Advisory Bodies to forward comments on the information received.

176. The information received, together with the comments of the State Party and the Advisory Bodies, will be brought to the attention of the Committee in the form of a state of conservation report for each property, which may take one or more of the following steps: Decision 39 COM 11
Decision 43 COM 11A

a) it may decide that the property has not seriously deteriorated and that no further action should be taken;

b) when the Committee considers that the property has seriously deteriorated, but not to the extent that its restoration is impossible, it may decide that the property be maintained on the List, provided that the State Party takes the necessary measures to restore the property within a reasonable period of time. The Committee may also decide that technical cooperation be provided under the World Heritage Fund for work connected with the restoration of the property, proposing to the State Party to request such assistance, if it has not already been done; in some circumstances States Parties may wish to invite an Advisory mission by the relevant Advisory Body(ies) or other organization(s) or expert(s) to seek advice on necessary measures to reverse deterioration and address threats;

c) when the requirements and criteria set out in paragraphs 177-182 are met, the Committee may decide to inscribe the property on the List of World Heritage in Danger according to the procedures set out in paragraphs 183-189;

d) when there is evidence that the property has deteriorated to the point where it has irretrievably lost those characteristics which determined its inscription on the List, the Committee may decide to delete the property from the List. Before any such action is taken, the Secretariat will inform the State Party concerned. Any comments which the State Party may make will be brought to the attention of the Committee;

e) when the information available is not sufficient to enable the Committee to take one of the measures described in a), b), c) or d) above, the Committee may decide that the Secretariat be authorized to take the necessary action to ascertain, in consultation with the State Party concerned, the present condition of the property, the dangers to the property and the feasibility of adequately restoring the property. Such measures may include the sending of a Reactive Monitoring mission or the consultation of specialists, or through an Advisory mission. The Secretariat shall report to the Committee on the results of its action. In case an emergency action is required, the Committee may authorize its financing from the World Heritage Fund through an emergency assistance request.

IV.B The List of World Heritage in Danger

Guidelines for the inscription of properties on the List of World Heritage in Danger

177. In accordance with Article 11, paragraph 4, of the *Convention*, the Committee may inscribe a property on the List of World Heritage in Danger when the following requirements are met:

a) the property under consideration is on the World Heritage List;

b) the property is threatened by serious and specific danger;

c) major operations are necessary for the conservation of the property;

d) assistance under the *Convention* has been requested for the property; the Committee is of the view that its assistance in certain cases may most effectively be limited to messages of its concern, including the message sent by inscription of a property on the List of World Heritage in Danger and that such assistance may be requested by any Committee member or the Secretariat.

Criteria for the inscription of properties on the List of World Heritage in Danger

178. A World Heritage property - as defined in Articles 1 and 2 of the *Convention* - can be inscribed on the List of World Heritage in Danger by the Committee when it finds that the condition of the property corresponds to at least one of the criteria in either of the two cases described below.

179. In the case of **cultural properties**:

a) ASCERTAINED DANGER - The property is faced with specific and proven imminent danger, such as:

i) serious deterioration of materials;

ii) serious deterioration of structure and/or ornamental features;

iii) serious deterioration of architectural or town-planning coherence;

iv) serious deterioration of urban or rural space, or the natural environment;

v) significant loss of historical authenticity;

vi) important loss of cultural significance.

b) POTENTIAL DANGER - The property is faced with threats which could have deleterious effects on its inherent characteristics. Such threats are, for example:

i) modification of juridical status of the property diminishing the degree of its protection;

ii) lack of conservation policy;

iii) threatening effects of regional planning projects;

iv) threatening effects of town planning;

v) outbreak or threat of armed conflict;

vi) threatening impacts of climatic, geological or other environmental factors.

180. In the case of **natural properties**:

Decision 39 COM 11

a) ASCERTAINED DANGER The property is faced with specific and proven imminent danger, such as:

i) A serious decline in the population of the endangered species or the other species of Outstanding Universal Value for which the property was legally established to protect, either by natural factors such as disease or by human-made factors such as poaching.

ii) Severe deterioration of the natural beauty or scientific value of the property, as by human settlement, construction of reservoirs which flood important parts of the property, industrial and agricultural development including use of pesticides and fertilizers, major public works, mining, pollution, logging, firewood collection, etc.

iii) Human encroachment on boundaries or in upstream areas which threaten the integrity of the property.

b) POTENTIAL DANGER The property is faced with major threats which could have deleterious effects on its inherent characteristics. Such threats are, for example:

i) a modification of the legal protective status of the area;

ii) planned resettlement or development projects within the property or so situated that the impacts threaten the property;

iii) outbreak or threat of armed conflict;

iv) the management plan or management system is lacking or inadequate, or not fully implemented.

v) threatening impacts of climatic, geological or other environmental factors.

181. In addition, the threats and/or their detrimental impacts on the integrity of the property must be those which are amenable to correction by human action. In the case of cultural properties, both natural factors and human-made factors may be threatening, while in the case of natural properties, most threats will be human-made and only very rarely a natural factor (such as an epidemic disease) will threaten the integrity of the property. In some cases, the threats and/or their detrimental impacts on the integrity of the property may be corrected by administrative or legislative action, such as the cancelling of a major public works project or the improvement of legal status. Decision 39 COM 11

182. The Committee may wish to bear in mind the following supplementary factors when considering the inclusion of a cultural or natural property in the List of World Heritage in Danger:

a) Decisions which affect World Heritage properties are taken by Governments after balancing all factors. The advice of the World Heritage Committee can often be decisive if it can be given before the property becomes threatened.

b) Particularly in the case of ascertained danger, the physical or cultural deteriorations to which a property has been subjected should be judged according to the intensity of its effects and analyzed case by case.

c) Above all, in the case of potential danger to a property, one should consider that:

i) the threat should be appraised according to the normal evolution of the social and economic framework in which the property is situated;

ii) it is often impossible to assess certain threats such as the threat of armed conflict as to their effect on cultural or natural properties;

iii) some threats are not imminent in nature, but can only be anticipated, such as demographic growth.

d) Finally, in its appraisal, the Committee should take into account any cause of unknown or unexpected origin which endangers a cultural or natural property.

Procedure for the inscription of properties on the List of World Heritage in Danger

183. When considering the inscription of a property on the List of World Heritage in Danger, the Committee shall develop, and adopt, as far as possible, in consultation with the State Party concerned, a "Desired state of conservation for the removal of the property from the List of World Heritage in Danger", and a programme for corrective measures.

Decision 39 COM 11

184. In order to develop the programme of corrective measures referred to in the previous paragraph, the Committee shall request the Secretariat to ascertain, as far as possible in cooperation with the State Party concerned, the present condition of the property, the dangers to the property and the feasibility of undertaking corrective measures. The Committee may further decide to send a Reactive Monitoring mission from the relevant Advisory Bodies or other organizations to visit the property, evaluate the nature and extent of the threats and propose the measures to be taken. In some circumstances, the State Party may wish to invite an Advisory mission to provide advice and guidance.

185. The information received, together with the comments as appropriate of the State Party and the relevant Advisory Bodies or other organizations, will be brought to the attention of the Committee by the Secretariat.

186. The Committee shall examine the information available and take a decision concerning the inscription of the property on the List of World Heritage in Danger. Any such decision shall be taken by a majority of two-thirds of the Committee members present and voting. The Committee will then define the programme of corrective action to be taken. This programme will be proposed to the State Party concerned for immediate implementation.

187. The State Party concerned shall be informed of the Committee's decision and public notice of the decision shall immediately be issued by the Committee, in accordance with Article 11.4 of the *Convention*.

188. The Secretariat publishes the updated List of World Heritage in Danger in printed form and is also available at: https://whc.unesco.org/en/danger

189. The Committee shall allocate a specific, significant portion of the World Heritage Fund to financing of possible assistance to World Heritage properties inscribed on the List of World Heritage in Danger.

Regular review of the state of conservation of properties on the List of World Heritage in Danger

190. The Committee shall review annually the state of conservation of properties on the List of World Heritage in Danger. This review shall include such monitoring procedures and expert missions as might be determined necessary by the Committee.

191. On the basis of these regular reviews, the Committee shall decide, in consultation with the State Party concerned, whether:

a) additional measures are required to conserve the property;

b) to delete the property from the List of World Heritage in Danger if the property is no longer under threat;

c) to consider the deletion of the property from both the List of World Heritage in Danger and the World Heritage List if the property has deteriorated to the extent that it has lost those characteristics which determined its inscription on the World Heritage List, in accordance with the procedure set out in paragraphs 192-198.

IV.C Procedure for the eventual deletion of properties from the World Heritage List

192. The Committee adopted the following procedure for the deletion of properties from the World Heritage List in cases: Decision 39 COM 11

a) where the property has deteriorated to the extent that it has lost those characteristics which determined its inclusion in the World Heritage List; and

b) where the intrinsic qualities of a World Heritage property were already threatened at the time of its nomination by human action and where the necessary corrective measures as outlined by the State Party at the time, have not been taken within the time proposed (see paragraph 116).

193. When a property inscribed on the World Heritage List has seriously deteriorated, or when the necessary corrective measures have not been taken within the time proposed, the State Party on whose territory the property is situated should so inform the Secretariat.

194. When the Secretariat receives such information from a source other than the State Party concerned, it will, as far as possible, verify the source and the contents of the information in consultation with the State Party concerned and request its comments.

195. The Secretariat will request the relevant Advisory Bodies to forward comments on the information received.

196. The Committee will examine all the information available and will take a decision. Any such decision shall, in accordance with Article 13 (8) of the *Convention*, be taken by a majority of two-thirds of its members present and voting. The Committee shall not decide to delete any property unless the State Party has been consulted on the question.

197. The State Party shall be informed of the Committee's decision and public notice of this decision shall be immediately given by the Committee.

198. If the Committee's decision entails any modification to the World Heritage List, this modification will be reflected in the next updated List that is published.

1. v. Excerpt from the relevant version of the Operational Guidelines on:

e. Observations on Periodic Reporting

V PERIODIC REPORTING ON THE IMPLEMENTATION OF THE *WORLD HERITAGE CONVENTION*

V.A Objectives

199. States Parties are requested to submit reports to the UNESCO General Conference through the World Heritage Committee, on the legislative and administrative provisions they have adopted and other actions which they have taken for the application of the *Convention*, including the state of conservation of the World Heritage properties located on their territories.

Article 29 of the *World Heritage Convention* and Resolutions of the 11th session of the General Assembly of States Parties (1997) and the 29th session of the UNESCO General Conference.

200. Periodic Reporting is a self-reporting process and should be led as far as possible by the States Parties in each region. The Secretariat coordinates and facilitates the Periodic Reporting Process at the global level. States Parties may request expert advice from the Advisory Bodies and the Secretariat, which may also (with agreement of the States Parties concerned) commission further expert advice.

Decision 41 COM 11

201. Periodic Reporting serves four main purposes:

a) to provide an assessment of the application of the *World Heritage Convention* by the State Party;

b) to provide an assessment as to whether the Outstanding Universal Value of the properties inscribed on the World Heritage List is being maintained over time;

c) to provide up-dated information about the World Heritage properties to record the changing circumstances and state of conservation of the properties;

d) to provide a mechanism for regional cooperation and exchange of information and experiences between States Parties concerning the implementation of the *Convention* and World Heritage conservation.

202. Periodic Reporting is important for more effective long term conservation of the properties inscribed, as well as to strengthen the credibility of the implementation of the *Convention*. It is also an important tool for assessing the implementation by States Parties and World Heritage properties of policies adopted by the World Heritage Committee and the General Assembly.

Decision 41 COM 11

V.B Procedure and Format

203. Every six years, States Parties submit periodic reports for examination by the World Heritage Committee. During the six-year Periodic Reporting cycle, States Parties report region by region in the following order:

Decision 22 COM VI.7
Decision 41 COM 11

- Arab States
- Africa
- Asia and the Pacific
- Latin America and the Caribbean
- Europe and North America

204. The sixth year of each cycle is a period for reflection and evaluation. This pause allows the Periodic Reporting mechanism to be assessed and revised as appropriate before a new cycle is initiated. The World Heritage Committee may also decide to use the reflection to initiate the development and publication of a Global World Heritage Report.

Decision 41 COM 11

205. At appropriate intervals, and whenever deemed necessary, the World Heritage Committee adopts and revises Monitoring Indicators and an Analytical Framework for Periodic Reporting.

205bis. The Periodic Reporting process is used as an opportunity for regional exchange and cooperation and to enhance active coordination and synchronization between States Parties, particularly in the case of transboundary and transnational properties.

Decision 41 COM 11

206. The Periodic Reporting questionnaire is an online tool to be completed by the respective National Focal Points and Site Managers of the World Heritage properties, as appropriate.

The format of this questionnaire was reviewed further to the second cycle of Periodic Reporting and was adopted by the World Heritage Committee at its 41st session (Krakow, 2017).

Decision 41 COM 10A

a) **Section I** refers to the legislative and administrative provisions which the State Party has adopted and other actions which it has taken for the application of the *Convention*, together with details of the experience acquired in this field. This particularly concerns the general obligations defined in specific articles of the *Convention*.

b) **Section II** refers to the state of conservation of specific World Heritage properties located on the territory of the State Party concerned. This Section should be completed for each World Heritage property.

206bis. The Periodic Reporting format may be reviewed following each cycle of Periodic Reporting. An outline of the format is contained in Annex 7 to the *Operational Guidelines*.

Decision 41 COM 11

207. In order to facilitate management and analysis of information, States Parties are requested to submit reports, in English or French, using the online tool provided on the website of the World Heritage Centre. The online tool of the full questionnaire can be accessed here:
https://whc.unesco.org/en/periodicreporting/

Decision 41 COM 11

V.C Evaluation and Follow Up

208. The Secretariat and the Advisory Bodies facilitate the States Parties to consolidate national reports into Regional State of the World Heritage reports, which are available in electronic format at https://whc.unesco.org/en/publications and in paper version (World Heritage Paper series).

Decision 41 COM 11

209. The World Heritage Committee carefully reviews issues raised in Periodic Reports and advises the States Parties of the regions concerned on matters arising from them.

210. States Parties, working in partnership with the Secretariat and the Advisory Bodies, develop long-term regional follow-up programmes structured according to the Committee's Strategic Objectives and submit them for examination. These programmes are adopted as follow-up to Periodic Reports and regularly reviewed by the Committee based on the needs of States Parties identified in Periodic Reports. They should accurately reflect the needs of World Heritage in the region and facilitate the granting of International Assistance.

Decision 36 COM 13.I
Decision 41 COM 11

1. v. Excerpt from the relevant version of the Operational Guidelines on:

f. Recommendations of the Advisory Bodies since the time of inscription

4. ICOMOS RECOMMENDATIONS

Recommendation for the future

Considering the architectural quality and character of the CST/VT, ICOMOS strongly recommends that restoration be undertaken by appropriately trained and qualified firms and specialists.

Taking note of the high quality of the urban fabric in the Fort Precinct, where the CST/VT is the focal point, ICOMOS stresses the importance for the State Party to make every effort to guarantee its integrity for the future.

ICOMOS welcomes the proposal to extend the buffer zone to cover the entire precinct area which in itself forms a fine example of the development in the 19th century Bombay.

Taking into account that the nomination refers to late 19th century development, when the station was inaugurated as Victoria Terminus, ICOMOS proposes that the State Party consider changing the name back to the first proposal: 'Victoria Terminus (Chhatrapati Shivaji Terminus).'

Recommendation with respect to inscription

That the property be inscribed on the World Heritage List on the basis of ***criteria ii and iv***:

Criterion ii: The Victoria Terminus of Bombay/Mumbai exhibits an important interchange of influences from Victorian Italianate Gothic Revival architecture, and from Indian traditional buildings. It became a symbol for Bombay as a major mercantile port city on the Indian Subcontinent within the British Commonwealth.

Criterion iv: The Victoria Terminus is an outstanding example of late 19th century railway architecture in the British Commonwealth, characterized by Victorian Gothic Revival and traditional Indian features, as well as its advanced structural and technical solutions.

ICOMOS, March 2004

1. v. Excerpt from the relevant version of the Operational Guidelines on:

g. Any other communication pertaining to World Heritage Status

1. Committee Decisions:

i. (2004) Decision: 28 COM 14B.34
Nominations of Cultural Properties to the World Heritage List (Chhatrapati Shivaji Terminus)

The World Heritage Committee,

1. Inscribes Chhatrapati Shivaji Terminus (formerly Victoria Terminus), India, on the World Heritage List on the basis of cultural criteria (ii) and (iv):
   Criterion (ii): Chhatrapati Shivaji Terminus of Mumbai (formerly Bombay) exhibits an important interchange of influences from Victorian Italianate Gothic Revival architecture, and from Indian traditional buildings. It became a symbol for Mumbai as a major mercantile port city on the Indian subcontinent within the British Commonwealth.
   Criterion (iv): Chhatrapati Shivaji Terminus is an outstanding example of late 19th century railway architecture in the British Commonwealth, characterized by Victorian Gothic Revival and traditional Indian features, as well as its advanced structural and technical solutions.
2. Recommends that, considering the high architectural quality and character of Chhatrapati Shivaji Terminus, restoration be undertaken by appropriately trained and qualified companies and specialists;
3. Taking note of the high quality of the urban fabric in the Fort Precinct where Chhatrapati Shivaji Terminus is the focal point, and which forms a fine example of development in 19th-century Mumbai,
4. Encourages the State Party to make every effort to guarantee the integrity of the Fort Precinct for the future.

ii. (2012) Decision: 36 COM 8B.56
Cultural Properties - Examination of minor boundary modifications - Chhatrapati Shivaji Terminus (India)

The minor boundary modification of the Chhatrapati Shivaji Terminus (formerly Victoria Terminus), India, was withdrawn at the request of the State Party.

iii. (2013) Decision: 37 COM 8E
Adoption of retrospective Statements of Outstanding Universal Value

Adopts the retrospective Statements of Outstanding Universal Value, as presented in the Annex of Document WHC-13/37.COM/8E.

2. i. Enquiry from World Heritage Centre regarding Newspaper Report

United Nations
Educational, Scientific and
Cultural Organization

Organisation
des Nations Unies
pour l'éducation,
la science et la culture

Organización
de las Naciones Unidas
para la Educación,
la Ciencia y la Cultura

Организация
Объединенных Наций по
вопросам образования,
науки и культуры

منظمة الأمم المتحدة
للتربية والعلم والثقافة

联合国教育、
科学及文化组织

Culture Sector
World Heritage Centre

H. E. Mr Jawed Ashraf
Ambassador Extraordinary and
Plenipotentiary of India to
France
Permanent Delegate of India to
UNESCO (Designate)
UNESCO House

4 August 2020

Ref.: CLT/WHC/APA/FJ/NH/20/120

Subject: **State of Conservation of the World Heritage Property 'Chhatrapati Shivaji Terminus'**

Dear Ambassador,

The UNESCO World Heritage Centre has received third party information regarding the renovation of the abovementioned property, which might result in an impact on its Outstanding Universal Value.

We are sending this information (see attached Annex for a news report on the issue) to you in accordance with Paragraph 174 of the *Operational Guidelines for the Implementation of the World Heritage Convention* to enable us to verify, with your authorities concerned, the content of the information that we have received. We look forward to receiving your response as soon as possible, preferably within 1 month after receipt of this letter.

Should you require any further information or clarification, please do not hesitate to contact Mr Feng Jing, Chief of the Asia and Pacific Unit (f.jing@unesco.org).

Thanking you for your continuous collaboration and support in the implementation of the *World Heritage Convention*, I remain,

Yours sincerely,

M. Rössler

Mechtild Rössler
Director

cc: Indian National Commission for Cooperation with UNESCO
UNESCO Office in New Delhi
ICOMOS International

7, place de Fontenoy
75352 Paris 07 SP, France
Tél. : +33 (0)1 45 68 18 72
www.unesco.org

2. ii. Reference Newspaper clipping attached to letter in 2.i.

Printed from
MumbaiMirror

Airport look for CSMT soon with its heritage look intact from outside; 7 other stations in queue

/ Jul 22, 2020, 06.30 AM IST

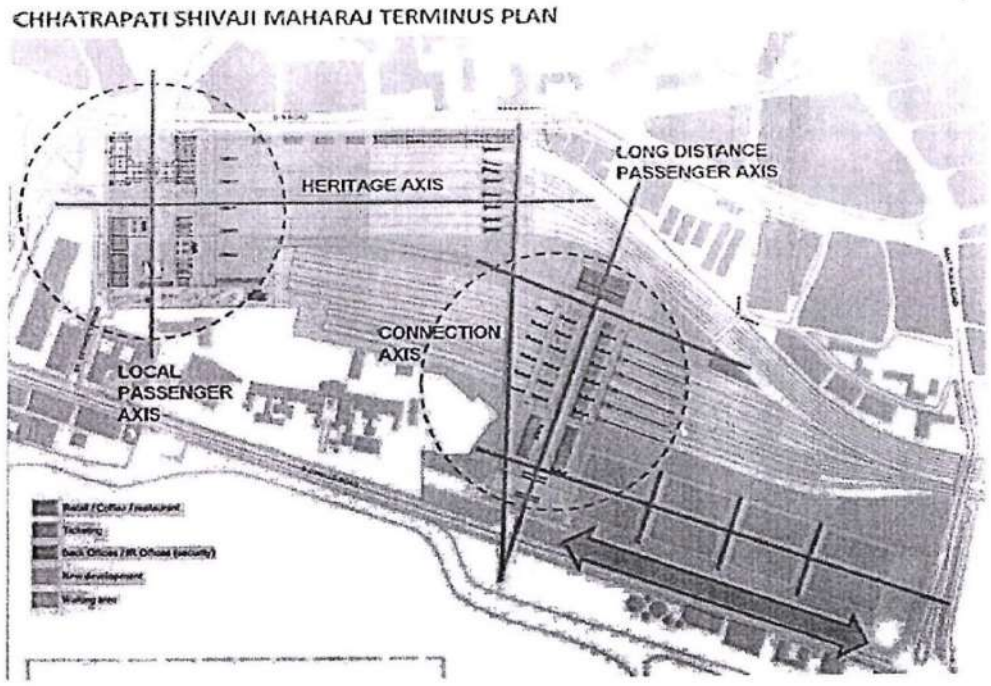
Chhatrapati Shivaji Maharaj Terminus

It will be the first station in the city to be redeveloped under the public-private partnership model; will be reconstructed while retaining the heritage look.

The Chhatrapati Shivaji Maharaj Terminus is all set to get an airport look from inside with its heritage look intact from the outside. The Indian Railways has decided to undertake the five-year project under the Public-Private Partnership (PPP) model, which will include brand new platforms, foot overbridges (equipped with escalators), new offices, a mall, a five-star plaza and even a hotel, with a waiting area double the current size. The project will not tamper with the height of the station, which is 24 mt.

The Railway Board has already approved the master plan and the project will be undertaken by the Indian Railway Stations Development Corporation Ltd. (IRSDC), the implementation arm of the railways.

Sanjeev Kumar Lohia, the managing director and CEO of IRSDC said a request for qualification (RFQ) will be invited from private parties after a nod from the PPP appraisal committee, which is the highest authority for approval. The committee comprises representatives of the Ministry of Home Affairs and the Ministry of Railways.



The Chhatrapati Shivaji Maharaj Terminus; and the masterplan for its redevelopment

Similar redevelopment has been planned for seven other railway stations, namely Thakurli, Kalyan, Lokmanya Tilak, Dadar, Andheri, Bandra Terminus and Borivali. While consultations for the Thakurli station master plan are under way, a draft conceptual plan is ready for the other stations. Whenever ready, a user fee, just like the airports, will be levied on passengers and visitors through platform or parking charges. This will be one of the main revenue streams for the concessionaire.

CSMT is the first railway station of the city to be redeveloped under the PPP model. It handles over 1,000 local trains and nearly 100 long-distance trains. Prior to the Covid-19 crisis, it had an average daily footfall in the range of five to six lakh.

Recently, a conservation project was undertaken for the terminus, which will be improved upon as part of the redevelopment. A senior IRSDC official said all new construction will not be taller than the current height of 24 metre.

Earlier in June, IRSDC had opened RFQ applications for Nagpur, Gwalior, Amritsar and Sabarmati railway stations and shortlisted a few developers under the PPP model. As part of a nationwide plan, the railway authorities are looking at a huge capital investment in station infrastructure in the next five years.

3. Response to letter in Document 2.i. and 2.ii.

SD

इंडियन रेलवे स्टेशन्स डेवलपमैन्ट कॉर्पोरेशन लिमिटेड
(रेल भूमि विकास प्राधिकरण और इरकॉन का एक संयुक्त उद्यम)
Indian Railway Stations Development Corporation Limited
(A JV of Rail Land Development Authority & IRCON)
CIN No. : U45204DL2012GOI234292

No.IRSDC/HQ/Civil/CSMT/2019/729/983 Dated: August 26, 2020

The Chief Project Director/SD,
Central Railway,
Mumbai

Dear Sir,

Sub: State of conservation of the World Heritage Property ' Chhatrapati Shivaji Terminus'.

Ref: i) CPD/SD, CR's E-mail dated 25.08.2020
ii) Director, Culture Centre, World Heritage Centre's letter No. CLT/WHC/APA/FJ/NH/20/120 dated 04.08.2020.

In above subject and reference following is submitted:

i) It is true that the redevelopment of CSMT Railway Station has been taken up by Indian Railways under the stations redevelopment programme of Government of India.
ii) Currently, the CSMT station is entrusted to IRSDC and the task of preparation of DPR is going on. A RFQ has been invited for the same on 20.08.2020.
iii) M/s. AREP VILLE from France are the consultants appointed by Ministry of Railways for preparing the DPR.
iv) IRSDC/Consultant is aware about the UNESCO Heritage status for CSMT station and planning done for the project takes this into account. Planning was done in the year 2012 and at that time, dialogue for approval of the same from heritage aspects was initiated with Heritage Committee and Executive Director/Heritage, Railway Board. A comprehensive study was commissioned by M/s. RITES (through MRVC) on the state of Conservation Audit of CST World Heritage property including the Outstanding Universal Values (SoUV) through M/s. Abha Narain Lambah Associates, Mumbai. Heritage impact of the redevelopment project was also included in the same. Comments received from Heritage Committee have been complied and incorporated in the plan. However, final plan shall be submitted again for approval.
vi) Further, it may be seen from the plan that major redevelopment is on the D'Mello Road which falls in Buffer Zone II.
vii) The laid down protocol for consultation/approvals regarding heritage shall be followed by IRSDC before the plan is finalised and the actual work of redevelopment of CSMT station is taken up.

Thanking you,
Yours faithfully,
For and on behalf of
Indian Railway Stations Development Corporation Ltd.

26/08/20
(R. K. Singh)
Director/Projects & Planning

Copy to : The Addl. Member/L&A, Railway Board, Rail Bhawan, New Delhi. For kind information please.

पंजीकृत एवं कॉर्पोरेट कार्यालय : सातवीं मंजिल, टॉवर 1, कन्नेक्टस बिल्डिंग, भावभूति मार्ग, नई दिल्ली–110002, भारत
दूरभाष : 91–11–68142400, फैक्स : 011–68142448 ईमेल : info@irsdc.in
Registered & Corporate Office : 7th Floor, Tower 1, Konnectus Building, Bhavbhuti Marg, New Delhi - 110002, India
Tel. : 91-11-68142400, Fax : 011-68142448, E-mail : info@irsdc.in
Website : www.irsdc.in facebook.com/IRSDC twitter/irsdcinfo

1. vi. Other compliances/ Information

a. **List of applicable local norms, laws and byelaws**
b. **List of applicable plans, schemes and programs (viz Master Plans, Zonal or Local Area Development Plan, or Transport or Infrastructure Plans et al)**

S. No.	Field	Name of Document	Where to source it
1.	Applicable Legal documents (if any)	a. *Draft Mumbai Metropolitan Regional Plan Report, 2016-36* b. *Draft Development Control Regulations for MMR - 2016-36* c. *The Development Control Regulations for Greater Mumbai, 1991* d. *Existing Land-use Plan for MMR, 2016* e. *Proposed Land-use Plan for MMR, 2036* f. *The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010* g. *Manual of Standards and Specifications for Railway Stations (MSSR)*	a. *MMRDA Maharashtra Gov. Website* b. *MMRDA Maharashtra Gov. Website* c. *Maharashtra Housing and Building Laws Website* d. *MMRDA Maharashtra Gov. Website* e. *MMRDA Maharashtra Gov. Website* f. *National Monument Authority Website* g. *Indian Railways Gov. Website*
2.	Applicable Regulations (if any)	a. *Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR) 2020* b. *Development Plan for Greater Mumbai 2014-34*	a. *MMRDA Maharashtra Gov. Website* b. *Urban Design Research Institute (UDRI) Website*
3.	Applicable Guidelines (if any)	a. *Heritage legislation & conservation* b. *Handbook of Conservation of Heritage Buildings, CPWD* c. *Listing and Grading of Heritage Buildings & Precincts in Mumbai, 2006* d. *Model Heritage Regulations, TCPO 2011* e. *Project Information Memorandum (IRSDC) 2020*	a. *Mumbai Metropolitan Region – Heritage Conservation Society (MMRHCS) Website* b. *Mumbai Metropolitan Region – Heritage Conservation Society (MMRHCS) Website* c. *MMRDA Maharashtra Gov. Website* d. *Town and Country Planning Organization (TCPO) Website* e. *IRSDC Website*
4.	Applicable Handbooks (if any)	a. *Indian Railways Stations Re-development Project*	a. *Indian Railways Institute of Civil Engineering (IRICEN) Website*
5.	Project/ Consultancy/ Reports (other than Conservation , Maintenance and Management Plans)	a. *Key Deliverables - Redevelopment of Mumbai CST Railway Station (Preparation of Master Plan and Feasibility Report) prepared by AREP & EGIS (2012)* b. *Redevelopment of CSMT, Mumbai (Progress Reports) – prepared by AECOM (as of 5th April, 2021)*	a. *As received from IRSDC* b. *As received from IRSDC*
6.	Prior Conservation , Maintenance and Management Plans)	a. *The Operational Guidelines for the Implementation of the World Heritage Convention, 2019* b. *Chhatrapati Shivaji Terminus (formerly Victoria Terminus) World Heritage UNESCO Nomination file 945rev, 2004* c. *State of Conservation (SoC) Report, 2013 – prepared by Abha Narain Lambah Associates* d. *The Victorian and Art Deco Ensemble of Mumbai (India) No 1480 – ICOMOS Report for Evaluations of Nominations of Cultural and Mixed Properties for the World Heritage Committee (2018)*	a. *World Heritage Committee UNESCO Website* b. *World Heritage Committee UNESCO (World Heritage List) Website* c. *Report on State of Conservation for Chhatrapati Shivaji Terminus (Formerly Victoria Terminus), World Heritage Site, 2013 (Retrospective SOUV)* d. *World Heritage Committee UNESCO Website*
NOTE: Documents highlighted in GREEN were received from IRSDC.			

1. vi. Other compliances/ Information

c. List of Committees, Organizations, Agency or a Third-Party body with a shared mandate in protection, conservation and or management of the World Heritage Property

S. No.	List of Committees, Organizations, Agency or Third-Party body	Role
1.	UNESCO World Heritage Committee	Regulatory Body for World Heritage Property
2.	ICOMOS (International Council on Monuments and Sites)	Advisory Body to WHC
3.	Divisional Railway Manager, Mumbai division, Central Railway.	Owner - administrative control and management
4.	Architectural Conservation Cell (ACC) (appointed by Central Railways)	Day-to-day maintenance and long-term maintenance and management
5.	Indian Railway Stations Development Corporation (IRSDC)	Nodal Agency for station development program
6.	Heritage Directorate, Railway Board, Ministry of Railways	Planning and decisions regarding the protection of railway heritage at National Level
7.	Archaeological Survey of India (ASI) {Advisory Committee for World Heritage Matters (ACWHM)}	Advisory body for World Heritage Properties in India
8.	Municipal Corporation of Greater Mumbai (MCGM)	Heritage Listing and review
9.	Mumbai Metropolitan Region – Heritage Conservation Society (MMRHCS)	Heritage Listing, Precinct Studies, Research, Conservation and Implementation, Outreach and Awareness
10.	Mumbai Heritage Conservation Committee (MHCC)	Review and advise proposals related to heritage structures and precincts
11.	Mumbai Metropolitan Regional Development Authority (MMRDA)	Apex planning authority for Mumbai city
12.	Mumbai Urban Transportation Plan (MUTP)	Upgradation of existing transport network of Mumbai
13.	Mumbai Rail Vikas Corporation (MRVC) A joint venture of Railways and Government of Maharashtra	Implementation of rail projects under MUTP
14.	Urban Design Research Institute (UDRI)	Research support and think tank with city-level focus
15.	Indian National Trust for Art and Cultural Heritage (INTACH)	Consultancy works

2. i. a. Statement of Integrity (as mentioned in the Nomination Dossier, 2004)

2.c Authenticity / Integrity :

The building still retains a large percentage of its structural integrity, however due to excessive increase in usage and occasionally due to insensitive repairs and additions, there has been a moderate change in the authenticity.

With increasing awareness of conservation the railway authorities have been keen on conserving the building. A comprehensive and systematic phase of conservation works has been identified and currently undertaken.
Refer Annexure VI : CD of ACC Architectural conservation master plan prepared by ACC

The details of authenticity surveys of floor plans are as follows:

	State of Authenticity	Percentage (%)					
	Range	Gr.Flr	1st Flr.	2nd Flr.	Attic Flr.	Roof	Average
1	Intact, original or Minor alterations	82.3	56	48	83.3	35	60.92
2	Moderate to Major alterations	13.1	44	52	16.7	65	38.16
3	Completely altered	4.6	-	-	-	-	0.92
	Total						100%

Refer Fig 23- 28 : Authenticity Surveys - Plans

The details of authenticity surveys of external elevations are as follows:

	State of Authenticity	Percentage (%)				
	Range	West	North	East	South	Average
1	Intact, original	79	62	48.8	67	64.2
2	Minor to moderate alterations	19	36	22.2	33	27.6
3	Major to completely altered	2	2	29	-	8.2
	Total					100%

Refer Fig 29- 32 : Authenticity Surveys - Elevations

Analysis of the above data reveals that to a larger extent CST has retained its authenticity, though minor alterations have been carried out. These interventions are like adding partitions in verandahs space, enclosing the arcades with glazed teakwood windows, placement of AC's, vinyl flooring over the existing flooring, etc. **It is easily possible to revert these back to original condition when the complete restoration project is conceptualized** (part of this has already commenced). Only a small percentage of authenticity has completely been damaged due to alterations carried out earlier. This will be reverted back to the original condition as far as possible by reconstruction using similar materials and techniques.

It is intended to restore the public or visible areas to their original glory. The inner operational areas will also be considered for restoration. However, if they cannot be restored due to functional or other reasons, they will be sensitively treated to recreate a matching ambience as close to the original as possible.

2. i. b. Statement of Integrity (as mentioned in the Advisory Body Evaluation (ICOMOS), 2004)

Authenticity and integrity

The Terminus station has been recently analysed in detail regarding its authenticity. As a general conclusion, structurally the original building is considered to be nearly intact even though, over time, there have been numerous alterations. These have been mainly additions and adjustments to accommodate the immediate needs of the personnel working in the building, resulting in the construction of partition walls, new ceilings, the instalment of lifts, etc. According to the analysis, most of these alterations are reversible, and the present restoration project is expected to improve the legibility of the original architecture by removing the undesirable additions, and restoring the original aspect.

Regarding the context of the building, there are many changes that have taken place here as well. Further changes will certainly be forthcoming as part of the on-going development process in this busy part of the metropolis. Nevertheless, the urban fabric of the surrounding area as a whole represents an important heritage from the late 19th and early 20th centuries, which merits protection at the highest level. Steps in this direction have already been taken, when the area was listed

for protection. The practical implementations of the consequences are still a challenge to be faced. There are also proposals for development, the impact of which is not yet to be foreseen.

As a conclusion, the Terminus building itself has maintained its authentic structural system and most of the original surfaces. The area has retained much of its integrity from the early 20th century, even though there have been changes.

2. i. c. Statement of Integrity (as mentioned in the Retrospective SOUV, 2013)

Statement of Integrity

Built at an important urban node in the planning of the historic Fort area in the 19th century Bombay, Chhatrapati Shivaji Terminus continues to dominate the cityscape and creates an urban vista on D.N. Road, which has retained its spatial and visual integrity despite the pressures of development and urbanisation in the city of Mumbai. As the first city to adopt heritage regulations in 1995, the city of Mumbai has been a pioneer in setting the guidelines for the protection and management of urban heritage. Its management policies have ensured that the integrity of its setting is maintained.

The Grade I heritage structure has maintained a high level of integrity, even in the light of extensive commuter pressure the station is subject to everyday. Some insensitive additions such as buildings to the rear and side are being removed in a phase-wise manner, key to strengthening the integrity of this property.

2. ii. a. Statement of Authenticity (as mentioned in the Nomination Dossier, 2004)

2.c Authenticity / Integrity :

The building still retains a large percentage of its structural integrity, however due to excessive increase in usage and occasionally due to insensitive repairs and additions, there has been a moderate change in the authenticity.

With increasing awareness of conservation the railway authorities have been keen on conserving the building. A comprehensive and systematic phase of conservation works has been identified and currently undertaken.
Refer Annexure VI : CD of ACC Architectural conservation master plan prepared by ACC

The details of authenticity surveys of floor plans are as follows:

	State of Authenticity	Percentage (%)					
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	Total						100%

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Refer Fig 29- 32 : Authenticity Surveys - Elevations

Analysis of the above data reveals that to a larger extent CST has retained its authenticity, though minor alterations have been carried out. These interventions are like adding partitions in verandahs space, enclosing the arcades with glazed teakwood windows, placement of AC's, vinyl flooring over the existing flooring, etc. **It is easily possible to revert these back to original condition when the complete restoration project is conceptualized** (part of this has already commenced). Only a small percentage of authenticity has completely been damaged due to alterations carried out earlier. This will be reverted back to the original condition as far as possible by reconstruction using similar materials and techniques.

It is intended to restore the public or visible areas to their original glory. The inner operational areas will also be considered for restoration. However, if they cannot be restored due to functional or other reasons, they will be sensitively treated to recreate a matching ambience as close to the original as possible.

2. ii. b. Statement of Authenticity (as mentioned in the Advisory Body Evaluation (ICOMOS), 2004)

Authenticity and integrity

The Terminus station has been recently analysed in detail regarding its authenticity. As a general conclusion, structurally the original building is considered to be nearly intact even though, over time, there have been numerous alterations. These have been mainly additions and adjustments to accommodate the immediate needs of the personnel working in the building, resulting in the construction of partition walls, new ceilings, the instalment of lifts, etc. According to the analysis, most of these alterations are reversible, and the present restoration project is expected to improve the legibility of the original architecture by removing the undesirable additions, and restoring the original aspect.

Regarding the context of the building, there are many changes that have taken place here as well. Further changes will certainly be forthcoming as part of the on-going development process in this busy part of the metropolis. Nevertheless, the urban fabric of the surrounding area as a whole represents an important heritage from the late 19th and early 20th centuries, which merits protection at the highest level. Steps in this direction have already been taken, when the area was listed

for protection. The practical implementations of the consequences are still a challenge to be faced. There are also proposals for development, the impact of which is not yet to be foreseen.

As a conclusion, the Terminus building itself has maintained its authentic structural system and most of the original surfaces. The area has retained much of its integrity from the early 20th century, even though there have been changes.

2. ii. c. Statement of Authenticity (as mentioned in the Retrospective SOUV, 2013)

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Statement of Authenticity

Since its construction in 1888, the Terminus is still in use and has thus retained the authenticity of its use. The foundation plaque at the building gives details of the cost and construction of the building. Most of the materials still survive intact on site and the conservation programme has addressed the issue of authenticity of material. Strict heritage regulations have ensured preservation of the structure with a high degree of authenticity. Since the building is a Grade I heritage structure, no interventions are permitted either on the exterior or the interior of the structure unless it is found necessary in the interest of strengthening and prolonging the life of the building or any part or features thereof.

The Railways have undertaken a conservation programme under supervision of conservation experts and skilled craftsmen. This has been guided by principles of authenticity and minimal intervention and thus has helped enhance the authenticity of the structure. Thorough documentation of the works that are being carried out has been maintained.

2. iii. a. Description of WHP Boundary (as mentioned in the Nomination Dossier, 2004)

1.d Exact location on map and indication of geographical coordinates to the nearest second

The site is located at latitude 18 degrees 55 minutes 23 seconds north and longitude 72 degrees 50 minutes 4 seconds east.

Refer Fig 2 : Map of Mumbai

The cultural property identified for inscription consists of the main head office building located on South side, its appurtenant open spaces on West, South and East followed by the concourse on its North.

Refer Fig 4 : Location Plan of Fort Precinct.

The site is located in the Island City of Mumbai – i.e. Southern most part of Mumbai City. It is located just outside the historic Fort area on its Northern side. The site comes under `A' ward of the Municipal Corporation of Greater Mumbai.

Refer Fig 6 : Site plan (reduced copy, original scale 1 : 480)

1.e Maps and / or plans showing boundary of area proposed for inscription and of any buffer zone

The inscribed area consists of the main head office building, the concourse and the appurtenant open space flanking the main building. The inscribed site is delineated as per architect FW Steven's original design.
Refer Fig 5 : Site plan (reduced copy, original scale 1:1000)

1.f.i Inscribed Area:

An area in which alteration of the existing state is strictly regulated to preserve the natural and/or historic environment.

The inscribed area as scaled from the original drawings is 2.85 hectares. This includes the ground floor and open space of the administrative building, and the concourse area. The built area of all floors works out to 4.02 hectares

Refer Fig 15 : Site plan and its boundary,
Refer Fig 16 : Proposed area for inscription of World Heritage List

2. iii. b. Description of WHP Boundary (as mentioned in the Retrospective SOUV, 2013)

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2.2. Delineation of the Property & Buffer Zone at the Time of Inscription

Property

The inscribed area consists of the main head office building, the concourse and the appurtenant open space flanking the main building. The total area of the property is 2.85 hectares.

The inscribed site falls under Sub-Precinct 11 VT precinct of the Fort precinct as per Govt. of Maharashtra 1995, Sr. 633.

2. iv. a. Description of Buffer Zone boundary(ies) (as mentioned in the Nomination Dossier, 2004)

Existing Buffer zone

The inscribed site falls under Sub Precinct 11 VT precinct of the Fort precinct as per Govt. of Maharashtra, heritage legislation 1995, Sr. 633. This buffer zone is defined by W.Hirachand Marg on South, Dr D.N Road on West, P D'Mello road on East and the boundary wall of St George Hospital on the North.

Refer Fig 14 : The Fort Precinct – A conservation zone

1.f Area of property proposed for inscription (ha.) and proposed buffer zone (ha.) if any.

To get additional protection additional buffer zones have been proposed. These are:

Proposed Buffer zones:

Buffer zone 1: Which is the prohibited zone, which constitutes of sub precinct 11 – VT Station precinct as defined by Urban Development Department of Govt. of Maharashtra Sr. No. 633 in Heritage Regulation for Greater Mumbai 1995. This is an immediate buffer zone surrounding this cultural property and a larger portion of the area is under Central Railway ownership. Remaining area belongs to the St George Hospital. This constitutes the area on Eastern side of the inscribed site. This buffer zone is defined by W.Hirachand Marg on South, Dr D.N Road on West, P D'Mello road on East and the boundary wall of St George Hospital on the North.

Buffer zone 2: Constitutes the track area and vacant area of Carnac Bundar, which belongs to the Central Railway only. This constitutes the North side. It is defined by P D 'Mello Road on East, the Carnac Bundar bridge on the north, the railway boundary wall on West, inclusive of the new administrative building flanking Dr DN road and the out station concourse along with the boundary wall of St George hospital on its South

Buffer zone 3: Constitutes the following 3 sub-precincts on the Mumbai Fort Precinct: Sub-precinct No 5: Esplanade sub-precinct, Sub-precinct No 12: The BMC sub precinct and part of sub-precinct 14 i.e. Oval sub-precinct. The buffer zone is defined by Dr D.N road on East, L. Tilak Road on its North, and M.G Road on its West. This has the residential, institutional and commercial fabric around the inscribed site located on its southern and western parts.

Refer Fig 35 : Proposal 1 for Buffer Zone

Description	Area in Hectares
Inscribed site	2.85 Ha
Proposed Buffer Zone 1	17.5 Ha
ProposedBuffer Zone 2	25.6 Ha
ProposedBuffer Zone 3	47.11 Ha

1.f.ii Buffer Zone: an area in which development actions over a certain scale are controlled to conserve the cultural landscape and natural environment.

Refer Fig 35 : Proposal 1 for Buffer Zone

a) Guidelines for Buffer Zones:

Buffer Zone I: (sub-precinct 11) : is defined by DN Road on its west, W.Hirachand Marg on South , PD'Mello road on east railway tracks on the North.

The approximate area of this sub-precinct is 17.5 Hectare.

This zone includes many significant heritage structures like GPO (General Post office) Sr 258 which is a Grade I building, Fort St George Hospital, Sr 210 Grade III and Fragment of Old Fort Wall, Sr No 240 Grade I.

This area has been identified as precinct with prima facie objective being to protect the CST from haphazard insensitive developments i.e., from the East side of CST i.e., within Fort George Hospital complex which has abundant open space for development.

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Guidelines are as follows:

- The Development plan of 1981-2001 has earmarked the CST area as C1 as commercial area this needs to be changed to an operational functional zone and not a commercial. No commercial activities are permissible
- This should be ideally a no development protective zone. However, if there is any proposal for public use then it is proposed to be restricted as low-rise development only (not higher the than the concourse ridge top or till the ridge level of the adjoining residential quarters of the hospital whichever is lower). Strict monitoring is essential for all proposed construction including street furniture, bus shelters, telephone booth etc.
- Grading of Fort St George Hospital is to be changed from grade III to Grade IIB and the whole complex is to be included in the grading as its present delineation in unclear whether the hospital or the complex building is listed.
- All encroachments abutting the heritage structures on PD Mello Road and on rear side of General Post Office are to be removed if illegal or rehabilitated in another location if they are legal and footpaths are to be restored back to its original condition. Grade I heritage site are to be free of any encroachments.
- Removal of all hoarding in this precincts. No new hoarding permissible.
- Color scheme of non listed buildings are strictly controlled, neutral colours like white or matching stone colour of adjoining heritage structures are permissible subject to permission from local stake holder (high powered steering) committee and MHCC.
- Any new development shall be predominately tiled roof top 75% of the floor area with a minimum gradient 25 degrees and partially flat terrace 25%. The new development is to be sensitive to existing heritages structures in mass, scale, architectural fenestration, and typology. New finishes if proposed are to be visually matching in appearance, colour and texture.
- Greens open space is be retained, no cuttings of old trees allowed.
- Unified street furniture and signage required for this zone. This is to be designed by professional designers and is to be approved by MHCC
- Listed buildings require skilful repairs with respect to authenticity.
- Any development or construction in this area requires Local Stake Holder Committees approval and then MHCC.

Buffer zone 2 (Railway land) : This belongs to the railways, the proposed guidelines are similar as those of sub precinct 11 (described above) .The idea is to avoid commercial, high rise development that shall congest the area, or obstruct or distract the view of CST from a distance or any location as a result be potential threat to the CST.

The present barren open space on the East can be suitably landscaped for public purpose rather than leaving it barren and unattended. The BPT gardens in Colaba is a successful example of converting a dumping site into one of the most tranquil and suitably landscaped sites of Mumbai.

The approximate area of this sub-precinct is 25.6 Hectare.

Buffer Zone 3:

Sub precinct 12 : The BMC precinct (approximate area: 47.11 hectares) **:** consists of predominant institutional building with large open spaces which is the essential character of this area. Many of these structures are listed individually and are hence protected.

Guidelines are as follows:

- This area is to be treated as equivalent to Grade II inclusive of all modern buildings. These modern buildings are allowed flexibility of modification subject to approval from MHCC and following the guidelines listed below
- No further development or development will be permitted in this zone which obstructs the view of CST from any road or through the maidans.
- Height of buildings to be frozen as increase in height mars the view of these historic landmarks thereby altering its cultural significance.
- Redevelopment proposals will be strictly monitored and only those buildings that are dilapidated or structurally weak and as certified by MHCC will be allowed reconstruction.
- Reconstruction of buildings will not be given advantage of extra height or FSI. Compensation for loss of FSI if any shall be in form of TDR (transfer of development right).
- Any works on such individually significant heritage buildings (Grade I) is to be carried out by qualified and experienced conservation professionals only.
- No amalgamation of plots allowed, no widening roads allowed as per existing rules.
- Cess rules overriding the heritage rules not applicable in this area.
- No encroachments or development of any kind is permissible in any of the open spaces.
- No hoarding or bill boards in this area
- No loud (in-terms of colour, material and size) signage allowed. Especially back lit & neon signage.
- No dish antenna, transmission tower, new water tanks, helipads etc, to be permitted on terraces and flat roofs which falls in cone of vision obstructing the view of these heritage buildings if viewed from ground level below.
- Modification to modern structures allowed but use of ultra modern materials like Glass, Aluminum panels which stands out as contrast to the historic character is to be restricted subject to the approval of MHCC or if its through an open national architectural competition as approved by Council of Architecture.
- In repairs, restoration and reconstruction of individually significant heritage structures like to like material is recommended as the best option as it is time tested. Other international rules of conservation like complete documentation, minimum intervention and retention of maximum original character should be adhered. All proposed additions should be sympathetic and harmonize with the old fabric in terms of mass, color, appearance and texture etc. However, subtle modern extensions are permissible subject to approval of MHCC
- No set backs allowed.

- This area is to be treated as a special tourist district and through traffic needs to be diverted to other arterial roads. Experimentation in traffic management like pedestrianisation of streets should be encouraged in particular D.N Road may be considered. Such an intervention shall result in less pollution which will help in preserving these landmarks
- No industrial activity or commercial activity, which pollutes or congests the area to be permitted respectively.
- Proposals regarding flyovers, subways, underground metros or parking is normally to be not allowed but may be considered keeping in mind above restrictions
- All encroachments – illegal structures to be demolished and monitored strictly.
- No box grills, no projecting AC or splits units to be allowed on main facades or facades abutting the road.
- Original teakwood doors and windows and fan lights which contributes to the architectural character be retained and not be replaced with metal or other materials.

Part of Sub precinct 14 : Oval precinct :

Guidelines are as follows:

- No development zone i.e., no new construction is to be allowed.
- all encroachments/illegal structures in and around Azad maidan are to be removed especially because this forms a forecourt to CST and BMC building together.
- The compound wall of this maidan is to be made perforated like that of the other maidans
- Parking of tourist buses that obstructs the view of CST from eye level or from across the maidan are to be removed from here.

Sub precinct 5: Esplanade Precinct

This constitutes planned area that was constructed after demolition of Fort walls in late 19th century and early 20th cent. This precinct has significant public, institutional and commercial buildings with few residential buildings. The development on East façade facing Dr D N Road constitutes of significant commercial buildings having designed and significant front facades with design controls in built like a mandatory arcade, stipulated cornices and floor heights, no set backs etc. The buildings facing the maidans on the west are institutional types with few palatial residences. In between these two stretches are located the schools and commercial/office buildings having traditionally a residential flat on its top floor belong to the caretaker.

This area has a distinct character due to its : planning (with open alleys), its typology and architectural language of buildings which merits protection.

Guidelines are as follows:

- This area is to be treated as equivalent to a Grade II inclusive of all modern buildings. These modern buildings are allowed flexibility of modification subject to approval from MHCC and following the guidelines listed below
- No further development or development will be permitted in this zone, which obstructs the view of CST from any road or through the maidans.

- Height of buildings to be frozen to existing heights as increase in height mars the view of these historic landmarks thereby altering its cultural significance.
- Redevelopment proposals will be strictly monitored and only those buildings that are dilapidated or structurally weak and as certified by MHCC will be allowed reconstruction.
- Reconstruction of buildings will not be given advantage of extra height or FSI. Compensation for loss of FSI if any shall be in form of TDR (transfer of development right).
- No amalgamation of plots or FSI or TDR to be allowed, no widening roads allowed as per existing rule. No set backs allowed.
- Cess rules overriding the heritage rules not applicable in this area.
- No development of any of the open spaces permissible, all encroachments to be removed.
- No hoarding or bill boards in this area
- No loud (in-terms of colour, material and size) signage allowed. Especially back lit & neon signage.
- No dish antenna, transmission tower, new water tanks, helipads etc, to be permitted on terraces and flat roofs which falls in cone of vision obstructing the view of these heritage buildings if viewed from ground level below.
- Modification to modern structures allowed but use of ultra modern materials like Glass, Aluminum panels which stands out as contrast to the historic character is to be restricted subject to the approval of MHCC.
- In repairs, restoration and reconstruction of individually significant listed heritage structures like to like material is recommended as the best option as it is time tested. Other international rules of conservation like complete documentation, minimum intervention and retention of maximum old should be adhered. All proposed additions should be sympathetic and harmonize to the old fabric in terms of mass, color, appearance and texture etc. However, subtle modern extensions are permissible subject to approval of MHCC
- No industrial activity or commercial activity which pollutes or congests the area to be permitted respectively.
- Proposals regarding flyovers, subways, underground metros or parking is normally to be not allowed but as special case if it benefits the city and the structures, the proposal can be considered.
- No box grills, no projecting AC or splits units to be allowed on main facades or facades abutting the road.
- All alleys spaces between two building should be kept free of encroachments like services , shops etc.
- Flooring of arcade is to be paved and to be redone in basalt only.

2. iv. b. Description of Buffer Zone boundary(ies) (as mentioned in the Advisory Body Evaluation (ICOMOS), 2004)

4. ICOMOS RECOMMENDATIONS

Recommendation for the future

Considering the architectural quality and character of the CST/VT, ICOMOS strongly recommends that restoration be undertaken by appropriately trained and qualified firms and specialists.

Taking note of the high quality of the urban fabric in the Fort Precinct, where the CST/VT is the focal point, ICOMOS stresses the importance for the State Party to make every effort to guarantee its integrity for the future.

ICOMOS welcomes the proposal to extend the buffer zone to cover the entire precinct area which in itself forms a fine example of the development in the 19th century Bombay.

Taking into account that the nomination refers to late 19th century development, when the station was inaugurated as Victoria Terminus, ICOMOS proposes that the State Party consider changing the name back to the first proposal: 'Victoria Terminus (Chhatrapati Shivaji Terminus).'

2. iv. c. Description of Buffer Zone boundary(ies) (as mentioned in the Retrospective SOUV, 2013)

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The total area of the buffer zone is 90.21 hectares. The existing buffer zone has been divided into 3 zones.

1. Buffer Zone I (sub-precinct 11):

This is an immediate buffer zone surrounding the property and is defined by D. N. Road on its West, Walchand Hirachand Marg on South, P. D'Mello road on East and the boundary wall of St. George Hospital on the North. The approximate area of this sub-precinct is 17.50 Hectare. A large portion of this buffer zone is under Central Railway ownership. Remaining area belongs to the St. George Hospital. This constitutes an area on the Eastern side of the inscribed site.

2. Buffer zone 2 (Railway land):

Area included in buffer zone 2 is in operational use of Railway for running of Railway services. It constitutes the track area and the vacant area of Carnac Bunder belonging to the Railway to the North of the property. The approximate area of this zone is 25.60 Hectare. It is defined by P D'Mello Road on East, the Carnac Bunder Bridge on the North, the railway boundary wall on West, inclusive of the new administrative building flanking Dr. D.N. Road and the outstation concourse along with the boundary wall of St. George hospital on its South. The ownership of the area vests with the Central Railways. It is not a part of defined delineated Fort area protected by Urban Development Department of Govt. of Maharashtra Sr. No. 633 in heritage regulation of Greater Bombay 1995.

3. Buffer Zone 3:

It is the main buffer zone at front side of the heritage structure. The main view of the heritage structure is visible from this zone only particularly from D. N. Road & Azad Ground. The buffer zone is defined by Dr. D.N. Road on East, L. Tilak Road on its North, and M.G. Road on its West. It consists of land (approximate area: 47.11 hectares) under 3 sub precincts i.e. 12, 14 and 5 as described under:

a. Sub precinct 12: The BMC precinct consists of predominant institutional buildings with large open space which is the essential character of this area. Many of these structures are listed individually and are hence protected.
b. Part of Sub precinct 14: Oval precinct.
c. Sub precinct 5: Esplanade Precinct.

The inscribed site falls under the delineated Fort area protected by Urban Development Department of Govt. of Maharashtra Sr. No 633 in heritage regulation of Greater Bombay 1995. The Fort area precinct further has 14 sub precincts in it.

Guidelines for Buffer Zones

There are basic control guidelines for the entire Fort precinct however as the CST is nominated for World Heritage Status the existing guidelines were revised so as to regulate the development around the CST to ensure that it's setting is not altered.

Buffer Zone I: (sub-precinct 11):

This is an immediate buffer zone surrounding the property and is defined by D. N. Road on its West, Walchand Hirachand Marg on South, P. D'Mello road on East and the boundary wall of St. George Hospital on the North. The approximate area of this sub-precinct is 17.50 Hectare.

This zone includes many significant heritage structures like GPO (General Post office) Sr 258 which is a Grade I building, Fort St George Hospital, Sr 210 Grade III and Fragment of Old Fort Wall, Sr No 240 Grade I.

This area has been identified as precinct with prima facie objective being to protect the CST from haphazard insensitive developments i.e., from the East side of CST i.e., within Fort George Hospital complex which has abundant open space for development.

(Precinct guidelines as per the Nomination Dossier)

Guidelines are as follows:

- The Development plan of 1981-2001 has earmarked the CST area as C1 as commercial area this needs to be changed to an operational functional zone and not a commercial. No commercial activities are permissible
- This should be ideally a no development protective zone. However, if there is any proposal for public use then it is proposed to be restricted as low-rise development only (not higher the than the concourse ridge top or till the ridge level of the adjoining residential quarters of the hospital whichever is lower). Strict monitoring is essential for all proposed construction including street furniture, bus shelters, telephone booth etc.
- Grading of Fort St George Hospital is to be changed from grade III to Grade IIB and the whole complex is to be included in the grading as its present delineation in unclear whether the hospital or the complex building is listed.
- All encroachments abutting the heritage structures on PD Mello Road and on rear side of General Post Office are to be removed if illegal or rehabilitated in another location if they are legal and footpaths are to be restored back to its original condition. Grade I heritage site are to be free of any encroachments.

- Removal of all hoarding in this precincts. No new hoarding permissible.
- Color scheme of non listed buildings are strictly controlled, neutral colours like white or matching stone colour of adjoining heritage structures are permissible subject to permission from local stake holder (high powered steering) committee and MHCC.
- Any new development shall be predominately tiled roof top 75% of the floor area with a minimum gradient 25 degrees and partially flat terrace 25%. The new development is to be sensitive to existing heritage structures in mass, scale, architectural fenestration, and typology. New finishes if proposed are to be visually matching in appearance, colour and texture.
- Greens open space is be retained, no cutting of old trees allowed.
- Unified street furniture and signage required for this zone. This is to be designed by professional designers and is to be approved by MHCC
- Listed buildings require skilful repairs with respect to authenticity.
- Any development or construction in this area requires Local Stake Holder Committee's approval and then MHCC.

Buffer zone 2 (Railway Land):

This belongs to the railways, the proposed guidelines are similar as those of sub precinct 11 (described above). The idea is to avoid commercial, high rise development that shall congest the area, or obstruct or distract the view of CST from a distance or any location as a result be potential threat to the CST. The approximate area of this sub-precinct is 25.6 Hectare.

The present barren open space on the East can be suitably landscaped for public purpose rather than leaving it barren and unattended. The BPT gardens in Colaba are a successful example of converting a dumping site into one of the most tranquil and suitably landscaped sites of Mumbai.

REPORT ON THE STATE OF CONSERVATION FOR CHHATRAPATI SHIVAJI TERMINUS (FORMERLY VICTORIA TERMINUS), WORLD HERITAGE SITE

Buffer Zone 3:

Sub precinct 12: The BMC precinct (approximate area: 47.11 hectares): consists of predominant institutional building with large open spaces which is the essential character of this area. Many of these structures are listed individually and are hence protected.

Guidelines are as follows:

- This area is to be treated as equivalent to Grade II inclusive of all modern buildings. These modern buildings are allowed flexibility of modification subject to approval from MHCC and following the guidelines listed below
- No further development or development will be permitted in this zone which obstructs the view of CST from any road or through the maidans.
- Height of buildings to be frozen as increase in height mars the view of these historic landmarks thereby altering its cultural significance.
- Redevelopment proposals will be strictly monitored and only those buildings that are dilapidated or structurally weak and as certified by MHCC will be allowed reconstruction.
- Reconstruction of buildings will not be given advantage of extra height or FSI. Compensation for loss of FSI if any shall be in form of TDR (transfer of development right).
- Any works on such individually significant heritage buildings (Grade I) is to be carried out by qualified and experienced conservation professionals only.
- No amalgamation of plots allowed, no widening roads allowed as per existing rules.
- Cess rules overriding the heritage rules not applicable in this area.
- No encroachments or development of any kind is permissible in any of the open spaces.
- No hoarding or bill boards in this area
- No loud (in-terms of colour, material and size) signage allowed. Especially back lit & neon signage.
- No dish antenna, transmission tower, new water tanks, helipads etc, to be permitted on terraces and flat roofs which falls in cone of vision obstructing the view of these heritage buildings if viewed from ground level below.
- Modification to modern structures allowed but use of ultra modern materials like Glass, Aluminium panels which stands out as contrast to the historic character is to be restricted subject to the approval of MHCC or if its through an open national architectural competition as approved by Council of Architecture.
- In repairs, restoration and reconstruction of individually significant heritage structures like to like material is recommended as the best option as it is time tested. Other international rules of conservation like complete documentation, minimum intervention and retention of maximum original character should be adhered. All proposed additions should be

sympathetic and harmonize with the old fabric in terms of mass, color, appearance and texture etc. However, subtle modern extensions are permissible subject to approval of MHCC

- No set backs allowed.
- This area is to be treated as a special tourist district and through traffic needs to be diverted to other arterial roads. Experimentation in traffic management like pedestrianisation of streets should be encouraged in particular D.N Road may be considered. Such an intervention shall result in less pollution which will help in preserving these landmarks
- No industrial activity or commercial activity, which pollutes or congests the area to be permitted respectively.
- Proposals regarding flyovers, subways, underground metros or parking is normally to be not allowed but may be considered keeping in mind above restrictions
- All encroachments – illegal structures to be demolished and monitored strictly.
- No box grills, no projecting AC or splits units to be allowed on main facades or facades abutting the road.
- Original teakwood doors and windows and fan lights which contributes to the architectural character be retained and not be replaced with metal or other materials.

Part of Sub precinct 14: Oval precinct:

Guidelines are as follows:

- No development zone i.e., no new construction is to be allowed.
- all encroachments/illegal structures in and around Azad maidan are to be removed especially because this forms a forecourt to CST and BMC building together.
- The compound wall of this maidan is to be made perforated like that of the other maidans
- Parking of tourist buses that obstructs the view of CST from eye level or from across the maidan are to be removed from here.

Sub precinct 5: Esplanade Precinct

This constitutes planned area that was constructed after demolition of Fort walls in late 19th century and early 20th cent. This precinct has significant public, institutional and commercial buildings with few residential buildings. The development on East façade facing Dr D N Road constitutes of significant commercial buildings having designed and significant front facades with design controls in built like a mandatory arcade, stipulated cornices and floor heights,

no set backs etc. The buildings facing the maidans on the west are institutional types with few palatial residences. In between these two stretches are located the schools and commercial/office buildings having traditionally a residential flat on its top floor belong to the caretaker.

This area has a distinct character due to its: planning (with open alleys), its typology and architectural language of buildings which merits protection.

Guidelines are as follows:

- This area is to be treated as equivalent to a Grade II inclusive of all modern buildings. These modern buildings are allowed flexibility of modification subject to approval from MHCC and following the guidelines listed below
- No further development or development will be permitted in this zone, which obstructs the view of CST from any road or through the maidans.
- Height of buildings to be frozen to existing heights as increase in height mars the view of these historic landmarks thereby altering its cultural significance.
- Redevelopment proposals will be strictly monitored and only those buildings that are dilapidated or structurally weak and as certified by MHCC will be allowed reconstruction.
- Reconstruction of buildings will not be given advantage of extra height or FSI. Compensation for loss of FSI if any shall be in form of TDR (transfer of development right).
- No amalgamation of plots or FSI or TDR to be allowed, no widening roads allowed as per existing rule. No set backs allowed.
- Cess rules overriding the heritage rules not applicable in this area.
- No development of any of the open spaces permissible, all encroachments to be removed.
- No hoarding or bill boards in this area
- No loud (in-terms of colour, material and size) signage allowed. Especially back lit & neon signage.
- No dish antenna, transmission tower, new water tanks, helipads etc, to be permitted on terraces and flat roofs which falls in cone of vision obstructing the view of these heritage buildings if viewed from ground level below.
- Modification to modern structures allowed but use of ultra modern materials like Glass, Aluminum panels which stands out as contrast to the historic character is to be restricted subject to the approval of MHCC.
- In repairs, restoration and reconstruction of individually significant listed heritage structures like to like material is recommended as the best option as it is time tested.

Other international rules of conservation like complete documentation, minimum intervention and retention of maximum old should be adhered. All proposed additions should be sympathetic and harmonize to the old fabric in terms of mass, color, appearance and texture etc. However, subtle modern extensions are permissible subject to approval of MHCC

- No industrial activity or commercial activity which pollutes or congests the area to be permitted respectively.
- Proposals regarding flyovers, subways, underground metros or parking is normally to be not allowed but as special case if it benefits the city and the structures, the proposal can be considered.
- No box grills, no projecting AC or splits units to be allowed on main facades or facades abutting the road.
- All alleys spaces between two building should be kept free of encroachments like services, shops etc.
- Flooring of arcade is to be paved and to be redone in basalt only.

2. v. a. Excerpts on State of Conservation of the WHP (as mentioned in the Nomination Dossier, 2004)

3.d Present state of conservation:

The Architectural Conservation Cell of ACC have prepared a detailed fabric status report or architectural conservation plan This was prepared in1997-98 based on which further course of actions have been formulated:

As summarized in the architectural conservation plan report of ACC:

> "...In totality it is summed that the Heritage building is in excellent shape structurally while the architecture, despite the pollution and overuse, continues to hold its status in the urban setting of Mumbai. It is the areas of adequate and sympathetic use, modern building services and attention to systematic and professionally managed restoration programes followed with training to in-house staff which requires to be taken cognizance of immediately."

Refer : Annexure VI : CD of Architectural Conservation master-plan prepared by ACC

2. v. b. Excerpts on State of Conservation of the WHP (as mentioned in the Advisory Body Evaluation (ICOMOS), 2004)

State of conservation:

There has been a recent analysis of the condition of the building, which has indicated that it is structurally sound, but there are a series of problems that need to be tackled, involving maintenance and repair.

Regarding the changes that have taken place over the years, the report has classified them according to their impact and amount. It is considered feasible to revert most of the alterations back to the original condition. In a few cases, this work will require limited reconstruction. In case, such changes cannot be removed, e.g. being essential for the functioning of the station, the aim is to treat them sensitively in relation to the original context. Particular attention is proposed to be given to the public or otherwise visible areas of the building.

2. v. c. Excerpts on State of Conservation of the WHP (as mentioned in Retrospective SOUV, 2013)

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The Property is in good state of conservation. The external restoration of the Property has been completed, including the exterior stone cleaning, roof repair, terrace waterproofing, statue and ornamental repair, etc. This has enhanced the overall appearance and structural and visual integrity of the building. A signage placed outside the monument also proclaims its status as a World Heritage Site.

The works have been undertaken as part of the comprehensive conservation programme for the site following the Conservation Report prepared by the Architectural Conservation Cell in 1997-98, which also outlined the works to be undertaken based on priority.

The Conservation Philosophy adopted for the process is guided by principles of sensitivity, extreme care, imagination and accountability, and stresses on minimal intervention, reversibility of intervention, authenticity of replacement, with the aim of prolongation of life of the Property and its values and its sustained use.

The visual integrity of the monument is intact with the strict monitoring of the environs through the heritage guidelines for the city of Mumbai.

The report on the present state of conservation annexed to this report (Annexure 1) would provide a detailed analysis of the state of conservation of the Property. The brief points of the report are as follows:

2. vi. a. Excerpts on Factors Affecting the WHP (as mentioned in the Nomination Dossier, 2004)

5. Factors Affecting the Site

5.a Development Pressures (e.g. encroachment, adaptation, agriculture, and mining).

5.a.i. ***Encroachments*** : There is no encroachment in the proposed inscribed site i.e. in the CST administrative head office building and its open-space and in its concourse. However in its immediate vicinity in buffer zone 1, its South and its West side on the footpath and the main road the existing encroachments have been removed.

5.a.ii Redevelopment: There is a potential threat to the site from the insensitive redevelopment of the areas surrounding it (viz. a viz. scale, mass, use of finish material and obliteration of the view & axis of station etc), therefore regulated buffer zones have been proposed to limit these pressures.

5.a.iii. ***Adaptation*** : From 1878-1887, the time this building was designed and constructed to the present date, it has maintained its function as the main railway terminus for the Central Railway as well as housing the administrative offices. However, the most significant change has been in the increase in the quantum of passengers that have been using the facilities of the terminus. From an initial 4 railway tracks, the terminus now has 6 suburban and 10 separate out-station tracks. This has led to the re-structuring of several areas, most notably, the concourse areas, with the addition of annex buildings, and also altering of the original circulation patterns. The large volume of passengers using the VT suburban lines daily meant that the main building could no longer be used as the main entrance, and this was accordingly modified. Further, the increase in the volume of trains and passengers correspondingly requires increased support staff and infrastructure, and hence the number of users of the administrative offices has also increased. The increase in new users has to be accommodated, and hence wherever possible, attempts have been made to adapt the existing spaces for the increased number of users.

The railways have taken a decision to decongest and the building is in the process of being conserved and maintained.

The areas most affected are the corridors that were provided all around the building. These corridors, that are 12 feet wide, are designed both for circulation, and as a climatic buffer for the interior spaces. The corridors of the North, South and East façade have been almost entirely modified to accommodate new users. This has lead to the blocking of the natural ventilation systems of the building, thus requiring artificial ventilation measures to be introduced.

An increase in the users correspondingly required an increase in the services for the building. Hence several toilet and wash areas have been added, as well as new overhead water tanks for the same. Electrical services also have increased, most notably air conditioning plants, and most of these service facilities have been added in the rear of the building, where open space was available. (this part of the building was originally a kitchen and canteen for staff, and was also landscaped.)

5.b Environment Pressures (e.g. pollution, climate change)

CST station faces much of the same environmental pressures that are faced by several buildings in Mumbai. However, it's extremely robust construction, and sound building materials have helped the building withstand the onslaught of these pressures. The main pressures include:

Extensive vehicular traffic, which occurs along the West façade that faces D.N.Road. This leads to highly polluted air, with high percentage of carbon monoxide. The facades that do not get cleaned by the monsoon are in poor condition. A high level of noise pollution due to traffic is also present along this corridor.

The East façade that faces the harbour and dock areas, and also the mills of Mumbai has been exposed to high levels of polluted air. However with the decline in industrial and harbour activities on Mumbai's east coast over the last few decades, this has been reduced.

The building is also exposed to the saline air of Mumbai, with its close proximity to the sea on 3 sides.

5.c Natural disasters and preparedness (earthquakes, floods, fires, etc.)

Mumbai region of Maharashtra state lies within seismic zone iii according to the classification of the earthquake zones. This building has withstood a number of earthquakes in the last 115 years and no sign of distress of deterioration has been noticed so far. From the past record, it has been observed that the area surrounding the CST building is not prone to flooding.

5.c.i *Fire fighting*: To avoid any eventuality of fire in the building, necessary steps have been taken by provision of fire hydrants, fire buckets and portable fire extinguishers at various convenient locations. Electrical fittings are regularly monitored and upgraded. This building is a two storied structure (low-rise). The existing wet riser system needs to be checked and made functional, and upgraded where required.

5.d Visitor / Tourism Pressures.

The largest volume of users of CST are the daily passengers who frequent the suburban rail services, who number approximately 3 to 3.5 million per day. These users have limited access to the premises, primarily to the concourse and Star Chamber, which is the booking office. Hence the pressure felt by these visitors, though large, is minimized.

5.e Number of inhabitants within property, buffer zone.

Only staff and authorized personnel (totaling to 1800), and their visitors (400) enter and use the rest of the building, the daily number of which does not exceed 2200. However, even this number is above three times over the estimated capacity of the building, and hence requires to be reduced.

The ground floor of the northern wing of the building is used as the booking office for the suburban system where thousands of passengers are using this area for buying tickets.

5.f. Other . None

2. vii. Excerpts of section on Management and Monitoring of the WHP (as mentioned in the Nomination Dossier, 2004)

a. Management of Key indicators

4. Management

4.a Ownership

The CST (erstwhile Victoria Terminus) including its moveable and immovable assets is owned by Central Railway under the Ministry of Railways, Government of India.

4.b Legal status

All legal rights of the property are vested in the Ministry of Railways, Government of India.

Mumbai became the first city in the country to have heritage legislation, which was enacted by Government Regulation No 67 in April 1995, which listed about 624 buildings as listed protected heritage structures. Eight precincts were identified of which the biggest one was Fort area having 14 sub precincts. A multi-disciplinary committee called Mumbai Heritage Conservation Committee (MHCC) was established to ensure protection of heritage buildings. 624 buildings with grades, of which approximately 63 are, grade I, including the CST receiving maximum legal protection. The role of the committee is to review and advise proposals related to heritage structures and precincts. Presently work on precinct areas has started for which draft recommendations have been prepared, but these are yet to be implemented.

The Fort area precinct has a restriction on heights of the building to 24 mts (except cessed properties which have been recently exempted). There is also restriction on amalgamation of property and road widening to ensure that heritage character is maintained.

Refer : Annexure IV : Heritage Regulation of Greater Mumbai, 1995.

4.c : Protective measures and means of implementing them :

4.c.i *Protection of the building under Mumbai Heritage Conservation Committee rules*

Under the Government of Maharashtra's Urban Development Department's Heritage Regulations for Greater Mumbai, 1995, the CST (erstwhile Victoria Terminus- Bori Bundar) Building is listed as a **Grade I** building, Sr No 121 page 21.

Definition

Grade I: Heritage Grade I comprise of buildings. And precincts of national or historical importance, embodying excellence in architectural style, design, technology and material usage; they may be associated with a great historical event, personality, movement or institution. They have been and are the prime landmarks of the city.

Objective:

Heritage Grade I deserves careful preservation.

Scope for Changes:

No interventions would be permitted either on the exterior or interior unless it is necessary in the interest of strengthening, and prolonging the life of the buildings or precincts or any part or features thereof. For this purpose, absolutely essential and minimal changes would be allowed and they must be in accordance with the original.

Refer : Annexure IV : Heritage Regulation of Greater Mumbai, 1995.

4.c.ii ***Protective measures and means of implementing them***

With the growing sensitivity to and recognition about heritage conservation, the Railways are aware that any proposed expansion due to growing needs is to be appropriately incorporated. Close coordination is essential between all of its departments.

At present there is no separate establishment for carrying out the specialized maintenance and repairs of CST main building. The day-to-day maintenance is carried out under the direct supervision of the custodian who looks after all the civil engineering maintenance activities. The electrical and signal and telecommunication department carry out the maintenance of electrical & telephone installation respectively. A maintenance manual for the buildings on the best methods of conserving has been prepared by the ACC for the building.

As CST is a grade I heritage structure which is being nominated as a World Heritage Site the present status of maintenance was reviewed and some of the problems were identified. To overcome these administrative problems higher level of monitoring is proposed.

Refer : Appendix I : Proposals : Proposed management committees

4.f Agreed plans related to property (e.g., regional, local plan, conservation plan, tourism development plan)

4.f.i *Regional*

On a regional level, the Railways are in the process of formulating a re-structuring plan with regard to the zoning of the railways across the country. The creation of new railway zones is proposed, and this would lead to the sub-division of the existing Central Railway. CST being the administrative headquarters of the Central Railways would thus see a reduction in the number of its users and functions. Such a proposal would lead to the de-congestion of the CST building, thus further enhancing its status and reducing the current pressures on the building.

The Mumbai Metropolitan Regional Development Authority (MMRDA), the apex planning authority for Mumbai city is in the process of executing a programme called the MUTP or Mumbai Urban Transportation Plan. This Plan envisages the up-gradation of the existing transport network of the city through the development of new transport corridors, improvement of existing linkages, and increase in carrying capacity of the existing transport facilities. Further, new solutions for Mass Rapid Transit are also being explored, so as to take off the tremendous load from the existing systems.

Any plan that promotes decentralization is beneficial to the CST, as it would once again reduce the existing load on the terminus that has reached its peak carrying capacity. This would thus allow the building to better take on additional roles as an important tourist destination and a heritage site of incomparable value.

4.f.ii *Local*

The Central Railway has already recognized that the existing north-south pattern of Mumbai's transportation network needs to be modified. With the aim of reducing the congestion on the existing transport terminals new terminals have been established for out-station trains, in keeping with the projected urban trends for Mumbai, that envisage the reduction of the role of the Central Business District at South Mumbai, and the emergence of new business districts in Bandra-Kurla and New Bombay, and to meet their new standards of operational needs. The Bandra and Kurla Terminus were set-up with these objectives in mind, and have since their inception, reduced the load on the existing terminals. Other schemes to decongest CST are being considered and will be further investigated.

With the shift of operations of the MPT (Mumbai Port Trust) to adjoining Nhava Sheva JNPT, the entire eastern water front is which is with the MPT will be soon opened for re-development. This will have far reaching consequences on the city and on CST, it being in a strategic location. It is premature to speculate on the nature of this development in the

absence of which the identification and protection of the buffer zones becomes very significant.

4.f.iii ***Conservation Plan:***

A five-year plan initiated in 1997-98 started with the appointment of the Architectural Conservation Cell of ACC, as Consultants to the Central Railway for the CST building.

The first step has been completed with the production of a competent document the 'Architectural Conservation Plan', which is a fabric status study undertaken in 1997-98 by Architectural Conservation Cell of ACC. The Central railways have accepted this plan.

Refer : Annexure VI : CD of ACC conservation master-plan prepared by ACC

Following on the recommendations of this plan, the cleaning of the west facade that is the most affected due to rain and wind direction, was carried out.

The next phase that is planned is the rationalization of the services, which is being currently studied and is to be undertaken in a phase manner.

The Railways plan to demolish the incongruous additions and extensions along the Eastern side in a phased manner so as to regain the original façade, which was covered by these extensions.

Training in conservation studies and practice, for Central Railways employees is the next step in enhancing in house conservation skills. In the absence of such in house skills, interventions will be carried out by qualified trained and experienced conservation architects.

Phase of Works :

- ***Phase I: 1997-2003:*** Preparation of Fabric status report – architectural conservation plan prepared by conservation professionals for the Railways.

    1) Allocation of funds for carrying out work in phases and for feasibility study of existing services.
    2) Cleaning of West – Front facade complete.
    3) Formation of two level committees.
    4) Appointment of consultants and specialist and identifying suitable agencies to carry out the work

- ***Phase II : 2004-2009 – 5 year plan – main components:***

    1) Complete restoration of external facades, rendering building water tight
    2) Up-gradation of services, removal of redundant and incompatible services
    3) Removal of unwanted additions, which have altered the character and authenticity of the building. Circulation areas like passages, corridors, and service areas to be restored to its original function and character.
    4) Restoring the concourse and star-chamber to regain its original appearance.

5) Demolition of car park shed, removal of hoardings from concourse and around the heritage site.
6) Traffic management around site
7) Comprehensive training program for staff so as to create in-house expertise and in-house conservation cell.
8) Tourism Management Plan developed and implemented.

- *Phase III : Long term plans to be undertaken in 2009- 2014*: Includes desirable works concerned with finishes like regaining lost authenticity of interiors, landscaping, and greening in Buffer zone.

4.f.iv *Tourism Development Plan*:

Refer : Appendix I :Proposal - iii) Proposed Tourist Development Plan

4.g Sources and levels of finance

The sources of finance for this building are the consolidated fund of India. Money required for maintenance for day-to-day working, or for development purpose is taken from the consolidated fund of India, after the sanction of the budget by the Parliament.

The Railways have the means to generate and set aside funds for conservation work required for the upkeep of their buildings.

4.h Sources of expertise and training in conservation and management techniques

With the growing awareness of conservation in Mumbai the situation is changing fast. We have in our city about a dozen trained conservation professionals who have worked on preparation of conservation plans both at the macro and micro level. Some of these plans and inspection reports have led to much needed conservation of buildings and precincts.

Architectural conservation has recently emerged as an important discipline in India. With the coming of the Multinational companies in a liberalized economy the historic buildings in the Fort received a much-needed facelift. Many of the new companies have established offices in important heritage buildings especially along the D.N. Road, which is the main arterial road leading off the CST and the prime business area of the city. The new owners have made a great effort to conserve these buildings. The successful examples include Amarchand Mansion, Deutsche Bank, American Express Branch Office at Flora Fountain, ANZ Grindlays Bank Head-office at M.G Road, and the Standard Chartered Bank at Fort, among others.

Important institutional buildings soon followed the same trend and the Army & Navy Building, the David Sasoon Library and the J.N Petit Library have been successfully restored to their former glory. This has led to an increased awareness on the part of the government who continues to be the largest owner of the grand institutional buildings. Conservation efforts by government departments include the restoration of the BMC Corporation Hall, the Elphinstone College, the High Court and the Rajabai Clock Tower and the University Library buildingThe state of art restoration work at Rajabai Tower and Library building of University of Mumbai was recongnised by UNESCO and awarded the Asia Pacific Conservation Award (Honorable

mention) for 2001. The restoration of the fire damaged BMC Corporation Hall received the Indian Heritage Society Urban Heritage Award for 2002.

The management of this building is with Indian Railways personnel who presently have the experience in maintaining the heritage structures of this type. For specialized conservation the Railways use the best professional skills with help of expert NGO's and qualified trained and experienced conservation architects.

The staff is well acquainted with normal civil engineering skills, through the Indian Railways Management Training Institute at the Railway Staff College, Vadodara and Technical Institute at Pune, called the Indian Railway Institute of Civil Engineering. It is due to start conservation courses at these two institutions. Distaster management is also proposed to be included in their training.

4.i Visitor facilities and statistics

The CST was designed as a railway station and also as the administrative headquarters of the Central Railways. Both these functions continue to be housed in the original buildings. An extraordinary increase in the volume and number of trains as well as passengers required expansion, and hence both the buildings and concourse were expanded to house new functions. The number of people who traverse through the site is approximately 3.5 million day.

The original booking office, known as the Star Chamber, is used even today as the suburban booking office, while most of the administrative offices continue as were originally designed.

Facilities for out-station passengers such as the waiting rooms and dining halls have been re-located to the new concourse area, as out-station trains all depart and arrive from here.

Public conveniences such as toilets, washrooms, information kiosks and food stalls now occupy the concourse areas.

It is proposed to augment the existing public facilities such as toilets, benches, dustbins, signage, by adopting a uniform and appropriate design for the same that would enhance the heritage structure, and not detract from the same. Professionals with expertise and experience in this field will be consulted for the same.

4.j Site management plan and statement of objectives

The Central Railway administration is aware of the importance of conservation of this property in its originality following all principles of conservation. **An accepted conservation management plan has already been drawn up called the Architectural Conservation Master Plan** prepared by "Architectural Conservation Cell, Research and Consultancy directorate of Associates Cement Companies. This conservation plan assures that its integrity and out standing universal value is maintained while it continues to fulfill its original operational functions.

Refer : Annexure VI : CD of Architectural Conservation master-plan prepared by ACC

4.k Staffing levels (professional, technical, maintenance).

The upkeep and maintenance of this building is done by the technical and non-technical staff as per the standard norms and yardstick followed on all over the Indian railways which needs to be enhanced considering this to a be a special heritage structure.

At the managerial level, an assistant engineer has been posted at CST. He is assisted by a senior sectional engineer and one sectional engineer and support staff.

The Divisional Railway Manager, Mumbai and his team of senior officers also exercise managerial control at the divisional level.

2. vii. Excerpts of section on Management and Monitoring of the WHP (as mentioned in the Nomination Dossier, 2004)

b. Monitoring of Key indicators

6. Monitoring

6.a Key indicators for measuring state of conservation.

A detailed report was in prepared 1997-98. It is recommended that the ACC report is augmented every 5 years so as to compare the change in fabric status. This is to be prepared by trained and qualified conservation experts. The in-house staff of railways would assist in the survey and thus gain exposure and experience

Refer : Annexure VI : CD of Architectural Conservation master-plan prepared by ACC

6.b Administrative arrangements for monitoring the property.

Refer : Appendix I : Proposals : i) Proposed management committees

6.c Results of previous reporting exercises.

A detailed chronological inventory of past interventions is desirable which includes referring archival records, referring old drawings for better understanding of the building. Some of conspicuous interventions are mentioned in the ACC report.

The following recorded measures have been undertaken in the past.

1. the statue of "progress" which was damaged in the 1969 due to lightening was restored to the original position with help of professionals from JJ College of Arts .

2. The lower half portion of stained glass in the dome drum that was broken and damaged was replaced during the centenary celebrations with acrylic sheets. These acrylic sheets were recently been redone in coloured glass with copper foil method in absence of traditional art techniques.

3. Scientific cleaning of the West facade was undertaken in 2000-02 by the ACC conservation team.

Appendix XI: Inspection, Monitoring, Maintenance and Repair (IMMR)

11.1 Format and Schedule for Initial Inspection

Note: These are sample formats and are to be adapted to the context. The checklist for an initial inspection of the structure and surroundings is provided in the table below:

11.1.1 Yard and Layout Plan-level Inspection

Table 1: Format and Schedule for Initial Inspection of Elements at Yard and Layout Plan level

S. No.	What to Inspect	Inspection Frequency	To be Inspected by	Safety Hazards to be mitigated
1.	**Landscape features (soft and hardscape, viz - Walkways, paths, pavements, retaining and other walls, gates and garden structures adjacent to the Historic Building**			
	• Check materials for cracks, loose elements, and loose mortar joints, moist or bulging areas. Repair, as necessary. • Inspect gates for soundness and damage. Test gates for operation. • Inspect for damaged, decayed, loose or missing pickets, posts, and rails. Check fence alignment. • Inspect for damaged or missing bollards and chains. Test bollards for stability. • Identify trees and shrubs requiring pruning. *Note: Pruning large trees should done only be by an arborist, and undertaken in accordance with Forest Laws.* • Check taps, sprinklers, and watering systems to prevent wastage and waterlogging once a month. • Check for presence and location of warning signs (such as those marking electric fence). • Inspect for uneven ground that may lead to water stagnation, trips and falls. • Inspect for open drains, manholes etc. that are a safety hazard. • Inspect the premises for unpleasant/unusual odors.	Annual + more often if required.	Garden/Estate in-charge, Housekeeping staff.	• Trips and Falls. • Falling branches from shrubs and trees. • Exposure to harsh chemicals from pesticides, Fertilizers. • Extended sun exposure. • Accidental cuts. • Insect bites/stings.
2.	**Site Drainage (Slope of the land and constructed elements like Pipes, Gutters, Swales, Drains)**			
	• Check for blockage, clogging, corrosion, and leaks in pipes, gutters, swales, catch basins. • Ensure all outlets from the gutters have downspouts to direct the water to extensions or splash backs. • Check downspouts for water flow and leaks. • Ensure the slope of the ground around the downspout runs away from the foundation. *Grading may require building up the ground around the foundation, making sure not to get within 150 mm of siding or other exterior cladding to prevent rot due to splash back.* • Ensure that the ground water/any water source is not polluted.	Pre and Post monsoons and snowfall + more often if required.	Garden/ Estate in-charge, Housekeeping Staff.	• Accidental falls and cuts. • Extended sun exposure. • Exposure to disease-carrying pests.
3.	**Exterior Illumination (Lamps, Light fixtures, Electrical parts like wires, conduits etc.)**			
	• Check for functionality. • Check for deteriorated paint, rust, corrosion, moisture damage, and wear.	Half-yearly.		• Fires/explosion from faulty apparatus. • Shocks, Burns. • Accidental cuts, bruises.

11.1.2 Building and Structural features Inspection

Table 2: Format and Schedule for Initial Inspection of elements at Building and Structural features-level

S. No.	What to Inspect	Inspection Frequency	To be Inspected by	Safety Hazards to be mitigated
1.	**Roof (Terraces, Roof tiles, Rafters, Beams, Gutters)**			
	• Check the covering over the ridge or hip of a roof to make sure it is tight, without gaps. • Where ventilation is introduced to a roof system, ensure that the sealing details (screens, flashing, and caulking) are visually inspected. • Check for loose or missing shingles. Look for moss growth, overhanging branches, level of roof. • Check the roof at changes in pitch or direction for failing materials or gaps. • Search roofing materials for deterioration -- cracks, blisters or curling, and for any loose or missing parts. • Inspect soffits and fascia for deterioration (sagging) or openings, where animals/insects could find access or where they could nest.	Annual	Conservator, Civil Engineer, Carpenter, Mason.	• Falls due to loose/weakened roof elements. • Insect bites/stings. • Cuts and bruises from broken elements, equipment.

S. No.	What to Inspect	Inspection Frequency	To be Inspected by	Safety Hazards to be mitigated
	• Inspect the joints, where roof and siding meet, for cracks. • Inspect for evidence of decay in the rafter ends and for water damage cornices. • Inspect for signs of clogging, inadequate slopes, or defects in the gutters and downspouts. • Inspect the pitch of the gutters. • Inspect water tightness of the roof. • Check eaves for bird/animal nests.			
2.	**Chimney (Hearth, Damper, Flue, Lining)**			
	• Inspect if the chimneys leaning above the roof line. • Inspect if the bricks near the top of the chimney are deteriorated. • Inspect if the chimneys are free of obstructions and soot build-up. • Inspect if the mortar is crumbling, or if there are loose or missing bricks. • Inspect if the flashing is rusted or pulling away from the roof and chimney.	Annual	Conservator, Mason.	• Falls due to weakened elements. • Insect bites/stings. • Exposure to dust, ash. • Work in confined spaces.
3.	**Foundation**			
	• Inspect for Movement: Check for signs of recent building settlement. • Are any serious cracks visible? • Are there any signs of movement -- patched cracks re-opening, cracks in walls, bulging siding, windows, or doors out of square? • Is the roofline straight and horizontal? • Are beams, columns, posts and joists sound? Are posts vertical and stable? • Are the foundation walls plumb?	Annual	Civil Engineer, Mason.	• Exposure to disease carrying pests/rodents. • Exposure to mold/fungal/algal growths. • Incorrect level of exposure and without necessary support shall render structure weak.
	• Inspect for Moisture percolation. • Are there any signs of leaking? • Are there any signs of excessive moisture -- musty smell, corrosion? • Is there any efflorescence or peeling paint on the walls or floor? • Is there any condensation forming? • Are there water stains or rotted wood near the floor? • Are the wood posts, beams or floor joists damp or soft?	Half-yearly -- Pre and post monsoons.		
	• Inspect the exterior of the foundation. • Is the parging in good condition? Are there any new cracks or flaking? • Is the ground properly sloped away from the building? • Are there any trees or saplings growing near the foundation?	Annual	Civil Engineer, Mason, Garden in-charge.	
4.	**Masonry (Stone, Brick exterior or interior walls, Arches, Vaults and Domes)**			
	• Check exposed exterior and interior surfaces of walls and foundations, with particular attention to areas of stairway, floor and wall openings, and changes in wall masonry material. • Check for cracks, collapsing, leaning, or bulging areas or other signs of uneven settlement, movement or structural deterioration. • Check interior wall surfaces at upper levels, with particular attention to joints between side and front and rear walls, joints between floors and end walls, and joints between partitions and ceilings. • Check for cracks, crumbled plaster, gaps, or other signs of movement. If significant cracks, surface spalling, or material deterioration is found, review the condition of masonry with a registered architect, materials conservator, or restoration contractor experienced in evaluating masonry. • Check for moist areas, cracks, crumbling material, loose pieces, missing mortar, or efflorescence (white discoloration). • Check for points of moisture ingress such as leaks in roofing, cornice, flashing, downspouts, and joints between masonry and other materials. • Check for vegetation, algal, mold growth on the masonry. • Check overgrowth of vegetation in close vicinity of the masonry.	Half-yearly - Pre and post monsoons/snowfall wherever applicable.	Conservator, Mason, Carpenter.	• Injury from falling objects/loose building elements. • Accidental falls.
5.	**Staircases (Balustrades, Steps, Stairwells)**			
	• Check for moisture ingress, cracks. • Check for corrosion in case of metal staircases. • Check for loose balusters/railings.	Half-yearly -- Pre and post monsoons/snowfall wherever applicable.	Conservator, Mason, Carpenter, Metalsmith.	• Accidental falls.
6.	**Openings/Fenestrations (Doors, Windows, Ventilators, Screens)**			

S. No.	What to Inspect	Inspection Frequency	To be Inspected by	Safety Hazards to be mitigated
	• Check for debris, clogged drainage. • Check for loose joints, deteriorated paint, corrosion, holes, moisture damage, and wear. • Check for cracked or broken panes of glass. • Check for moisture damage, warping, splitting, and unsound joints. Check window putty for cracks or missing sections. • If wood is decayed, determine source of moisture, for leaks, and replace decayed wood to match original material. Repair unsound or loosened joints. Replace missing wooden elements to match original in dimensions, species, workmanship, and finish. • Check putty for cracks or missing pieces. • Check for loose attachments of hardware. Reattach as necessary. • Check for vandalism or break and enter damage to windows and doors. • Check for tight, broken or defective locks and latches. • Check nets/screens for tears.	Half-yearly.	Conservator, Carpenter.	• Accidental cuts/bruises due to broken glass, rust in metals. • Injury from falling objects.
7.	**External and Internal Finishes (Plastered surfaces, Painted surfaces, Flooring finishes)**			
	• Check for loose spots, sagging, large cracks, and significant holes in plaster. • Check for efflorescence (visible salts) on plaster. • Check for signs of dampness and moisture intrusion. • Check for peeling, blistering painted surfaces. • Check for mold/algal growth in plastered or painted surfaces. • Check for excessive wear and tear in flooring surfaces. • Check for missing grouts in case of tiles. • Check for missing/broken tiles. • Check for animal droppings and its impact on the finish. • Check for termite/termite/another pest action. • Check for graffiti or signs of vandalism.	Post monsoons.	Conservator.	• Exposure to fumes from paint. • Exposure to mold, micro-organism growth. • Exposure to dust from peeling finish.
8.	**Water Conduction system (Downspouts, gutters)**			
	• Test for leaks or blocked sections of water conduction systems. • Check for any loose or missing gutters, downspouts, or other system components. • Check joinery between gutters/downspouts for leaks. • Check for obstructions in downspouts.	Monthly.	Licensed Plumber.	• Exposure to disease-carrying micro-organisms/pests/rodents.
9.	**Plumbing system (Water Heater, Plumbing Fixtures, Water Supply)**			
	• Check water, waste and vent piping and fittings. Visually Inspect for leaks, corrosion, damage and ease of operation. Check kitchen sinks and garbage disposal equipment. • Check for leaks in the water heater, drain to reduce sediment build-up. Check temperature setting, and safety mechanisms. • Check metal ductwork for holes, loose connections. Keep air handlers clear of debris/exhaust. • Check spigots on the exterior of buildings. • Identify polluting sources.	Pre and post monsoons.	Licensed Plumber.	• Accidental falls. • Exposure to disease-carrying micro-organisms/pests/rodents.
10.	**Electrical Work (Lighting, Wiring, Vents, Security Monitoring)**			
	• Identify electrical wiring and components that may have degraded over time. • Reveal if any electrical circuits are overloaded. • Reveal if any lack of earthing. • Identify any defective wiring. • Spot oversized fuses or breakers that may cause an electrical fire hazard. • Find any potential electric shock risks. • Check interior incandescent and fluorescent bulbs. • Check fittings and wall connections. Check electrical outlets for damage, secure plate connections. • Check smoke detectors. Check wiring, sockets and fixtures. Visually inspect for sparks, frayed ends, loose connections, corrosion and other damage. • Check and clean vents hood in kitchens. • Check security monitoring, test annually, ensure regular inspection by licensed professionals.	Half-yearly.	Licensed Electrician.	• Fires/explosion from faulty apparatus. • Shocks, Burns. • Accidental cuts, bruises.
11.	**Fire Extinguisher**			
	• Check all fire extinguishers, test annually, ensure regular inspection by a licensed professional. Ensure that extinguishers are not blocked by equipment, coats or other objects that could interfere with access in an emergency.	Annual.	Licensed Personnel.	

S. No.	What to Inspect	Inspection Frequency	To be Inspected by	Safety Hazards to be mitigated
	• Ensure extinguisher pressure is at the recommended level. For extinguishers equipped with a gauge, the needle should be in the green zone - not too high and not too low. *Note if the nozzle or other parts are damaged in any way, and if the pin and tamper seal are intact.* • Check to see that there are no dents, leaks, rust, chemical deposits and/or other signs of abuse/wear. Wipe off any corrosive chemicals, oil, debris, etc. that may have deposited on the extinguisher.			
12.	**Mechanical building systems (HVAC)**			
	• Change and clean filters, vents, and condensation pans to control fungus, molds, and other organisms as often as needed. • Inspect for adequate ventilation, ensure that area is free of musty smell. • Check for visible signs of moisture damage from HVAC system (staining, wet patches, bubbling). • Ensure that a semi-annual inspection is performed by qualified HVAC professionals prior to the start of heating and air conditioning seasons.	Quarterly or more often if required.	Licensed HVAC Consultant.	• Exposure to chemicals. • Shocks, burns due to fires, explosion.

11.2 Format and Schedule for Regular Inspection, Maintenance and Repair

After the initial inspection is complete, the next step is to prioritize what needs immediate attention and what shall be included in regular maintenance planning cycle -- and shall be categorized as Preventive, Corrective or Emergency maintenance. A detailed format with provisions to enter details of inspection (Date, Type, Name of Inspector, Location of Issues, Issues Noted, etc.) with appropriate maintenance measures have been formulated and provided below.

Note: These formats are a starting point towards formulating one which is efficient and context specific. It shall be developed through application and shall be undertaken by the team who plan, finance, monitor and implement work. These shall be filled in an .xls format to integrate with GIS database.

Table 3: Format and Schedule for Regular Inspection

Sr. No.	Area of Inspection			Inspection					
	Features	No.	Element	Date of Inspection (DD/MM/YY)	Type of Inspection (Routine/Scheduled /Unscheduled)	Name of Inspector	Weather conditions during inspection	Inspection notes/Issues noted**	Methods used for inspection
1.	**Landscape features (soft and hardscapes)**	**a**		DD/MM/YY	Routine			Unsecured Combustibles (e.g.: boxes, lumber) stored within or in the vicinity of the building	Visual
		b		DD/MM/YY	Routine			Accumulation of garbage/debris	Visual
2.	**Site-Drainage**	**a**			Scheduled			Water stagnation due to improper site grading	Visual
		b							
3.	**External Illumination**	a			Routine			Lamps not functional	Visual
		b			Scheduled			Corrosion in Historic lighting fixture	
4.	**Roof**	a			Scheduled				
		b			Unscheduled			Broken tiles due to heavy rains and hail	Visual
		c			Scheduled			Termite attack on wooden rafters	Visual + Hammer test for solidness of wood
5.	**Chimney**	a						Cracks in the flue of chimney	Visual
6.	**Foundation**	a							
7.	**Masonry**	a						Cracks (<2mm) on roofs/ walls	Visual + crack monitoring
		b						Gaps in masonry joints due to ad hoc repairs, additions, and alterations	
		c						Use of cement and insensitive repairs	
		d						Removal of blocked openings/arches/alcove	

Sr. No.	Area of Inspection			Inspection					
	Features	**No.**	**Element**	**Date of Inspection** (DD/MM/YY)	**Type of Inspection** (Routine/Scheduled /Unscheduled)	**Name of Inspector**	**Weather conditions during inspection**	**Inspection notes/Issues noted****	**Methods used for inspection**
		e						Removal of new internal walls and surface finishes added to upgrade toilets	
8.	**Staircases**				Scheduled			Excessive wear and tear of flooring finishes	
9.	**Opening/Fenestrations**		Window		Routine			Broken glass panes	Visual
10.	**External and Internal finishes**				Scheduled			Cement plaster layer over historic lime plaster	
					Scheduled			Damaged lime plaster	
					Scheduled			Cracks in walls or in external render	
					Scheduled			Damage to floor surfaces	
					Scheduled			New, incompatible layers of paint	
					Scheduled			Staining or damage to decorative finishes or to features such as fireplaces, staircases, etc.	
					Unscheduled			Leaks, damp patches, condensation, flaking paint or salt deposits on surfaces	
								Damaged ceiling and loss of plastered surface	
								Cleaning of historic masonry	
								Salt deposits, plant or algae growth on surfaces indicating saturation of the wall	
								Failed or damaged mortar in the joints between bricks or stones	
								Blackening of stone surface	
								Moist areas, cracks, loose pieces or crumbling stucco or concrete	
								Litter, graffiti on historic surfaces	
11.	**Water conduction system**				Unscheduled			Blocked downspout due to debris accumulation after heavy rains	Visual
12.	**Plumbing system**								
13.	**Electrical system**							Exposed or improper wiring	
								Overloaded electrical circuits	
								Electrical shock hazards	
14.	**Fire extinguisher**				Scheduled			Inaccessible location	Visual
15.	**Mechanical building system**				Routine			Historic lift not functional	Visual

Table 4: Format and Schedule for Regular Maintenance and Repair

Sr. No.	Area of Inspection			Maintenance and Repair		
	Features	No.	Element	Recommended measures	Maintenance Type (Corrective/Preventive/Emergency)	Measures addressed (DD/MM/YY)
1.	**Landscape features (soft and hardscapes)**	**a**		With all safety measures in place, remove/secure the combustible items	Emergency	DD/MM/YY
		b			Emergency	DD/MM/YY
2.	**Site - Drainage**	**a**				
		b				
3.	**External Illumination**	a				
		b				
4.	**Roof**	a				
		b				
		c		Inspect all sources of termite, Termite treatment		
5.	**Chimney**	a				
6.	**Foundation**	a				
7.	**Masonry**	a				
		b				
8.	**Staircases**					
9.	**Opening/Fenestrations**		Window			
10.	**External and Internal finishes**					
11.	**Water conduction system**					
12.	**Plumbing system**					
13.	**Electrical system**					
14.	**Fire extinguisher**					
15.	**Mechanical building system**					

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