



Indian Audit & Accounts Department

Case Study

On

Construction and Utilization of Limited Height Subway

Prepared by:

**Regional Capacity Building and Knowledge Institute
Kolkata**

Website: <https://cag.gov.in/rti/kolkata/en>

December 2023

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Preface

Regional Capacity Building and Knowledge Institute, Kolkata is the designated Knowledge Centre for Audit of Railway Sector in the Department. In pursuit of excellence in our designated knowledge areas, we prepare case studies highlighting the instances of frauds/deviations from rules and regulations, inefficiency in functioning of the existing system and their reasons as reported and reflected in the C&AG audit reports of Union Government/State Governments.

The case study on ‘*Construction and utilization of Limited Height Subway (LHS)*’ is based on the audit paragraph printed in the C&AG’s report (*Paragraph No. 3.1 of Compliance Report No. 19 of 2019 of Union Government (Railways)*). Certain facts and circumstances of the case have been modified keeping in view the classroom requirements.

Limited Height Subways (LHS) in Indian Railways provide a secure route for road traffic (vehicles, pedestrians) while reducing collision risks between trains and road users. Unlike traditional crossings that cause delays, LHS provides a separate pathway, facilitating continuous movement for both trains and vehicles, thus optimizing schedules and saving time for commuters.

The case study analyses the decision-making process involved in identifying and constructing LHSs, considering a range of factors such as safety, operational benefits, feasibility, and collaboration with State Governments. It emphasizes the importance of adhering to prescribed norms and guidelines during construction of projects to ensure safety, avoid unnecessary duplication, and optimize resource utilization. Moreover, the case study aims to identify and explore challenges that may arise during the execution of infrastructure projects, such as construction in low traffic areas, inadequate drainage, and coordination issues with external stakeholders.

Disclaimer:

The information contained in this study is to be used as a case study example for training purposes only. Opinions formulated and materials provided are intended to stimulate fruitful class discussion.

Anadi Misra
Principal Director

RCBKI, Kolkata
December, 2023

Section 1: Case Study for the Participants

1. Introduction:

- 1.1 The ensuing case study, derived from Paragraph 3.1 in the Comptroller and Auditor General's Compliance Report No. 19 of 2019 on the Union Government (Railways), has been tailored to facilitate classroom discussion.
- 1.2 A key metric in this discussion is the Train Vehicle Unit (TVU), defined as the product of the number of trains and the number of vehicles on intersecting roads at a given rail-road junction within a 24-hour timeframe.
- 1.3 The safety and efficiency of the Indian railway system are of utmost importance. Level Crossings (LCs) are vital for traffic regulation but pose significant challenges in ensuring the safety of both rail and road users. This case study explores the implementation of Limited Height Subways (LHS) as a solution to enhance safety at LCs. The Case Study will delve into the construction process, challenges faced, and audit outcomes at the South East Central Railway (SECR).
- 1.4 It's crucial to distinguish between Road Under Bridge (RUB) and Limited Height Subway (LHS). While RUBs have a height exceeding 5.0 meters and accommodate all vehicle types, LHS structures are designed with a height ranging from 2.5 to 3.5 meters and a width of 4.0 meters. LHS specifically cater to small/light vehicles, two-wheelers, and pedestrians (**Annexure-I**).
- 1.5 A Glossary of full-form of acronyms used in the Case Study has been provided in **Annexure-II**.

2. Background

2.1 Level Crossings (LCs) are vital for traffic regulation, but their existence poses significant safety challenges for train operations. The perilous nature of Unmanned Level Crossings (UMLCs) is evident, contributing to about 70 percent of railway fatalities. Recognizing this, Indian Railways' Vision 2020 underscores the urgency to address the vulnerabilities associated with LCs.

In response to the safety concerns linked with UMLCs, the Railway Board, in November 2006, issued directives to phase out level crossings by introducing Limited Height Subways. These subways, characterized by their restricted height, aimed to accommodate light vehicles and two-wheelers, offering a cost-effective solution. Zonal Railways took on the responsibility of identifying suitable unmanned/manned level crossings for the implementation of these subways. The approval process involved the personal endorsement of the General Manager, especially at critical locations.

The criteria for selecting locations for Limited Use Subways encompassed:

Safety: Identifying LC locations prone to accidents due to poor visibility, where removal would enhance safety.

Operational Benefits: Targeting locations where eliminating LCs would yield significant operational advantages, especially in areas with a high number of crossings or in suburban sections.

Feasibility: Focusing on sites where the embankment height of 3 meters is adequate to prevent water accumulation beneath the subway and its surroundings. A low water table and a viable approach road were also critical considerations.

Train Vehicle Units (TVUs): Selecting locations with low TVUs, either suitable for manned operation or meeting the qualifications for manned operation.

The South East Central Railway (SECR) implemented this strategy, constructing 159 Limited Height Subways across the Bilaspur, Nagpur, and Raipur Divisions between 2011 and 2016.

2.2 Scope of Audit:

Authority Source:

- Authority for audit derived from Section 13 of the C&AG's (DPC) Act, 1971.

Audit Focus:

- Audit covers all expenditure from the Consolidated Fund of India, States, and Union territories with Legislative Assemblies.
- Ensures legality, availability, and appropriateness of disbursed funds.
- Verifies transactions related to Contingency Funds and Public Accounts.
- Audits trading, manufacturing, profit and loss accounts, and balance sheets in Union or State departments.

Audit Principles and Methodologies:

- Auditing Standards and Regulations on Audit and Accounts issued by the C&AG guide the audit process.

2.3 Audit objectives:

a. Compliance and Justification:

Evaluate adherence to Railway Board guidelines in the construction of Limited Height Subways (LHS).

Assess the adequacy of justifications for selecting specific LHS locations.

b. Drainage System Adequacy:

Examine the presence of effective drainage systems at LHS to prevent water accumulation, particularly during the rainy season.

c. Utilization and Safety Impact:

Evaluate the effective utilization of constructed LHS.

Assess the contribution of LHS to accident reduction and overall safety enhancement.

d. Maintenance Responsibilities and Commitments:

Review the existence of clear agreements between Railways and State Governments regarding LHS maintenance responsibilities.

Verify the fulfillment of commitments by State Governments in this regard.

e. Lapses Impacting Safety:

Investigate whether any lapses in construction, maintenance, or operation contributed to accidents in proximity to or at LHS locations.

3. Main Story

The Railway Board's orders in November 2006 urged Zonal Railways to identify UMLCs (Unmanned Level Crossings) that could be replaced with Limited Height Subways (LHSs) for light vehicles, two-wheelers, etc., considering safety, reduction in LC numbers, site feasibility, and Train Vehicle Units (TVUs). In an effort to enhance safety and streamline operations, the construction and maintenance of Limited Height Subways (LHS) have been undertaken by various railway zones. However, Audit revealed several shortcomings and lapses in the construction, feasibility assessment, and maintenance of LHS by SECR's execution of LHS construction as detailed below and relevant audit inspection images have been tabulated as **Annexure-III**:

1. Justification for construction of LHS:

During audits, two key issues related to Limited Height Subways (LHS) construction within the South East Central Railway (SECR) highlighted deviations from prescribed norms:

a. Construction at LCs with Very Low TVUs:

- The Railway Board advocated selecting locations with low Train Vehicle Units (TVUs) for LHS construction, especially if they had the potential for manned operation or already qualified for manning.
- Despite a directive in August 2014 to close Unmanned Level Crossings (UMLCs) with negligible or no TVUs, SECR constructed seven LHS at a cost of ₹10.92 crore with TVUs ranging from 68 to 321.
- SECR justified its actions by claiming no specific guidelines from the Railway Board regarding minimum TVUs for LHS construction. However, the Chairman of the Railway Board had directed Zonal Railways in September 2011 to outrightly close LCs with very low TVUs, typically under 500.

b. Construction at Places with Existing Diversion Roads:

- Railway Board instructions from May 2010 emphasized formulating a Master Plan for UMLC elimination, with one approach involving diverting roads to alternative Level Crossings (LCs).
- Joint inspections revealed LHS construction at LC no. BK-39, where a diversion Road Under Bridge (RUB) existed a mere 134 meters away. Waterlogging and dry mud accumulation beneath the LHS basement were evident during audit, directing vehicles towards the existing RUB.
- SECR explained the initial elimination of LC no. BK-39 through a diversion road as an interim safety measure. However, the diversion road became unusable during peak monsoons, necessitating a subway for year-round safe use.

- Similar instances occurred at LC nos. AB-23, AB-24, AB-25, and AB-35, where LHS construction was within approximately 300 meters of existing diversion RUBs. SECR initially eliminated these LCs through diversion roads, but subsequent demands for subways, driven by additional distances and steep slopes during monsoons, led to LHS construction.
- Audit findings questioned the justification for these actions, highlighting that very short distances between diverted RUBs and closed LCs did not warrant LHS construction.

2. Challenges Post LHS Construction:

After the completion of Limited Height Subways (LHS) construction, various challenges emerged, as evidenced by observations and joint inspections:

- Despite the Railway Board's acknowledgment in March 2010 of the need for adequate embankment height and waterproofing arrangements for LHS, substantial issues persisted.
- The directive in April 2008 emphasized that the cost of approaches and drainage beyond Railway boundaries should be managed by State Governments or local authorities.
- Among 18 jointly inspected LHS, 11 faced non-gravitational drainage concerns, leading to water stagnation. Seven of these LHS lacked complete drainage systems, resulting in persistent water accumulation, particularly during the rainy season.
- Audits identified water accumulation problems in 39 LHS of Nagpur Division, 11 in Bilaspur Division, and seven in Raipur Division, suggesting insufficient site condition review during LHS planning.
- Subsequent joint inspections from April to June 2017 revealed persistent water accumulation and drainage issues, with some LHS remaining non-operational due to waterlogging.
- SECR acknowledged challenges and emphasized efforts to implement gravitational drainage. However, despite measures like retaining walls and drainage systems, many LHS faced waterlogging, leading to closures for a significant portion of the year.

3. Agreements with State Government for LHS Maintenance:

In April 2012, the Railway Board issued directives for Zonal Railways to construct subways, replacing level crossings (LCs) on a cost-sharing basis. State Governments were tasked with providing land and maintaining roads, lighting, drainage systems, diversion roads, and related works. SECR corresponded with State Governments, but most LCs did not fall within municipal areas, making SECR responsible for maintenance.

- SECR sought to withdraw the maintenance condition in May 2014, but the proposal was not accepted by the Railway Board.
- Audit findings revealed SECR incurring maintenance costs due to faulty LHS construction and the absence of agreements with State Governments.

- In Bilaspur and Raipur Divisions, dewatering for seven LHS was outsourced to zonal contractors. Nagpur Division spent ₹25.35 lakh on dewatering across 20 subways.
- A re-evaluation of roles and responsibilities between Railways and State Governments is crucial. Clarity is needed, and the Railway Board should proactively engage State Governments in cost-sharing commitments, possibly through a comprehensive model agreement or Memorandum of Understanding (MoU).

4. Accidents at LCs where LHS could not be used:

Audit investigations uncovered accidents and safety risks related to LHS at various railway crossings:

- A reported accident on December 6, 2016, at LC no.286 highlighted improper barricading despite the closure of the crossing. A subsequent joint inspection on December 7, 2016, revealed the LHS filled with water.
- An accident on September 13, 2016, attributed to heavy rainfall flooded the LHS.
- Another accident on May 22, 2014, at LC no. BK-12 noted incomplete LHS construction, contrary to the scheduled completion date of September 11, 2013.

4. Assignment Questions:

- What were the primary safety concerns associated with unmanned level crossings (UMLCs) in the Indian Railways system? How did Indian Railways address these concerns?
- Describe the criteria used by Indian Railways for selecting locations for Limited Height Subways (LHS). How were these criteria intended to enhance safety and operational efficiency?
- Analyse the challenges faced by the Railways Administration during the construction of Limited Height Subways (LHS). How did these challenges impact safety and operational effectiveness?
- Explain the rationale behind constructing Limited Height Subways (LHS) in locations with low Train Vehicle Units (TVUs), despite prescribed norms suggesting elimination of such LCs.
- What were the challenges and concerns related to maintenance agreements with State Governments for Limited Height Subways (LHS)?
- Based on the case study, identify three key learning objectives related to infrastructure project planning and execution in the context of railway safety.

Section 2 – Teaching Notes for the Instructor

1. Synopsis:

The case study explores the implementation of Limited Height Subways (LHS) to enhance safety at level crossings (LCs) in the Indian railway system. Indian Railways' Vision 2020 prioritized this issue.

The Railway Board's 2006 directives mandated the replacement of LCs with LHSs for light vehicles, focusing on safety, operational benefits, feasibility, and Train Vehicle Units (TVUs).

An audit of execution of LHS highlighted concerns such as building LHSs at locations with low TVUs, ignoring embankment guidelines, inadequate drainage causing waterlogging, accidents, and reliance on State Governments for maintenance. Recommendations encompassed optimizing existing LHSs, completing ongoing projects, clarifying State Government responsibilities, and ensuring adherence to safety norms.

2. Teaching and Learning Objectives

2.1 To make the participants gain knowledge of:-

- Gain insight into the safety challenges posed by level crossings (LCs) in railway systems, particularly unmanned level crossings (UMLCs), and their potential for accidents and fatalities for both trains and road users.
- Learn about the various strategies employed by Indian Railways to address LC-related safety concerns, including the construction of Limited Height Subways (LHS)
- Analyse the decision-making process involved in identifying and constructing LHSs, considering factors such as safety, operational benefits, feasibility, and collaboration with State Governments.
- Understand the importance of adhering to prescribed norms and guidelines in construction projects, with a focus on ensuring safety, avoiding unnecessary duplication, and optimizing resource utilization.
- Identify challenges that can arise during the execution of infrastructure projects, such as construction in low traffic areas, inadequate drainage, and coordination issues with external stakeholders.
- Explore the concept of risk management in infrastructure projects, emphasizing the need to address potential risks like waterlogging and accidents during project planning and execution.

3. Target Audience

The case study is prepared for the Group A and Group B officers' of IA&AD.

4. Relevant Readings

Following topics/documents are relevant to the case study, which requires to be studied and disseminated to the participants' for better understanding of the case study:

(A) Documents related to IA&AD

- Compliance Auditing Guidelines
- Paragraph no. 3.1 of Compliance Audit Report no. 19 of 2019 of Union Government (Railways)
- 52nd Report of the Public Accounts Committee on Construction and Utilization of Limited Height Subway.

(B) Documents related to Department specific other than IA&AD

- Indian Railways Vision 2020 (December 2009);
- Mission Raftaar (2016);
- Indian Railways policy letters

5. Assignment Questions

Instructor may encourage the participants to raise questions during the presentation and the following are vital audit questions that need to be raised:

1. What were the primary safety concerns associated with unmanned level crossings (UMLCs) in the Indian Railways system? How did Indian Railways address these concerns?
2. Describe the criteria used by Indian Railways for selecting locations for Limited Height Subways (LHS). How were these criteria intended to enhance safety and operational efficiency?
3. Analyze the challenges faced by the South East Central Railway (SECR) Administration during the construction of Limited Height Subways (LHS). How did these challenges impact safety and operational effectiveness?
4. Explain the rationale behind constructing Limited Height Subways (LHS) in locations with low Train Vehicle Units (TVUs), despite prescribed norms suggesting elimination of such LCs.
5. What were the challenges and concerns related to maintenance agreements with State Governments for Limited Height Subways (LHS)?
6. Based on the case study, identify three key learning objectives related to infrastructure project planning and execution in the context of railway safety.

6. Teaching Plan:

6.1 Time allotment:

Introduction (15 mins):

- i. Briefly introduce the topic and the importance of safe railway operations.
- ii. Explain the purpose of the case study and its modifications for classroom use.

Background and Context (05 mins):

- (i) Discuss the role of level crossings (LCs) in regulating traffic and safety challenges.

- (ii) Introduce the concept of Limited Height Subways (LHS) and their significance.
- (iii) Share statistics and data on accidents at unmanned level crossings (UMLCs).

Construction and Challenges (15 mins):-

- (i) Discuss key considerations for selecting LHS locations: safety, operational benefits, feasibility, TVUs.
- (ii) Explain the Railway Board's directives regarding the construction of LHS at low TVU locations.
- (iii) Describe challenges encountered during LHS construction, such as drainage issues and water accumulation.
- (iv) Highlight the problems arising from construction near existing diversion RUBs.

Issues Post-Construction (15 mins)

- (i) Discuss the Railway Board's guidelines on embankment height and water accumulation prevention.
- (ii) Present findings from joint inspections indicating water accumulation and drainage challenges.
- (iii) Explain SECR's efforts to address drainage concerns through gravitational drainage and other measures.
- (iv) Discuss the impact of poor feasibility assessment on LHS functionality.
- (v) Highlight accidents and safety risks due to inadequate LHS utilization and maintenance.

Roles and Responsibilities (10 mins):-

- (i) Introduce the Railway Board's directives on LHS maintenance and agreements with State Governments.
- (ii) Explain the responsibilities of Railways and State Governments in LHS maintenance.
- (iii) Discuss SECR's interactions with State Governments and the challenges faced.

Accidents and Safety Risks (10 mins)

- (i) Present case studies of accidents related to LHS, including details from the audit report.
- (ii) Highlight the importance of proper barricading and maintenance to prevent accidents.

Conclusion and Discussion (5 mins):-

- (i) Summarize the key points discussed during the session.
- (ii) Open the floor for questions and answers, encouraging participants to share their thoughts.
- (iii) Emphasize the need for improved feasibility assessment, proper drainage, and collaborative efforts to enhance LHS functionality and safety.

Note: The above teaching plan allows for a balanced presentation, interactive discussions, and case study analysis within a 75-minute time frame. It provides an opportunity to cover essential

concepts, challenges, responsibilities, and real-life examples, fostering engagement and understanding among participants.

7. Suggested/possible answers to assignment questions:		
Sl. No.	Question	Suggested reply
1	What were the primary safety concerns associated with unmanned level crossings (UMLCs) in the Indian Railways system? How did Indian Railways address these concerns?	The primary safety concerns of UMLCs were accidents and fatalities involving both trains and road users. Indian Railways addressed these concerns through measures such as the construction of Limited Height Subways (LHS), Road Over Bridges (ROBs), and Road Under Bridges (RUBs). LHSs provided all-weather passage for pedestrians and light vehicles, while ROBs and RUBs eliminated LCs altogether, enhancing safety.
2	Describe the criteria used by Indian Railways for selecting locations for Limited Height Subways (LHS). How were these criteria intended to enhance safety and operational efficiency?	Indian Railways selected LHS locations based on criteria such as safety (accident-prone LCs), operational benefits (high LC density areas), feasibility (suitable embankment height, approach road, etc.), and Train Vehicle Units (TVUs). These criteria aimed to improve safety by addressing accident-prone areas and enhancing operational efficiency by targeting locations with high LC density or low TVUs.
3	Analyze the challenges faced by the South East Central Railway (SECR) Administration during the construction of Limited Height Subways (LHS). How did these challenges impact safety and operational effectiveness?	SECR faced challenges such as construction in low traffic areas, inadequate drainage leading to waterlogging, proximity to diversion RUBs, and lack of collaboration with State Governments for maintenance. These challenges compromised safety, rendered some LHSs unusable, and led to accidents. Waterlogging, poor drainage, and incomplete construction affected operational effectiveness.
4	Explain the rationale behind constructing Limited Height Subways (LHS) in locations with low Train Vehicle Units (TVUs), despite prescribed norms suggesting elimination of such LCs.	The Railways' rationale was to provide all-weather passage for pedestrians and light vehicles in areas with low TVUs. While the focus was on eliminating UMLCs, the Railways considered safety and local requirements in their decisions. They aimed to create safer crossings in areas with limited train vehicle traffic, where the removal of LCs was not feasible or protested by the local public.
5	What were the challenges and concerns related to maintenance agreements with State Governments for	The Railway Board directed Zonal Railways to eliminate LCs through LHS construction and outlined maintenance responsibilities for State Governments. However, audit findings revealed that maintenance agreements were lacking in

	Limited Height Subways (LHS)?	many cases, as LCs did not fall within municipal areas. SECR attempted to withdraw the maintenance condition, but the proposal was not accepted. Consequently, SECR had to bear the maintenance costs, including dewatering, leading to recurring expenditures.
6	Based on the case study, identify three key learning objectives related to infrastructure project planning and execution in the context of railway safety.	Three key learning objectives are: (a) Understanding the importance of adhering to prescribed norms and guidelines in infrastructure projects to ensure safety and optimal resource utilization. (b) Analyzing the challenges and considerations involved in selecting project locations, including safety concerns, operational benefits, and feasibility. (c) Exploring the significance of collaboration and coordination among stakeholders, such as railway authorities and government bodies, for the successful execution and sustainability of infrastructure projects.

8. Suggested teaching methods

- Lecture-based presentation using PPT (**Annexure-IV**) with interactive discussions and case study analysis.

9. What happened subsequently

The Parliamentary Committee extensively examined the issue of Level Crossings (LCs) in the light of the said Audit Report on 20.07.2022. The Public Accounts Committee (PAC) conducted a comprehensive review of the Audit observations regarding the construction and maintenance of Limited Height Subways (LHS) by the South East Central Railway (SECR). The PAC scrutinized discrepancies, lapses, and challenges identified by the Audit, seeking explanations from the Railway Board regarding adherence to guidelines, construction practices, and incidents of accidents. The subsequent recommendations and observations of the PAC provide insights into the need for improved planning, coordination with local authorities, and stringent adherence to safety standards in railway infrastructure projects.

Point 1: Construction of LHS at Low TVUs

Audit Observation:

The Audit noted that seven Limited Height Subways (LHS) were constructed in areas with Train Vehicle Units (TVU) ranging from 68 to 321, contrary to the prescribed norm of building LHS only in places with TVU exceeding 500. The Committee expressed concern over SECR's lack of awareness or disregard for stipulated norms and questioned whether corrective actions were taken.

Railways' Reply:

In 2017, SECR informed the Audit that there were no guidelines for LHS construction, but the Audit found a clear directive issued by Railways in 2011. The Railways failed to explain the lapse and the absence of action against those responsible for non-compliance.

PAC Recommendation:

The Committee deprecated the Railway Board's failure in monitoring its guidelines. It sought a suitable explanation regarding actions taken against officials responsible for permitting LHS construction in violation of stipulations.

Point 2: Lack of Consultation with District Administration

Audit Observation:

The Railway Board prescribed obtaining consent from district administrations for eliminating Level Crossings (LCs), but LCs were closed and LHS constructed without such consultation, leading to public protests.

Railways' Reply:

The Railways acknowledged protests but did not provide details on why local consultations were bypassed. No mechanism for obtaining ground-level feedback was evident.

PAC Recommendation:

The Committee emphasized the impact of LHS on local communities and protests due to insufficient planning. It recommended developing an effective communication mechanism for ground-level feedback during project planning.

Point 3: Revision of Guidelines on TVUs for LHS Construction

Audit Observation:

Guidelines on TVUs for LHS construction remained on paper, and the Committee recommended revisiting and reframing these guidelines with a clear action plan.

Railways' Reply:

The Railways responded evasively, and no details on actions taken were provided.

PAC Recommendation:

The Committee insisted on revisiting and reframing guidelines, considering the sanctions for LHS construction in violation of Railway Board guidelines. It expected information on actions taken regarding non-compliance.

Point 4: Water Accumulation in LHS

Audit Observation:

Audit highlighted water accumulation issues in numerous LHS, emphasizing poor pre-feasibility studies. It noted accidents and the Ministry's silence on expenses incurred for LC No. 51.

Railways' Reply:

The Railways defended construction processes but offered no details on actions taken in the mentioned cases.

PAC Recommendation:

The Committee recommended fixing responsibility for poor pre-feasibility studies, emphasizing the need for revisiting design phases. It demanded information on actions taken for water accumulation and drainage issues.

Point 5: Responsibility for Maintenance of LHS

Audit Observation:

State Governments' responsibilities, as per 2012 directives, remained unfulfilled, leading to Railway expenditure on maintenance. Lack of clarity on the State Government's role was noted.

Railways' Reply:

The Railways expressed displeasure over State Governments' lack of interest but provided no details on actions taken.

PAC Recommendation:

The Committee recommended revisiting responsibilities and engaging State Governments in cooperative federalism. It sought clarification on the lack of response and urged assigning a designated officer for maintenance.

Point 6: Accidents at LCs with LHS

Audit Observation:

The Audit reported accidents at LCs with LHS due to non-barricading and incomplete construction. The Railways' reply contradicted the RPF report.

Railways' Reply:

The Railways' response contradicted the RPF report, leading to a lack of clarity on the circumstances of accidents.

PAC Recommendation:

The Committee expressed displeasure over the Railway's casual response, emphasizing the importance of human life. It recommended fixing responsibility and sought a detailed explanation of the RPF report.

Point 7: Delay in LHS Construction and Monitoring of Barricaded LCs

Audit Observation:

Audit noted a delay of more than eight months in LHS construction at LC no. BK-12 and emphasized the importance of monitoring barricaded LCs.

Railways' Reply:

The Railways justified penalizing contractors but provided no details on actions against railway officers.

PAC Recommendation:

The Committee questioned the efficacy of penalizing contractors and recommended identifying senior railway officers responsible for delays. It stressed the need for a monitoring mechanism for barricaded LCs



Limited Height Subway



Road Under Bridge



Manned Level Crossing

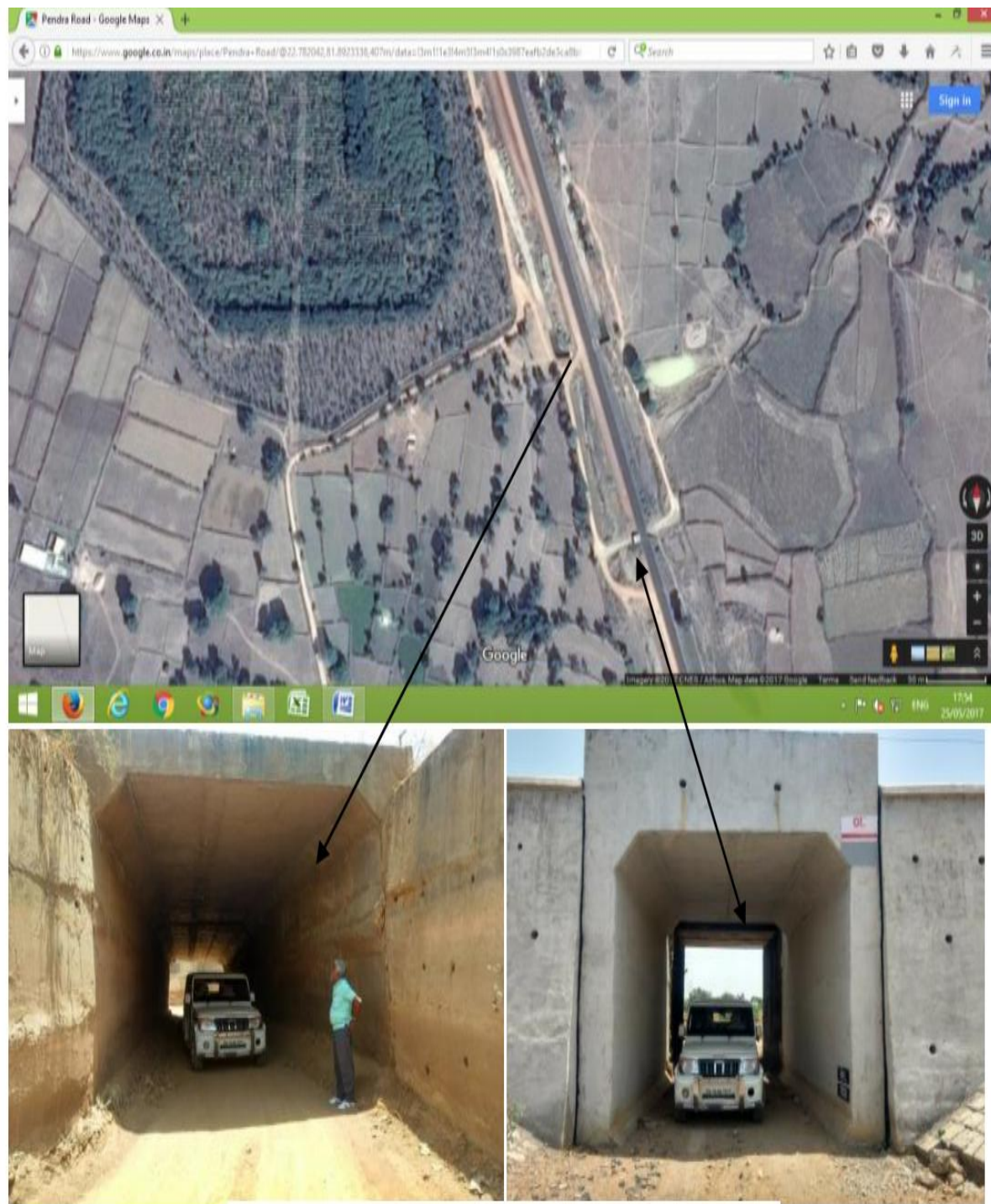


Unmanned Level Crossing

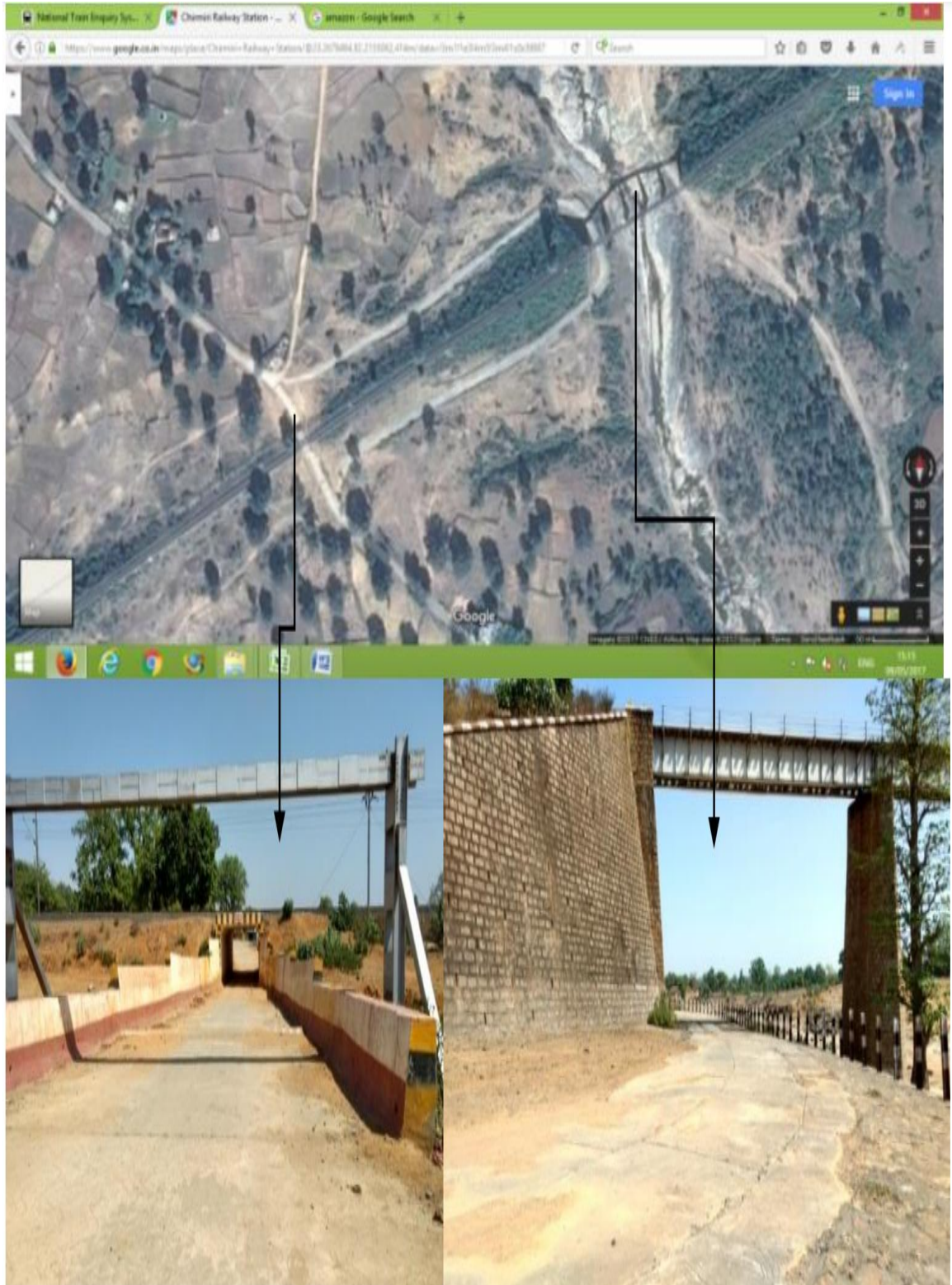
Abbreviations

LC	Level Crossing
LHS	Limited Height Subway
NHS	Normal Height Subway
PAC	Public Accounts Committee
ROB	Road Over Bridge
RUB	Road Under Bridge
SECR	South East Central Railway
SOP	Standard Operating Procedure
TVU	Train Vehicle Units
UMLC	Unmanned Level Crossing

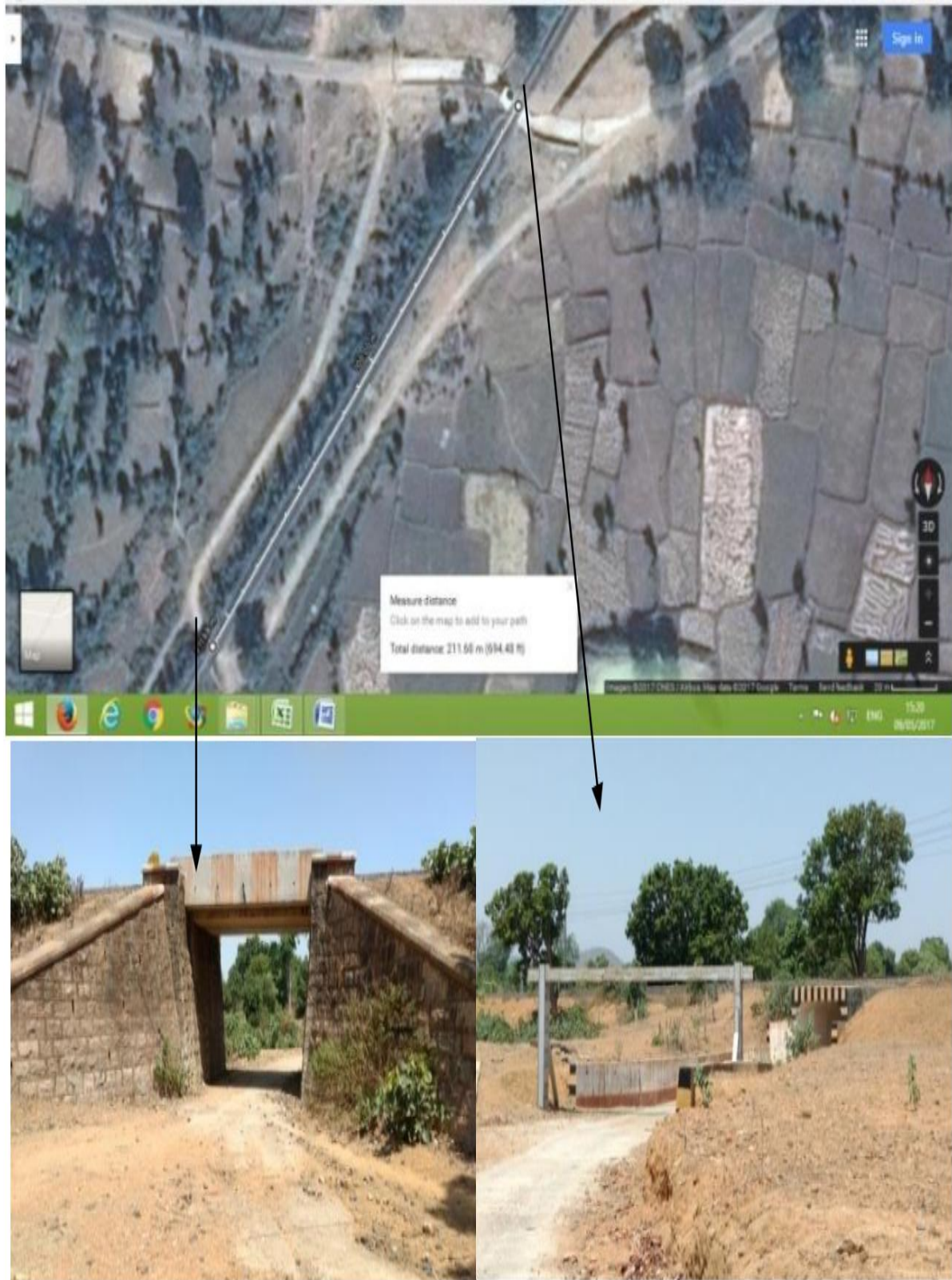
Annexure-III



Clockwise – Satellite image of BK-39, RUB and LHS



Clockwise - Satellite image of LHS at LC No. AB-23, RUB and LHS



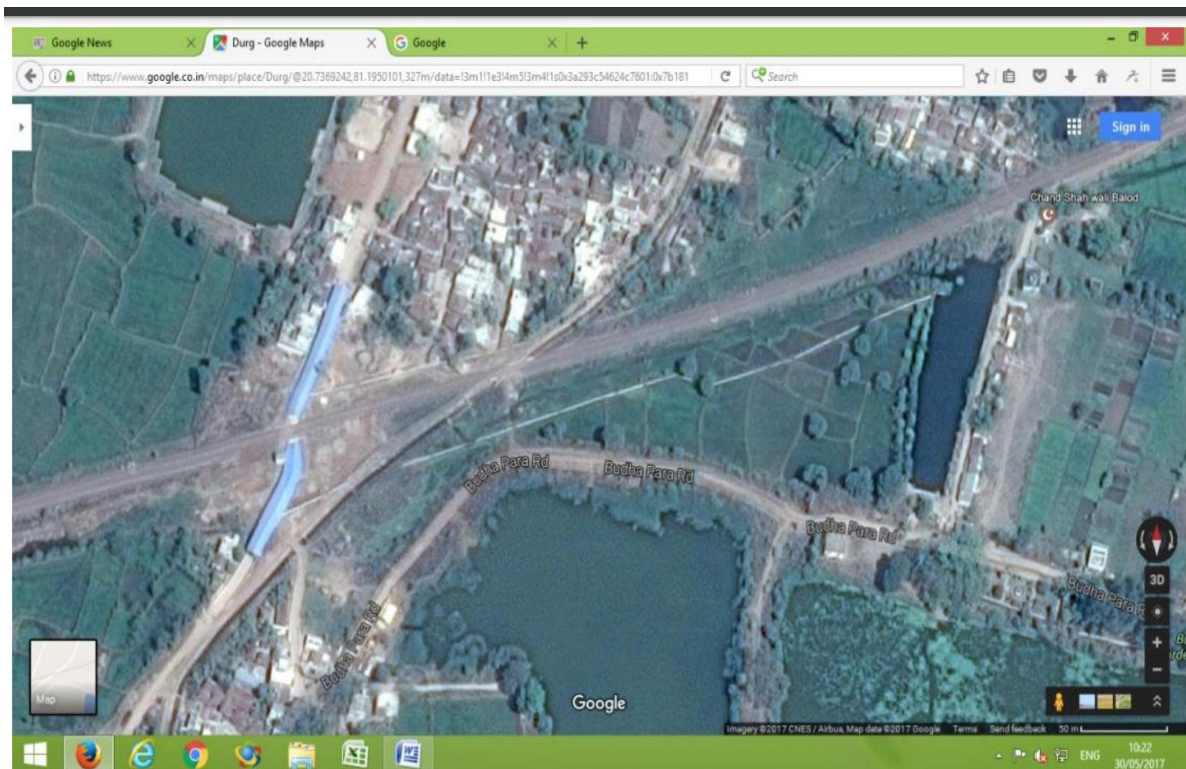
Clockwise - Satellite image of LHS at LC No. AB-25, LHS and diversion RUB



LHS at LC No. AB-24 and diversion RUB



LHS at LC No. AB-35, LHS and diversion RUB



Three ponds in the vicinity of the LHS



Accumulation of water in LHS due to incorrect assessment of drainage



LHS no. CG-7 in Bilaspur Division was full of water even during hot, dry summer season (April 2017)



Clockwise - LHS 295 (Dongha Dhakel-Raigarh), LHS 286 (Bhikharimal-Raigarh) and LHS 294 (Parsada-Raigarh) has Water accumulation with mud; and LHS GCF-49 full of water up to the brink-looking like swimming pool and could not be commissioned due to water logging

Annexure-IV

List of Zonal Railways in India

Sl. No	Zonal Name	Abbr.	Headquarters	Divisions
1.	Central	CR	Mumbai	Mumbai, Bhusawal, Pune, Solapur, Nagpur
2.	East Central	ECR	Hajipur	Danapur, Dhanbad, Mughalsarai, Samastipur, Sonpur
3.	East Coast	ECoR	Bhubaneswar	Khurda Road, Sambalpur, Visakhapatnam
4.	Eastern	ER	Kolkata	Howrah, Sealdah, Asansol, Malda
5.	North Central	NCR	Allahabad	Allahabad, Agra, Jhansi
6.	North Eastern	NER	Gorakhpur	Izzatnagar, Lucknow, Varanasi
7.	North Western	NWR	Jaipur	Jaipur, Ajmer, Bikaner, Jodhpur
8.	Northeast Frontier	NFR	Guwahati	Alipurduar, Katihar, Lumding, Rangia, Tinsukia
9.	Northern	NR	Delhi	Delhi, Ambala, Firozpur, Lucknow, Moradabad
10.	South Central	SCR	Secunderabad	Secunderabad, Hyderabad, Guntakal, Guntur, Nanded, Vijayawada
11.	South East Central	SECR	Bilaspur	Bilaspur, Raipur, Nagpur
12.	South Eastern	SER	Kolkata	Adra, Chakradharpur, Kharagpur, Ranchi
13.	South Western	SWR	Hubli	Hubli, Bangalore, Mysore
14.	Southern	SR	Chennai	Chennai, Madurai, Palakkad, Salem, Tiruchchirapalli, Thiruvananthapuram
15.	West Central	WCR	Jabalpur	Jabalpur, Bhopal, Kota
16.	Western	WR	Mumbai	Mumbai Central, Ratlam, Ahmedabad, Rajkot, Bhavnagar, Vadodara

Slide 1



Indian Audit & Accounts Department

Case Study On Construction and Utilization of Limited Height Subway

Prepared by:
Regional Capacity Building and Knowledge Institute
Kolkata
Website: <https://cag.gov.in/rti/kolkata/en>
December 2023

Slide 2

Introduction

- **Case Study Source:**
 - Adapted from Paragraph 3.1 in C&AG's Compliance Report No. 19 of 2019 on Union Government (Railways).
 - **Key Metric: Train Vehicle Unit (TVU)**
 - Definition: Product of trains and vehicles at a rail-road junction in a 24-hour period.
 - **Focus on Railway Safety and Efficiency:**
 - Importance of Level Crossings (LCs) for traffic regulation.
 - Challenges in ensuring safety for rail and road users.
 - Exploration of Limited Height Subways (LHS) as safety solutions.
 - Examination of LHS implementation, construction, challenges, and SECR audit outcomes.
 - **RUB vs. LHS:**
 - Distinction between Road Under Bridge (RUB) and Limited Height Subway (LHS).
 - RUBs: Height > 5.0 meters, accommodates all vehicles.
 - LHS: Height 2.5 to 3.5 meters, width 4.0 meters, designed for small vehicles, two-wheelers, and pedestrians (Annexure-I).
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Slide 3

Background

- **Background on Level Crossings (LCs):**
 - Vital for traffic regulation.
 - Significantly challenge train operations' safety.
 - **Safety Concerns and Vision 2020:**
 - Unmanned Level Crossings (UMLCs) contribute to 70% of railway fatalities.
 - Indian Railways' Vision 2020 emphasizes addressing LC vulnerabilities urgently.
 - **Directive for Limited Height Subways (LHS):**
 - Railway Board's November 2006 directives to phase out LCs.
 - Introduction of Limited Height Subways (LHS) as a safety solution.
 - **Characteristics of LHS:**
 - Restricted height for accommodating light vehicles and two-wheelers.
 - Cost-effective safety solution.
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Slide 4

Background...contd.

- **Responsibility and Approval Process:**
 - Zonal Railways tasked with identifying suitable LCs.
 - Personal endorsement by General Manager, especially at critical locations.
 - **Criteria for LHS Location Selection:**
 - **Safety:** Identifying accident-prone LC locations with poor visibility.
 - **Operational Benefits:** Targeting locations for significant operational advantages.
 - **Feasibility:** Focusing on sites with adequate embankment height (3 meters), low water table, and viable approach road.
 - **TVUs:** Selecting locations with low Train Vehicle Units (TVUs), suitable for manned operation.
 - **Implementation by SECR:**
 - SECR constructed 159 LHS across Bilaspur, Nagpur, and Raipur Divisions (2011-2016).
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Slide 5

Background...contd.

- **Scope of Audit:**
 - **Authority Source:**
 - Authority derived from Section 13 of the C&AG's (DPC) Act, 1971.
 - **Audit Focus:**
 - Covers all expenditure from the Consolidated Fund of India, States, and Union territories with Legislative Assemblies.
 - Ensures legality, availability, and appropriateness of disbursed funds.
 - Verifies transactions related to Contingency Funds and Public Accounts.
 - Audits trading, manufacturing, profit and loss accounts, and balance sheets in Union or State departments.
 - **Audit Principles and Methodologies:**
 - Auditing Standards and Regulations on Audit and Accounts issued by the C&AG guide the audit process.

Slide 6

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Background...contd.

Audit objectives:

- **Compliance and Justification:**
 - Evaluate adherence to Railway Board guidelines in LHS construction.
 - Assess adequacy of justifications for selected LHS locations.
- **Drainage System Adequacy:**
 - Examine presence of effective drainage systems at LHS to prevent water accumulation, especially during the rainy season.
- **Utilization and Safety Impact:**
 - Evaluate effective utilization of constructed LHS.
 - Assess contribution of LHS to accident reduction and overall safety enhancement.
- **Maintenance Responsibilities and Commitments:**
 - Review existence of clear agreements between Railways and State Governments on LHS maintenance.
 - Verify fulfillment of commitments by State Governments.
- **Lapses Impacting Safety:**
 - Investigate whether lapses in construction, maintenance, or operation contributed to accidents near or at LHS locations.

Slide-7

Main Story

Shortcomings and lapses in the construction, feasibility assessment, and maintenance of LHS by SECR as detailed below:

- **1. Justification for construction of LHS:**

- **a. Construction at LCs with Very Low TVUs:**

- SECR constructed seven LHS at a cost of ₹10.92 crore with TVUs ranging from 68 to 321, deviating from Railway Board directives.
- SECR justified actions by claiming no specific guidelines on minimum TVUs for LHS construction.
- Railway Board had directed closing LCs with very low TVUs, typically under 500, in September 2011.

- **b. Construction at Places with Existing Diversion Roads:**

- LHS constructed at LC no. BK-39, where a diversion RUB existed 134 meters away, leading to waterlogging issues.
- Instances at LC nos. AB-23, AB-24, AB-25, and AB-35 questioned the justification for LHS construction near existing diversion RUBs.
- Audit findings highlighted short distances between diverted RUBs and closed LCs, raising concerns about the necessity of LHS construction.

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Main Story... contd.

- **2. Challenges Post LHS Construction:**

- Persistent issues despite Railway Board directives on embankment height and waterproofing arrangements for LHS.
- 11 out of 18 jointly inspected LHS faced non-gravitational drainage concerns, leading to water stagnation.
- Seven LHS lacked complete drainage systems, resulting in persistent water accumulation, particularly during the rainy season.
- Water accumulation problems identified in 39 LHS of Nagpur Division, 11 in Bilaspur Division, and seven in Raipur Division.
- Many LHS faced waterlogging, leading to closures for a significant portion of the year.

- **3. Agreements with State Government for LHS Maintenance:**

- Railway Board directives in April 2012 for Zonal Railways to construct subways on a cost-sharing basis with State Governments.
 - SECR sought to withdraw the maintenance condition in May 2014, leading to incurred maintenance costs due to faulty LHS construction.
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Main Story... contd.

- Dewatering for seven LHS outsourced to zonal contractors in Bilaspur and Raipur Divisions, with Nagpur Division spending ₹25.35 lakh.
- A re-evaluation of roles and responsibilities between Railways and State Governments is crucial for clarity and proactive engagement.
- **4. Accidents at LCs where LHS could not be used:**
 - Improper barricading at LC no. 286 on December 6, 2016, despite closure, revealed during a joint inspection on December 7, 2016.
 - An accident on September 13, 2016, attributed to heavy rainfall flooded the LHS.
 - Another accident on May 22, 2014, at LC no. BK-12 noted incomplete LHS construction, contrary to the scheduled completion date of September 11, 2013

Slide 10

Assignment Questions

- What were the primary safety concerns associated with unmanned level crossings (UMLCs) in the Indian Railways system? How did Indian Railways address these concerns?
 - Describe the criteria used by Indian Railways for selecting locations for Limited Height Subways (LHS). How were these criteria intended to enhance safety and operational efficiency?
 - Analyse the challenges faced by the Railways Administration during the construction of Limited Height Subways (LHS). How did these challenges impact safety and operational effectiveness?
 - Explain the rationale behind constructing Limited Height Subways (LHS) in locations with low Train Vehicle Units (TVUs), despite prescribed norms suggesting elimination of such LCs.
 - What were the challenges and concerns related to maintenance agreements with State Governments for Limited Height Subways (LHS)?
 - Based on the case study, identify three key learning objectives related to infrastructure project planning and execution in the context of railway safety.
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What happened subsequently

- **Point 1: Construction of LHS at Low TVUs**
 - **Audit Observation:**
 - SECR constructed seven LHS in areas with TVUs ranging from 68 to 321, contrary to the norm of TVU exceeding 500.
 - **Railways' Reply:**
 - SECR claimed no guidelines for LHS construction, despite a clear directive issued by Railways in 2011.
 - **PAC Observation:**
 - Committee deprecates Railway Board's failure to monitor guidelines, seeks explanation and actions against responsible officials.
 - **Point 2: Lack of Consultation with District Administration**
 - **Audit Observation:**
 - LCs closed, and LHS constructed without district administration consultation, leading to public protests.
 - **Railways' Reply:**
 - Acknowledges protests but provides no details on bypassing local consultations.
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What happened subsequently

- **Point 1: Construction of LHS at Low TVUs**
 - **Audit Observation:**
 - SECR constructed seven LHS in areas with TVUs ranging from 68 to 321, contrary to the norm of TVU exceeding 500.
 - **Railways' Reply:**
 - SECR claimed no guidelines for LHS construction, despite a clear directive issued by Railways in 2011.
 - **PAC Observation:**
 - Committee deprecates Railway Board's failure to monitor guidelines, seeks explanation and actions against responsible officials.
 - **Point 2: Lack of Consultation with District Administration**
 - **Audit Observation:**
 - LCs closed, and LHS constructed without district administration consultation, leading to public protests.
 - **Railways' Reply:**
 - Acknowledges protests but provides no details on bypassing local consultations.
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What happened subsequently

- **Point 1: Construction of LHS at Low TVUs**
 - **Audit Observation:**
 - SECR constructed seven LHS in areas with TVUs ranging from 68 to 321, contrary to the norm of TVU exceeding 500.
 - **Railways' Reply:**
 - SECR claimed no guidelines for LHS construction, despite a clear directive issued by Railways in 2011.
 - **PAC Observation:**
 - Committee deprecates Railway Board's failure to monitor guidelines, seeks explanation and actions against responsible officials.
 - **Point 2: Lack of Consultation with District Administration**
 - **Audit Observation:**
 - LCs closed, and LHS constructed without district administration consultation, leading to public protests.
 - **Railways' Reply:**
 - Acknowledges protests but provides no details on bypassing local consultations.
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What happened subsequently...Contd.

- Railways' reply contradicts RPF report.
 - **Railways' Reply:**
 - Response contradicts RPF report, lacks clarity on accident circumstances.
 - **PAC Observation:**
 - Committee expresses displeasure, recommends fixing responsibility, seeks detailed explanation on RPF report.
 - **Point 7: Delay in LHS Construction and Monitoring of Barricaded LCs**
 - **Audit Observation:**
 - Notes a delay of over eight months in LHS construction at LC no. BK-12, emphasizes monitoring barricaded LCs.
 - **Railways' Reply:**
 - Justifies penalizing contractors, provides no details on actions against railway officers.
 - **PAC Observation:**
 - Committee questions efficacy of penalizing contractors, recommends identifying responsible senior officers, stresses need for monitoring mechanism for barricaded LCs
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Thank You
