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Road Maintenance Project Dhan Khola-Lamahi Road Section, 40Km

“Pavement FDR design and Superpave Implementation”

Date: 15 April 2024

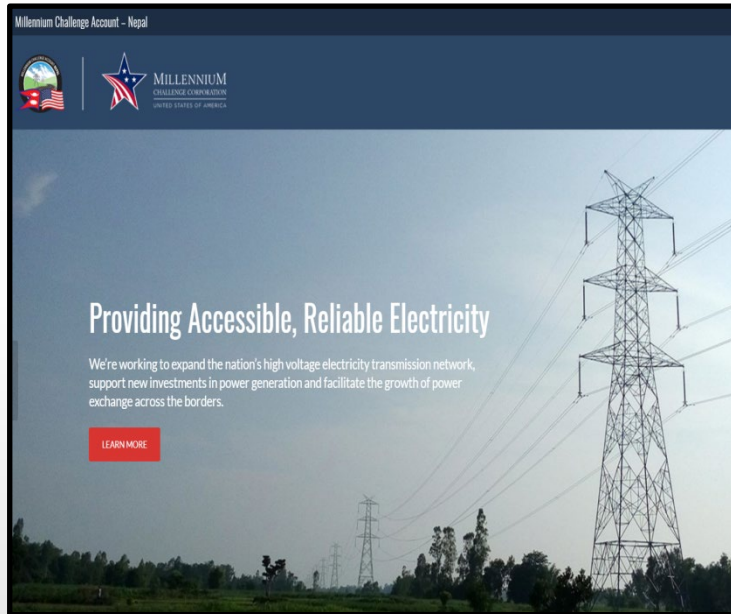


Overview of MCA-Nepal Compact

MCA-Nepal Compact consists of Two Projects

Electricity Transmission Project (ETP)

Road Maintenance Project (RMP)



- 300 km of 400 kv electric transmission lines
- Three substations
- Technical Assistance (TA) to Nepal Electricity Authority and Electricity Regulatory Committee

- A \$500M Compact, with a \$197M government contribution, for a combined program total of \$697M
- RMP \$52M

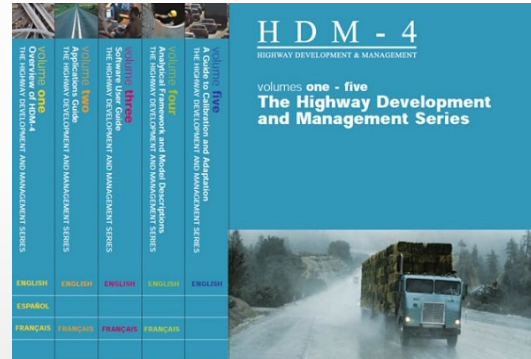


- Up to 130 km of Enhanced Road Maintenance
- Technical Assistance (TA) to Department of Roads and Roads Board Nepal

Road Maintenance Project (RMP)

➤ Project components

Technical Assistance



- Pavement Preservation and Rehabilitation Manual
- Improved road maintenance system
- Increased funding for road maintenance
- Integration of New Pavement Technologies in Nepal
- Road Safety Campaign

Matching funds for maintenance works



- Sub-Activity 01 new pavement recycling technologies introduction FDR and Superpave
- Sub-Activity 02 periodic road maintenance with the introduction of Asphalt milling technology



Road Maintenance Project (RMP)

➤ New Technology Introduction

FDR + Resurfacing (Superpave)

When there is a need for additional structural strength
Reduces deterioration rate and therefore transportation cost

DHAN KHOLA LAMAHI ROAD

Milling + Resurfacing (Superpave)

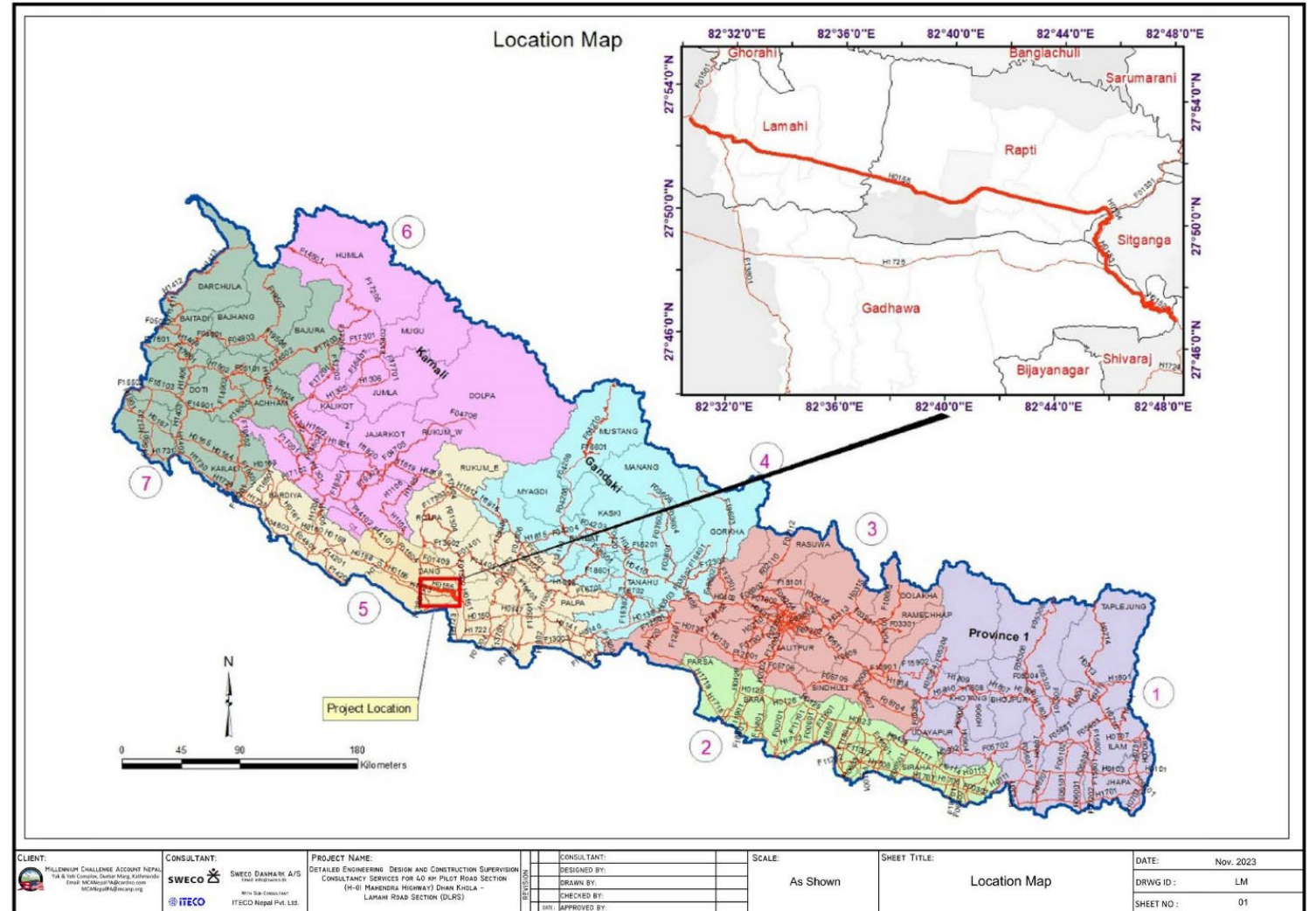
When there is only a need to improve driving comfort
Reduces transportation cost

CANDIDATE ROADS UNDER DUE DILIGENCE



Project Definition/Scope

- Dhan Khola Lamahi Road Section (DLRS) lies in Dang and Arghakhanchi districts of Lumbini Province
- Project road starts from Dhan Khola Bridge and ends at Arjun Khola near Lamahi Junction (way to Ghorahi)
- Project starting point is 345 km from Kathmandu, and 110 km from Sunwal border with India





Project Definition/Scope

- RMP Objective: Maintain road quality of SRN by using new technology for pavement strengthening such as FDR and Superpave in Nepal including improved traffic safety
- Dhan Khola Lamahi Road Section (DLRS) constructed in 1985, resurfacing (Double Bituminous Surface Treatment (DBST)/Bituminous carpeting) has been conducted thereafter
- International Road Assessment Programme (iRAP) recommendation: Countermeasures to improve safety “Star” rating to at least a 3-Star or higher
- Recommended road width: International Road Assessment Programme (iRAP) assessment and DOR geometric standard for Highway- 7m carriageway with 2.5m shoulders
- Improves roughness (Key performance indicator): The target International Roughness Index (IRI) is 1.2 to 1.7 m/km



Key Elements of ToR

- **Roughness**

International Roughness Index (IRI) measured on outer wheel path from Dhan Khola to Lamahi 8.75 m/km and Lamahi to Dhan Khola 8.89 m/km

Target IRI is 1.2 to 1.7 m/km

- **Distress**

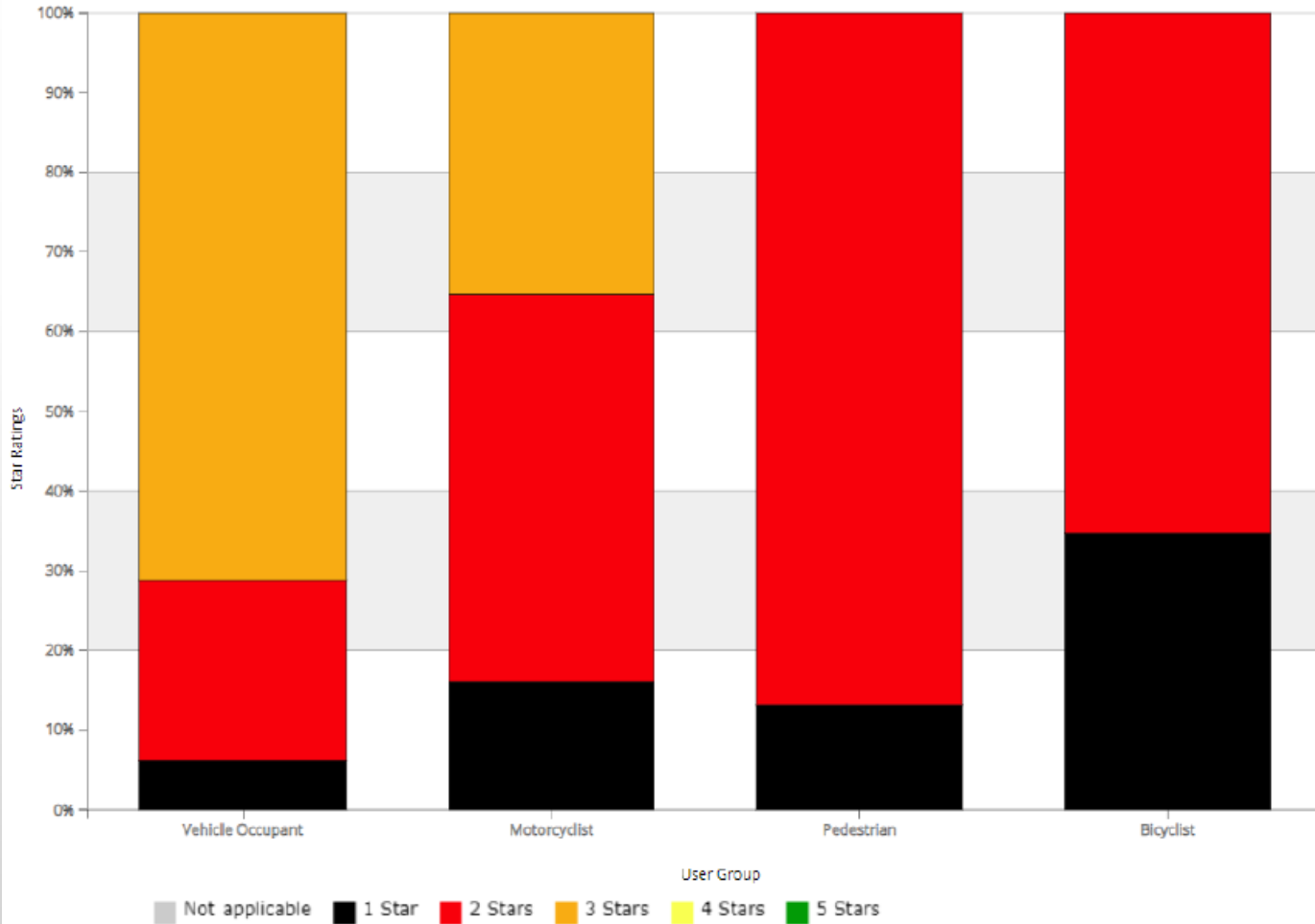
The main distresses observed are alligator cracking, disintegration and potholes

Edge Cracking	Alligator Cracking	Disintegration	Potholes	Patching	Bleeding
2.5 per km	25%	14.9 per km	10.6 per km	16.8 per km	4%



Key Elements of ToR

- iRAP Assessment of DLRS



Dhankhola - Lamahi road is currently rated at **1, 2 and 3 stars**

Target **iRAP** countermeasure is to upgrade the road to **3 stars**

Average Annual Daily Traffic (AADT) was 5,436 vehicles per day in 2022 according to the DoR



Key Elements of ToR

iRAP Countermeasures Adapted

- Widening to be limited to two locations only at Bhalubang and Lamahi Bazar
- Improve minor intersections
- Improve all the major intersections
- Provide kerb-stones for segregated sidewalks along the ribbon development of the Road
- Provide curvature improvements
- Provide WCLT along the Dhan Khola- Bhalubang section and five semi-urban areas

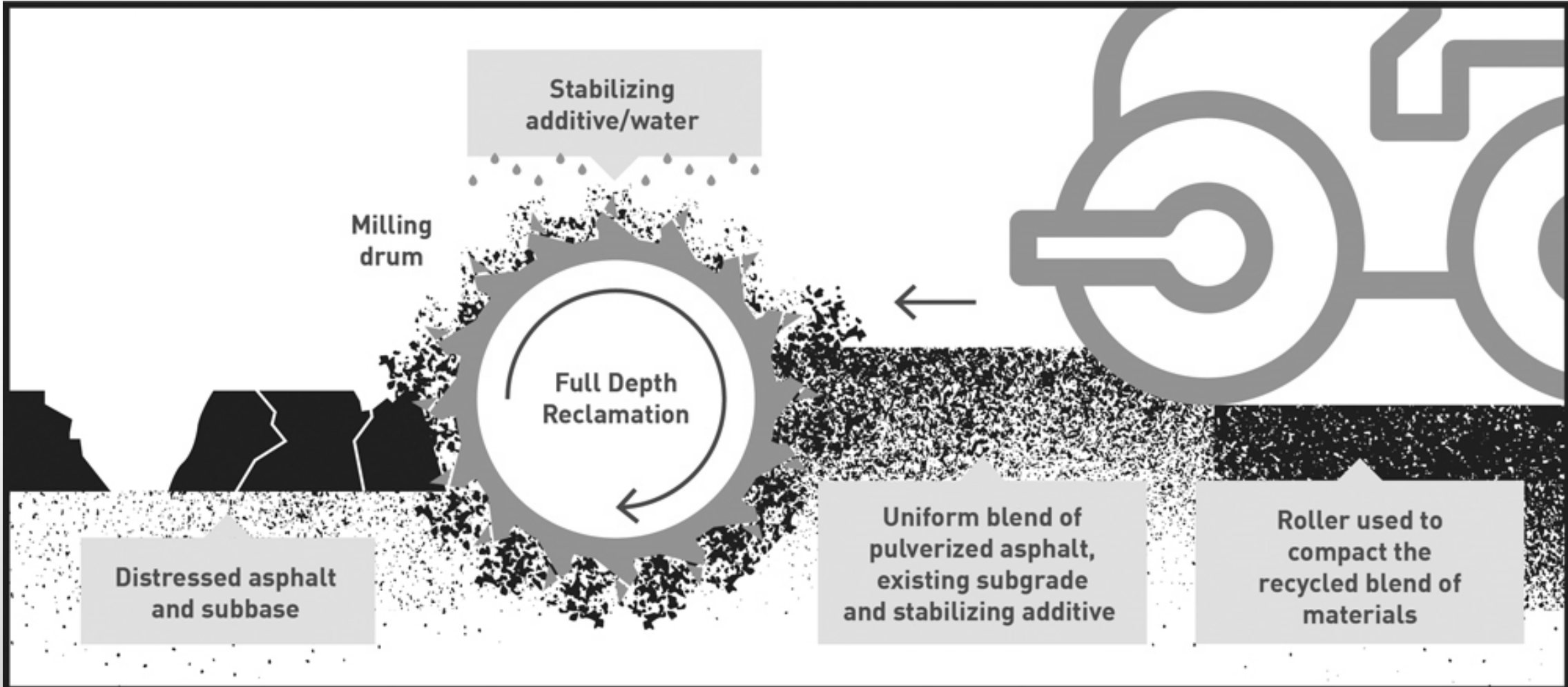


Project Implementation Arrangement

- MCA-Nepal: as the implementation agency, tasked with implementing and monitoring both civil works and environmental and social mitigation measures
- MCC: will provide oversight and support to MCA-Nepal throughout the project's implementation
- Department of Roads (DoR): will oversee the design and implementation of the works and will ultimately take charge of the road upon its completion. Further DoR will continue FDR projects because of cost effectiveness and durability
- Supervising Consultant Engineer: will supervise the works and the environmental and social mitigation measures; they report to MCA-Nepal
- Contractor: performs all construction activities, including environmental and social safeguards
- Once the Defect Notification Period (DNP) is concluded, the road section will be transferred to the Department of Roads



Specific Construction Measures or Technologies



Full Depth Reclamation Process



Specific Construction Measures or Technologies

Simulates ageing in the laboratory

Simulates real compaction efforts to assess compactibility

1

3

Superpave

=

Superior Performing Asphalt Pavement

**Superpave Process
(replaces Marshall Method to improve pavement performance over life cycle)**

2

4

Accounts for traffic loading and environmental conditions

Accounts for rutting and cracking



Specific Construction Measures or Technologies

- **First time in Nepal: Full Depth Reclamation (FDR), an innovative and cost-effective road construction technology.**
 - involves recycling existing pavement materials;
 - process involves applying and uniformly mixing Portland or mix of cement and water, followed by compaction using padfoot, smooth drum, and/or pneumatic-tired rollers
 - followed by shaping with motor graders, and ensuring proper curing until full strength
 - Depth of pulverization is 250mm and 300mm.
 - followed by the application of two layers of Superpave asphalts.
- **First time in Nepal: Superpave**
 - Longer lasting asphalt pavement compared to normal asphalt concrete
 - Better consideration of climate, -22° to $+76^{\circ}$ C (Bitumen Grade: PG76H-22)
 - Customizable as per site





Specific Construction Measures or Technologies

FDR and Superpave - Why these technologies

➤ FDR

- ✓ Recycles and reuse
- ✓ Makes use of local binder – cement
 - Avoids import and use of Nepal product
- ✓ Produces a stronger base
- ✓ Base not sensitive to moisture fluctuations
- ✓ Can stabilize soils as well as granular materials



➤ Superpave

- ✓ Longer lasting asphalt pavements
- ✓ Further develops viscosity based specifications
- ✓ Better consideration of climate
- ✓ Balanced mix design concepts and on site performance testing



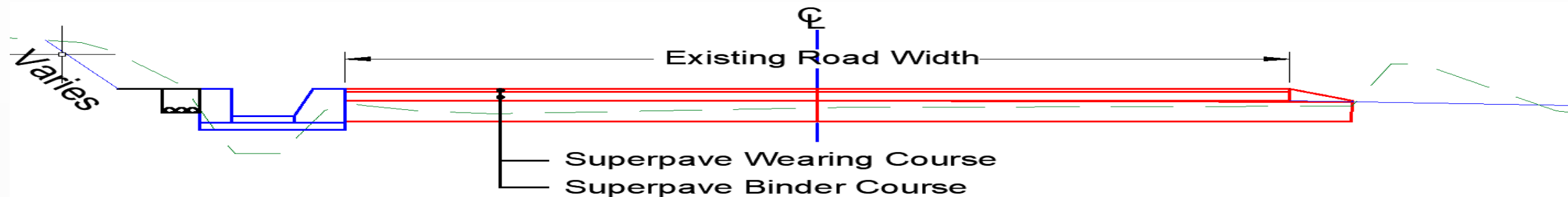


Road Design Details

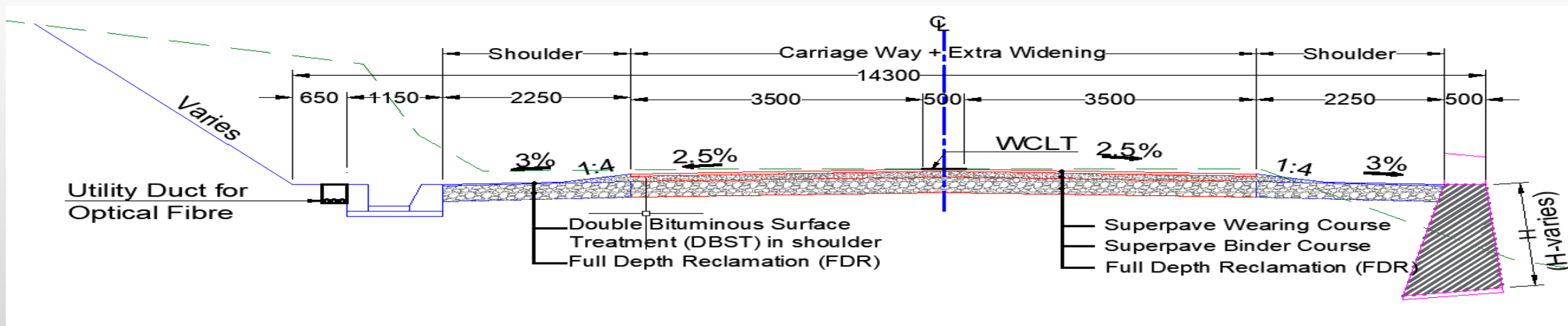
- Carriageway of 7m and shoulder width of 2.5m. In case of Wide Centre Line Treatment (WCLT) section, Shoulder width will be 2.25m
- Lane separation by providing WCLT of 0.5m to reduce head-on collision **at hilly terrain** and **5 semi-urban** areas namely Pakhapani, Pipari, Sishaniya, Narti and Bankatti
- Avoidance of extensive cutting of fragile slopes as recommended by geotechnical expert/geologist
- 2-urban areas (Bhalubang and Lamahi) proposed for service lane with medians
- Improvement of 2 major junctions at Bhaluwang and Arjun Khola. In Arjun Khola, roundabout is proposed
- Access Road Improvement: length of 15m with DBST
- Drainage improvement by means of extension, replacement and new culverts and side drains
- Improvement of road safety, road markings, barriers, rumble strips and signage
- 650mm wide space at hill side for Utility Duct for Optical Fiber Cables



Road Design Details



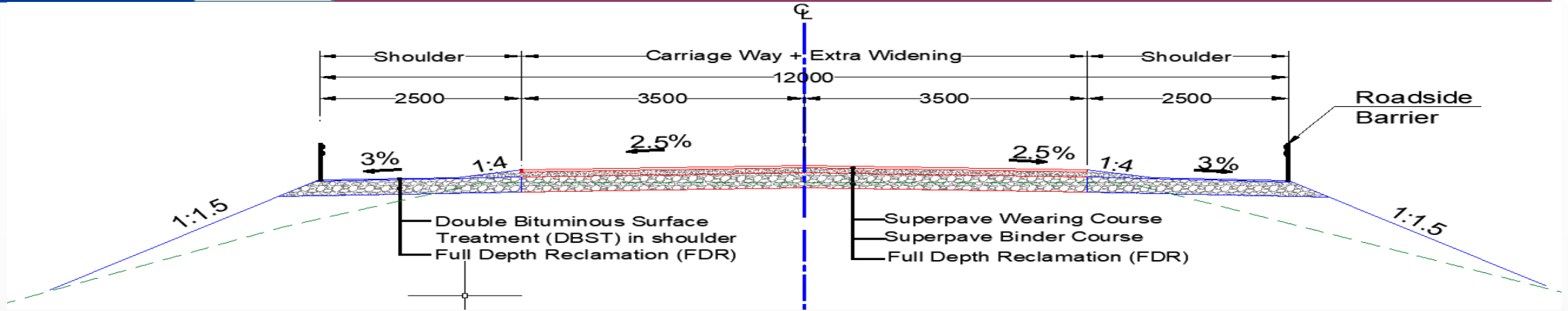
Typical X-section at Dhan Khola Bazaar Area (720m)
(From Km 676+000 to Km 676+720)



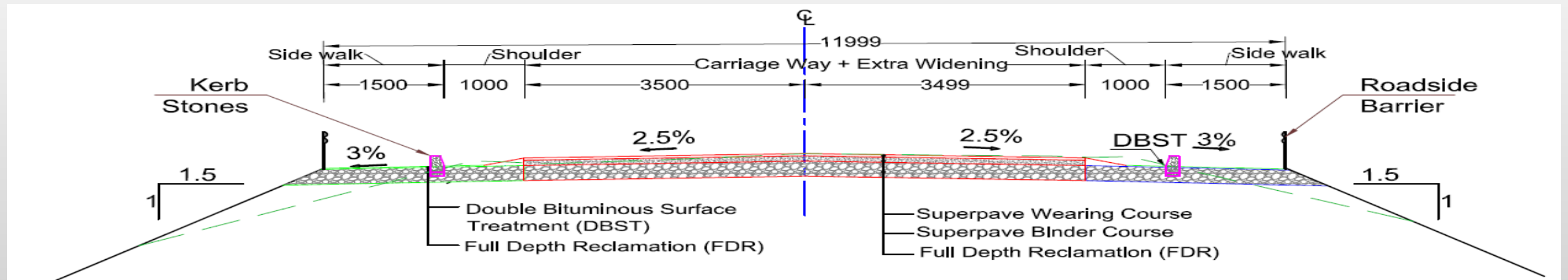
Typical X-section for hilly section with WCLT
(From Km 676+720 to Km 688+067)



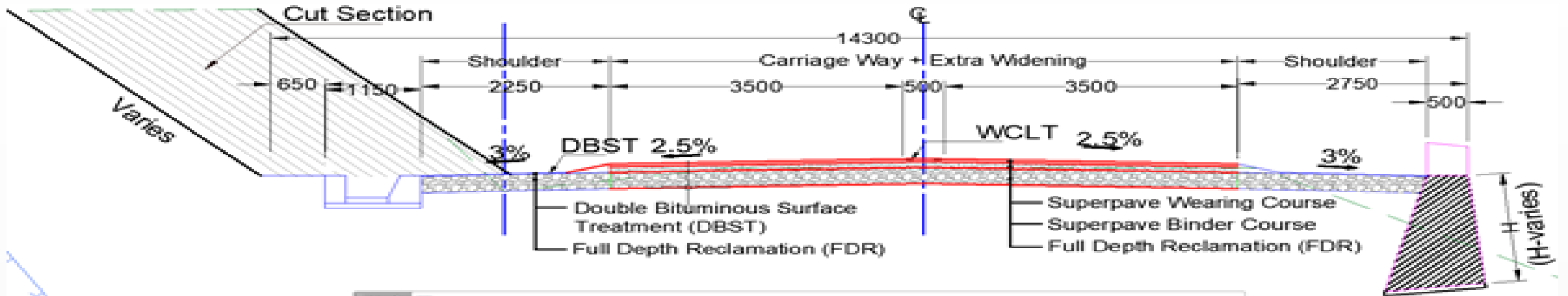
Road Design Details



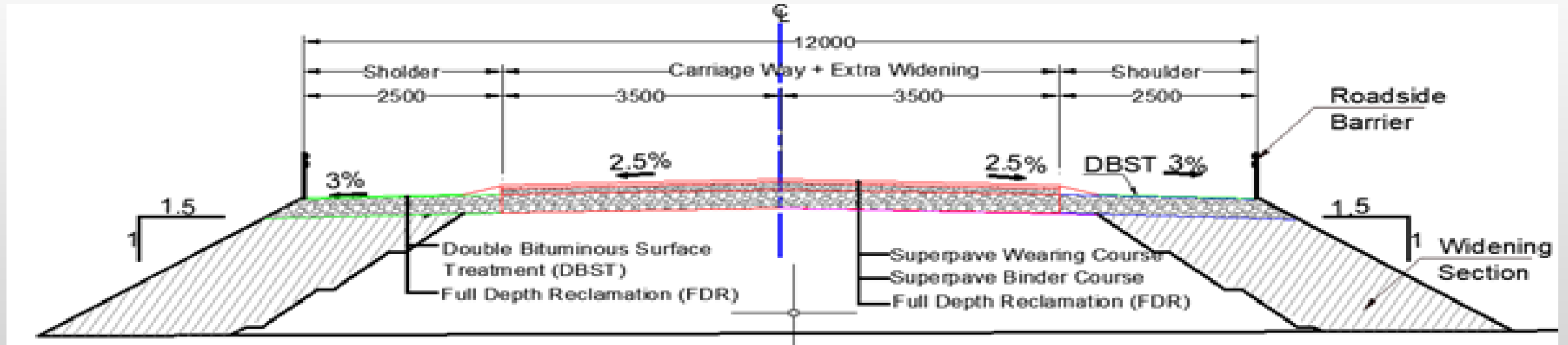
Typical X-section of plain/flat rural section- Bhalubang to Lamahi
(From Km 688+067 to Km 714+985)



Typical Section showing Provision of Sidewalk



Typical Section: Hilly Section with widening



Typical Section: Plain Rural Section with widening



Proposed 12m road width, Dhankhola-Bhalubang Section, Existing avg. road width-6m





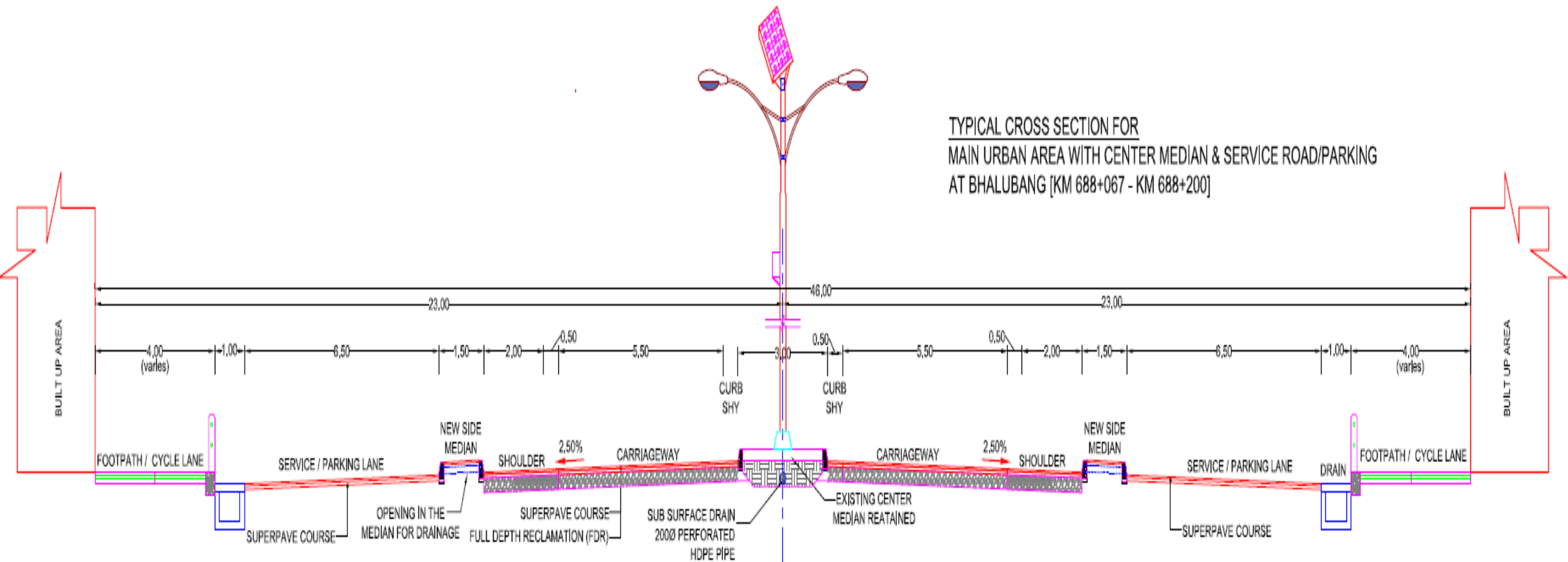
Proposed 12m road width, Bhalubang-Lamahi Section, Existing avg. road width-6m



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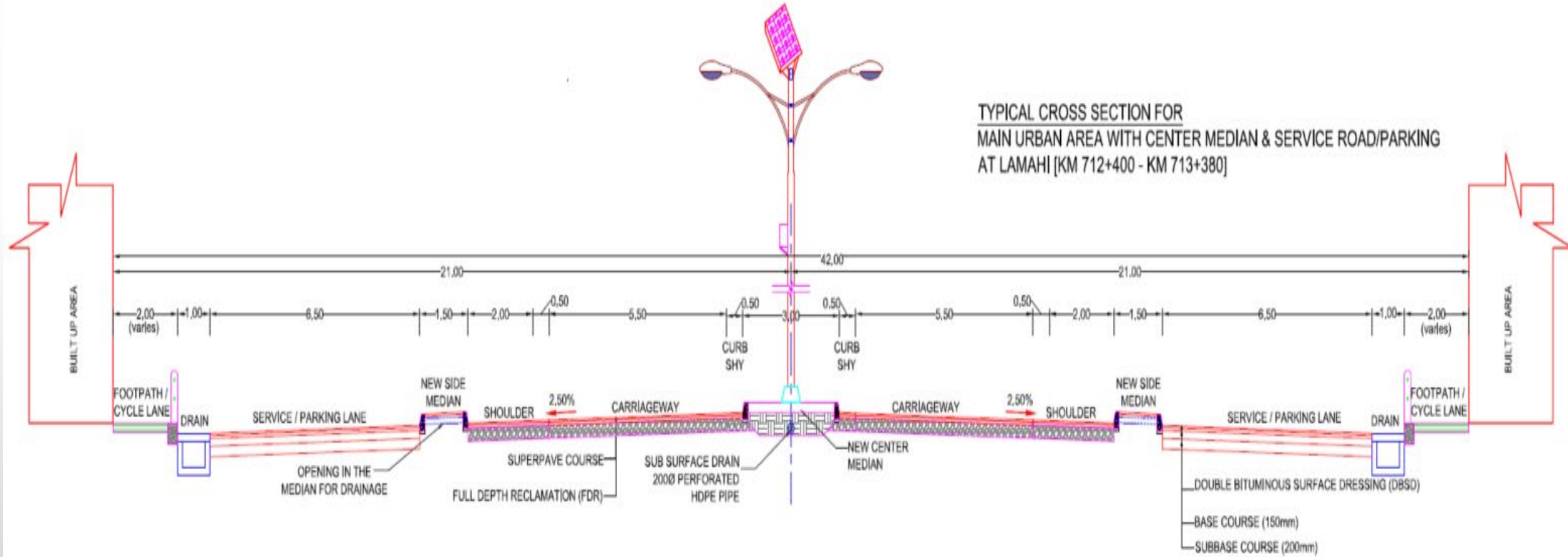
Road Design Details



Typical Section: Plain Major Urban Area at Bhalubang



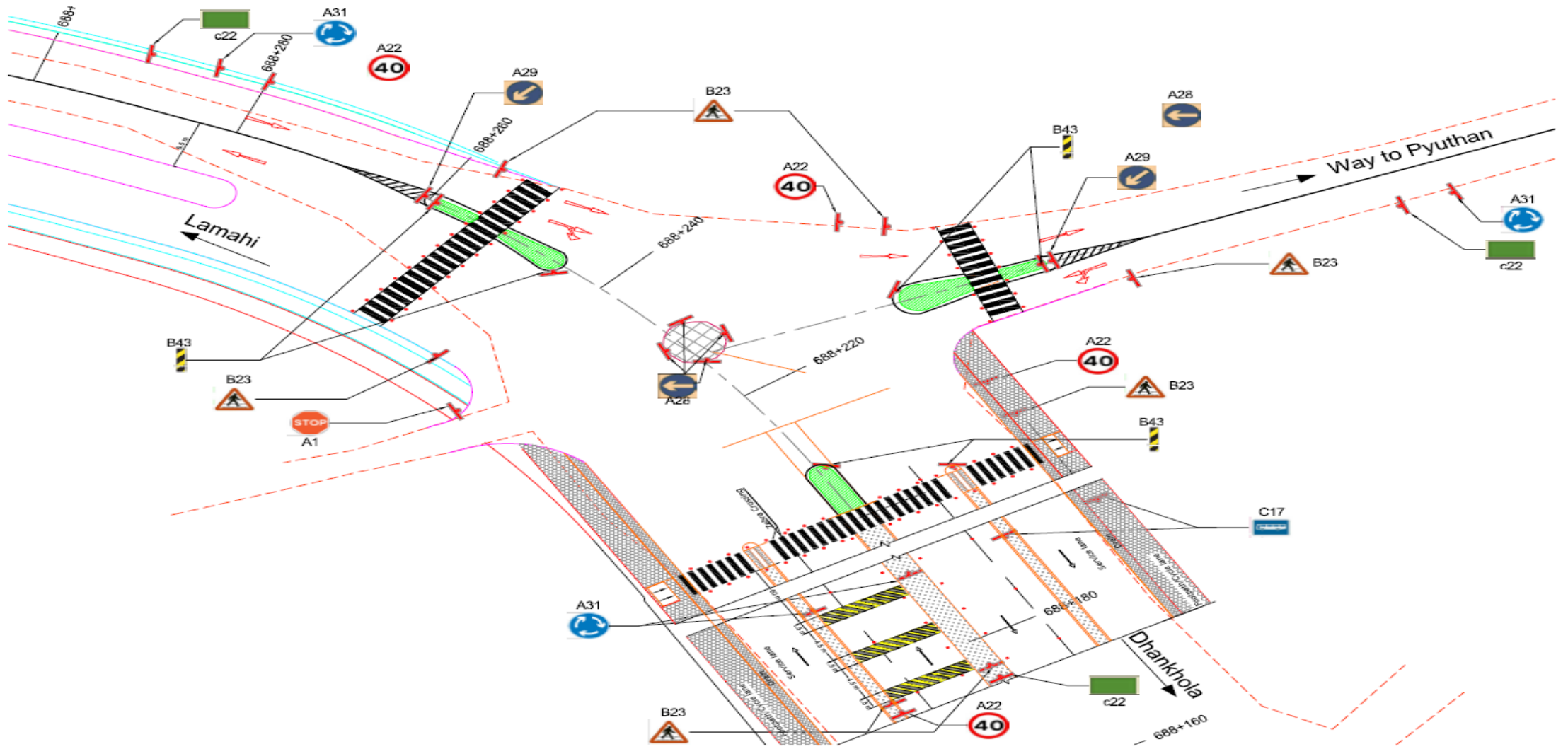
Road Design Details



Typical Section: Plain Major Urban Area at Lamahi



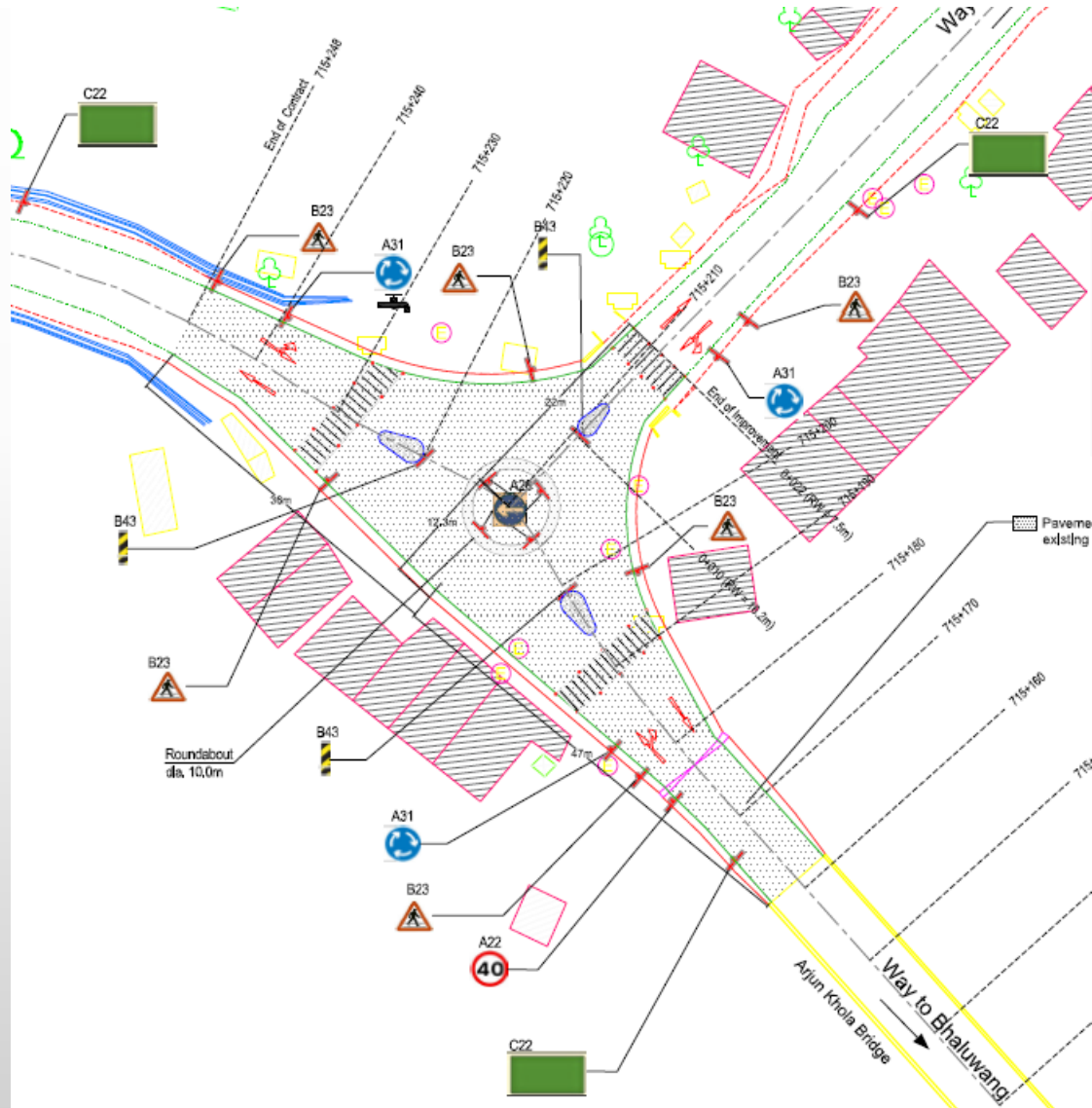
Road Design Details



Junction Improvement at Bhalubang



Road Design Details



Junction Improvement at Arjun Khola



Road Design Details



Retained	Retained and Extended. Extension usually 2 m at each side of the existing structure	To be Replaced with RCBC due to hydraulic or structural reasons	Total
6	76	6	88

Details of Slab Culvert Improvement

Retained	Retained and Extended. Extension usually 2.50 m at each side of the existing structure	To be Replaced due to hydraulic or structural reasons.		Other: Add new, rebuild, remove	Total
		PC	BC		
6	28	74	10	4	122

Details of Pipe Culvert Improvement

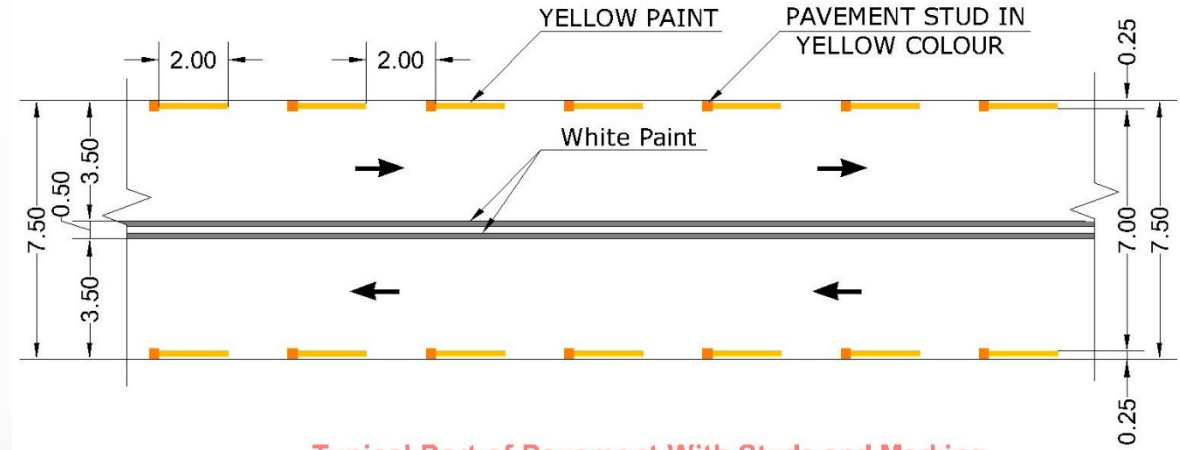
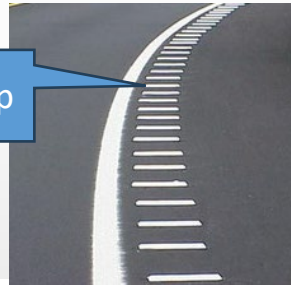


Road Design Details

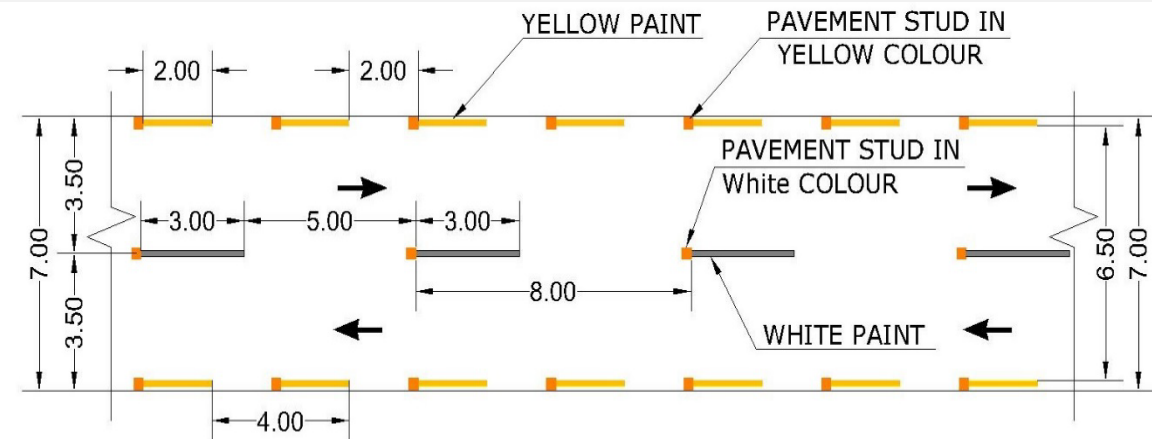
Traffic Safety

- Provision of road marking and traffic signs as per DoR Traffic Signs Manual Vol. 1 & 2
- Provision of painted rumble strip at pedestrian crossings at settlement areas
- Provision of crash barriers at sharp curves along with Chevron.
- Road studs
- Safety element at bridges

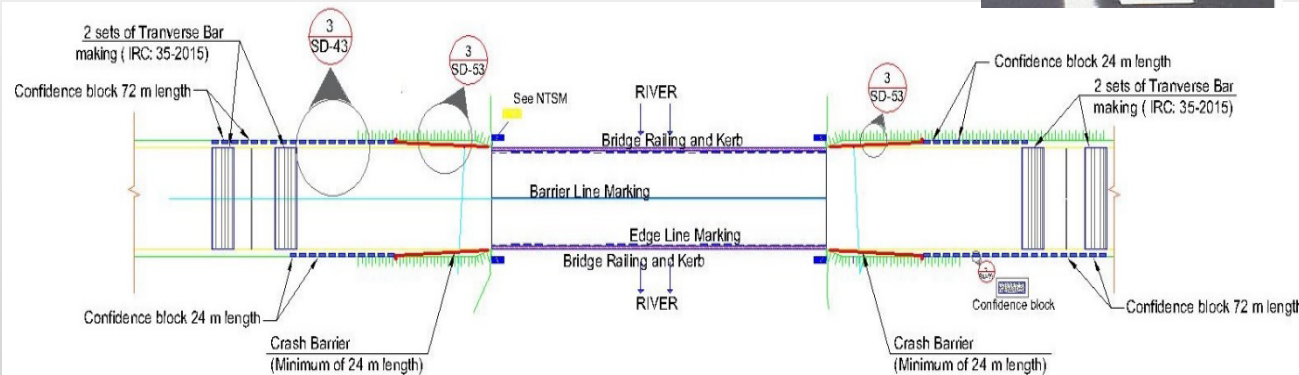
Painted rumble strip



Typical Part of Pavement With Studs and Marking
Dhankhola to Bhaluwang



Typical Part of Pavement With Studs and Marking
Bhaluwang to Lamahi



Schematic Diagram of Safety Treatment at Approach to Existing Bridges



Road Design Details

• **Repair and Maintenance of Bridges and Slab Culverts**

- No widening to 24 nos. of bridges (Avg. width is 7.0m)
- Repair and Maintenance of bridge's bearings and other elements such as railings, deck slabs, curb stones, painting, drainage spouts, expansion joints, crack sealing and provision of minor river training works
- Safety features at the approach to the bridges



Construction & Implementation Schedule

Construction Timeline

- Tendering and Procurement: 6 months
- Tendering expected to launch in July 2024
- Contracting in December 2024
- Construction Period: 24 months
- Project Monitoring and Evaluation: Defects Notification Period (DNP) 12 months

Procurement	Construction Period	DNP
6 months	24 months	12 months

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