

বাংলাদেশ



গেজেট



অতিরিক্ত সংখ্যা

কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, আগস্ট ১৬, ২০২১

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
পরিকল্পনা কমিশন  
ভৌত অবকাঠামো বিভাগ  
সড়ক পরিবহন উইং

প্রজ্ঞাপন

তারিখ: ০৭ জুলাই ২০২১

নং ২০.০৩.০০০০.৭০২.১৪.৫১৪.১৯-১১০—একই শ্রেণীর সড়ক পুনঃনির্মাণ, নতুন নির্মাণ, প্রশস্তকরণ ও মজবুতকরণের ক্ষেত্রে সংস্থা ভেদে সড়কের ডিজাইন, কাজের মান এবং ব্যয়ের বিদ্যমান তারতম্য পরিহারের লক্ষ্যে জেলা, উপজেলা ও ইউনিয়ন সড়ক, সেতু ও কালভার্টসমূহের মান (Standards) ও ব্যয় নির্ধারণ করে সরকার কর্তৃক "Road Design Standards" অনুমোদনপূর্বক ০৫ সেপ্টেম্বর ২০০৪ তারিখে গেজেটে প্রকাশ করা হয়।

২। উক্ত গেজেট অনুসরণে সড়ক ও জনপথ অধিদপ্তর (সওজ) এবং স্থানীয় সরকার প্রকৌশল অধিদপ্তর (এলজিইডি) স্ব-স্ব সংস্থার নীতিমালা অনুযায়ী তাদের আওতাধীন সড়ক নির্মাণ, পুনঃনির্মাণ, প্রশস্তকরণ ও মজবুতকরণ কার্যক্রম পরিচালনা করছে।

৩। বর্তমানে এলজিইডি'র আওতাধীন সড়কসমূহে যানবাহনের সংখ্যা এবং এক্সেল লোড পূর্বের তুলনায় বৃদ্ধি পাওয়ায় এলজিইডি'র আওতাধীন সড়কের বিদ্যমান রোড ডিজাইন হালনাগাদপূর্বক সরকার "Road Design Standards of LGED" অনুমোদন করেছে। এতদ্বারা অনুমোদিত "Road Design Standards of LGED" এলজিইডি কর্তৃক অনুসরণের জন্য জনস্বার্থে জারী করা হলো।

৪। অনুমোদিত "Road Design Standards of LGED" ০৫ সেপ্টেম্বর ২০০৪ তারিখে জারীকৃত "Road Design Standards" এর সাথে "এলজিইডি'র জন্য প্রযোজ্য" মর্মে সংযোজিত হবে।

৫। ইহা গেজেটে প্রকাশের তারিখ হতে কার্যকর বলে গণ্য হবে।

রাষ্ট্রপতির আদেশক্রমে

মীর্জা মোহাম্মদ আলী রেজা  
উপপ্রধান (উপসচিব)।

(১২৪০৭)

মূল্য: টাকা ৪৮.০০

## 1 Introduction

- 1.1 Road transportation plays a vital role in providing accessibility and mobility that contributes to the socio-economic development of a country. Bangladesh has around 3,75,000 km road network comprising National highway, Regional highway, Zila road, Upazila road, Union road, and Village road. The latter three category rural roads are developed and maintained by the Local Government Engineering Department (LGED). For the design purpose, LGED generally follows the road design standards gazette published on 5 September 2004.
- 1.2 Bangladesh's economy has made remarkable progress and economic activities have increased manifold in the last decade. Both the number and axle load of the traffic on roads have increased significantly. In some areas, Union and/or Village roads experience more axle load than Upazila roads because of rapid industrialization. Besides, due to the impact of global climate change, the variation of rainfall pattern and temperature over the years are now prominent and natural calamities like flash floods, tidal surges are more frequent in Bangladesh. In this backdrop, to support and accelerate the development pace, the upgrading of rural road design standards has been indispensable.
- 1.3 In order to upgrade the existing design standards of rural roads, LGED engaged the Bureau of Research, Testing and Consultation (BRTC) of Bangladesh University of Engineering & Technology (BUET). The composition of the BRTC, BUET team has been listed in Appendix-A. The team reviewed the existing manual, visited topographically and geographically dissimilar areas of the country, collected traffic data, measured soil's bearing capacity, conducted necessary tests, and finally after detail technical analysis submitted the upgraded standards. Subsequently, upon request of LGED, the upgraded standards were reviewed by an International Expert, Dr. John Rolt from Transport Research Laboratory (TRL), UK who is one of the writers of Overseas Road Note 31, a globally used guideline for designing roads in tropical and sub-tropical areas. Moreover, under the National Resilience Programme, the United Nations Office for Project Services (UNOPS) reviewed the standards through resilience perspective and their recommendations have been addressed accordingly.

- 1.4 The report on upgraded standards were placed to the Physical Infrastructure Division of Planning Commission through the Local Government Division under the Ministry of Local Government, Rural Development & Cooperatives (LGRD&C) for gazette notification. The standards were discussed in the Committee for Classification, Ownership, Responsibility Fixation, and Dispute Resolution of Roads under the Physical Infrastructure Division of the Planning Commission (list of committee members has been mentioned in Appendix - B). The committee conducted three meetings in this regard. Besides, the Hon'ble Minister of LGRD&C also chaired two meetings in this connection and reviewed the standards. After incorporating the decisions of different meetings, the standards were placed in the Road Design Standards Committee (list of committee members and ToR have been mentioned in Appendix - C) for recommending for gazette notification.

## 2 Summary of Issues Covered

- 2.1 The committee overviewed the design standards for new construction of all types of rural roads namely Village Road, Union Road, & Upazila Roads, and concluded that the key design criteria for all roads will be based on traffic volume, axle loads, and CBR (California Bearing Ratio) of subgrade.
- 2.2 It was agreed to consider fourteen design templates to form a logical progression in terms of road width and pavement thickness based on traffic and soil considerations. The agreed design standards will guide LGED in selecting the appropriate design of new roads following the traffic and soil data.
- 2.3 In addition to the fourteen templates, the committee recommended LGED for customized designing of roads on a case by case basis when feasible or situation demands.

## 3 Glossary

A list of technical terminology used in the standards has been listed alphabetically in Appendix - D with their definitions.

#### 4 Principle of Design Standards

- 4.1 The existing design standards were limited to a few templates considering small variations in the Commercial Vehicles per Day (CVD) and soil's bearing capacity i.e. sub-grade CBR.
- 4.2 To overcome the limitations of the existing standards and to cover all possible scenarios, the geometric and structural design of rural roads has been suggested based on the traffic volume, axle load, subgrade CBR, environment & climate change scenario.
- 4.3 The extent of the road damage caused by vehicles depends on their axle loads. The damaging intensity of axles is related to a standard axle of 8.2 tons using equivalence factors derived from empirical studies. Due to the change in traffic patterns throughout the country, the equivalence factors for different axle loads have been changed from the previous standard as mentioned in Appendix - E. The loads imposed by private cars are not significant for structural damage and therefore only the total number and axle loading of heavy vehicles that the road will experience during the design period have been considered for structural design.

#### 5 Geometric Design

- 5.1 The geometric dimensions of roads shall be sufficient enough to carry all traffic (vehicles and pedestrians) efficiently and safely. The suggested combination of carriageway widths of LGED road pavement and PCU factors for LGED road vehicles are summarized in Appendix - F. To simplify the selection of road carriageway, surveys were performed in many locations of the country and established the best possible approximation of PCU/hr and CVD.
- 5.2 The existing and recommended geometric dimensions of roads have been mentioned in the following Table 1 and Table 2 respectively.

Design Type	Corresponding CVD	Carriage Way	Crest
Type-8	0-50	3m / 10ft	5.5m / 18ft
Type-7	51-100	3.7m / 12ft	5.5m / 18ft
Type-6	101-200	3.7m / 12ft	7.3m / 24ft
Type-5	201-300	5.5m / 18ft	7.3m / 24ft
Type-4	301-600	5.5m / 18ft	9.7m / 32ft

Table 1: Existing Geometric Dimensions

The existing standards suggested design Type- 7 & 8 for Union road and Type- 4, 5, & 6 for Upazila road.

Design Type	Corresponding CVD	Carriage Way	Crest
Type-8	0-50	3m / 10ft	5.5m / 18ft
Type 7	51-100	3.7m / 12ft	6.7m / 22ft
Type 6	101-200	5m / 16ft	8.7m / 28.5ft
Type-5	201-300	5.5m / 18ft	9.2m / 30ft
Type-4B	301-400	6.1m / 20ft	11m / 36ft
Type-4A	401-500	6.1m / 20 ft	11m / 36ft
Type-4S-B	501-750	6.7m / 22ft	9.7m / 32ft
Type-4S-A	751-1000	7.3m / 24ft	11m / 36ft

Table 2: Recommended Geometric Dimensions

- 5.3 CVD shall be the main criterion for the selection of geometric dimensions of roads. If the CVD of any category road is found higher than its corresponding CVD, then the geometric dimensions mentioned against that CVD will govern. For instance, if any village road's CVD is more than 50 but less than 101, then its carriageway will be 12 ft instead of 10 ft. However, it is anticipated that in most of the cases design Type- 8 will be applicable for the Village roads, design Type- 7 & 8 will be applicable for the Union roads, and design Type- 4A, 4B, 5 & 6 will be applicable for the Upazila roads. Design type 4S-A & 4S-B will be applicable for roads in heavy traffic areas i.e. CVD>500. For the hilly area, six (6) types of design templates have been recommended that will be selected based on the CVD values of roads. The roads with traffic volumes where CVD>1000 will be designed on a case-by-case basis.
- 5.4 In case of special and/or unavoidable situations, e.g. unavailability of land, site criticality, etc., LGED will take case-specific decisions regarding carriageway, shoulder, and other dimensions.

5.5 LGED shall take necessary actions to acquire the required land lawfully to ensure the geometric standards of roads. The roads will have sufficient sight distance and the number of curves per kilometer will be as low as possible. Adequate land shall be acquired to provide necessary widening at the curve, intersection, and, wherever needed from the safety and level of service point of view. Nevertheless, in general, efforts will be made to keep land acquisition as minimum as possible.

## 6 Pavement Designs

6.1 The pavement is the main element of a road and therefore, careful consideration shall be given to the choice of pavement type and its design. Different factors like initial (construction) cost, availability of good materials, maintenance or rehabilitation cost, technology requirement and its availability govern the selection of the type of pavement.

6.2 The options of pavement available are:

- Flexible/bituminous pavement (BC);
- Reinforced cement concrete (RCC) pavement;
- Block pavement;
- Composite pavement.

Characteristically selection of pavement will be guided by several other factors, such as type and strength of soil along the alignment; availability of good aggregates, availability of contractors, drainage conditions, etc.

### 6.3 Flexible Pavement

6.3.1 At large, the number of Commercial Vehicles per Day (CVD) shall be the main criterion for the selection of design templates of roads. If the CVD of any category is found higher than its corresponding CVD, then the structural design mentioned against that CVD will govern.

6.3.2 The structural design of pavement for roads with heavy traffic (CVD>500) shall be based on the forecast cumulative number of Equivalent Standard Axles (ESAs) that the road will experience over its lifetime. It has been recommended that roads with CVD>1000 and/or ESA>20 million shall be designed on a case by case basis.

6.3.3 It has been recommended to prepare and use customized structural design of road pavements on a case by case basis wherever feasible and/or deemed necessary.

6.3.4 The recommended flexible pavement design templates (eight no) for different CVD values (0-1000) have been shown in the following pages. Besides, six additional templates recommended for roads in hilly areas have been shown in Appendix - G. A graphically illustration of the existing and proposed pavement thickness considering 4% subgrade CBR and maximum 5.5 million ESA for Type-4SA & 4SB shows a logical progression of increasing pavement thickness with traffic volume in Figure 1.

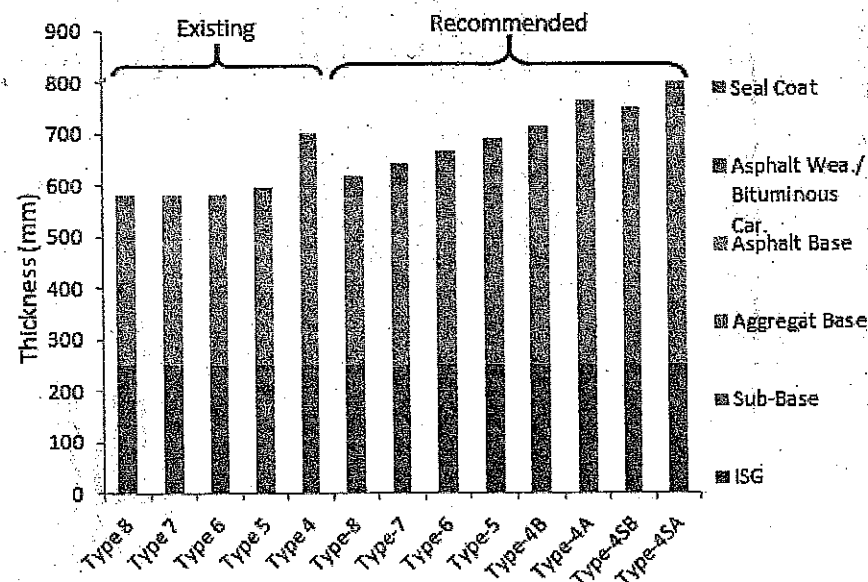
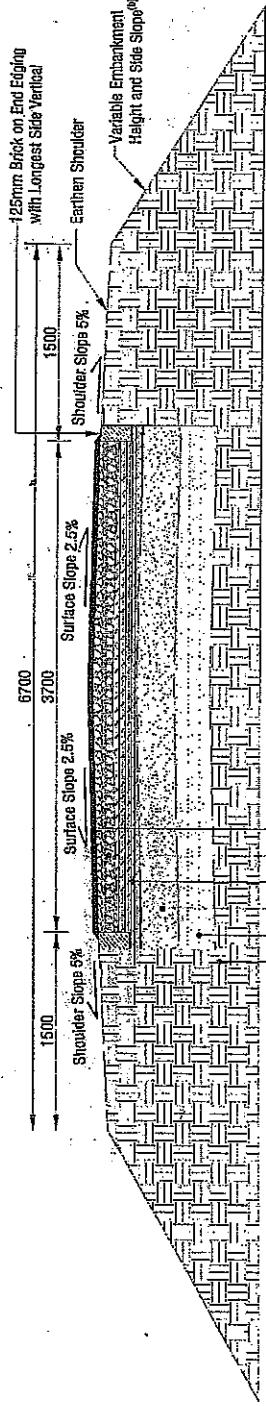


Figure 1: Comparison of Pavement Thickness

**PAVEMENT DESIGN TEMPLATE FOR CVD 51-100**

**Type-7**



(I) Asphalt Wearing Course

- (II) Aggregate Base Course: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two layers, each layer Soaked CBR min. 80%; Compacted to 100% of MDD Modified Proctor
- (III) Sub-Base: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two/Three layers, each layer Soaked CBR min. 30%; Compacted to 98% of MDD Modified Proctor
- (IV) Compacted Sand Improved Subgrade<sup>(a)</sup>, Sand FM min. 0.5; PI value < 6%; Compacted in Two layers, each layer Soaked CBR min. 8%; Compacted to min. 98% of MDD Modified Proctor
- (V) Subgrade: Compaction min. 96% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2%; PI value 8%–20% Original Soil cut into designed shape, or fill with normal soil, PI value 8%–20%; Compaction min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

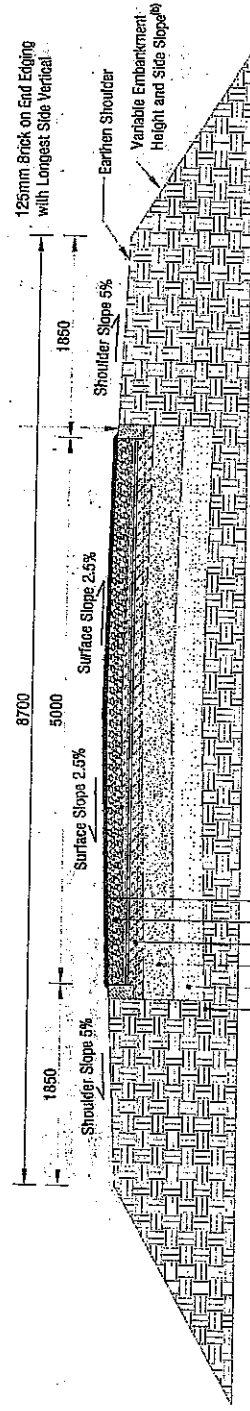
**NOTES:**

- (a) All dimensions are in millimeter unless otherwise specified;
- (b) Side Slope Protection method will vary for different conditions;
- (c) The local sand can be used as ISG subject to approval of LGED if the sand satisfies the following two conditions:
  - (i) Passing # 200 sieve ( Not more than 15% ) and
  - (ii) CBR Value: 8% or above.

Subgrade Soaked CBR (%)	Wearing Course (mm)	Base Course (mm)	Sub-base Course (mm)	Improved subgrade (mm)	Subgrade (mm)
1	40	150	275	300	300
2	40	150	275	300	300
3	40	150	250	300	300
4	40	150	200	250	300
5	40	150	200	225	300
6	40	150	200	200	300
≥ 7	40	150	150	-	300

**PAVEMENT DESIGN TEMPLATE FOR CVD 101-200**

**Type-6**



(I) Asphalt Wearing Course

- (II) Aggregate Base Course: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two layers, each layer Soaked CBR min. 80%; Compacted to 100% of MDD Modified Proctor
- (III) Sub-Base: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two/Three layers, each layer Soaked CBR min. 30%; Compacted to 98% of MDD Modified Proctor
- (IV) Compacted Sand Improved Subgrade<sup>(a)</sup>, Sand FM min. 0.5; PI value < 6%; Compacted in Two layers, each layer Soaked CBR min. 8%; Compacted to min. 98% of MDD Modified Proctor
- (V) Subgrade: Compaction min. 95% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2%; PI value 8%–20% Original Soil cut into designed shape, or fill with normal soil, PI value 8%–20%; Compaction min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

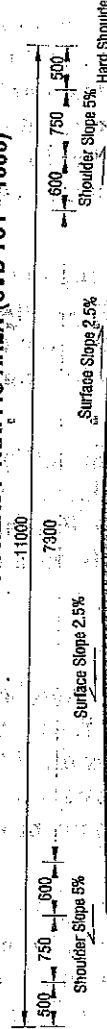
**NOTES:**

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- (b) Side Slope Protection method will vary for different conditions;
- (c) The local sand can be used as ISG subject to approval of LGED if the sand satisfies the following two conditions:
  - (i) Passing # 200 sieve ( Not more than 15% ) and
  - (ii) CBR Value: 8% or above.

Subgrade Soaked CBR (%)	Wearing Course (mm)	Base Course (mm)	Sub-base Course (mm)	Improved subgrade (mm)	Subgrade (mm)
1	40	150	300	300	300
2	40	150	300	300	300
3	40	150	275	300	300
4	40	150	225	250	300
5	40	150	225	225	300
6	40	150	225	200	300
≥ 7	40	150	175	-	300

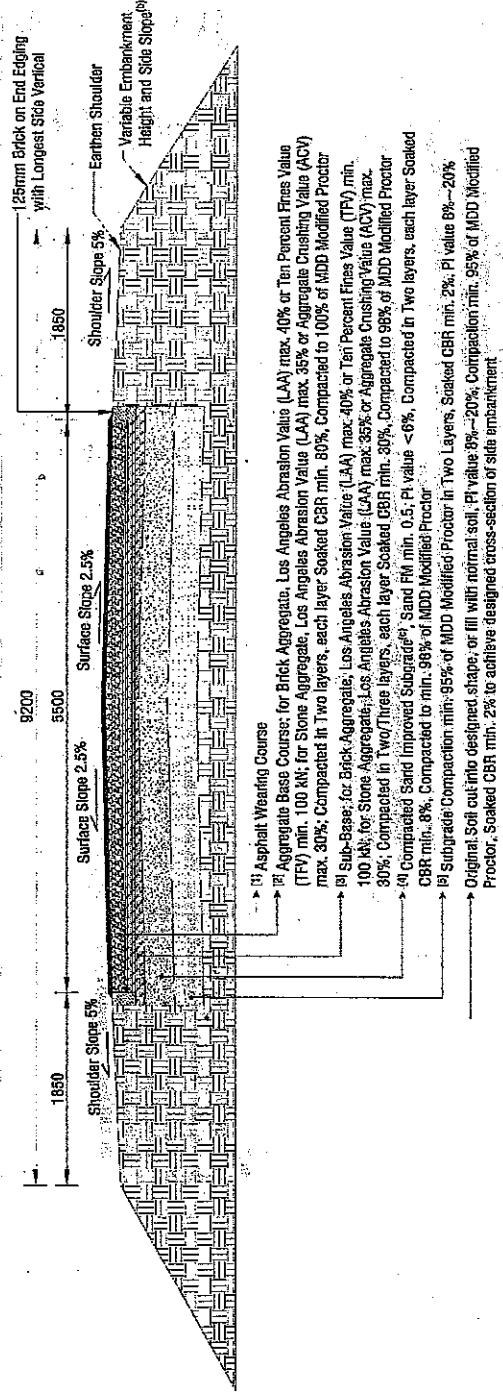
**PAVEMENT DESIGN TEMPLATE FOR HEAVY TRAFFIC AREA (CVD 751 -1000)**

**Type-4S(A)**



**PAVEMENT DESIGN TEMPLATE FOR CVD 201-300**

Type-5



- (1) Asphalt Wearing Course
- (2) Aggregate Base Course: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Finest Value (TFV) min. 100 MM; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in two layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD Modified Proctor
- (3) Sub-Base: for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Finest Value (TFV) min. 100 MM; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two/Three layers, each layer Soaked CBR min. 80%, Compacted to 98% of MDD Modified Proctor
- (4) Compacted Sand (Improved Subgrade), Sand Fin min. 0.5, PI value < 6%, Compacted in Two layers, each layer Soaked CBR min. 8%, Compacted to min. 98% of MDD Modified Proctor
- (5) Subgrade Compaction: min. 95% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2%; PI value 8%--20% Original Soil cut into designed shape, or fill with normal soil, PI value 8%--20%; Compaction: min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

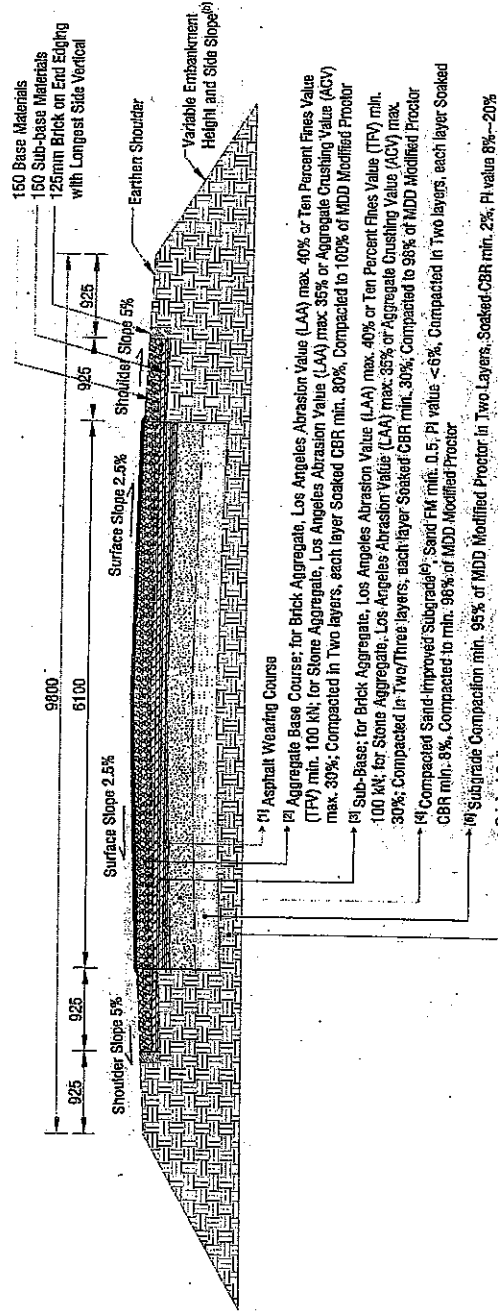
**NOTES:**

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- (b) Side Slope Protection method will vary for different conditions;
- (c) The local sand can be used as ISG subject to approval of LGED. If the sand satisfies the following two conditions:
  - (i) Passing # 200 sieve (Not more than 15%) and
  - (ii) CBR Value: 8% or above.

Subgrade Soaked CBR (%)	Wearing Course (mm)	Base Course (mm)	Sub-Base Course (mm)	Improved subgrade (mm)	Subgrade (mm)
2	40	175	300	300	300
3	40	175	275	300	300
4	40	150	250	250	300
5	40	150	250	225	300
6	40	150	250	200	300
≥7	40	150	200	200	300

**PAVEMENT DESIGN TEMPLATE FOR CVD 301-400**

Type-4B



150 Base Materials  
100 Sub-base Materials  
125mm Brick on End Edging  
with Longest Side Vertical

Shoulder Slope 5%  
Surface Slope 2.5%

Earthen Shoulder  
Variable Embankment  
Height and Side Slope<sup>(a)</sup>

(I) Asphalt Wearing Course  
(II) Aggregate Base Course; for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two Layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD Modified Proctor  
(III) Sub-Base; for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two/Three layers, each layer Soaked CBR min. 30%, Compacted to 98% of MDD Modified Proctor  
(IV) Compacted Sand Improved Subgrade<sup>(c)</sup>; Sand FM min. 0.5; PI value < 6%; Compacted in Two layers, each layer Soaked CBR min. 8%, Compacted to min. 98% of MDD Modified Proctor  
(V) Subgrade Compaction min. 95% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2%, PI value 8%–20%  
Original Soil cut into designed shape, or fill with normal soil, PI value 8%–20%, Compaction min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

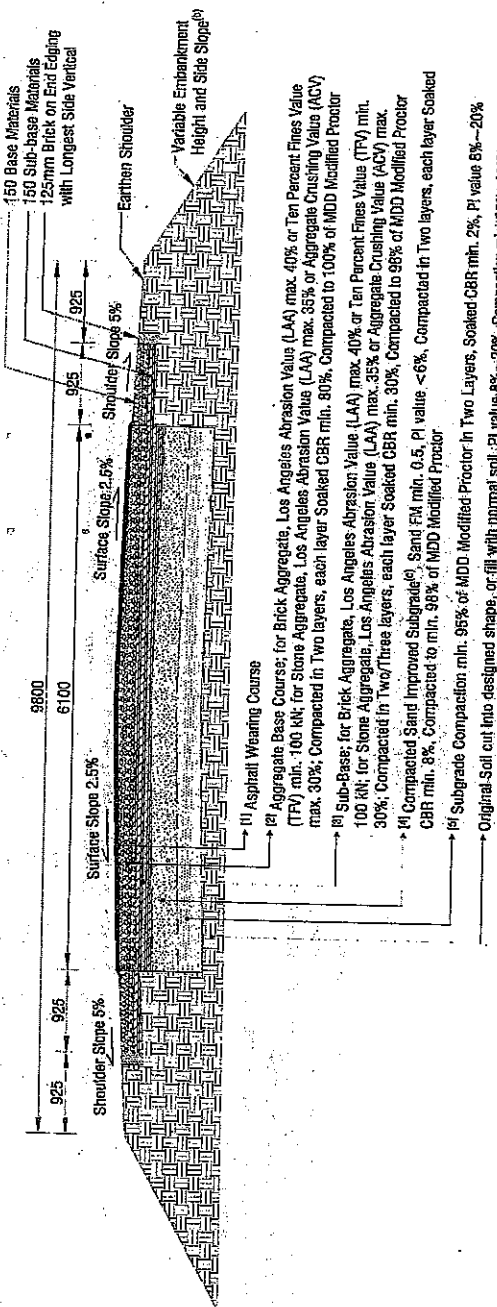
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(i) Passing # 200 sieve (Not more than 15%) and  
(ii) CBR Value: 8% or above.

Subgrade Soaked CBR (%)	Wearing Course (mm)	Base Course (mm)	Sub-base Course (mm)	Improved subgrade Subgrade (mm)
2	40	200	300	300
3	40	200	275	300
4	40	175	250	300
5	40	175	250	225
6	40	175	250	200
≥ 7	40	175	200	300

**PAVEMENT DESIGN TEMPLATE FOR CVD 401-500**

Type-4A



150 Base Materials  
100 Sub-base Materials  
125mm Brick on End Edging  
with Longest Side Vertical

Shoulder Slope 5%  
Surface Slope 2.5%

Earthen Shoulder  
Variable Embankment  
Height and Side Slope<sup>(a)</sup>

(I) Asphalt Wearing Course  
(II) Aggregate Base Course; for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two Layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD Modified Proctor  
(III) Sub-Base; for Brick Aggregate, Los Angeles Abrasion Value (LAA) max. 40% or Ten Percent Fines Value (TFV) min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two/Three layers, each layer Soaked CBR min. 30%, Compacted to 98% of MDD Modified Proctor  
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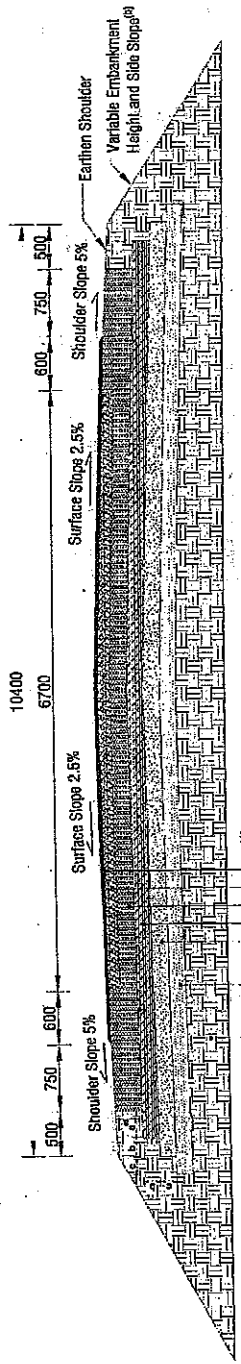
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- (c) The local sand can be used as ISG subject to approval of LGED if the sand satisfies the following two conditions:  
(i) Passing # 200 sieve (Not more than 15%) and  
(ii) CBR Value: 8% or above.

Subgrade Soaked CBR (%)	Wearing Course (mm)	Base Course (mm)	Sub-base Course (mm)	Improved subgrade Subgrade (mm)
2	40	225	300	300
3	40	225	275	300
4	40	200	275	300
5	40	200	250	225
6	40	200	250	200
≥ 7	40	200	200	300

**PAVEMENT DESIGN TEMPLATE FOR HEAVY TRAFFIC AREA (CVD 501 - 750)**

TYPE-4S(B)



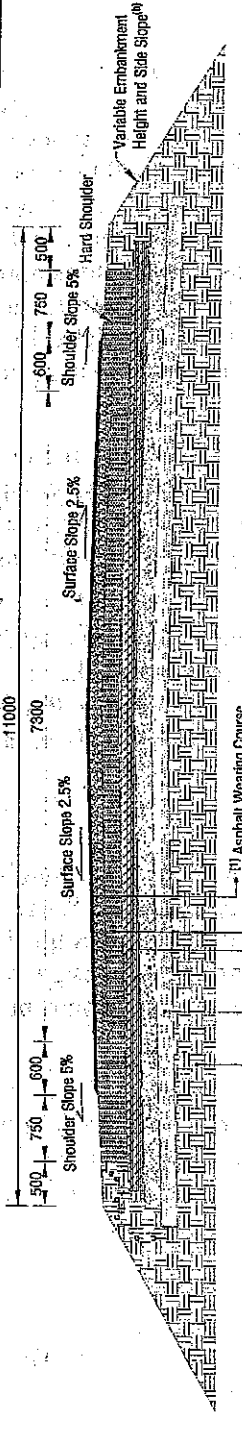
- (1) Asphalt Wearing Course
- (2) Asphalt Base Course
- (3) Aggregate Base Course; for Stone Aggregate Los Angeles Abrasion Value (LAA) max. 95% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two Layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD Modified Proctor
- (4) Sub-Base; for Brick Aggregate, Los Angeles Abrasion Value max. 40% or Ten Percent Fines Value min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value max. 35% or Aggregate Crushing Value max. 30%; Compacted in Two/Three layers depending on layer thickness (Max. 100mm/layer), each layer Soaked CBR min. 30%, Compacted to 98% of MDD Modified Proctor
- (5) Compacted Sand Improved Subgrade (SIG)<sup>(a)</sup>, Sand FM min 0.5, PI value <6%, Compacted in Two layers, each layer Soaked CBR min. 8%, Compacted to min. 98% of MDD Modified Proctor
- (6) 300 mm Subgrade Compaction min. 95% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2% or 4% or 7% as per Subgrade Design CBR, PI value 6%–20%
- (7) Original Soil cut into designed shape, or fill with normal soil, PI value 8%–20%, Compaction min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

**NOTES:**  
 (a) All dimensions are in millimeter unless otherwise specified;  
 (b) Side Slope Protection method will vary for different conditions;  
 (c) The local sand can be used as ISG subject to approval of LGED if the sand satisfies the following two conditions:  
 (i) Passing # 200 sieve (Not more than 15%) and  
 (ii) CBR Value: 8% or above.

Traffic in ESA (Millions)	Layer Thickness for Subgrade Soaked CBR 2% - 3%					Layer Thickness for Subgrade Soaked CBR 4% - 6%					Layer Thickness for Subgrade Soaked CBR ≥ 7%				
	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
2.5-5.5	50	50	200	250	300	50	50	200	200	250	50	50	200	200	250
5.6-10.5	50	75	225	275	300	50	75	200	225	250	50	75	200	225	250
10.6-20.0	50	100	250	275	300	50	100	225	225	300	50	100	225	250	250

**PAVEMENT DESIGN TEMPLATE FOR HEAVY TRAFFIC AREA (CVD 751 - 1000)**

TYPE-4S(A)



- (1) Asphalt Wearing Course
- (2) Asphalt Base Course
- (3) Aggregate Base Course; for Stone Aggregate Los Angeles Abrasion Value (LAA) max. 35% or Aggregate Crushing Value (ACV) max. 30%; Compacted in Two layers, each layer Soaked CBR min. 80%, Compacted to 100% of MDD Modified Proctor
- (4) Sub-Base; for Brick Aggregate, Los Angeles Abrasion Value max. 40% or Ten Percent Fines Value min. 100 kN; for Stone Aggregate, Los Angeles Abrasion Value max. 35% or Aggregate Crushing Value max. 30%; Compacted in Two/Three layers depending on layer thickness (Max. 100mm/layer), each layer Soaked CBR min. 30%, Compacted to 98% of MDD Modified Proctor
- (5) Compacted Sand Improved Subgrade (SIG)<sup>(a)</sup>, Sand FM min 0.5, PI value <6%, Compacted in Two layers, each layer Soaked CBR min. 8%, Compacted to min. 98% of MDD Modified Proctor
- (6) 300 mm Subgrade Compaction min. 95% of MDD Modified Proctor in Two Layers, Soaked CBR min. 2% or 4% or 7% as per Subgrade Design CBR, PI value 6%–20%
- (7) Original Soil cut into designed shape, or fill with normal soil, PI value 8%–20%, Compaction min. 95% of MDD Modified Proctor, Soaked CBR min. 2% to achieve designed cross-section of side embankment

**NOTES:**  
 (a) All dimensions are in millimeter unless otherwise specified;  
 (b) Side Slope Protection method will vary for different conditions;  
 (c) The local sand can be used as ISG subject to approval of LGED if the sand satisfies the following two conditions:  
 (i) Passing # 200 sieve (Not more than 15%) and  
 (ii) CBR Value: 8% or above.

Traffic in ESA (Millions)	Layer Thickness for Subgrade Soaked CBR 2% - 3%					Layer Thickness for Subgrade Soaked CBR 4% - 6%					Layer Thickness for Subgrade Soaked CBR ≥ 7%				
	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
2.5-5.5	50	50	200	250	300	50	50	200	200	250	50	50	200	200	250
5.6-10.5	50	75	225	275	300	50	75	200	225	250	50	75	200	225	250
10.6-20.0	50	100	250	275	300	50	100	225	225	300	50	100	225	250	250



#### 6.4 Rigid Pavement

6.4.1 Rigid pavements offer an alternative to flexible pavements especially where the soil strength is poor, the aggregates are costly, mobilization of heavy construction equipment is difficult and drainage conditions are poor. Rigid pavement has been recommended for the submersible roads in Haor areas and road segments across hat-bazar, growth center, and built-up areas where water logging is a common phenomenon. The geometric and structural design of rigid pavement will generally depend on CVD values. Design templates for rigid pavement for various scenarios have been suggested in Appendix-H.

6.4.2 To construct a durable rigid pavement in coastal regions that withstands the aggressive marine environment, composite cement of appropriate type, high range water reducing admixture, and fusion bonded epoxy coated reinforcing bar will be used.

6.5 The design templates for the Flexible/Bituminous pavement (BC) and Reinforced Cement Concrete (RCC) pavement have been recommended in the standards. LGED shall design Block Pavement, Composite Pavement and HBB (Herringbone Bond) roads on a case by case basis.

#### 7 Design Period

7.1 The design period or design life is usually defined as the number of years until the first major reconstruction is anticipated. It has been considered appropriate that roads in rural areas shall be designed for a design period of 10 years. But rigid pavements designed and constructed as per recommendations contained in this document shall have a design life of not less than 20 years.

7.2 However, the design life of pavement may be affected by various environmental factors such as moisture, humidity, salinity, rainfall intensity, wind, temperature fluctuations, and solar radiation. It may also be affected by factors like maintenance practices, usage intensity, overloading of vehicle, flash flood, tidal surge etc.

#### 8 Road Drainage

8.1 The drainage of the road surface, road pavement layers, and subgrade are some of the most important aspects of road construction. The road surface will be designed to shed water as quickly as possible during the rainfall.

8.2 To prevent the rapid deterioration of pavement layers and to maintain the subgrade at or above the design strength, it is essential that any water entering the pavement layers be allowed to drain away as quickly as possible. Not only standing water in the pavement layers reduce the pavement strength but also the high pore-water pressures developed under the action of traffic loads rapidly lead to a disintegration of surfacing. The pavement will drain the water away through channels on both sides. The drainage material must be of a size that allows the passage of the water; not be too large to allow fines to be washed away from the pavement.

#### 9 Side-slope Protection

9.1 Stabilizing the roadside slope is very important for ensuring the sustainability and durability of road embankments. The rural roads will adopt different methods to stabilize side-slopes for different scenarios with different side slope ratios (V: H). The methods recommended for side slope protection work in rural roads have been mentioned in Appendix - I which include but are not limited to grass turfing, geo-jute, gunny bags, synthetic geotextiles, gabions, long-rooted vegetation, concrete blocks, and palisading work with concrete posts. Designers will select or customize the protection method considering cost-effectiveness, the availability of construction materials, and skilled workers. A side slope ratio from 1:1.5 to 1:2 has been recommended. However, designers may apply their engineering judgment to optimize the side slope ratio for better stabilization in a particular field condition. A summary of the recommended slope protection methods with preferable scenarios is given in Table 3.

Sl. No.	Method	Preferable Scenario
01	Slope Protection work with Long Rooted Grass Turfing	General Road Embankments
02	Slope Protection Work for High Embankment (Above 4.5 m) with Long Rooted Grass	High Embankments, Haor/Coastal Areas
03	Slope Protection Work with Grass Turfing & Jute Geotextile on Slope for Sandy Soil	Sandy Soil
04	Slope Protection work with Grass Turfing, Jute Geotextile & Geo-Bags on Slope for Clayey Soil	Clayey Soil
05	Slope Protection work with Long Rooted Grass Turfing & Jute Geotextile on Slope for Hilly Areas	Hilly Areas
06	Slope Protection work with Gunny Bagged Riprap	General Road Embankments

Sl. No.	Method	Preferable Scenario
07	Slope Protection work with Gabions	Haor Areas/Coastal Areas
08	Slope Protection work with Long Rooted Grass, Vegetation, Block and Gabions	Haor Areas/Coastal Areas
09	Slope Protection work with Masonry Brick and Pre-Cast RCC Post	General Road Embankments

Table 3: Methods of Side Slope Protection

## 10 Road Safety

10.1 The roads will be designed with effective and adequate road furniture, for instance, road marking, guard rails, traffic signage, etc. Sufficient offset distance from natural roadside features will be maintained and sharp curves will be widened in the inner sides. Passing lanes and bus bays will be provided wherever convenient. Properly designed traffic calming devices like speed humps, rumble strips, etc. will be used wherever applicable.

10.2 The road intersections will be channelized with the provision of stacking lanes and adequate turning radii. In the case of LGED and RHD road intersection, the traffic will entry and exit through slip lanes with acceleration and deceleration lanes. The typical sections have been shown in Appendix-J.

## 11 Environment & Climate Change

11.1 The standards have addressed the environment and climate change issues. Climatic vulnerabilities have been taken care of in designing slope protection works and surface drainage systems. For quick run-off surface water, 2.5% cross-fall in camber and 5% cross slope in shoulder have been prescribed.

11.2 It has been recommended to preserve a freeboard of 0.9 m from the bottom of the sub-grade to the Highest Flood Level (HFL) on 20 years' return period. The 20-year return period has been suggested to increase to 30 years in the flood-prone areas to prevent the subgrade saturation. Based on the site condition, the designers will apply their engineering judgment in this regard.

11.3 The harder grades of bitumen with higher viscosity (e.g. VC 30, VC 40) has been suggested in the area with prolonged intense rainfall and high projected traffic volumes. Besides, the Polymer Modified Bitumen (PMB) has been suggested using on a pilot basis for wearing courses at those sections of the road only where extreme traffic volume is expected.

11.4 In addition, LGED will apply on a pilot basis any other environmentally conducive new or improved technology/practice and subsequently scale up based on the findings/results to have a competitive advantage.

## 12 Culverts and Bridges

12.1 Bridges shall be designed for a period of at least 75 years. The latest version of 'AASHTO LRFD Bridge Design Specifications' will be used as design standards for LGED bridges. For the vehicular live load of bridges, the AASHTO HL-93 loading shall be followed.

12.2 The designers shall design on a case by case basis for culvert and bridge. In general, the width of bridge and/or culvert will be equal to or more than the crest width of the carriageway. The vertical and horizontal navigational clearance of bridges shall be in accordance with the guideline of BIWTA (Bangladesh Inland Water Transport Authority).

12.3 Other necessary clearances, if requirement arises in future, for roads, overpass and bridges shall have to be received from relevant government organizations.

12.4 This standard is subject to future review in every five year.

## 13 Cost

The cost of engineering interventions shall be estimated based on the schedule of rates of LGED to ensure optimal utilization of resources. The rates of different items vary regionally because of the availability of local construction material, labor, equipment, difficulties and distance of transporting construction material in remote & inaccessible areas, etc. The schedule of rates will be updated regularly to cope with the latest scenarios.

## 14 Conclusions

LGED is responsible to construct, maintain/rehabilitate and upgrade the rural roads i.e. Upazila road, Union road & Village roads in Bangladesh which are the lifeline of fast expanding rural economy. The standards shall guide LGED in constructing new roads in a sustainable way. The recommended standards have considered the growing traffic volume, varying subgrade condition of different geographic areas, climate change, and other relevant aspects. The standards were originally prepared by BRTC, BUET and critically reviewed/revised by various stakeholders. It can be expected that the upgraded design standards will contribute in the sustainable development of the country.

## Appendix-A

## Composition of the BRTC, BUET team engaged in upgrading of the Standards

Sl. No	Name of Professor	Position Assigned	Area of Expertise
1.	Prof. Dr. Md. Mizanur Rahman	Team Leader and Senior Material Specialist	Highway Materials, Geometric design of pavement, Traffic survey
2.	Prof. Dr. Hasib Mohammed Ahsan	Senior Transport Planning and Safety Specialist	Transportation and Land use planning, Road safety
3.	Prof. Dr. Md. Shamsul Hoque	Senior Road Management Specialist	Geometric design of pavement, Road planning, Road management, Concrete block pavement
4.	Prof. Dr. Md. Moazzem Hossain	Senior Pavement Design Specialist	Structural design of Rigid and Flexible pavement
5.	Prof. Dr. Tanweer Hasan	Senior Pavement Design Specialist	Structural design of Rigid and Flexible pavement.
6.	Prof. Dr. Abdul Jabbar Khan	Senior Geotechnical Specialist	Embankment Slope protection, Geo-jute and Geo-material
7.	Prof. Dr. Md. Hadiuzzaman	Traffic Survey and Modelling Specialist	Traffic survey, Traffic modeling and Traffic simulation.

## Appendix-B

## Members of the Committee for Classification, Ownership, Responsibility Fixation and Dispute Resolution of Roads

1. Member, Planning Commission (Physical Infrastructure Division) – Convener;
2. Representative, Ministry of Road, Transport & Bridges / Local Government Division;
3. Representative, Planning Commission (Rural Institution Wing);
4. Representative, Roads and Highways Department / Local Government Engineering Department.

## Terms of Reference

The committee will recommend for approval and gazette notification on the Road Design Standards of LGED.

## Appendix- C

## Road Design Standards Committee

## Members

1. Chief, Physical Infrastructure Division, Planning Commission - Convener
2. Representative from Implementation, Monitoring and Implementation Division (IMED)
3. Representative from Roads and Highways Department (RHD)
4. Representative from Local Government Engineering Department (LGED)
5. Representative from Bangladesh Water Development Board (BWDB)
6. Representative from Bangladesh Institute of Development Studies (BIDS)
7. Representative from Bangladesh University of Engineering and Technology (BUET)
8. Representative from Department of Geography & Environment, University of Dhaka

## Terms of Reference

The committee will review the Road Design Standards of LGED and recommend to the 'Committee for Classification, Ownership, Responsibility Fixation and Dispute Resolution of Roads' for finalizing.

## Composition of the BR

Sl. No	Name of Prof
1.	Prof. Dr. Md. Mi. Rahman
2.	Prof. Dr. Hasib Mohammed Ahsa
3.	Prof. Dr. Md. Sha Hoque
4.	Prof. Dr. Md. Moa Hossain
5.	Prof. Dr. Tanweer
6.	Prof. Dr. Abdul Jal Khan
7.	Prof. Dr. Md. Hadiuzzaman

## Appendix- D

## Glossary

Asphalt	An adhesive substance that is used in road construction as a binder material.
Asphalt Base Course	The base course underneath the wearing course of a flexible pavement which is treated with asphalt, is asphalt base course.
Asphalt Concrete (AC)	A mixture to predetermined proportions of aggregate, filler and bituminous binder material plant mixed and usually placed by means of a paving machine.
Asphalt Surfacing	The layer or layers of asphalt concrete constructed on top of the base course, and, in some cases, the shoulders.
Asphalt Wearing Course	The top course of an asphalt surfacing or, for gravel roads, the uppermost layer of construction of the roadway made of specified materials.
Average Annual Daily Traffic (AADT)	The total yearly traffic volume in both directions divided by the number of days in the year.
Average Daily Traffic (ADT)	The total traffic volume during a given time period in whole days greater than one day and less than one year divided by the number of days in that time period.
Base Course	This is the main component of the pavement contributing to the spreading of the traffic loads. In many cases, it will consist of crushed stone or gravel, or of good quality brick chips.
Bitumen	The most common form of bitumen is the residue from the refining of crude oil after the more volatile material has been distilled off. It is essentially a very viscous liquid comprising many long-chain organic molecules.
Carriageway	That portion of the roadway including the various traffic lanes but excluding shoulders.
Commercial Vehicle	A specific classification of vehicles is suggested by Bangladesh Planning Commission to be considered for survey and design purpose; among the enlisted vehicles, vehicles itemized sequentially from "delivery vehicle" to "7 Axle vehicle" are defined as commercial vehicle.
Crest	Peak formed by the junction of two gradients.
Design Period	The period of time that an initially constructed or rehabilitated pavement structure will perform before reaching a level of deterioration requiring more than routine or periodic maintenance.

Equivalent Standard Axles (ESAs)	A measure of the potential damage to a pavement caused by a vehicle axle load expressed as the number of 8.2 tons single axle loads that would cause the same amount of damage.
Equivalent Single Axle Load (ESAL)	Summation of equivalent 8.2 tons single axle loads used to combine mixed traffic to calculate the design traffic loading for the design period.
Fill	Material of which a man-made raised structure or deposit such as an embankment is composed, including soil, soil-aggregate or rock.
Flexible Pavements	Pavement with a bituminous surfacing and with a base course layer and a sub-base course layer.
Heavy Vehicle	Those having an unloaded weight of 6577 kg or more.
Passenger Car Unit (PCU)	A measure of the impedance offered by a vehicle to the passenger cars in the traffic stream. Usually quoted as the number of passenger cars required to offer a similar level of impedance to the cars in the stream.
Shoulder	Part of the road outside the carriageway, but at substantially the same level, for accommodation of stopped vehicles for emergency use, for lateral support of the carriageway.
Side Slope	Area between the outer edge of shoulder or hinge point and the ditch bottom.
Sub-base	The layer of material of specified dimensions on top of the subgrade and below the road base. The secondary load-spreading layer underlying the base course.
Subgrade	The surface upon which the pavement structure and shoulders are constructed.
Subsurface Drain	Covered drain constructed to intercept and remove subsoil water, including any pipes and permeable material in the drains.
Super elevation	Inward tilt or transverse inclination given to the cross section of a carriageway throughout the length of a horizontal curve to reduce the effects of centrifugal force on a moving vehicle; expressed as a percentage.
Traffic Volume	Volume of traffic usually expressed in terms of average annual daily traffic (AADT).

## Appendix-E

## Equivalence Factors for Different Axle Loads

Types Classification	ESA Factor
7 Axle 3PM4T 44T	6.7
6 Axle 3PM3T 41T	3.8
5 Axle 3PM2T 38T	4.6
5 Axle 2PM3T 35T	2.9
4 Axle 2PM2T 33T	5.0
4 Axle 2PM2T 32T	4.4
4 Axle 2R4 30T	3.4
4 Axle 2R4 25T	1.4
3 Axle 2PM1T 25T	6.7
3 Axle 2R3 22T	2.7
2 Axle 2R2 15T	4.6
Truck Medium (Two or Three Axle Rigid > 3.5 Ton pay-loads)	4.62
Truck Medium (Two Axle Rigid > 3.5 Ton pay-loads)	4.62
Bus Medium (>40 seats and > 36 Feet Seats)	1
Bus Mini (16-39 seats and < 36 Feet Seats)	0.5
Bus Light (≤16 seats)	0.5
Utility (Land rover/Jeep type vehicles)	0.5
Delivery Vehicle (Panel Van, Pickup Truck)	0.5

Table 4: ESA Factors for different Axle Loads

Note: For local vehicles in different areas used as commercial vehicles, the ESA factor can be assumed by applying engineering judgment.

## Appendix-F

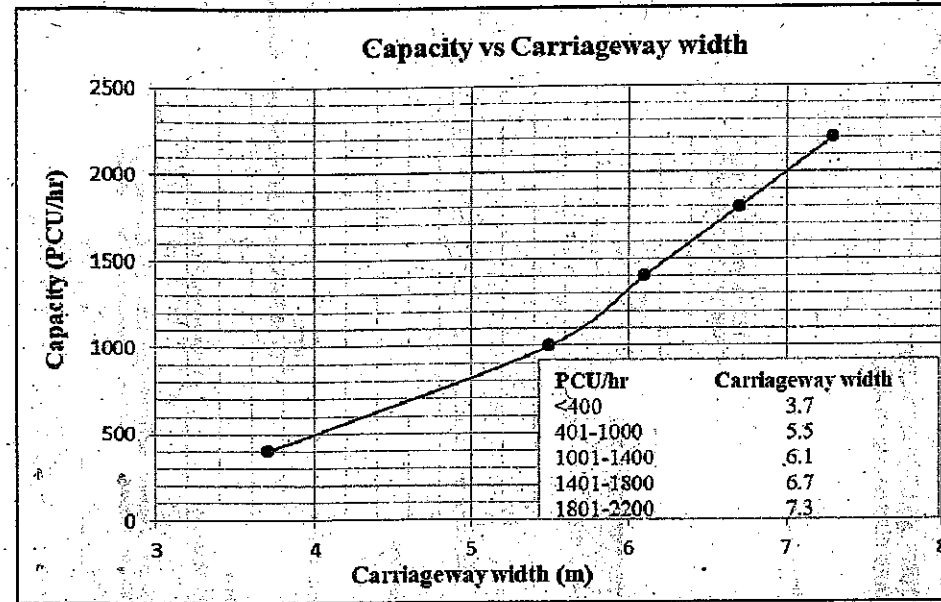
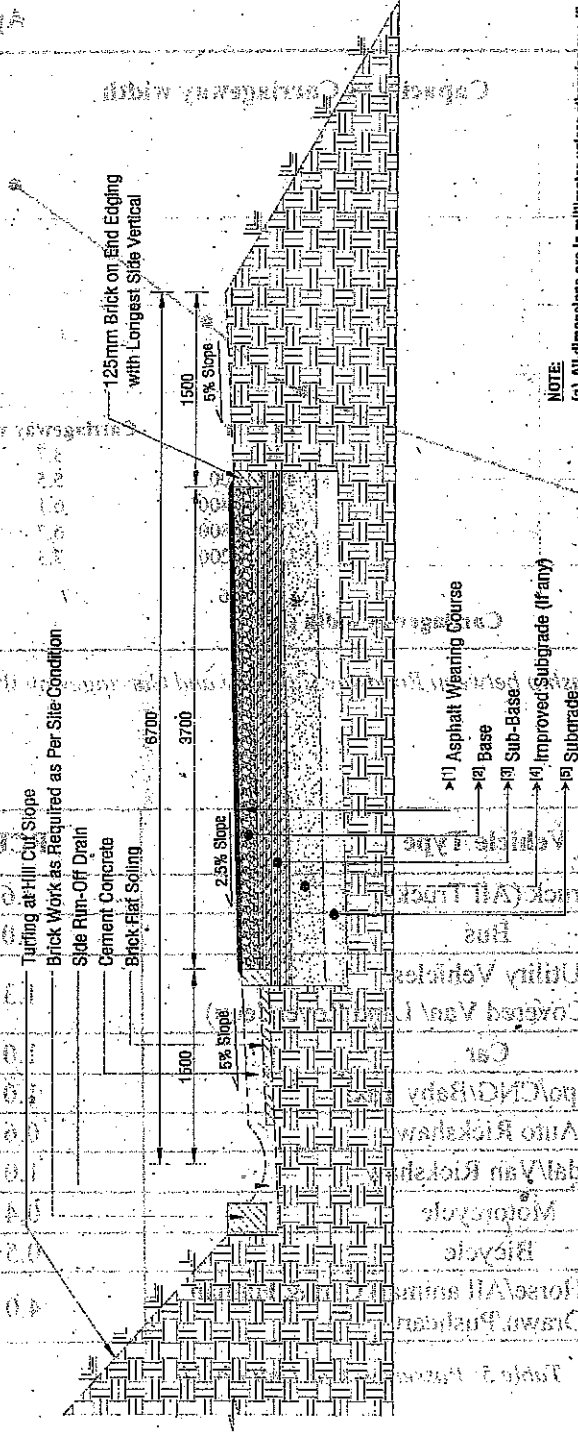


Figure 2: Relationship between Roadway Capacity and Carriageway Width

Vehicle Type	PCU
Truck (All Trucks)	3.6
Bus	3.0
Utility Vehicles (Delivery Van/ Covered Van/ Land Rover/Jeep)	1.3
Car	1.0
Tempo/CNG/Baby Taxi	1.0
Auto Rickshaw	0.6
Pedal/Van Rickshaw	1.0
Motorcycle	0.4
Bicycle	0.5
Animal (Bullock/Horse/All animal) Cart & Human Drawn/Pushcart	4.0

Table 5: Passenger Car Unit (PCU)

**PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)  
HAVING HILL-CUT ON ONE SIDE AT INWARD CURVATURE TO HILL**



NOTE:  
(a) All dimensions are in millimeter unless otherwise specified.

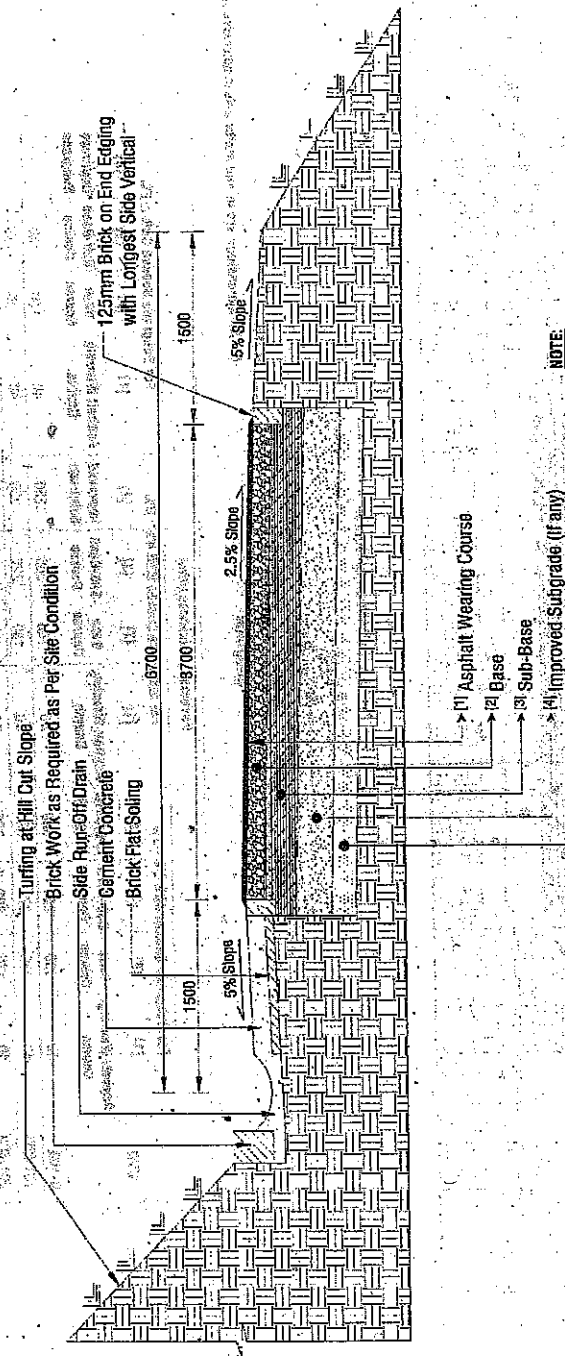
CVD	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥ 7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
0-100	40	150	250	300	40	150	200	250	40	150	150	150
101-200	40	150	275	300	40	150	225	250	40	150	150	175
201-300	40	175	300	300	40	150	250	250	40	150	150	200

Pavement Thickness (mm)

- Turfing at Hill Cut Slope
- Brick Work as Required as Per Site Condition
- Side Run-Off Drain
- Cement Concrete
- Brick Flat Soling

- (1) Asphalt Wearing Course
- (2) Base Course
- (3) Sub-Base Course
- (4) Improved Subgrade (if any)
- (5) Subgrade

**PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)  
HAVING HILL-CUT ON ONE SIDE AT OUTWARD CURVATURE TO HILL**



NOTE:  
(a) All dimensions are in millimeter unless otherwise specified.

CVD	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥ 7%			
	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]	[1]	[2]	[3]	[4]
	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade	Asphalt Wearing Course	Base Course	Sub-Base Course	Improved Subgrade
0-100	40	150	250	300	40	150	200	250	40	150	150	150
101-200	40	150	275	300	40	150	225	250	40	150	150	175
201-300	40	175	300	300	40	150	250	250	40	150	150	200

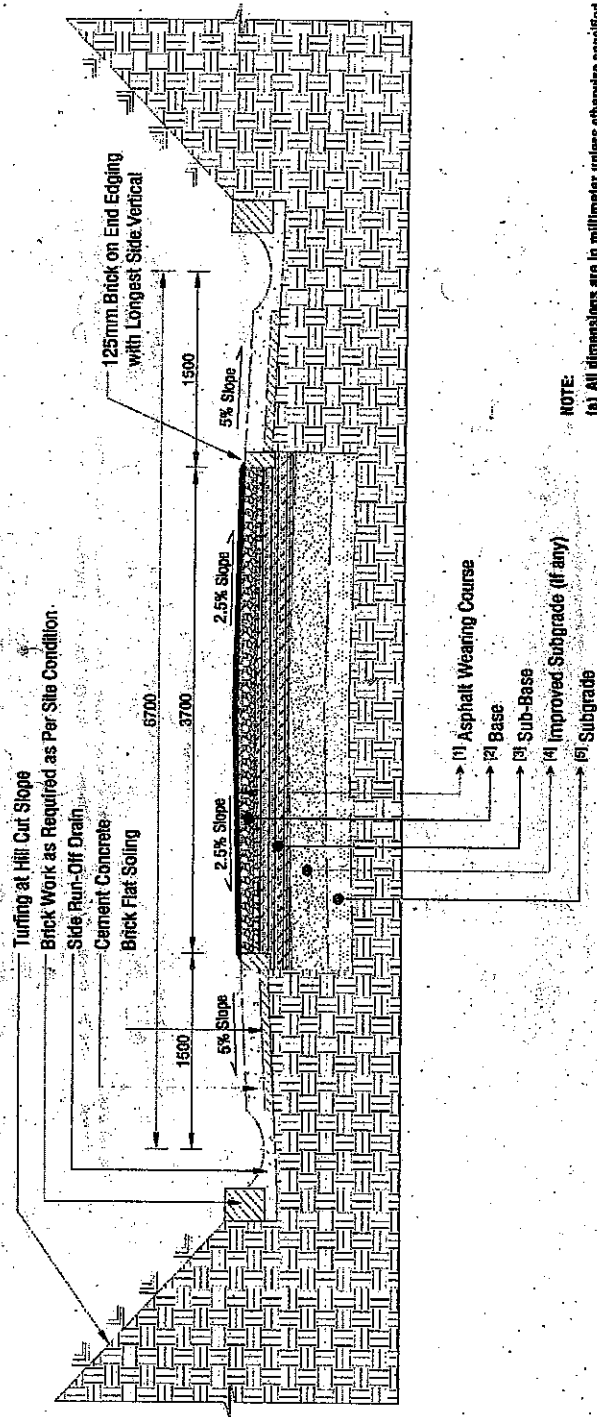
Pavement Thickness (mm)

- Turfing at Hill Cut Slope
- Brick Work as Required as Per Site Condition
- Side Run-Off Drain
- Cement Concrete
- Brick Flat Soling

- (1) Asphalt Wearing Course
- (2) Base Course
- (3) Sub-Base Course
- (4) Improved Subgrade (if any)
- (5) Subgrade



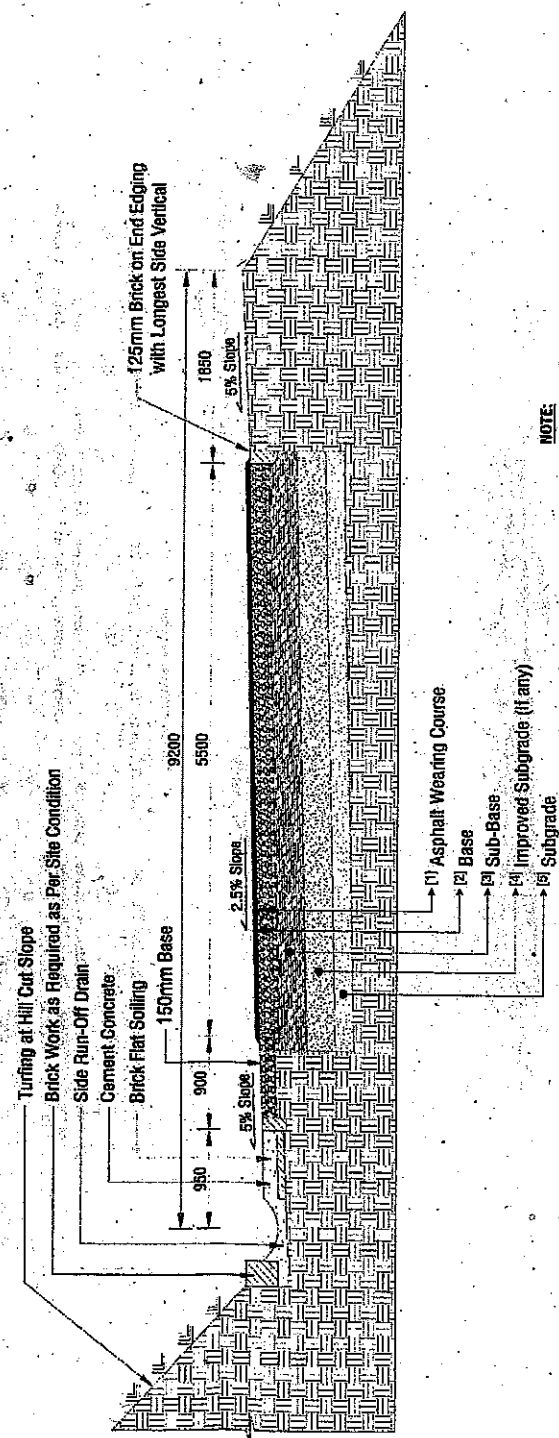
**PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD 0-300)  
HAVING HILL-CUT ON BOTH SIDES**



NOTE:  
(a) All dimensions are in millimeter unless otherwise specified.

CVD	For Subgrade Soaked CBR 2% - 3%				For Subgrade Soaked CBR 4% - 6%				For Subgrade Soaked CBR ≥ 7%			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
0-100	40	150	250	300	40	150	200	250	40	150	150	150
101-200	40	150	275	300	40	150	225	250	40	150	175	175
201-300	40	175	300	300	40	150	250	250	40	150	200	200

**PAVEMENT DESIGN TEMPLATE THROUGH HILLS (CVD > 300)  
HAVING HILL-CUT ON ONE SIDE AT INWARD CURVATURE TO HILL**



NOTE:  
(a) All dimensions are in millimeter unless otherwise specified.

CVD	Layer Thickness for Subgrade CBR 2% - 3%				Layer Thickness for Subgrade CBR 4% - 6%				Layer Thickness for Subgrade CBR ≥ 7%			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
301-400	40	200	300	300	40	175	250	250	40	175	200	200
401-500	40	225	300	300	40	200	250	250	40	200	200	200

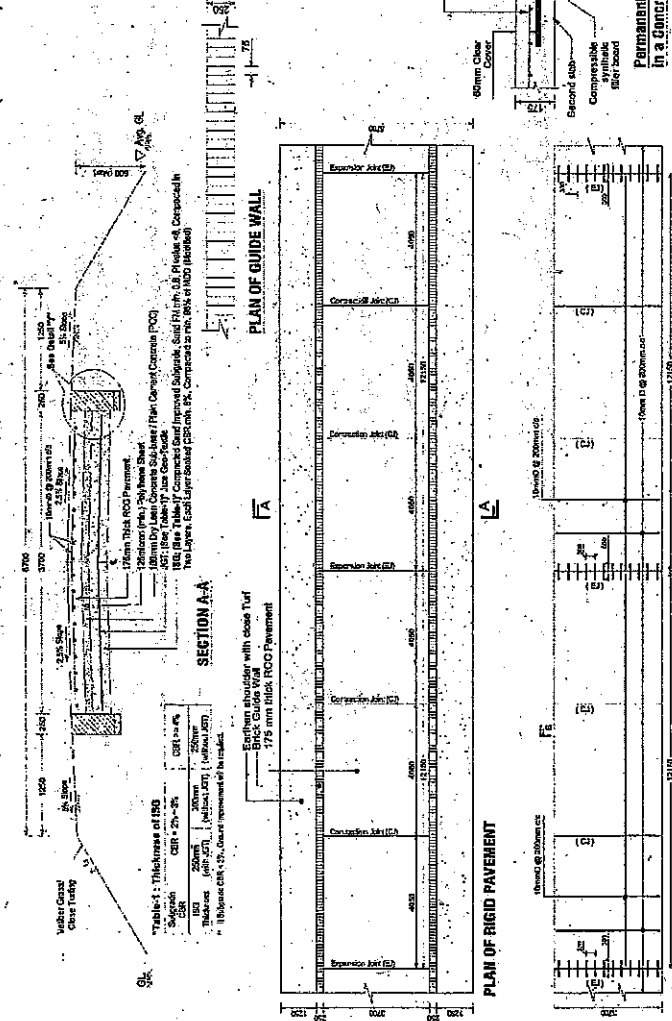
Note: Hilly roads with CVD > 500 will be designed case by case based on traffic and subgrade condition



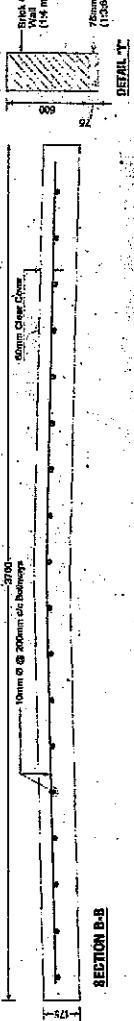


Appendix -H

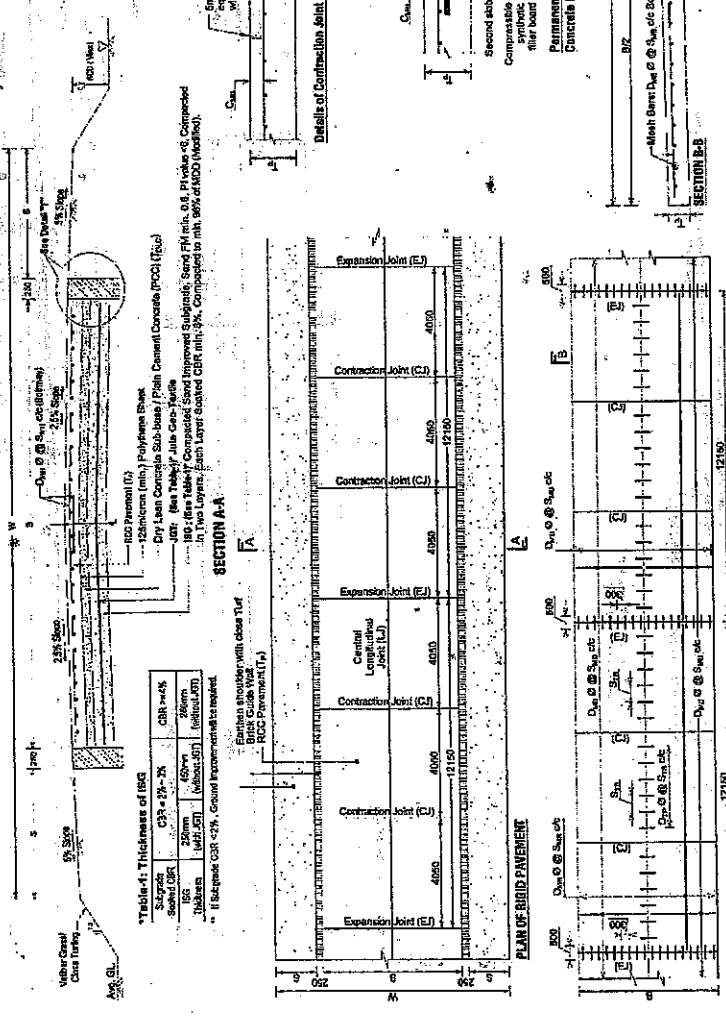
RIGID PAVEMENT DESIGN TEMPLATE FOR SUBMERSIBLE ROAD (CVD ≤ 100)



REINFORCEMENT DETAILS OF RIGID PAVEMENT



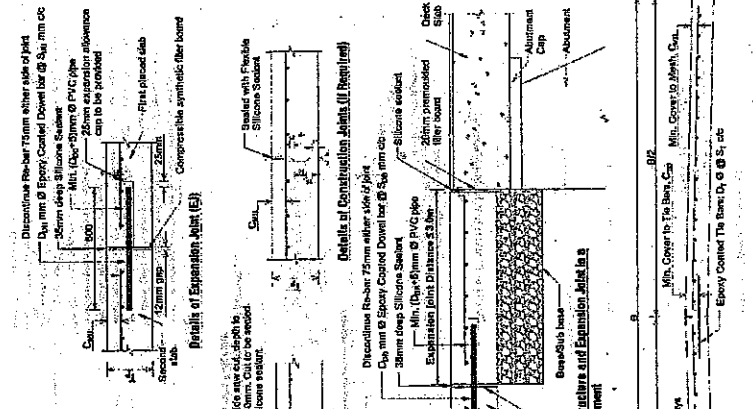
RIGID PAVEMENT DESIGN TEMPLATE FOR SUBMERSIBLE ROAD (CVD > 100)



REINFORCEMENT DETAILS OF RIGID PAVEMENT

CVD	Width & n		Reinforcement Details		Reinforcement Details	
	Width (m)	n	Reinforcement	Reinforcement	Reinforcement	Reinforcement
10-200	5.0	8	175	10mm	10mm	10mm
201-500	5.0	8	175	10mm	10mm	10mm
501-750	6.0	9	175	10mm	10mm	10mm
751-1000	7.0	10	175	10mm	10mm	10mm

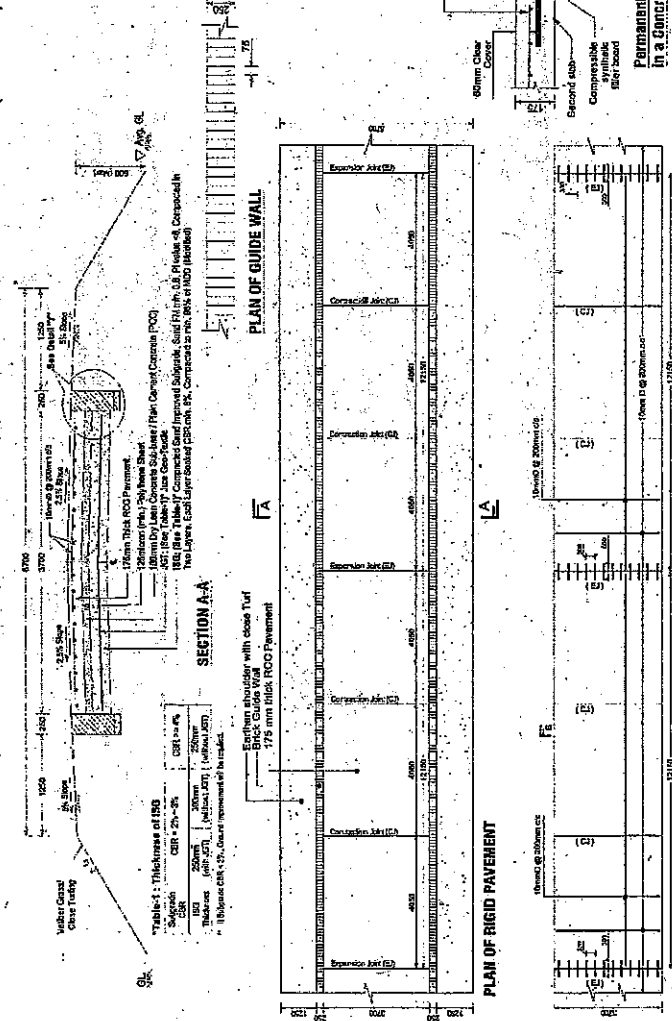
Note: Road with CVD > 100 will be designed case by case based on initial subgrade condition.



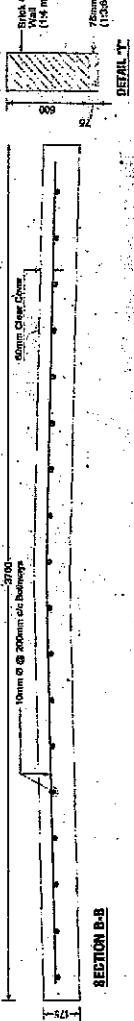
- NOTES:**
- All dimensions are in millimeter unless otherwise stated.
  - Average Ground Level should be taken at a distance of minimum 25m from the centerline of the road alignment.
  - 28 days cylinder crushing strength of concrete is = 30 MPa, Flexure Strength = 3.5 MPa with suggested min. rate = 1:2:2.5 and maximum water content ratio 0.4. Using minimum 140/200 mesh size aggregate.
  - CS-20mm coarse aggregate with graded stone chips, F.M. = 2.5.
  - Expansion joints shall be placed at 101.160m minimum spacing on pavement & (B) 3.0m (max.) with any road structure.
  - Contraction joints shall be placed at work extends when placing onto adjacent right pavements.

Appendix -H

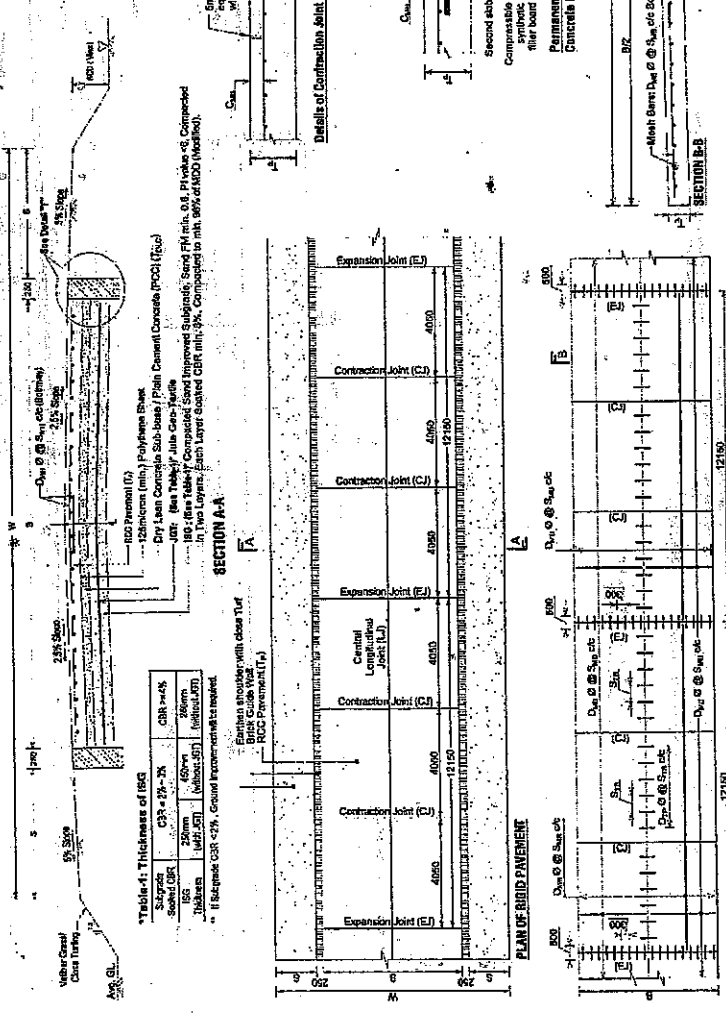
RIGID PAVEMENT DESIGN TEMPLATE FOR SUBMERSIBLE ROAD (CVD ≤ 100)



REINFORCEMENT DETAILS OF RIGID PAVEMENT



RIGID PAVEMENT DESIGN TEMPLATE FOR SUBMERSIBLE ROAD (CVD > 100)

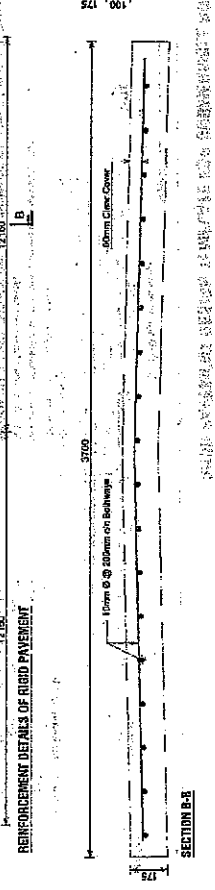
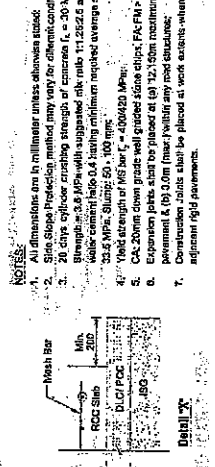
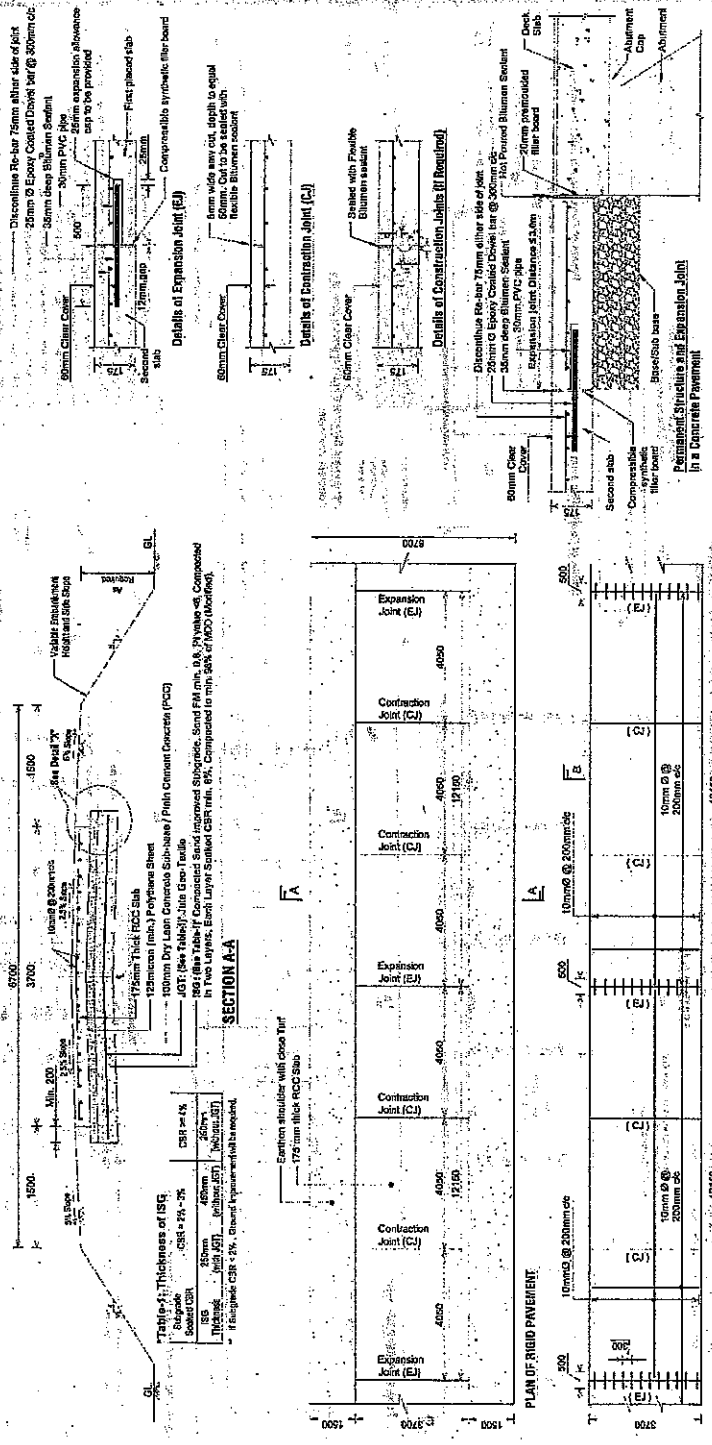


REINFORCEMENT DETAILS OF RIGID PAVEMENT

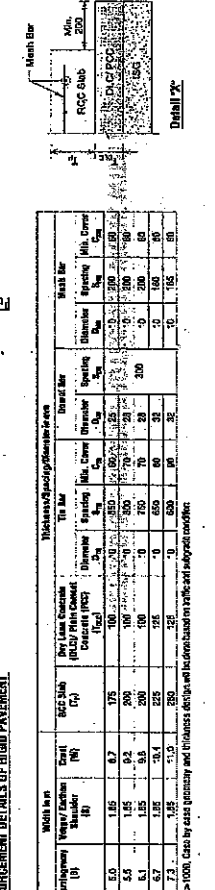
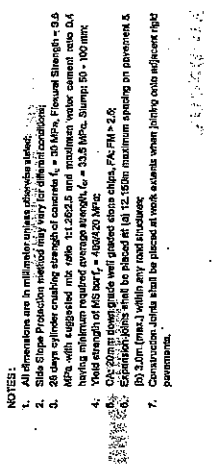
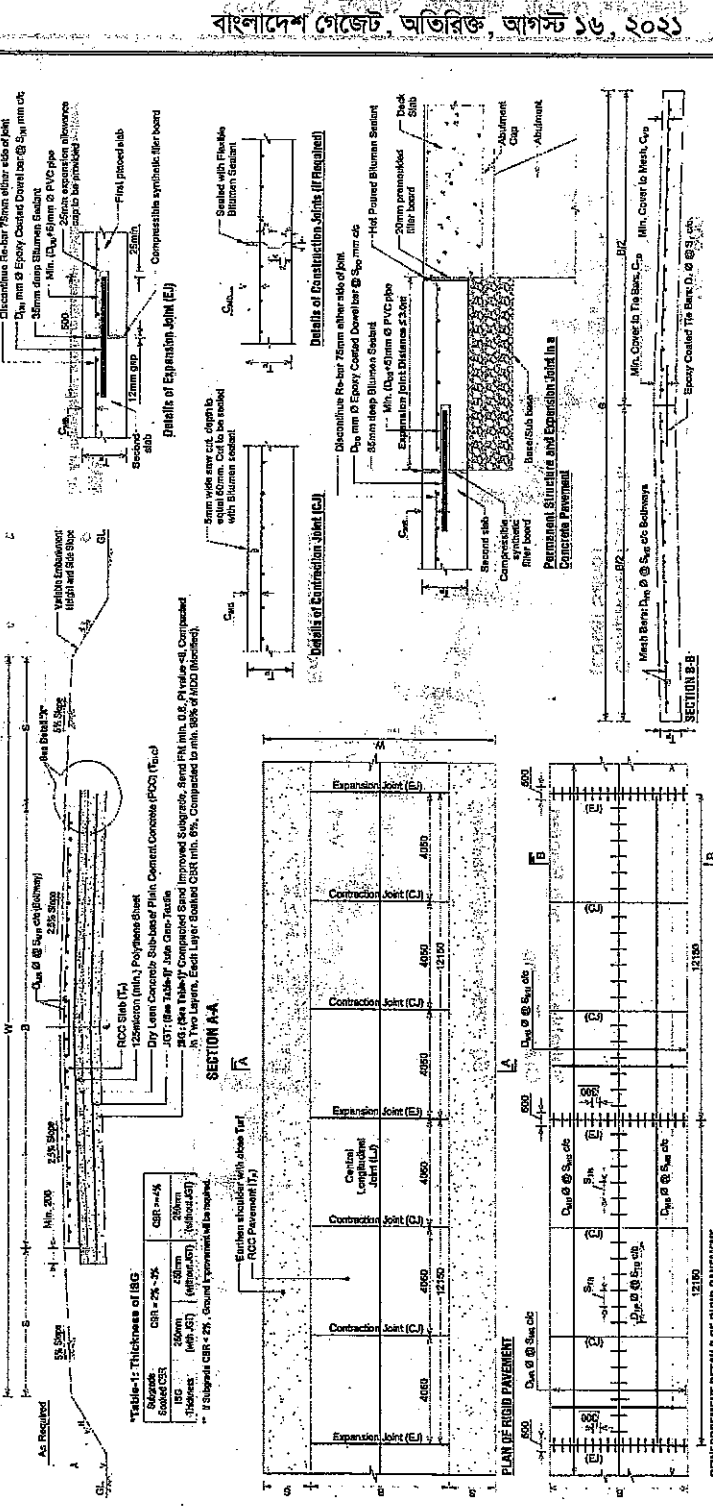
CVD	Width & n		Reinforcement Details		Reinforcement Details	
	Width (m)	n	Reinforcement	Reinforcement	Reinforcement	Reinforcement
10-200	5.0	8	175	10mm	10mm	10mm
201-500	5.0	8	175	10mm	10mm	10mm
501-750	6.0	9	175	10mm	10mm	10mm
751-1000	7.0	10	175	10mm	10mm	10mm

Note: Road with CVD > 100 will be designed case by case based on initial subgrade condition.

**RIGID PAVEMENT DESIGN TEMPLATE FOR HAT/BAZAR /GROWTH CENTER/WATER LOGGED AREA (CVD ≤ 100)**



**RIGID PAVEMENT DESIGN TEMPLATE FOR HAT/BAZAR/GROWTH CENTER/WATER LOGGED AREA (CVD > 100)**

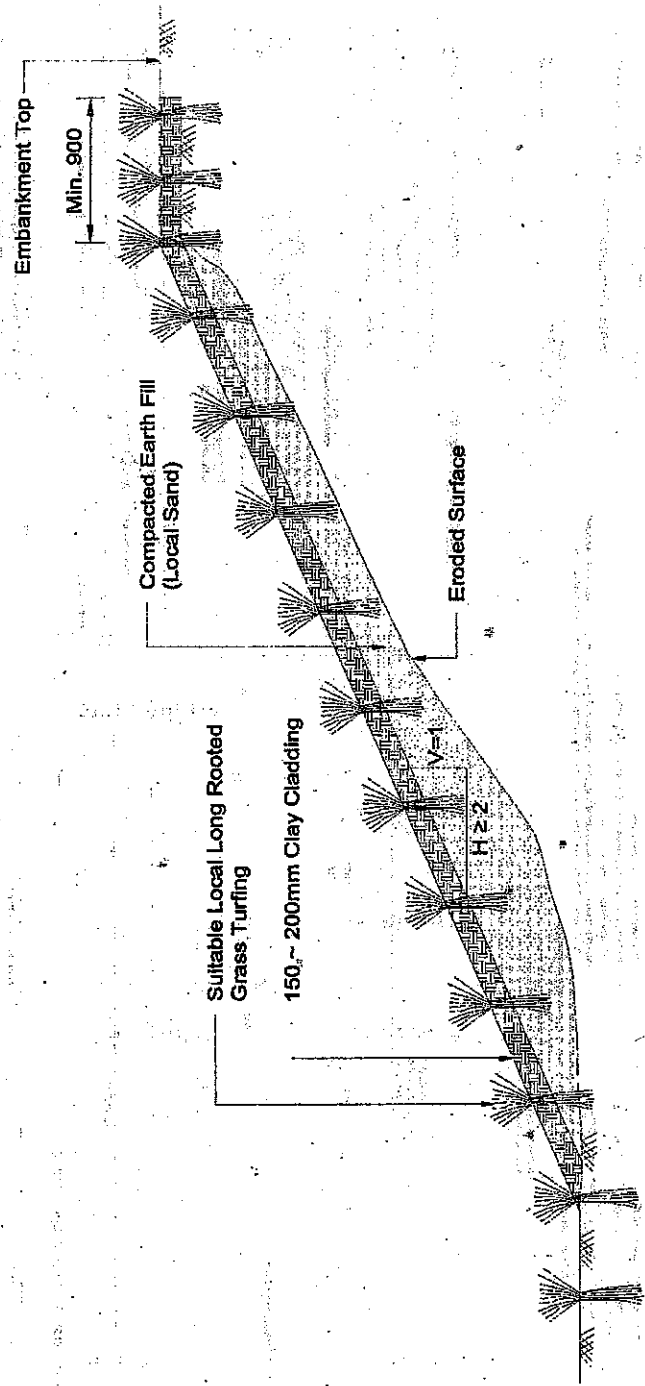


**Table 1-3: Thickness of ISG**

CVD	Width in Meter/Feet	CSB (%)	ISG (mm)	ISG (mm)		ISG (mm)		ISG (mm)		ISG (mm)	
				ISG (mm)	ISG (mm)	ISG (mm)	ISG (mm)	ISG (mm)	ISG (mm)		
10-200	5.0	1.05	0.2	175	100	100	100	100	100	100	100
20-300	5.4	1.05	0.2	175	100	100	100	100	100	100	100
30-400	5.8	1.05	0.2	175	100	100	100	100	100	100	100
40-500	6.2	1.05	0.2	175	100	100	100	100	100	100	100
50-750	6.7	1.05	0.4	225	100	100	100	100	100	100	100
75-1000	7.3	1.05	0.5	250	100	100	100	100	100	100	100

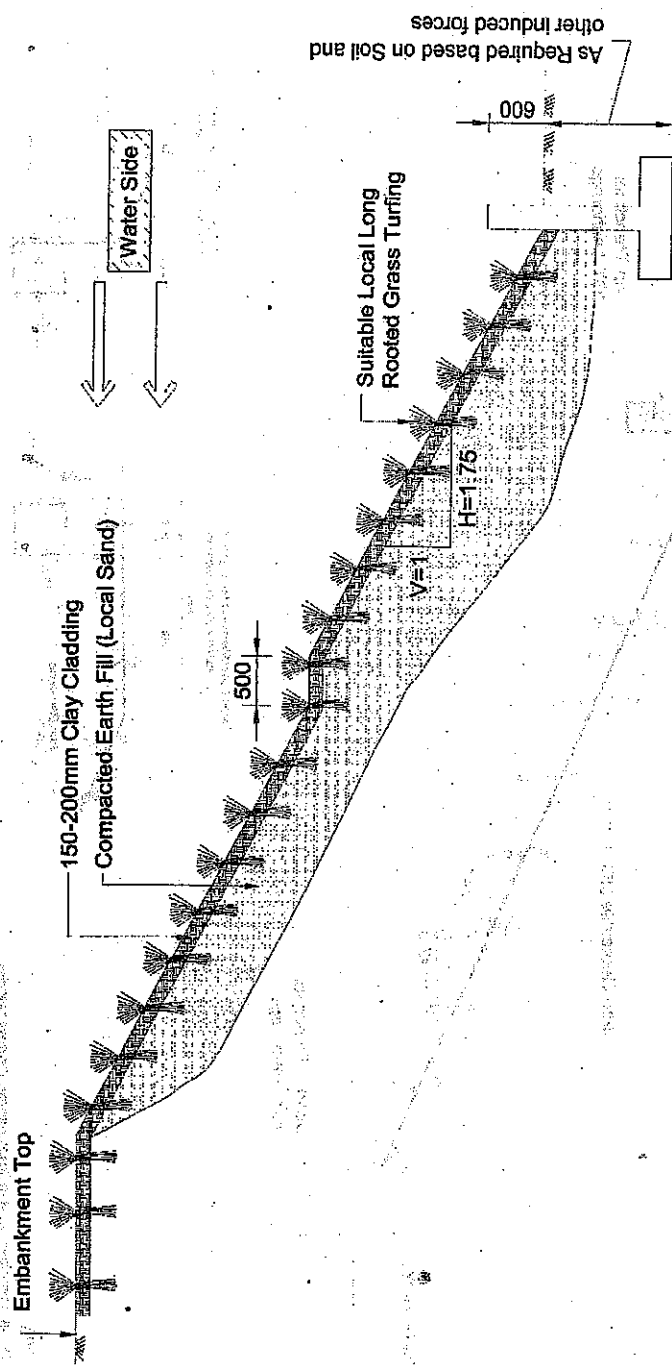
Note: For CVD > 1000, Case by case quantity and thickness details will be done based on traffic and subgrade condition.

**METHOD-01: SLOPE PROTECTION WORK WITH LONG ROOTED GRASS TURFING**



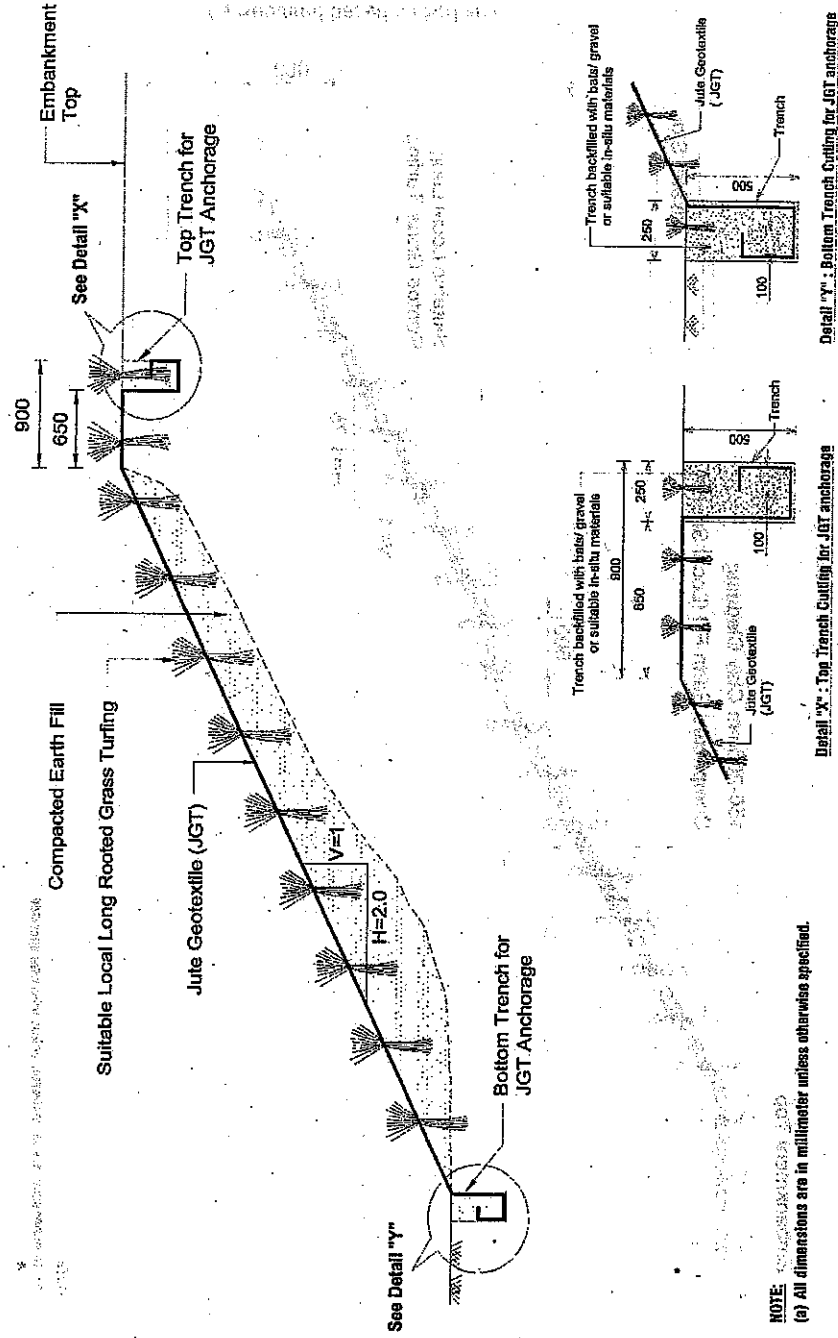
**NOTE:**  
(a) All dimensions are in millimeter unless otherwise specified.

**METHOD-02: SLOPE PROTECTION WORK FOR HIGH EMBANKMENT (ABOVE 4.5m) LONG ROOTED GRASS**



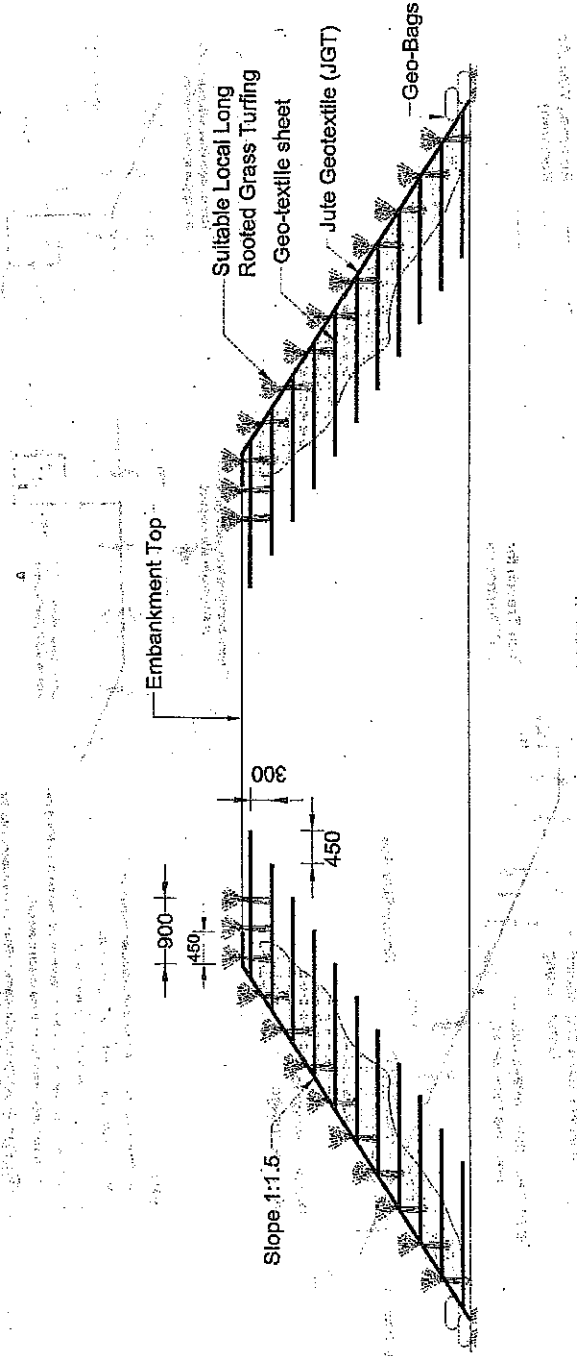
**NOTE:**  
(a) All dimensions are in millimeter unless otherwise specified.

**METHOD-03: SLOPE PROTECTION WORK WITH LONG ROOTED GRASS TURFING & JUTE GEOTEXTILE ON SLOPE FOR SANDY SOIL**



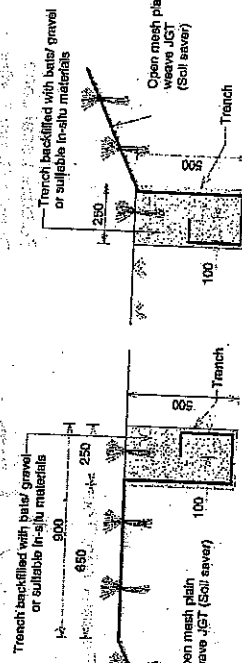
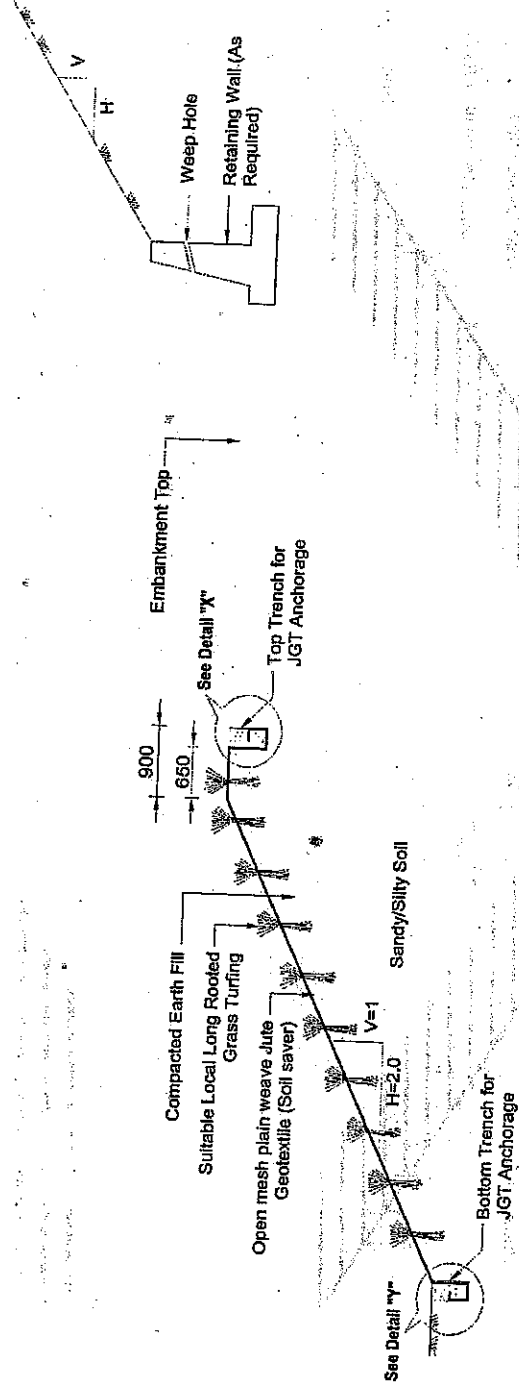
**NOTE:**  
(a) All dimensions are in millimeter unless otherwise specified.

**METHOD-04: SLOPE PROTECTION WORK WITH GRASS TURFING, JUTE GEOTEXTILE & GEO-BAGS ON SLOPE FOR CLAYEY SOIL**

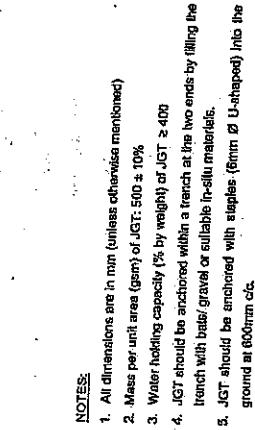


**NOTES:**  
1. All dimensions are in mm (unless otherwise mentioned);  
2. Length of Geotextile in each layer depends on the failure plane;  
3. Overlapping of Geotextile for succeeding layers should be at least 40%.

**METHOD-05: SLOPE PROTECTION WORK WITH LONG ROOTED GRASS TURFING & JUTE GEOTEXTILE ON SLOPE FOR HILLY AREA**



Detail 'V-V' : Top Trench Cutting for JGT anchorage

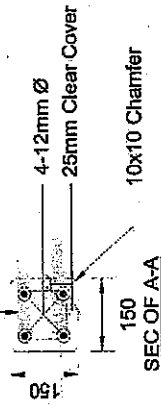
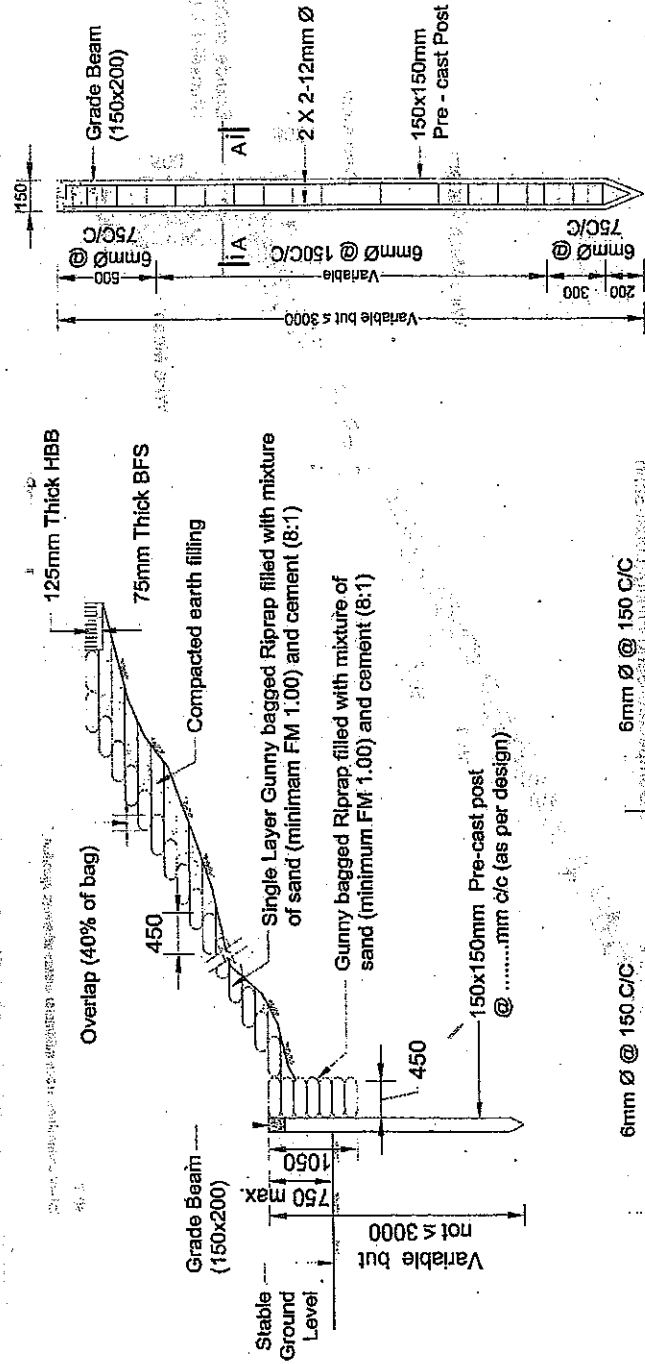


Detail 'V-V' : Bottom Trench Cutting for JGT anchorage

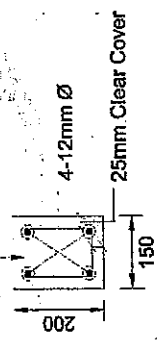
**NOTES:**

1. All dimensions are in mm (unless otherwise mentioned)
2. Mass per unit area (gsm) of JGT: 500 ± 10%
3. Water holding capacity (% by weight) of JGT ≥ 40%
4. JGT should be anchored within a trench at the two ends by filling the trench with better gravel or suitable in-situ materials.
5. JGT should be anchored with staples (6mm Ø U-shaped) into the ground at 800mm c/c.

**METHOD-06: SLOPE PROTECTION WORK WITH GUNNY-BAGGED RIP-RAP**

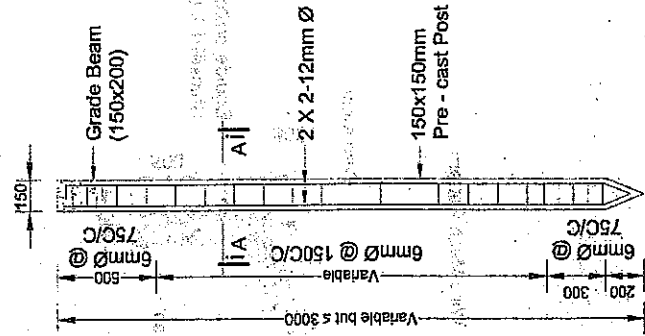


SEC OF A-A



SEC OF GRADE BEAM

**Re-bar Details of RCC Post**

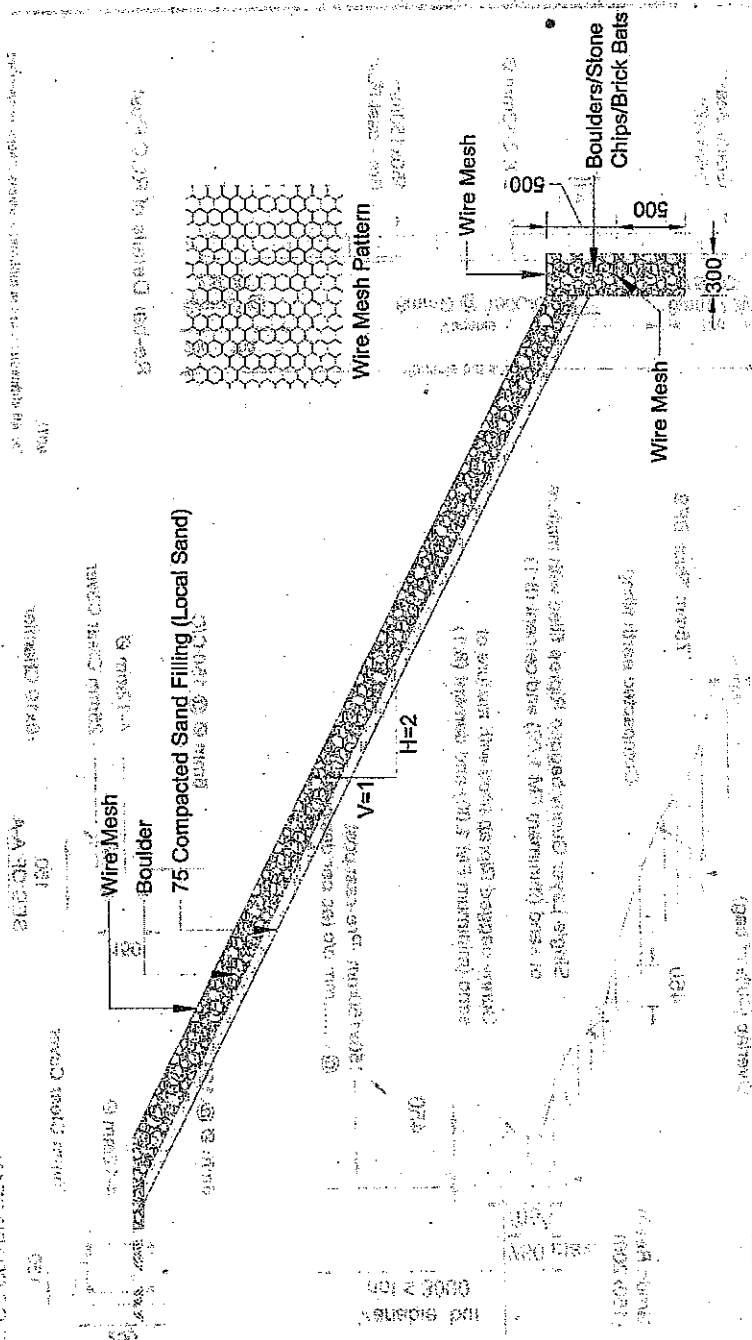


**NOTE:**

(a) All dimensions are in millimeter unless otherwise specified.

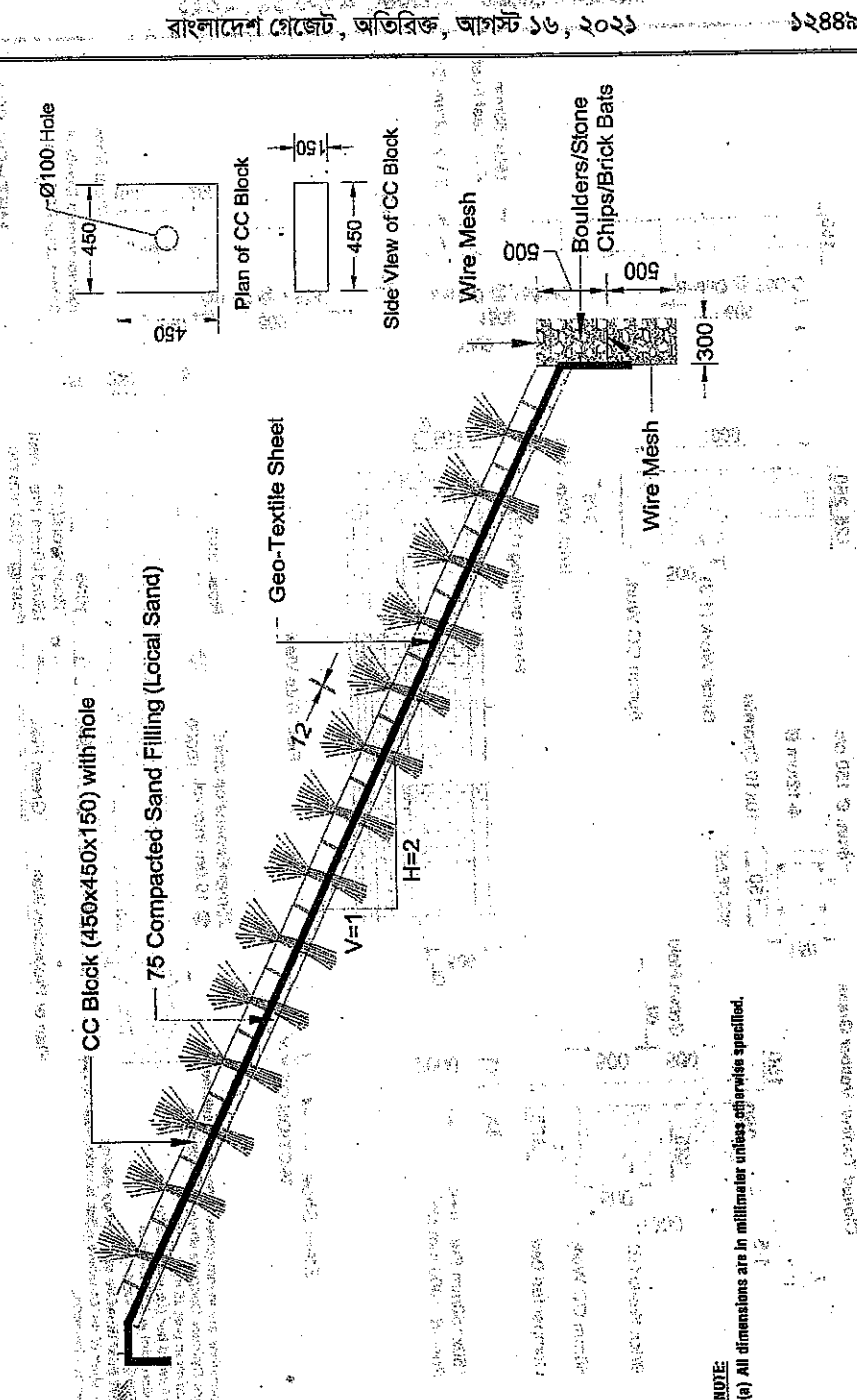
REBAR DETAIL SHOULD BE CALCULATED FROM DATA SUPPLIED

METHOD-07: SLOPE PROTECTION WORK WITH GABIONS



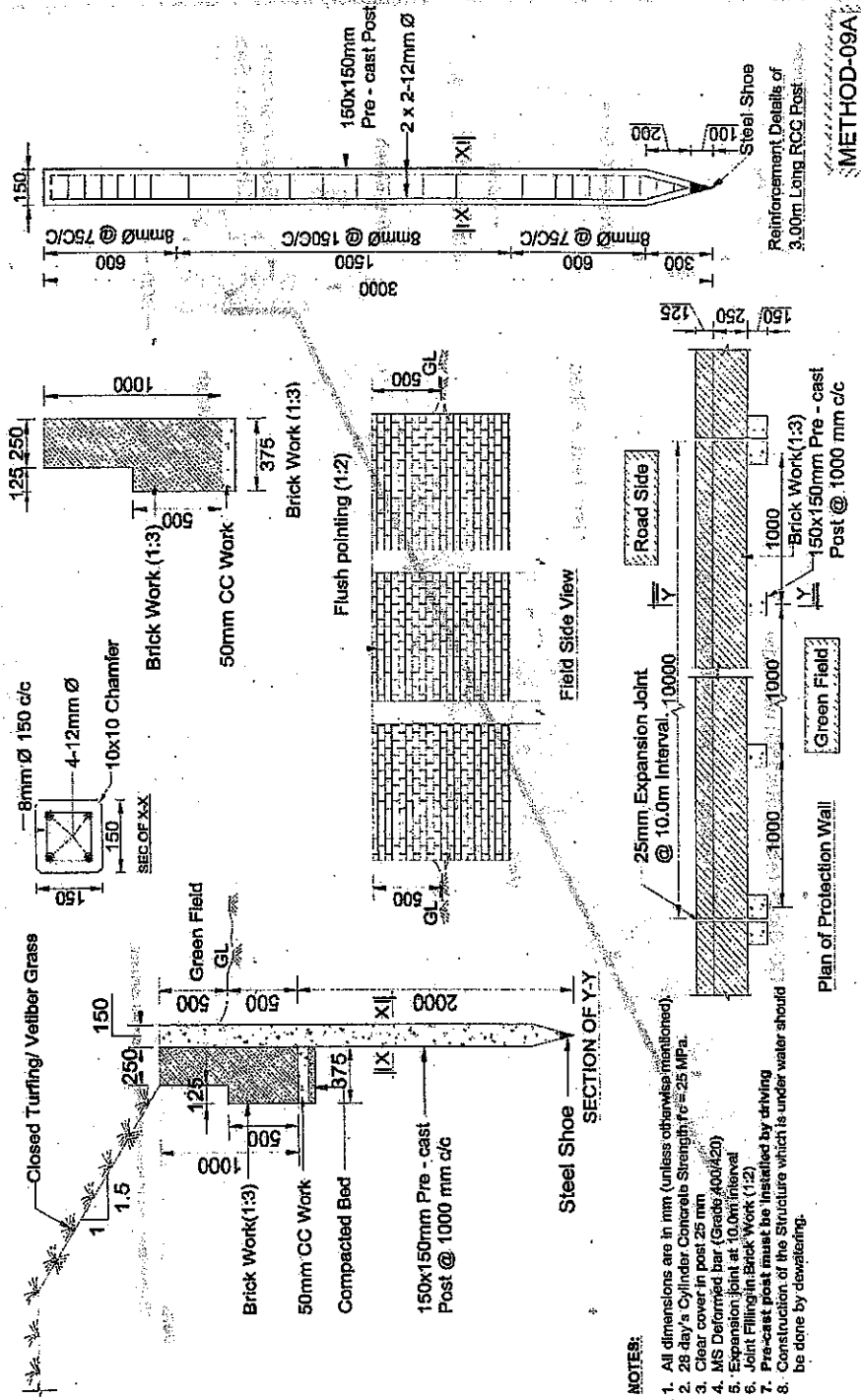
১২৮৮৮ নং স্লোপ প্রকল্পের জন্য প্রস্তুতকৃত নকশা

METHOD-08: SLOPE PROTECTION WORK WITH LONG ROOTED GRASS, VEGETATION, BLOCK AND GABIONS



১২৮৮৮ নং স্লোপ প্রকল্পের জন্য প্রস্তুতকৃত নকশা

**METHOD-09: SLOPE PROTECTION WORK WITH MASONRY BRICK AND PRE-CAST RCC POST**

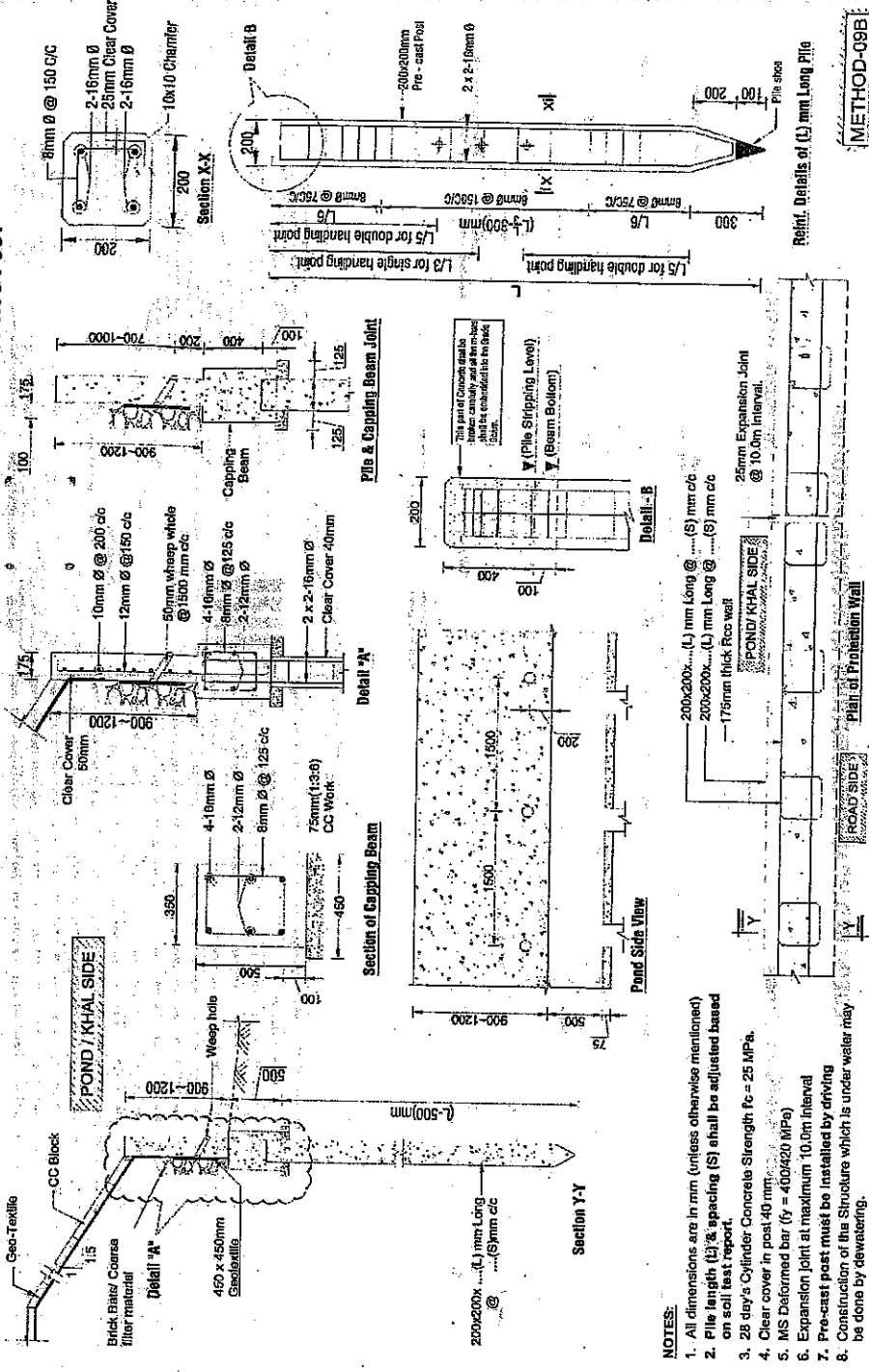


**NOTES:**

1. All dimensions are in mm (unless otherwise mentioned)
2. 28 day's Cylinder Concrete Strength  $f_c = 25$  MPa.
3. Clear cover in post 25 mm
4. MS Deformed bar (Grade 400/420)
5. Expansion joint at 10.0m interval
6. Joint Filling in Brick Work (1:2)
7. Pre-cast post must be installed by driving
8. Construction of the Structure which is under water should be done by dewatering.

METHOD-09A

**METHOD-09: SLOPE PROTECTION WORK WITH MASONRY BRICK AND PRE-CAST RCC POST**



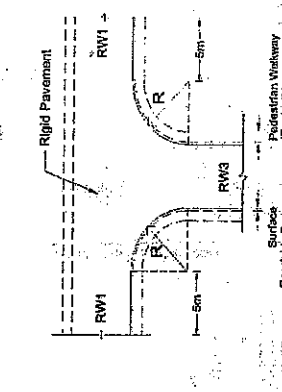
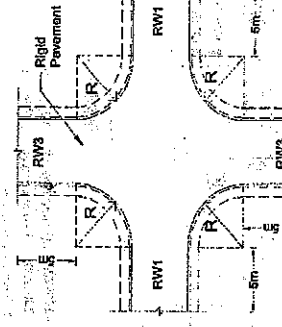
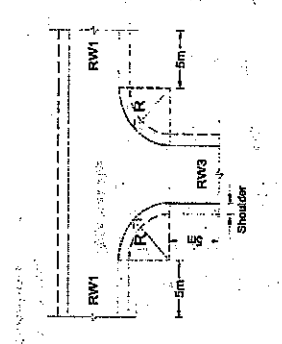
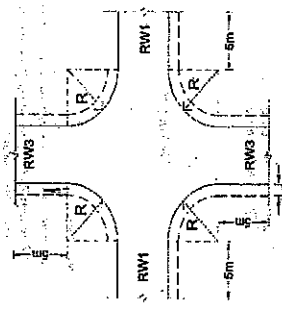
**NOTES:**

1. All dimensions are in mm (unless otherwise mentioned)
2. Pile length (L) & spacing (S) shall be adjusted based on soil test report.
3. 28 day's Cylinder Concrete Strength  $f_c = 25$  MPa.
4. Clear cover in post 40 mm.
5. MS Deformed bar ( $f_y = 400/420$  MPa)
6. Expansion joint at maximum 10.0m interval
7. Pre-cast post must be installed by driving
8. Construction of the Structure which is under water may be done by dewatering.

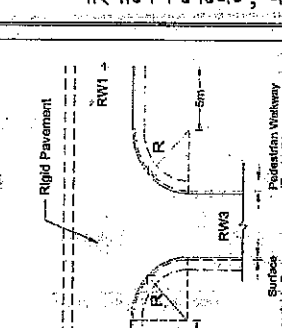
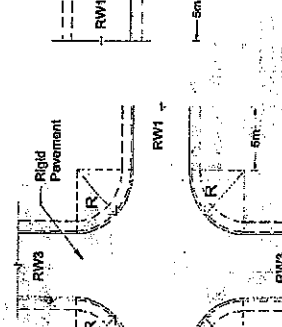
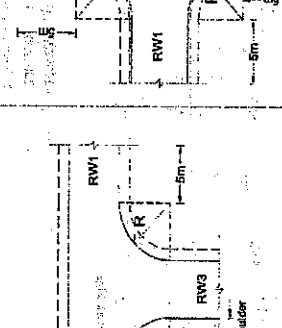
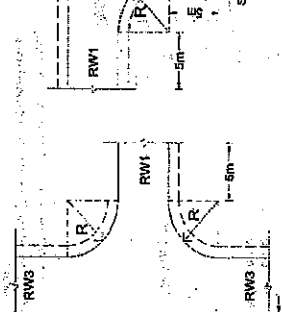
METHOD-09B



Non Hat-Bazar Areas

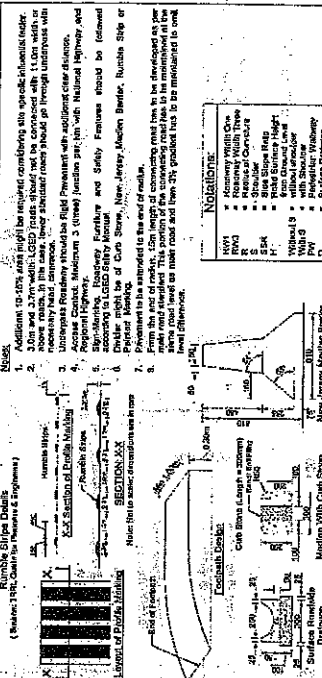


Hat-Bazar Areas



Connectivity with Circular Curves

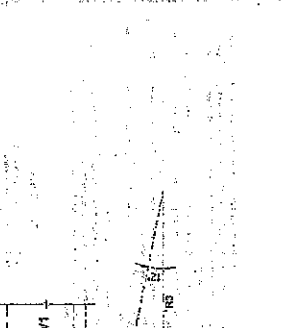
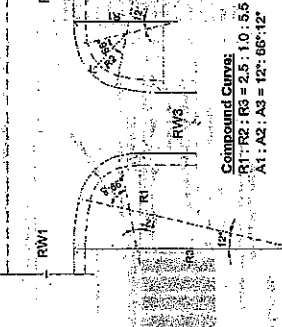
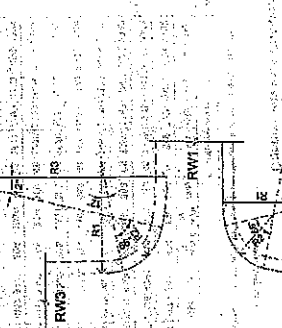
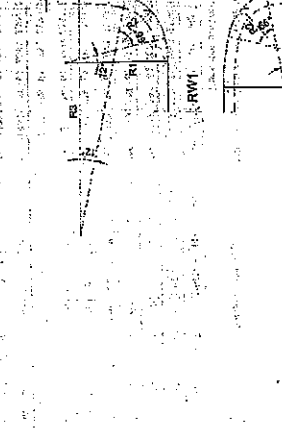
Roadway Data (m)	Approximate Area (sq) Needed in Ground Level with Interchange Influence Area (sqm on each leg)												
	Circle Intersections			T-Intersections			Rural Areas			Urban Areas			
RW1 RW3 S R	H1 H2 H3 H4	H5 H6 H7 H8	H9 H10 H11 H12	H13 H14 H15 H16	H17 H18 H19 H20	H21 H22 H23 H24	H25 H26 H27 H28	H29 H30 H31 H32	H33 H34 H35 H36	H37 H38 H39 H40	H41 H42 H43 H44	H45 H46 H47 H48	
01	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
02	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
03	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
04	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
05	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
06	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
07	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
08	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
09	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
10	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
11	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
12	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2



- Notations:**
- RW1: Economy Width
  - RW3: Economy Width
  - S: Shoulder
  - R: Road
  - H: Hat
  - B: Bazar
  - W: Walkway
  - D: Drain
  - W: Walkway
  - S: Shoulder
  - R: Road
  - H: Hat
  - B: Bazar
  - W: Walkway
  - D: Drain

LGED-LGED CROSS-ROAD INTERSECTIONS WITH COMPOUND CURVES

Non-Hat-Bazar Areas



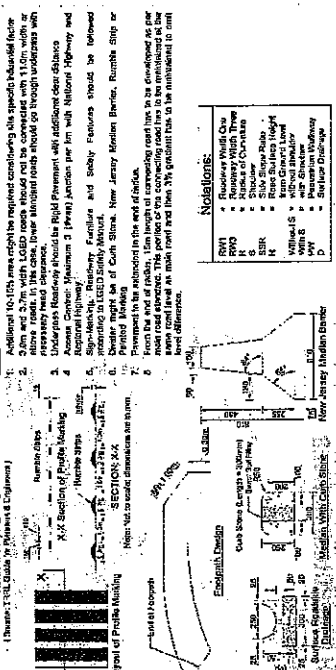
Compound Curves:  
R1: R2: R3 = 2.5: 1.0: 5.5  
A1: A2: A3 = 12: 68: 12

Compound Curves:  
R1: R2: R3 = 2.5: 1.0: 5.5  
A1: A2: A3 = 12: 68: 12

Connectivity with Compound Curves

Roadway Data (m)	Approximate Area (sq) Needed in Ground Level with Interchange Influence Area (sqm on each leg)												
	Circle Intersections			T-Intersections			Rural Areas			Urban Areas			
RW1 RW3 S R	H1 H2 H3 H4	H5 H6 H7 H8	H9 H10 H11 H12	H13 H14 H15 H16	H17 H18 H19 H20	H21 H22 H23 H24	H25 H26 H27 H28	H29 H30 H31 H32	H33 H34 H35 H36	H37 H38 H39 H40	H41 H42 H43 H44	H45 H46 H47 H48	
01	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
02	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
03	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
04	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
05	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
06	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
07	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
08	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
09	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
10	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
11	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
12	3.0	3.0	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Connectivity with Compound Curves

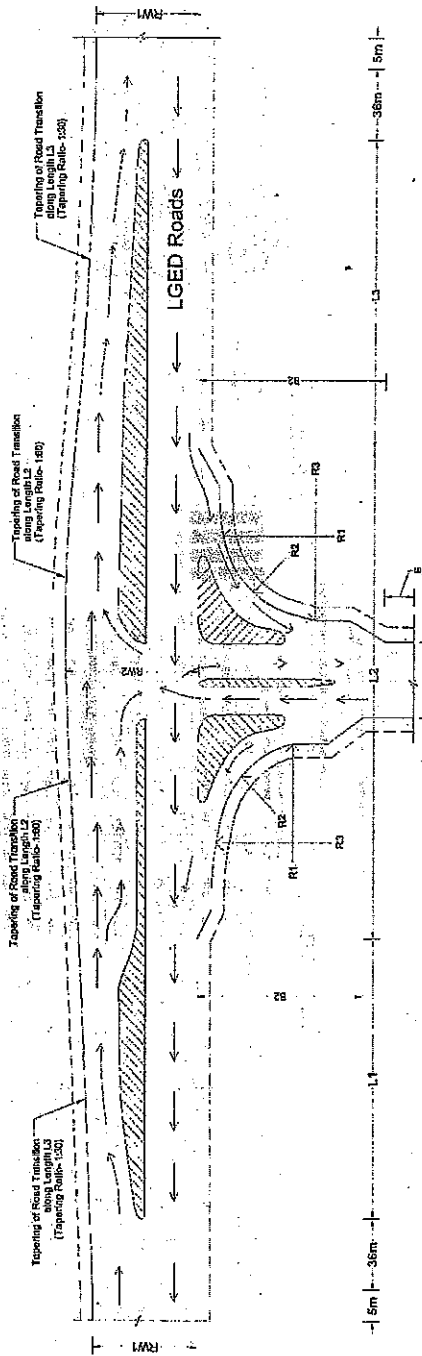


- Notations:**
- RW1: Economy Width
  - RW3: Economy Width
  - S: Shoulder
  - R: Road
  - H: Hat
  - B: Bazar
  - W: Walkway
  - D: Drain
  - W: Walkway
  - S: Shoulder
  - R: Road
  - H: Hat
  - B: Bazar
  - W: Walkway
  - D: Drain



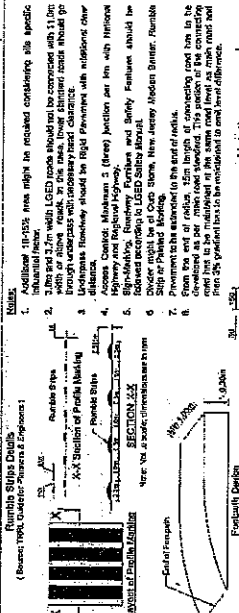


LGED-LGED ROAD T-INTERSECTIONS ON NON HAT-BAZAR AREAS



Connectivity with Channelization

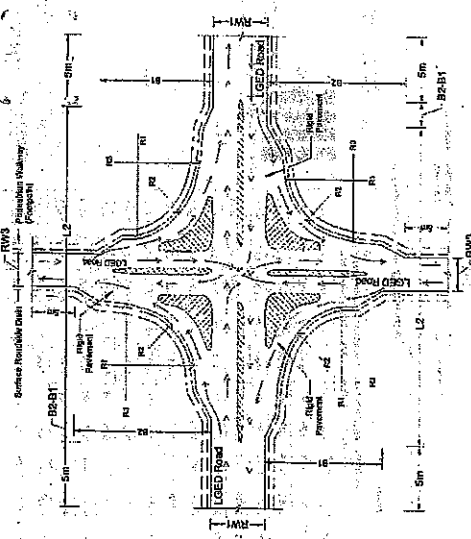
Connectivity Type	Roadway Data (m)										Approximate Area (sqm) Needed in Ground Level with Intersection Influence Area (sqm on each leg)														
	RW1	RW2	RW3	R2	L2	L1	L3	B1	B2	S	SBR	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10				
13	6.1	9.8	4.5	18	75	139	75	51	83	2	12	1	2	3	4	5	4927	6346	1359	219	8284	10009	11722	13421	15077
14	6.7	10.4	5.5	16	75	130	75	51	80	2	11	1	2	3	4	5	5150	6748	1359	219	8505	10232	11945	13662	15340
15	7.3	11.0	6.5	10	75	129	75	51	82	2	12	1	2	3	4	5	5972	6991	1399	219	8729	10455	12167	13868	15523
16	11.8	15.5	6.5	22	75	204	75	57	142	2	12	1	2	3	4	5	9084	11658	1700	300	15891	19584	22993	26117	29113
17	6.1	9.8	4.5	18	75	140	75	51	83	2	12	1	2	3	4	5	4086	6656	1400	220	8245	10072	11765	13487	15143
18	6.7	10.4	6.1	18	75	140	75	51	83	2	12	1	2	3	4	5	5209	6929	1400	220	8668	10295	12009	13710	15366
19	7.3	11.0	6.1	18	75	140	75	51	83	2	12	1	2	3	4	5	5432	7052	1400	220	8791	10518	12332	14034	15690
20	11.8	15.5	6.1	22	75	205	75	57	142	2	12	1	2	3	4	5	7800	9291	1462	220	11107	12916	14701	16479	18194
21	6.7	10.4	6.7	18	75	141	75	51	83	2	12	1	2	3	4	5	5428	6890	1461	220	8630	10358	12073	13776	15433
22	7.3	11.0	6.1	18	75	140	75	51	83	2	12	1	2	3	4	5	5432	7052	1400	220	8791	10518	12332	14034	15690
23	11.8	15.5	6.7	22	75	205	75	57	142	2	12	1	2	3	4	5	9291	11264	1793	301	13392	15808	18011	20202	22428
24	7.3	11.0	7.3	18	75	141	75	51	83	2	12	1	2	3	4	5	5552	7174	1402	220	8916	10645	12361	14065	15724
25	11.8	15.5	7.3	22	75	205	75	57	142	2	12	1	2	3	4	5	9290	11468	1793	301	13993	16210	18314	20399	22434
26	11.8	15.5	11.0	25	75	243	75	61	148	2	12	1	2	3	4	5	11205	13224	1919	300	15711	18885	21447	23796	26068



- NOTATIONS:**
- RWS: Rumble Width One
  - R: Rumble
  - S: Shoulder
  - SBR: Shoulder Barrier
  - H: Height
  - W: Width
  - WWS: Wheel Stop
  - D: Drainage

INTERSECTION DETAIL DESIGN

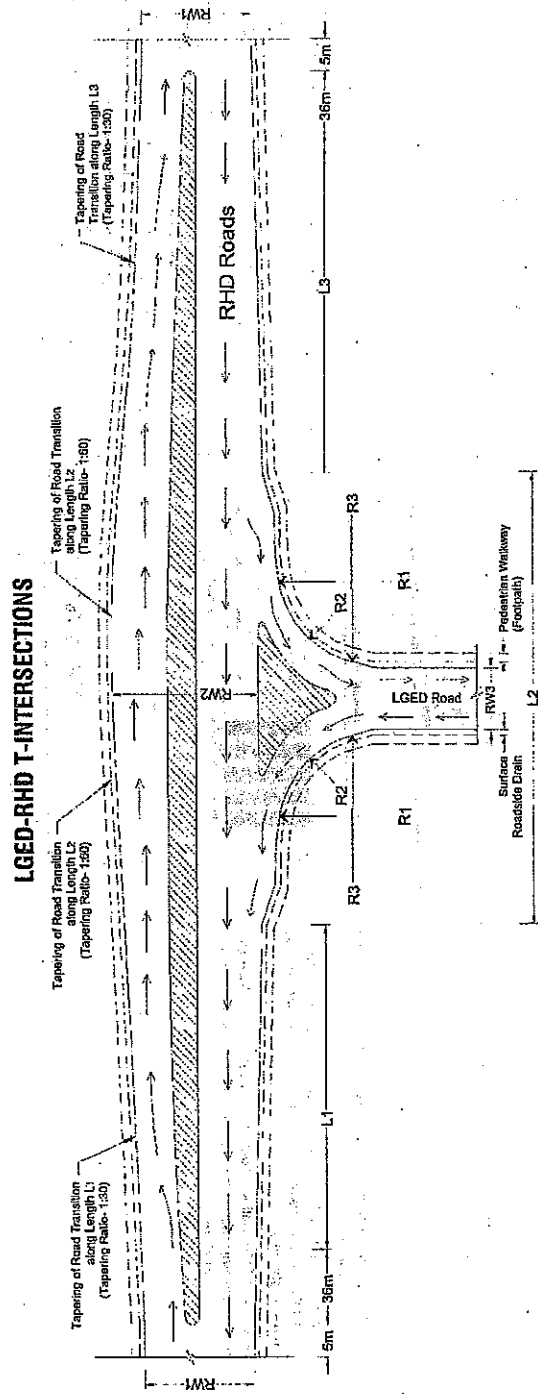
LGED-LGED CROSS-ROAD INTERSECTIONS ON HAT-BAZAR AREAS



Connectivity with Channelization

Connectivity Type	Roadway Data (m)										Approximate Area (sqm) Needed in Ground Level with Intersection Influence Area (sqm on each leg)														
	RW1	RW2	RW3	R2	L2	L1	L3	B1	B2	S	SBR	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10				
13	6.1	9.8	4.5	18	75	139	75	51	83	2	12	1	2	3	4	5	4927	6346	1359	219	8284	10009	11722	13421	15077
14	6.7	10.4	5.5	16	75	130	75	51	80	2	11	1	2	3	4	5	5150	6748	1359	219	8505	10232	11945	13662	15340
15	7.3	11.0	6.5	10	75	129	75	51	82	2	12	1	2	3	4	5	5972	6991	1399	219	8729	10455	12167	13868	15523
16	11.8	15.5	6.5	22	75	204	75	57	142	2	12	1	2	3	4	5	9084	11658	1700	300	15891	19584	22993	26117	29113
17	6.1	9.8	4.5	18	75	140	75	51	83	2	12	1	2	3	4	5	4086	6656	1400	220	8245	10072	11765	13487	15143
18	6.7	10.4	6.1	18	75	140	75	51	83	2	12	1	2	3	4	5	5209	6929	1400	220	8668	10295	12009	13710	15366
19	7.3	11.0	6.1	18	75	140	75	51	83	2	12	1	2	3	4	5	5432	7052	1400	220	8791	10518	12332	14034	15690
20	11.8	15.5	6.1	22	75	205	75	57	142	2	12	1	2	3	4	5	7800	9291	1462	220	11107	12916	14701	16479	18194
21	6.7	10.4	6.7	18	75	141	75	51	83	2	12	1	2	3	4	5	5428	6890	1461	220	8630	10358	12073	13776	15433
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23	11.8	15.5	6.7	22	75	205	75	57	142	2	12	1	2	3	4	5	9291	11264	1793	301	13392	15808	18011	20202	22428
24	7.3	11.0	7.3	18	75	141	75	51	83	2	12	1	2	3	4	5	5552	7174	1402	220	8916	10645	12361	14065	15724
25	11.8	15.5	7.3	22	75	205	75	57	142	2	12	1	2	3	4	5	9290	11468	1793	301	13993	16210	18314	20399	22434
26	11.8	15.5	11.0	25	75	243	75	61	148	2	12	1	2	3	4	5	11205	13224	1919	300	15711	18885	21447	23796	26068

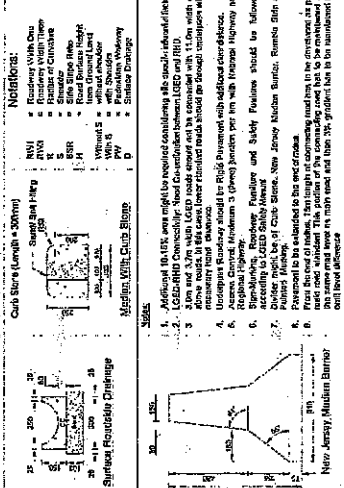
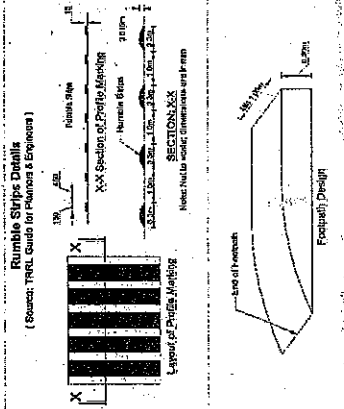




**Notes:**

1. Necessary dimensions will be determined through case by case geometric design
2. Vehicles from LGED roads will travel a distance along the RHD service roads, where available, before getting on the highways
3. LGED will follow all instructions / orders issued time to time regarding road safety including intersection from different ministries.

**Connectivity with Channelization**

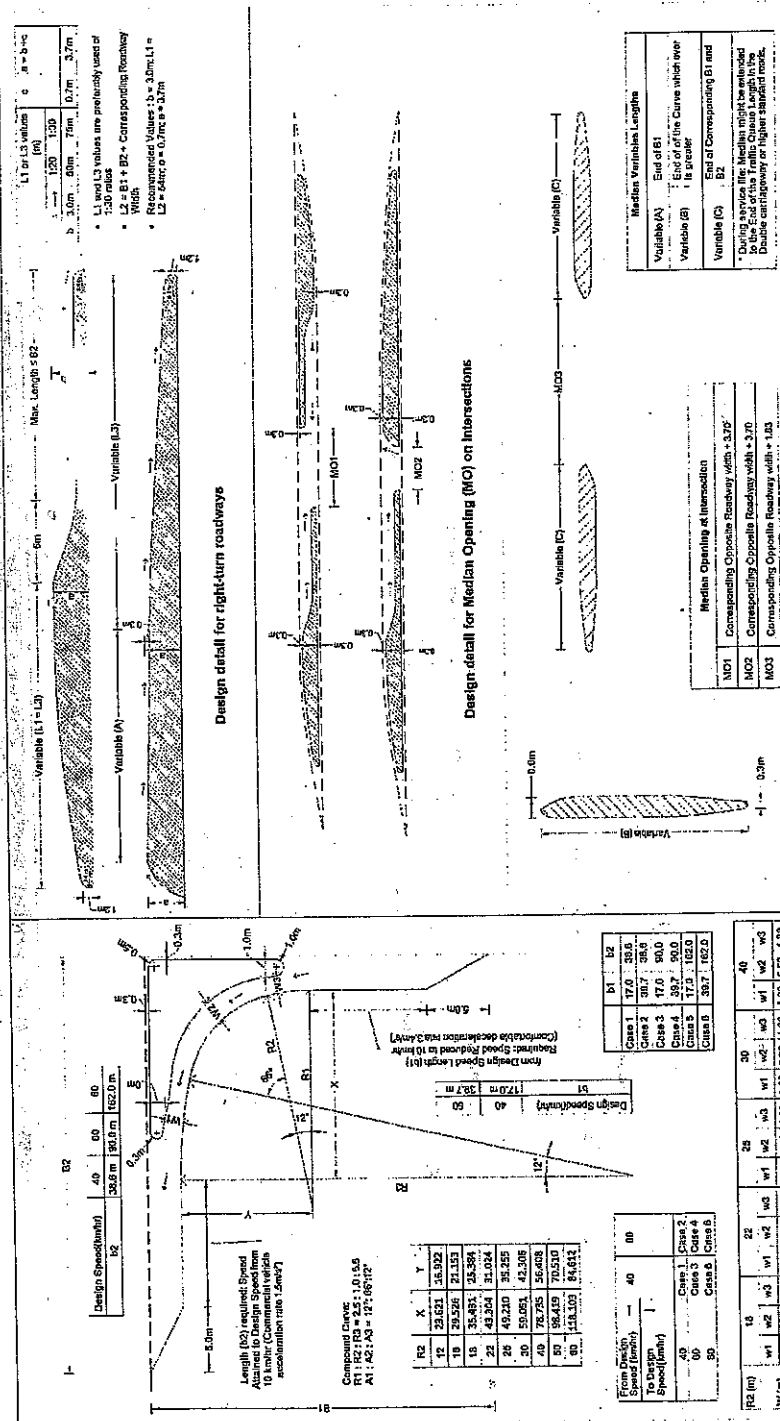


**NOTIFICATION:**

- 1. Additional to the above mentioned details, the following shall be observed:
- 2. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 3. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 4. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 5. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 6. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 7. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.
- 8. The L3 level shall be provided between the L2 and R1 level on both sides of the road. In the case, later elevated road through the road, the L3 level shall be provided between the L2 and R1 level on both sides of the road.

**NEW JERSEY Median Barrier:** Rumble Strip or

**INTERSECTION DETAIL DESIGN**



L1 or L3 values

Variable (A)	Variable (B)	Variable (C)	Variable (D)
1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00

L1 level L3 values are preferably used of 1:30 miles

- L2 = B1 + B2 + Corresponding Penalty Width
- L3 = B1 + B2 + Corresponding Penalty Width + 0.30m, L1 = 0.30m, L2 = 0.30m, L3 = 0.30m

Median Opening at Intersection

MO1	MO2	MO3
Corresponding Opposite Roadway width = 3.70'	Corresponding Opposite Roadway width = 3.70'	Corresponding Opposite Roadway width = 1.83'

Median Variables Lengths

Variable (A)	End of B1
	End of B1 curve which over
Variable (B)	End of B2
	End of B2 curve which over
Variable (C)	End of Corresponding B1 and B2
	End of Corresponding B1 and B2 curve which over
	End of this Traffic Queue Length in the Double carriageway or higher standard road.

Design detail for left-turn roadway

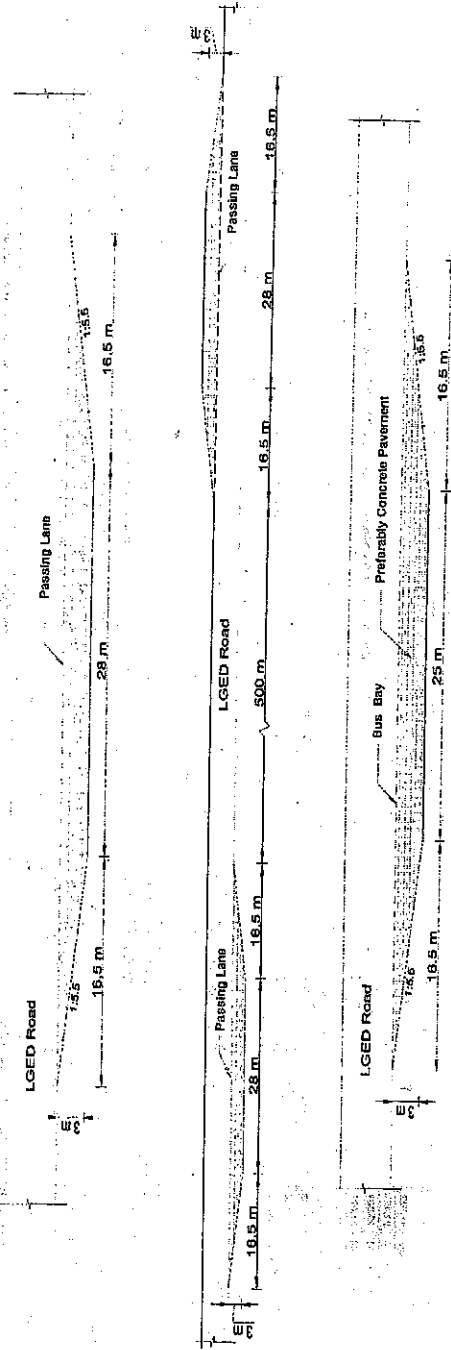
Design detail for Nose Splitter and Median Opening on Intersections

From Design Speed (km/h) 40 60 80

To Design Speed (km/h)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
w1	w2	w3	w4	w5	w6	w7	w8	w9	w10	w11	w12	w13	w14	w15	w16	w17	w18	w19	w20	w21	w22	w23	w24	w25	w26	w27	w28	w29	w30	w31	w32	w33	w34	w35	w36	w37	w38	w39	w40	
w1 (m)	w2 (m)	w3 (m)	w4 (m)	w5 (m)	w6 (m)	w7 (m)	w8 (m)	w9 (m)	w10 (m)	w11 (m)	w12 (m)	w13 (m)	w14 (m)	w15 (m)	w16 (m)	w17 (m)	w18 (m)	w19 (m)	w20 (m)	w21 (m)	w22 (m)	w23 (m)	w24 (m)	w25 (m)	w26 (m)	w27 (m)	w28 (m)	w29 (m)	w30 (m)	w31 (m)	w32 (m)	w33 (m)	w34 (m)	w35 (m)	w36 (m)	w37 (m)	w38 (m)	w39 (m)	w40 (m)	

\* w1 is on the mid of circular curve

**LGED ROAD PASSING LANE AND BUS BAY (SCHEMATIC DIAGRAM)**



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