



Chapter 11

Arterial Roads

11 Arterial Roads

11.1 Introduction

This Chapter deals only with those roads which are defined within the hierarchy as Primary and Secondary Arterials, and gathers together the advice contained in various locations within this manual. It should be noted that Expressways and Freeways, whose design characteristics enable them to carry greater volumes of traffic with fewer access points, are dealt with in Chapter 12. Previous Chapters deal with Local Roads (Chapter 9) and Collectors (Chapter 10).

The function of Arterials is to provide high-speed, high-volume links between major points in both the rural and urban road networks. Arterials are divided roads, normally of four or six lanes.

Rural Arterials are designed on the basis of traffic volume needs, and should be constructed to the highest standards possible. The geometric design is determined from the selected design speed and design traffic volumes, taking into account the type of terrain and the general characteristics of the alignment. Direct access to adjoining development should rarely be permitted.

Urban Arterials have mobility as their main determinant, with limited service to adjacent development. Where greater development access is required, service roads are often provided. In major centers of activity, the arterial street system must cater for vehicular mobility while recognizing and providing for a significant level of pedestrian activity.

11.2 Basic Design Parameters

11.2.1 Design Vehicle

The geometry of Arterials should be adequate for all sizes of design vehicle.

11.2.2 Design Speed

The permitted range of Design Speed for a Primary Arterial is from 100km/h down to 80 km/h. For Secondary Arterials, the range is 90km/h down to 60km/h. It may be necessary in mountainous terrain to adopt lower design speeds, and values of 60km/h for Primary Arterials, or 50km/h for Secondary Arterials, may be used.

In the absence of other relevant considerations, the recommended Design Speed for a Primary Arterial is 100km/h (rural) and 90km/h (urban), with 80km/h being appropriate for Central Business Districts. The corresponding recommended



figures for Secondary Arterials are 90km/h (rural), 70km/h (urban) and 60km/h (CBD).

11.2.3 Levels of Service

Level of Service C is normally adopted for design purposes on all Arterials, but in urban areas heavily-developed parts of the network may necessitate the use of Level of Service D.

11.2.4 Sight Distances

The Stopping Sight Distances and associated vertical curvature K values are set out in Table 11.1. (For increased Stopping Sight Distance on roads which are on a downgrade, refer to Table 4.1)

Table 11.1 : Stopping Sight Distances and Associated Vertical Curvature for Arterials

Design Speed (km/h)	Stopping Sight Distance (m) (Level Road)	Minimum K value for Vertical Curves	
		Crest	Sag
50	65	11	12
60	85	18	18
70	110	30	25
80	140	50	32
90	170	75	40
100	205	105	50

As all arterials in Dubai are divided roads, passing is not a relevant consideration. Decision Sight Distance should be provided at relevant locations in accordance with the guidance set out in Section 4.5 and in Table 11.2.

Table 11.2 : Decision Sight Distances and Associated Vertical Curvature for Arterials

Design Speed (km/h)	Decision Sight Distance (m)	Minimum K value for Vertical Crest Curves
50	170	75
60	215	100
70	260	135
80	305	185
90	350	225
100	400	310

11.2.5 Grades

The longitudinal profile of an Arterial should be designed to suit the topography. The maximum grade permitted is 6%; flatter grades should be achieved where possible.

The critical grade length set out in Table 6.2 should not be exceeded.

The minimum grade to be adopted on an Arterial road is 0.3%.

11.2.6 Superelevation and Crossfall

The maximum superelevation for all urban Arterials is 4%. In rural areas, the maximum is 6% for Secondary Arterials and 8% for Primary Arterials. Normal crossfall of 2% outwards from the median should be provided on straights.

11.2.7 Horizontal Curvature

The minimum radii for horizontal curves are set out in Table 11.3 below.



Table 11.3 : Minimum Radius for Arterials (m)

Design Speed (km/h)	4% superelevation	6%* superelevation	8%* superelevation
50**	100	90	80
60	150	135	125
70	210	190	170
80	285	255	230
90	370	335	300
100	n/a	n/a	385

* The maximum superelevation in urban areas is 4%.

** A design speed of 50km/h can be adopted only in mountainous terrain.

11.2.8 Widths

Urban Arterial roads are curbed and should be provided with lanes which are 3.65m in width. At lower design speeds, no curb clearance is required, but at higher speeds an outer curb clearance of 0.6m, and either a median curb clearance of 0.6m or a median shoulder of 1.2m, are provided.

Rural Arterial roads are not curbed, and have 3.65m lane widths with a 2.5m outer shoulder and a 1.2m median shoulder.

Median widths depend on circumstances, but are normally 6.0m to 8.0m on urban Secondary Arterials, 8.0 to 10.0m on urban Primary Arterials, and varying on all rural Arterials.

Section 11.6 contains further details and typical cross sections.

11.3 Intersections

Arterials are generally characterized by at-grade intersections, although grade-separation is always permissible and may be more appropriate in certain instances.

Not all at-grade intersections are suitable for use on Primary Arterials.

- On Primary Arterials in urban areas, Major / Minor intersections should not be used, and U-turns should be avoided wherever possible. Signalized intersections and roundabouts are appropriate types to use.

- On rural Primary Arterials, Signalized intersections should not be used, as experience elsewhere has shown that the risk of high-speed accidents can be unacceptably high. Roundabouts may be preferable, but often grade separation will be considered appropriate.

11.4 Service Roads

Parking is generally discouraged on or abutting the through running lanes of an Arterial road, as this could lead to excessive speed differentials and unexpected maneuvers.

Where parking is required in order to serve the fronting land uses, Service Roads are the preferred facility. These are roads provided parallel to, and physically separated from, the main line (see Section 7.13.2). It is normal for Service Roads to have a single one-way running lane of at least 3.5m width, and adjacent parallel or angled parking bays on the side adjacent to the development, with an appropriate buffer lane being provided where possible (see Section 8.5.3). Occasionally it is appropriate to provide a further bank of parking bays (and a further buffer lane) adjacent to the outer separation between the service road and the arterial proper.

11.5 Pedestrian Facilities

11.5.1 Sidewalks

Sidewalks should normally be provided on both sides of an urban Arterial, and should be provided where justified on rural Arterials.

In locations with high pedestrian flow, the width of the sidewalk depends on the level of pedestrian activity, as given in Table 8.2.

In other locations, the widths set out in Table 11.4 should be provided.

Table 11.4 : Preferred Sidewalk Width for Arterial Roads (m)

	Urban		Rural
	Primary Arterial	Secondary Arterial	All Arterials
Desirable	4.3 or more	3.35 or more	Where provided within verge width, sidewalk should be 1.8m to 3.0m
Minimum	1.8	1.8	



11.5.2 Pedestrian Crossings

It can be hazardous for pedestrians to cross Arterial roads, and adequate thought should be given at the design stage to the requirements for pedestrian crossings.

- Grade-separated crossings (bridges and subways) are always acceptable on Arterials, but may not always be cost-justified.
- Crossings incorporated within intersections are normally provided on Arterials.
- Controlled marked at-grade crossings (of the "Pelican" type) are generally the norm for mid-block crossings of Arterials.
- Uncontrolled marked at-grade crossings (of the "Zebra" type) are only acceptable on urban Secondary Arterials with a posted speed of 60km/h.

11.6 Summary of Design Parameters

Tables 11.5 and 11.6 summarize the key geometric parameters relating to preferred Design Speeds for Primary and Secondary Arterials respectively.

Table 11.5 : Summary of Geometric Parameters for Primary Arterials

Geometric parameter	Rural	Urban	
		Generally	in CBD*
Preferred Design Speed (km/h)	100	100	80
Stopping Sight Distance (m) (level road)	205	205	140
Decision Sight Distance (m) (level road)	400	400	305
Minimum Horizontal Radius (m) (for e=4%)	480	480	285
Maximum Superelevation (%)	8	4	4
Maximum Longitudinal Grade (%)	6	6	6
Minimum Longitudinal Grade (%)	0.3	0.3	0.3
Minimum Sag Curve K value	50	50	32
Minimum Crest Curve K value	105	105	50
Minimum Crest Curve K value (for Decision Sight Distance)	310	310	185
Minimum Vertical Clearance (m)	5.5	5.5	5.5

*CBD = Central Business District

Table 11.6 : Summary of Geometric Parameters for Secondary Arterials

Geometric parameter	Rural	Urban	
		Generally	in CBD*
Preferred Design Speed (km/h)	90	80	60
Stopping Sight Distance (m) (level road)	170	140	85
Decision Sight Distance (m) (level road)	350	305	215
Minimum Horizontal Radius (m) (for e=4%)	370	285	150
Maximum Superelevation (%)	6	4	4
Maximum Longitudinal Grade (%)	6	6	6
Minimum Longitudinal Grade (%)	0.3	0.3	0.3
Minimum Sag Curve K value	40	35	18
Minimum Crest Curve K value	75	50	18
Minimum Crest Curve K value (for Decision Sight Distance)	225	185	100
Minimum Vertical Clearance (m)	5.5	5.5	5.5

* CBD = Central Business District

Typical cross-sectional elements relating to Arterials are shown on the Figures which follow.

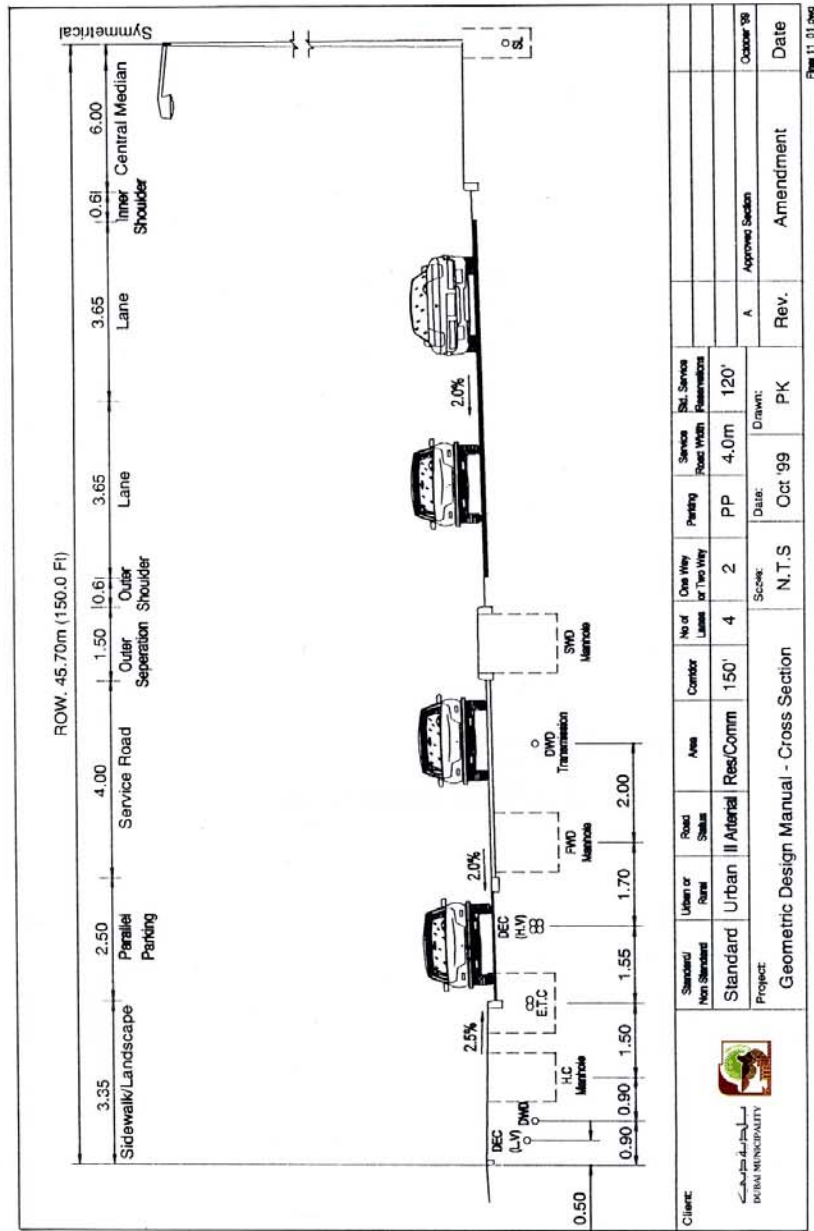
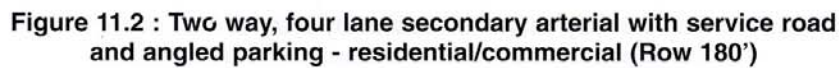
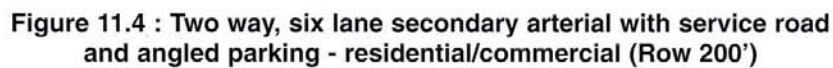


Figure 11.1 : Two way, four lane secondary arterial with service road and parallel parking - residential/commercial (Row 150')





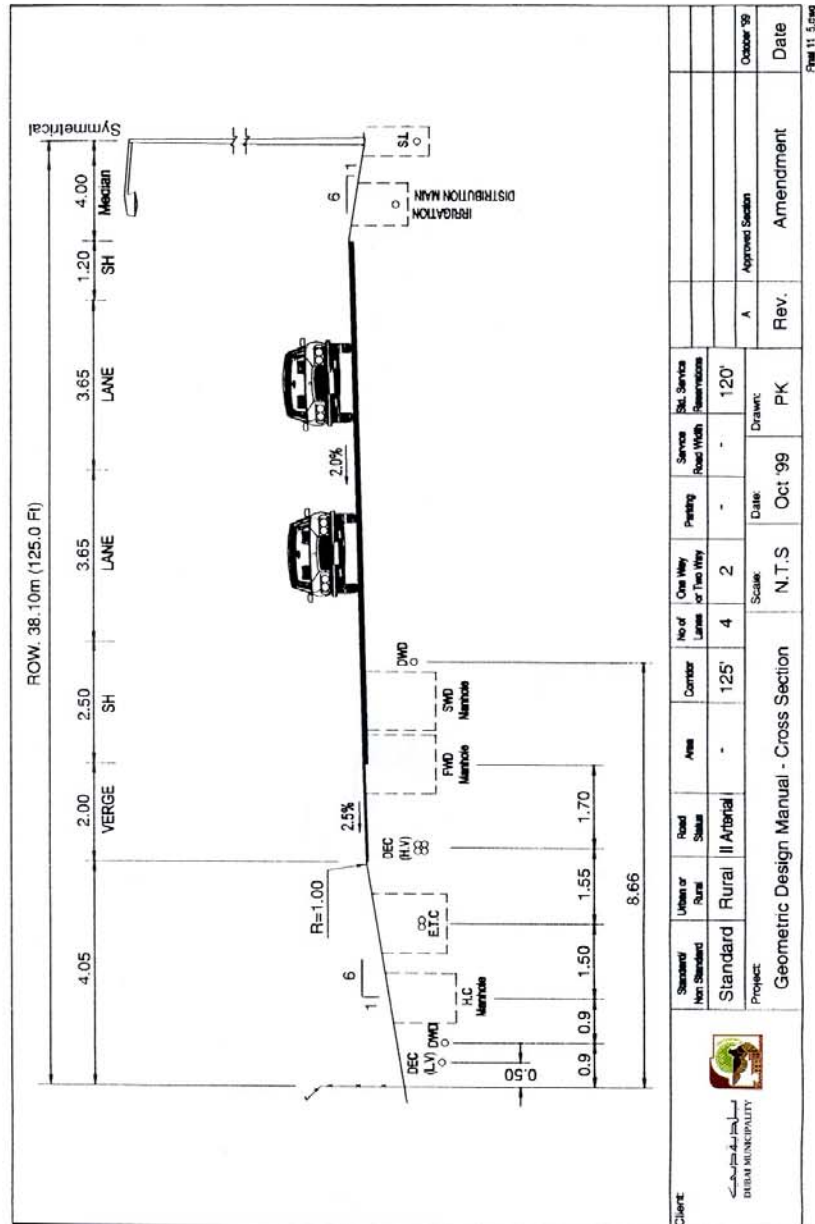


Figure 11.5 : Two way, four lane secondary arterial - rural (Row 125')



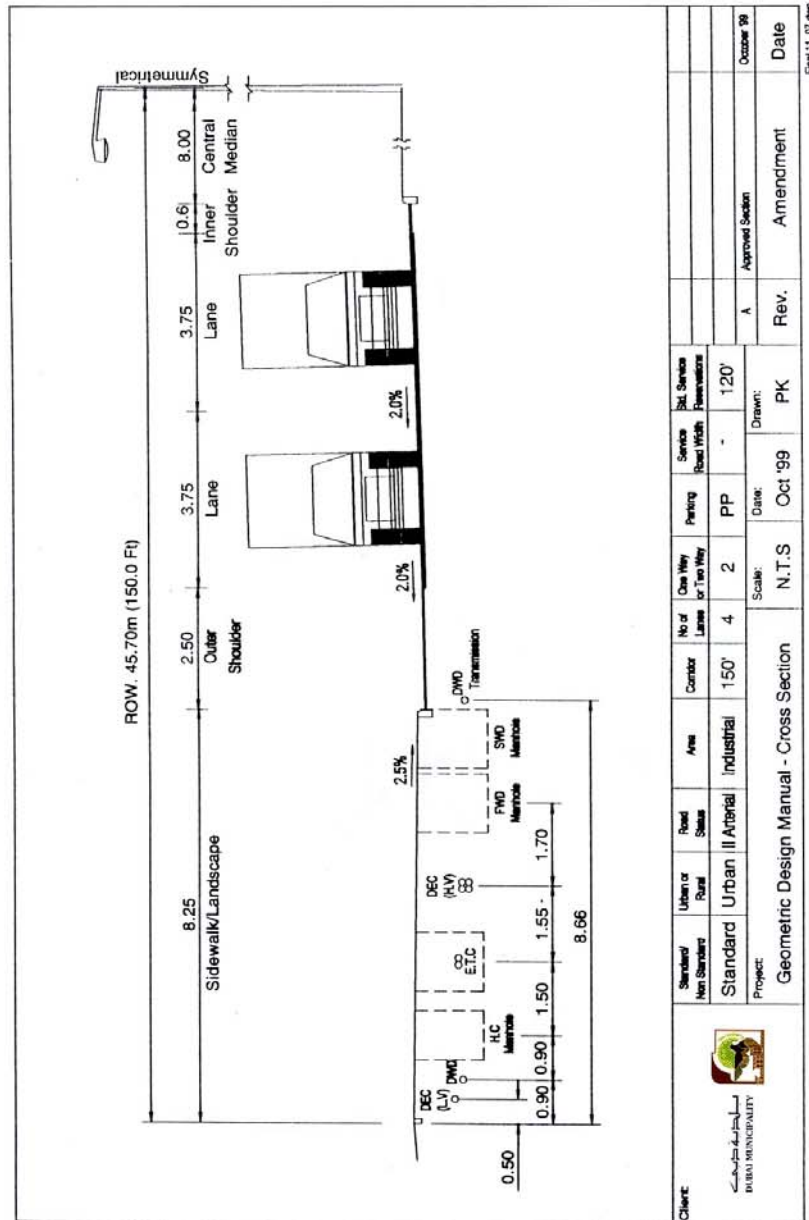
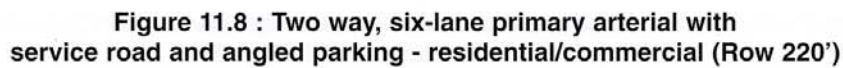


Figure 11.7 : Two way, four-lane secondary arterial industrial - (Row 150')





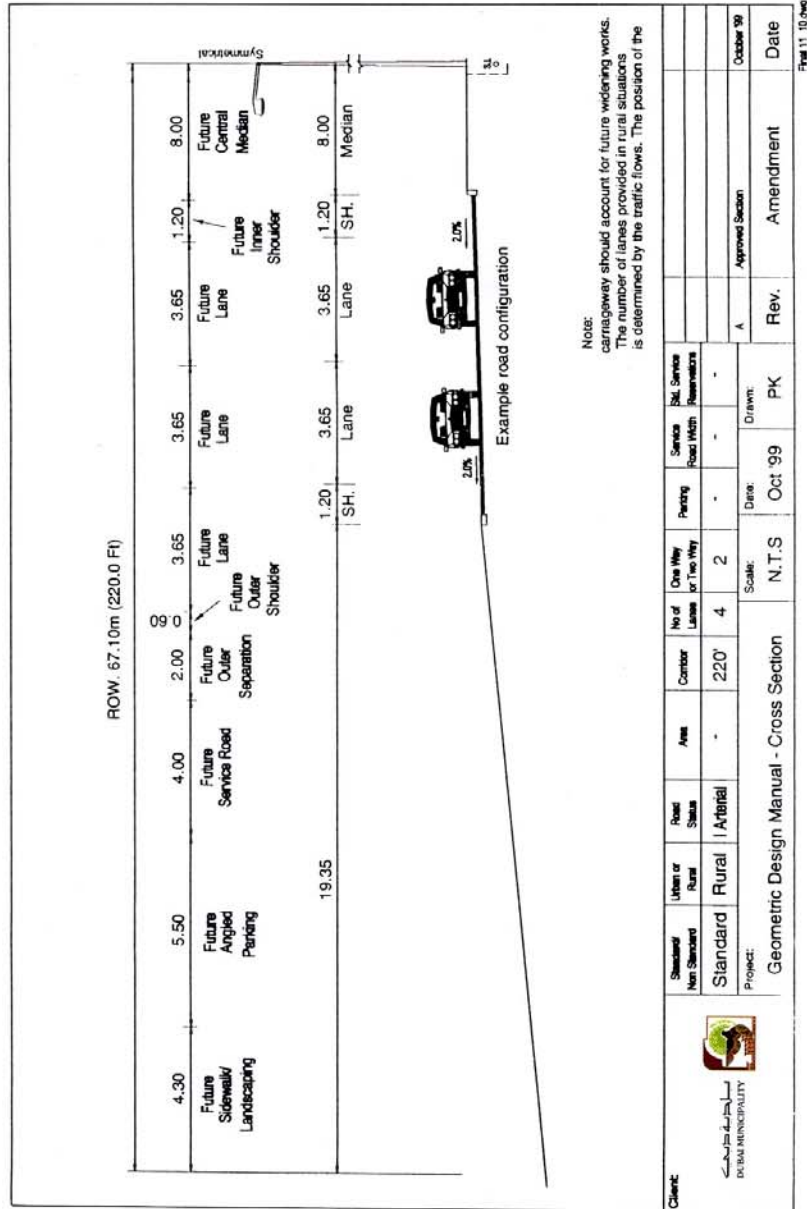


Figure 11.11 : Example road configuration primary arterial - rural (Row 220')

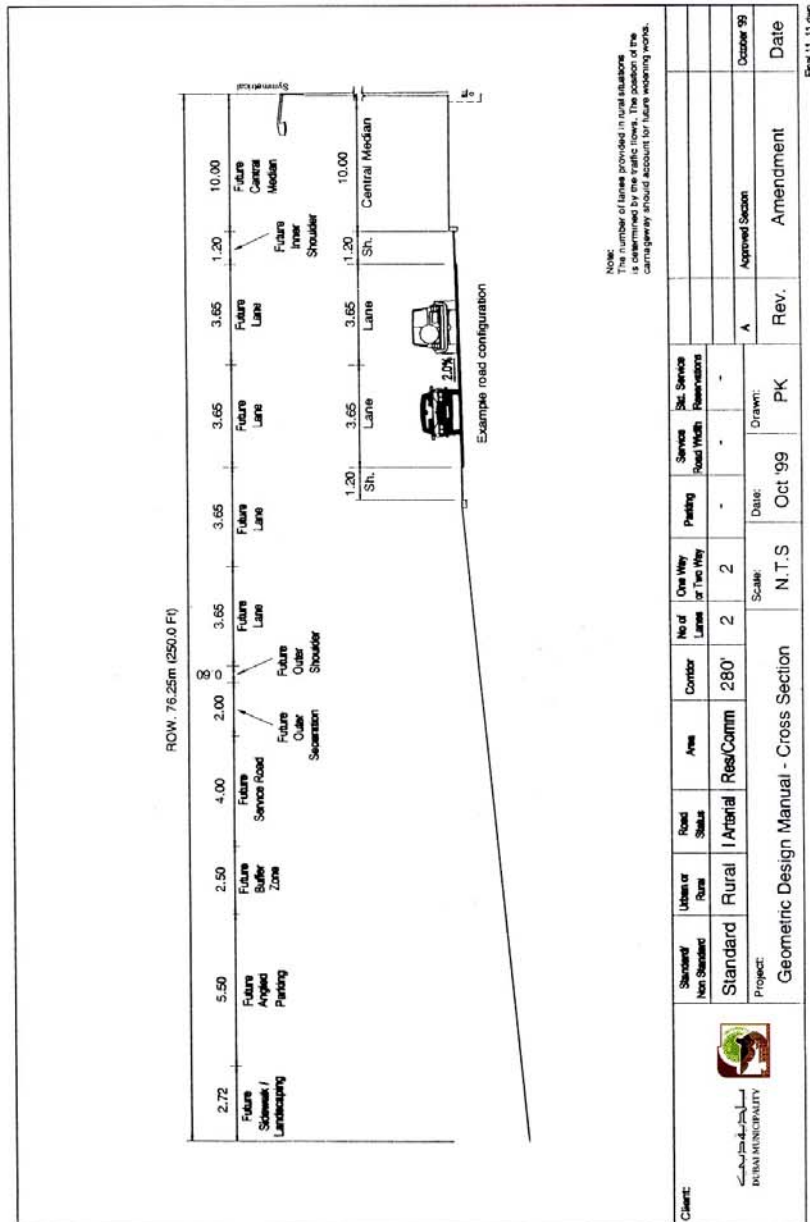


Figure 11.12 : Example road configuration primary arterial - rural (Row 250')