
PLANTATION PLAN

1. INTRODUCTION

Due to the proposed development, some of the existing trees are to be felled. To offset this impact, compensatory afforestation programme through Avenue plantation has been prepared, based upon the experiences of successful implementation of several ongoing and completed projects.

2. OBJECTIVE

The main objectives are as follows:

- Reducing the impacts of air pollution
- Natural noise barrier
- Arrest of land erosion
- Prevention of vehicle glare from vehicles coming from opposite direction
- Enhancement of aesthetic view of the corridors
- Climatic amelioration
- Defining of ROW especially at sharp curves during night

3. SPECIES SELECTION

Grasses, shrubs and trees are the main species that are readily available in India. Wherever possible, the use of non-native species should be avoided since they can out compete and displace native plants leading to loss of native biodiversity. To maximise the chances of success of survival of species, selection of species shall be done according to environmental conditions of the project site. Care should also be taken to select species with root systems that match the nature of the soil movement at the project site. Homogenous avenues of trees should be selected for long stretches as it provides aesthetic qualities in the landscaping. One should also consider the economic and other social benefits while selecting the species for plantation. During the selection of species, preference should be given towards rapid growing, pollution tolerant and pest & disease resistant species. Shrub species, which are dwarf

and pollution tolerant, are to be planted in the median to prevent the glare of traffic moving in opposite direction. Flowering, ornamentals plants and climbers can also be planted in urban areas to provide beauty. For this purpose, the species may be decided by interaction with local forest authority and local populace. Few species are recommended in the table below.

Table 1: Species Recommended

Scientific name	Common Name	Reason
<i>Ailanthus excelsa</i>	Maharukh / Adu Neem	Pollution Sink, Noise Barrier
<i>Alstonia scholaris</i>	Saptaparni	Pollution Sink, Aesthetic Value, Medicinal Value
<i>Azadirachta indica</i>	Neem	Noise barrier, Pollution sink, Economic & Medicinal Value
<i>Bombax ceiba</i>	Semal	Aesthetic Value, Economic Value
<i>Butea monosperma</i>	Dhak	Aesthetic value, Pollution sink
<i>Calistemon viminalis</i>	Bottle Brush	Aesthetic value, Pollution Sink
<i>Cassia fistula</i>	Amaltas	Landscaping, Flowering plant, Pollution sink, Medicinal Value
<i>Dalbergia sissoo</i>	Sheesham	Economic Value, Pollution Sink
<i>Ficus bengalensis</i>	Bargad	Noise barrier, Pollution sink, Medicinal Value & Religious value
<i>Ficus religiosa</i>	Peepal	Noise barrier, Pollution sink, Religious values
<i>Melia azedarach</i>	Bakain	Noise Barrier, Pollution Sink, Economic and Medicinal Value
<i>Moringa oleifera</i>	Sahajana	Economic Value, Medicinal value
<i>Pongamia pinnata</i>	Karanj	Economic and Medicinal Value
<i>Syzygium cumini</i>	Jamun	Pollution sink, Economic Value
<i>Tamarindus indica</i>	Imli	Noise barrier, Pollution sink, Economic & Medicinal Value
<i>Tecomella undulata</i>	Rohira	Aesthetic Value, Economic and Medicinal Value
<i>Terminalia arjuna</i>	Arjun	Noise barrier, Pollution sink, Medicinal Value

4. TASKS OF THE CONTRACTOR/ CONCESSIONAIRE

As part of this project implementation, the contractor/ concessionaire shall plant and maintain flowering, shade, medicinal, ornamental & fruit bearing trees in suitable area for which cost has been budgeted besides planting and maintenance of ornamental, medicinal & flowering plants and shrubs in the median for which cost has also been budgeted. The specific roles and responsibilities of the Contractor/Concessionaire include:

- Identification of the plantation stretches with NHAI and / or Consultant.
- Identification of nursery area and preparation of nurseries
- Planting of saplings in the nurseries during the construction period so that the saplings are a minimum 24 months old.
- Replantation of old saplings to the plantation stretches.
- Maintenance for three years including watering, removal of weed, litter and debris from the vicinity of the plantation.
- Ensure the protection of the tree guards provided to the saplings from trampling and browsing by the cattle.

5. GUIDELINES FOR HORTICULTURE PLANTATION AND LANDSCAPING

5.1. General

5.1.1. Scope

Contractor/ Consultant to furnish all materials, labour and related items necessary to complete the work indicated on drawing and specified herein.

5.1.2. Materials

Plant Materials

- Plant Materials shall be well formed and shaped true to type, and free from disease, insects and defects such as knots, sun-scaled, windburn, injuries, abrasion or disfigurement.
- All plant materials shall be healthy, sound, vigorous, free from plant diseases, insects, pests of their eggs, and shall have healthy, well-developed root systems. All plants shall be hardy under climatic conditions like native species of the project area. Plants supplied shall confirm to the names listed on the plant list provided above. Besides these plant species, the Contractor/ Concessionaire shall supply other species as desired by the landscaping specialist and or the environmental specialist of the consultant. Under no circumstances, non-native species which might have a negative impact on the ecology of the area shall be permitted. No plant material will be accepted if branches are damaged or broken. All material must be protected from the sun and weather until planted.
- Any nursery stock shall have been inspected and approved by the Environmental Specialist of the Consultant.
- All plants shall conform to the requirements specified in the plant list. Except that plants larger than specified may be used if approved but use of such plants shall not increase the contract

price. If the use of the larger plant is approved, the spread of roots or ball of earth shall be increased in proportion to the size of plant. Deliver plants with legible identification labels.

Topsoil (Good Earth)

- Topsoil or good earth shall be a friable loam, typical of cultivated topsoil of the locality containing at least 2% of decayed organic matter (humus). It shall be taken from a well-drained arable site. It shall be free of subsoil, stones, earth skids, sticks, roots or any other objectionable extraneous matter or debris. It shall contain no toxic material. No topsoil shall be delivered in a muddy condition. It shall have pH value ranging in between 6 to 8.5.

Fertilizer

- Measurement of sludge shall be in stacks, with 8% reduction for payment. It shall be free from extraneous matter, harmful bacteria, insects or chemicals (Subjected to safety norms).

Root System

- The root system shall be conducive to successful transplantation. While necessary, the root-ball shall be preserved by support with Hessian or other suitable material. On soils where retention of a good ball is not possible, the roots should be suitably protected in such a way that the roots are not damaged.

5.1.3. Condition

Trees and shrubs shall be substantially free from pests, diseases and shall be materially undamaged. Torn or lacerated roots shall be pruned before dispatch. No roots shall be subjected to adverse conditions such as prolonged exposure to drying winds or subjection to water logging between lifting and delivery.

5.1.4. Supply and Substitution

Upon submission of evidence that certain materials excluding the plant Species prescribed are not available at time of contract, the Contractor/ Concessionaire shall be permitted to substitute with an equitable adjustment of price. All substitutions shall be of the nearest equivalent species and variety to the original specified and shall be subjected to the approval of the Environmental Specialist of the Consultant.

5.1.5. Packaging

Packaging shall be adequate for the protection of the plants to avoid heating or drying out.

5.1.6. Marking

Each specimen of tree and shrub or each bundle shall be legibly labelled with the following particulars:

- Its name
- The name of the supplier, unless otherwise agreed.
- The date of dispatch from the nursery.

5.2. Plantation Pattern

The type of plantation would be based upon the requirements and the feasibility of the sites along the project corridor. The availability of the space in the RoW is a major guiding factor for landscaping.

The plantation pattern to be followed is:

- The first row of plants along the highways will be of small to medium height plants planted at a spacing of 2m c/ c and the distance from the second row should be 3m. The second row should be in staggered. The distance from the toe of the embankment should be 1m minimum and the height should be between 2m to 3m.

For special landscaping, embankment slopes and ground cover, herbaceous species to be used. Turfing to be done by grass.

5.3. Tree Planting

5.3.1. Plants and Shrubs

Trees should be supplied with adequate protection as approved. After delivery, if planting is not to be carried out immediately, balled plants should be placed back to back and the ball covered with sand to prevent drying out. Bare rooted plants can be heeled in by placing the roots in prepared trench and covering them with earth, which should be watered into, avoid air pockets round the roots and shrubs shall be planted with the approval of Environmental Specialist of Consultant.

5.3.2. Digging of Pits

Tree pits shall be dug a minimum of three weeks prior to backfilling. The pits shall be 120 cms in diameter and 120 cms deep. While digging the pits, the top soil up to a depth of 30 cms may be kept aside, if found good (depending upon site conditions), and mixed with the rest of the The side of the pit shall be replaced with the soil mixture as specified further herein. If the soil is normal it shall be mixed with manure; river sand shall be added to the soil if it is heavy. The bottom of the pit shall be forked to break up the subsoil.

1.1.1. Back Filling

The soil for backfilling shall be watered thoroughly and gently pressed down, a day before planting, to make sure that it may not further settle down after planting. The soil shall be pressed down firmly by treading it down, leaving a shallow depression all-round for watering.

1.1.2. Planting

No tree pits shall be dug until final tree position has been pegged out for approval. Care shall be taken that the plant sapling when planted is not buried deeper than in the nursery, or in the pot. Planting should not be carried out in waterlogged soil. Plant trees at the original soil depth; soil marks on the stem is an indication of this and should be maintained on the finished level, allowing for setting of the soil after planting. All plastic and other imperishable containers should be removed before planting. Any broken or damage roots should be cut back for sound growth.

The bottom of the planting pit should be covered with 50mm to 75mm of soil. Bare roots should be spread evenly in the planting pit; and small mound in the centre of the pits on which the roots are placed will aid on even spread. Soil should be placed around the roots, gently shaking the tree to allow the soil particles to shift into the root system to ensure close contact with all roots and prevent air pockets. Back filled soil should be firmed as filling proceeds, layer by layer, care being taken to avoid damaging the roots. The balance earth shall be filled in a mixture of 1:3 (1-part sludge to 3-part earth by volume) and 50gms potash, 50gms of Super Phosphate and 1 Kg. Neem oil cake. Aldrin or equivalent shall be applied every 15 days in a mixture of 5ml in 5 litres of water.

1.1.3. Staking

Newly planted trees must be held firmly although not rigidly by staking to prevent a pocket forming around the stem and newly formed fibrous roots being broken by mechanical pulling as the tree rocks.

The main methods of staking shall be:

- A single vertical stake, 900mm longer than the clear stem of the tree, driven 600mm to 900mm into the soil.
- Two stakes as above driven firmly on either side of the tree with a cross bar to which the stem is attached. It is suitable for bare- rooted or ball material.
- A single stake driven in at an angle at 45 degrees and leaning towards the prevailing wind, the stem just below the lowest branch being attached to the stake. Suitable for small bare- rooted or ball material.



- For plant material 3m to 4.5m high with a single stem, a three- wire adjustable guy system may be used in exposed situations.

The end of stake should be pointed and the lower part up to 1 m to 1.2 m should be coated with a non- injurious wood preservative allowing at least 150mm above ground level.

1.1.4. Tying

Each tree should be firmly secured to the stake to prevent excessive movement. Abrasion must be avoided by using a buffer, rubber or Hessian, between the tree and stake. The tree should be secured at a point just below its lowest branch, and just above ground level: normally two ties should be used for tree. These should be adjusted or replaced to allow for growth.

1.1.5. Watering

The Contractor/ Concessionaire through the Landscape Contractor should allow for the adequate watering of all newly planted trees and shrubs immediately after planting and he shall during the growing season, keep the plant material well-watered

1.1.6. Fertilising

Fertilising shall be carried out by application of rotation of the following fertilisers, every 15 days from the beginning of the monsoon till the end of winter:

- Sludge or organic well-rotted dry farmyard manure: 0.05 cum or tussle.
- Urea 25gm.
- Ammonium sulphate 25gm.
- Potassium sulphate 25gm.

All shrubs, which are supplied pot grown, shall be well soaked prior to planting. Watering in and subsequent frequent watering of summer planted container- grown plants is essential.


Divisional Manager
MPRD, D. D. Road

The activities are listed in table below-

Table 4: Proposed Activities Schedule for Avenue Plantation Plantation

Year	Month	Activities to be done	
1st Year	January-March	1	Surveying & cleaning of the area
		2	Digging of Pits
		3	Procurement of Angles Iron and barbed wire (or other fencing material), an erecting the fence
	April-June	4	Procurement of Tree guard
	July-Sept.	5	SMC work
	Oct-Dec.	6	Planting of Saplings
		7	Watering
	Jan -March	8.	Watering
Year	Month	Activities to be done	
2nd Year	April-June	1	Purchase of Farm yard manure
		2	Brick/iron etc. guard for 1 st row
		3	Plantation along the highway
		4	Filing up of Pits with Farm Yard manure and Soil
	July-August	1	Transportation of Plants
		2	Planting of Saplings
		3	Watering
		4	Weeding and hoeing
	September-November	1	Weeding and hoeing
		2	Watering 4 times a month
	December-February	1	Weeding and hoeing
		2	Maintenance

	March	1	Watering 4 times a month
Year	Month	Activities to be done	
3rd Year	April-June	1	Watering 6 times a month
	July-August	1	Casualty Replacement (20% of the total plants)
		2	Weeding
		3	Maintenance by Mali
	September-November	1	Watering 2 times a month
		2	Maintenance by Mali
	Dec.-Feb.	1	Maintenance by Mali
	March	1	Watering 4 times a month
		2	Maintenance by Mali
Year	Month	Activities to be done	
4th Year	April-March	1	Watering
		2	Casualty Replacement (10% of the total plants)
		3	Maintenance by Mali
Year	Month	Activities to be done	
5th Year	April-March	1	Watering
		2	Casualty Replacement (5% of the total plants)
		3	Maintenance by Mali


 Divisional Manager
 MPRDC, Bhopal-I

COST OF TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

5182623.00

6. HORTICULTURE

B	C	D	E	F	G	H
11.9	Planting of Trees and their Maintenance for one Year (Planting of trees by the road side (Avenue trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trench, watering, fixing the tree guard and maintaining the plants for one year) (10 Trees for each tree being cut)	each	2548.80	570	1452816.00	

8.19	G.I Barbed wire Fencing 1.2 metre high Providing and fixing 1.2 metres high G.I barbed wire (weighing 9.38 kg per 100 mts.) fencing with 1.8 m angle iron posts 40 mm x 40 mm x 6 mm placed every 3 metres center to center founded in M15 grade cement concrete, 0.6 metre below ground level, every 15th post, last but one end post and corner post shall be struted on both sides and end post on one side only and provided with 3 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with G.I staples, turn buckles etc complete as per clause 808	M	7646.40	222	1697500.80	
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