SUB SECTION 4.3
TECHNICAL SPECIFICATION
FOR
HORTICULTURE WORK

Applicable Standards
For
Horticulture Work

HORTICULTURE & LANDSCAPING WORK

1.1 GENERALREQUIREMENTS

1.2 Scope

1.1.1 The scope of this section includes the preparation of planted areas and the supply, planting, protection and maintenance of trees, shrubs, vines, ground cover plants and grass of the species and size shown on the drawings. The section covers the provision of qualified labor, equipment, and material necessary to carry out all operations required for landscaping herein specified and shall be read in conjunction with all other relevant sections of the Specification.

1.1 Submittals

1.1.1 The Contractor shall submit to the Engineer-in-charge information and certificates formaterials to be used for this Contract forapproval.

1.1.2 Such submittals shall include, but not be limited to thefollowing:

a. ShopDrawings:

1. The contractor shall submit shop drawings of the planting plans and details to the Architect and Engineer-in-charge for review andaction.
2. The Contractor shall submit a method statement for the soft landscape installation including all milestones according to bestpractices.

b. ProductData:

1. Provide manufacturers certified data analysis of all standard products, including fertilizers, soil amendments, herbicides, pesticides, fungicides, showing description of ingredients, and recommendations for usage and application rates for each material to beused.

c. Samples:

1. Samples of all materials to be used in this contract shall be submitted for approval. The approved samples shall be the quality standard for the material and itsplacement.
2. The Architect shall inspect all plant material at the site-growingnursery.
3. The Architect shall reserve the right to reject any plant material deemed unacceptable which shall then be replaced with approvedspecimens.

d. Certifications & Quality Control: Submit the following forapproval:

1. A certified analysis by an approved laboratory for non-standard products (soil,compost).
2. Certificates confirming the origin, size, and age of all plantmaterial.
3. Phytosanitary certificates for all imported plantmaterial.
4. Turf: Provide certification from the grower for the type and trueness to the grass variety or strain.

e. Programs and Schedules: Provide the following forapproval:

1. Schedules showing program of implementation for each type of landscape work, indicating anticipated dates and locations for each type ofplanting.
2. The contractor shall submit a Plant Procurement Schedule, identifying the source of every plant species, including the importedplants.
3. If necessary revised planting schedules with documentation of reasons for therevision.

f. As-BuiltDrawings:

1. The As-Built drawings shall be submitted to the Architect and Engineer-in-charge for approval prior to the issue of the CompletionCertificate.

2. The drawings shall include accurate documentation of the final planting installation, including but not limitedto:

- Plant material substitutions with size, genus, andspecies.

- Materialsubstitution.
- Revisions to the scope ofwork.

3. On approval of the As-Built drawings, the Contractor shall forward thefollowing:
   - Three complete sets of As-Built drawings properly folded and provided in the plastic folders as part of the Operations and Maintenance manual.
   - Annual maintenance schedule
   - One set of computer discs properly labeled and marked.

1.3 Project/ Siteconditions

1.3.1 Weatherconditions:

a) All work shall be carried out during the appropriate season and in weather conditions suitable for theoperation.

b) When special conditions affect the planting times and conditions, a planting schedule shall be submitted to the Engineer-in-charge for review andapproval.

1.3.2 ExistingServices

a) The Contractor shall determine the location of all existing underground services prior to commencing excavation works. Damage to underground utilities shall be repaired at the Contractor'sexpense.

b) When conditions on site are considered detrimental to the plants, such as rubble, ongoing works or obstructions, the Contractor shall notify the Engineer-in-charge prior to performing the plantingworks.

c) Any excavation in confined spaces, around existing trees or in the vicinity of major utility services shall be executed byhand.

1.3.3 Rubbish:

All rubbish and litter as it accumulates within the landscape boundary shall be cleared and removed daily.

The areas shall be kept in a clean and tidy condition with all driveways, paths, edges, gutters and gullies swept and kept clear of debris at all times. All rubbish and debris shall be removed from the site.

1.3.4 Oil and PetrolStorage

All oil and petrol containers are to be kept in suitable sheds provided by the Contractor, who is to observe all regulations regarding the storage of inflammable liquids. If any areas of soil are affected by oil or petrol spillage, the contaminated soil is to be dug up until uncontaminated ground is reached and removed from site and such areas made good as directed by the Engineer-in-charge.

1.4 Nursery

1.4.1 The Contractor shall establish and maintain a suitable holding/acclimatization nursery on or adjacent to the site. It shall be protected from construction works, shaded from sun and wind, and shall be provided with an adequate supply of irrigation water. The size, location, and timing of establishing the site nursery shall be approved by theEngineer-in-charge.

1.5 HorticulturalSupervisor

1.5.1 A written approval of the Engineer-in-charge shall be obtained for the Contractor's proposed HorticulturalSpecialist.

1.5.2 The written approval of the Engineer-in-charge shall be obtained for any temporary or permanentreplacements.

1.5.3 The Engineer-in-charge shall inspect all plants for approval and shall supervise the planting of all accents and ornamentalpalms.

1.6 ApprovedChemicals

1.6.1 Only chemicals approved and listed by the IIHR India shall be used. All chemicals shall be non-toxic to human beings, birds, and animals and subject to the approval of a qualified specialist. The Contractor shall be liable for ensuring that all chemicals are stored separately, handled, and supplied strictly in accordance with the manufacturer's printed instructions. Neem cake shall be used as biological pesticide where specified.

2.0 PRODUCTS ANDMATERIALS

2.1 Soil

2.1.1 Medium draining /Clay-Loam
Soil 60% to 40% cow dung manure

This soil type is for trees at upper and middle promenade level

Wind will affect more on the upper level, which can cause the uprooting of small trees, so we are using soil here that has more clay parts. To provide porosity and aeration to the roots and prevent water logging, we are using 40% of cow dung manure in the soil mix. Cow dung manure increases porosity, provides nutrition, balances the pH of soil, and works as a conditioner for soil.

Specifications

- Soil shall consist of a free-draining organic soil from horizons less than 300mm fromthe original surface, of a workable crumbly and lump-free loamycharacter.
- It shall contain no weed growth, other foreign material, stones exceeding 25mmin diameter.
- Total stone content shall be no greater than 5% by volume. Soil should conform tothe following parameters: pH 6 - 7.8, Electrical conductivity 08 to 2.5 (mmhos/cm), Soil texture Sand (0.05 - 2.00mm) 20-40%, Silt (0.002 - 0.05mm) 20-40%, Clay (less than 0.002mm)30-40%.
- Manure shall be well decomposed and dried with good quality. It should be inpowdered form. Manure shall be free from soil clods & fresh mung grass. It should be at least 1 yearold.

2.1.2 Free draining /Loam
Soil 60%, 30% cow dung manure and 10% Vermicompost.

This soil type is for trees at lowest promenade level

For drainage purposes and preventing root rot during floods, we need soil with more silt and sand parts. Using more cow dung manure in this area can produce fungus during water-log conditions, which will affect roots. Use of vermicompost provides nutrition and increases the aeration and porosity of the soil.

Specifications

- Soil shall consist of a free-draining organic soil from horizons less than 300mm fromthe original surface, of a workable crumbly and lump-free loamycharacter.
- It shall contain no weed growth, other foreign material, stones exceeding 25mmin diameter.
- Total stone content shall be no greater than 5% by volume. Soil should conform tothe following parameters: pH 6 - 7.8, Electrical conductivity 08 to 2.5 (mmhos/cm), Soil texture Sand (0.05 - 2.00mm) 20-40%, Silt (0.002 - 0.05mm) 30-50%, Clay (less than 0.002mm)10-30%.
- Manure shall be well decomposed and dried with good quality. It should be inpowdered form. Manure shall be free from soil clods & fresh mung grass. It should be at least 1 yearold.
- Vermicompost should be more than 3 months old but not more than 3 years old,deep dark brown color with uniform texture andmoist.

2.1.3 'Black' sand shall not beapproved.

2.1.4 The representative samples of sweet soil shall be analysed for all the above characteristics and results Submitted to the Engineer-in-charge forapproval.

2.1.5 The soil report shall include recommendations on soil amendment, and fertilizerapplication, depending on the soil analysisresults.

2.2 Compost

2.2.1 Compost shall be approved well-rotted cow manure (poultry manure shall not be accepted), free from any deleterious matter. The rotted manure is guaranteed to be free from nematodes and harmful bacteria. Special care is to be taken to ensure manure is weed free (especially cypressrotundus)

2.2.2 Vermicompost shall be recycling of garden waste/ kitchen waste or other preferable kind of waste. It can be done by natural composting/ vermin composting and mechanical composting (In vessel Composting (OWC)) technique converts the waste into manure to increase soil fertility and used as manure. It shall be added to the soil mixture as suggested by the Engineer-in-charge.

2.3 Fertilizers

2.3.1 General fertilizer shall be sulfur-coated compound N.P.K.16-18-5+ trace elements for shrubs, trees, and grass areas, and shall be Osmocote or equal and approved by the Engineer-in- charge.

2.3.2 Slow-release fertilizer tablets shall be equivalent to N.P.K.18-18-5+TSE or N.P.K 17-17-4+TSE and shall be used for trees andshrubs.

2.3.3 Fertilizer shall be furnished in standard containers with the name, weight and guaranteed analysis of the contents clearlymarked.

2.3.4 When a mixed fertilizer is specified, the first number shall represent the minimum percentage of soluble nitrogen, the second number shall represent the minimum percentage of available phosphoric acid and the third number shall represent the minimum percentage of water- solublepotash.

2.4 PlantingMedium

2.4.1 Planting medium shall consist of a homogeneous mixture of soil, compost and fertilizers as specified.

2.4.2 One bag of compost shall contain 25kg of compost and shall be applied at the followingrates:

palm pit	One and a half bags per pit (applied 6monthsafterplanting)tree pit
	One bag perpit
shrub pit	Half bag perpit
grass/groundcoverbed	Half bag perm^2
vine pit	Half bag perpit
shrub bed	One bag perm^2
beddingplants	1 bag perm^2

2.4.3 General fertilizer shall be applied at the followingrates:

palm pit	175 gms per pit (applied 6months afterplanting)
tree pit	100 gms perpit
shrub pit	50 gms perpit

shrub beds 100 gms perm^2
grass/groundcoverbed 100 gms perm^2
beddingplants 100 gms perm^2

2.4.4 Slow-release fertilizer tablets shall be applied at the followingrates:

trees 21gms for every 10mm of trunkdiameter

shrubs 21gms for every 300mm ofheight

2.4.5 The rates mentioned in this clause are for the first application prior to planting only. Further applications before and during the maintenance period shall be done in accordance with the Engineer-in-charge's instructions and Client'sapproval.

2.5 Planting medium forpalms
Planting medium shall consist of a homogeneous mixture of soil, compost and fertilizers as specified.

2.5.1 Soil mix in all areas where palms are to be planted will consist of 30% Coco Peat, 30% Composted organic pine bark, 30% sweet sand and 10% Perlitemix.

2.5.2 Coco peat shall be coarse brown coco peat, not containing woody materials, free from Sulphur and iron. Its pH value shall be in the range of 4 and 5. Organic matter content shall be 95-99% dry weight, and the water holding capacity shall be from45-55%.

The peat shall have the following physical characteristics:

- Fibrousquality
- Brown in colour whendry
- High resistance to decay (lasting one yearminimum)
- High cation exchangecapacity.

2.5.3 Composted organic tree bark shall be aged over a period of 5-10 years to prevent nitrogen drawdown. The composted bark shall typically have a size range of 5-8mm and a pH value of 6.5.

2.5.4 The sweet soil shall be free-draining, non-toxic and capable of sustaining healthy plant growth. The soil shall not contain calcium carbonate, subsoil, and refuse, roots, heavy clay, noxious weeds, phyto-toxic materials, coarse sand, rocks, brush, litter or any other deleterious materials.

2.5.5 The sweet soil shall have followingcharacteristics:

a)	PH 6.0 and 7.5 of saturatedsoil	
b)	EC	less than 2500 mmhos in saturatedextract
c)	Chlorides	<220 ppm in saturatedextract
d)	Sulphate	<15 ppm in saturatedextract
e)	SAR	<5%
f)	Nitrates	75 ppm in saturatedextract

Physical loam made up by particle size asfollows: Sand (2mmto0.05mm) 70% to80%
Silt (0.05mmto0.002mm) 25%to30%Clay
(<0.002mm) 5%max.

2.5.6 The representative samples of sweet soil shall be analyzed for all the above characteristics and results submitted to the Engineer forapproval.

Perlite shall be used in the growing medium for its light weight, physical stability and ability to provie non capillary pore space, which improves the soil texture.

Horticulture grade perlite shall have a 25% size grading between 1.18mm and

0.0075mm. Bulk density shall be approximately 0.1g/m3 and moisture less than 0.5%.

2.6 Plants

2.6.1 General

a) All plants shall be of the size specified in the Plant Schedule & Planting Palette at the time of delivery to the site and shall be obtained from an approved source. The Contractor shall allow for all imported and locally sourced plants to be 'grown on' in the holding nursery in order to meet the required specification at time ofplanting.

b) All plants shall be supplied as specified in tender documents and the Contractor is expected to import stock if it is not available locally. All imported plant material must be sourced from a reputable Nursery to be approved by the Architect and Engineer-in-charge prior to purchase. Plants shall be true to and supplied under Latin names. Synonyms must be checked with the Architect andEngineer-in-charge.

c) Engineer-in-charge shall inspect and approve all imported and locally sourced plant material at their place of origin. Samples from all plant material shall be made available for approval by the Architect andEngineer-in-charge.

d) When inspected, plants shall show no sign of pest infestation, disease, infection, nutrient deficiencies orsunscalds.

e) All plants shall be container grown, except for field-grown palm species. Container grown nursery stock shall be vigorous, healthy, and have a well-established root system spread throughout the growing medium container to maintain a firm ball when the container is removed.

f) All trees and particularly palms forming avenues or formal planting lines shall be selected to be uniform size and appearance all to the approval of the Architect and Engineer-in-charge. Clear stem height, overall height, and trunk girth shall be consistent and standardized among the selected trees/palmsstock.

g) The Tender must be based, without exception, upon plants that are specified. If plants are subsequently found to be unobtainable, alternatives may be submitted, stating how they differ from the Specification. Such substitutions may not be acceptable, and submission of further alternatives may be required. Approval in writing shall be obtained for anysubstitution.

h) Plants shall be true to and supplied under Latin names. Synonyms must be checked with the Architect and Engineer-in-charge. Nomenclature of trees and plants shall confirm to the scientific names givenin:

(i) Royal Horticultural Society, "Directory ofGardening"
Oxford University Press, reprinted 1974 and Supplement 1969
(ii) Hortus3.
(iii) Exotica

All plants must agree with the botanical description in these books. Hortus 3 and Exotica are the only authorities for plants that are not listed in the RHS Directory.

2.6.2 Trees

a) Tree stock shall be container grown, or bur lapped with geo fabric and grown in sandybeds.

b) Trees shall have a minimum girth of 10cm unless otherwise specified in the planting schedule (girth/ trunk circumference shall be measured at 1.0m above the soil level, excluding containerheight).

c) The tree trunk shall be free of any damage caused by insect, fungal or viral infestation and free from any physical damage orscarring.

d) The tree trunk shall be straight and vertical. There should not be any abrupt changes in girth of thetrunk.

e) The form or shape of the crown shall be typical for the specimen of the species. The crown shall not be significantly deformed by wind, pruning practices, pests or otherfactors.

f) Trees shall be single stemmed unless otherwisespecified.

g) Main branches shall be well spaced with a minimum of four branches atplanting.

h) The size, colour and appearance of leaves shall be typical for the time of year and stage of growth of the tree species. Leaves shall not be damaged ordiscoloured.

i) The root system shall be free of injury from biotic (insects, pathogens) infestation and shall be uniform throughout the soil mix or growth media. Container grown nursery stock shall have a well-established root system reaching the sides of the container to maintain a firm ball when the container isremoved.

Island of palms				
1	PL 01	*Areca catechu*	Betel Palm	12
2	PL 02	*Caryota mitis*	Clumping Fish Tail Palm	15
3	PL 03	*Caryota urens*	Shakarjata, Fish Tail Palm	4
4	PL 04	*Cycas circinalis*	Fern Palm	10
5	PL 05	*Licuala spinosa*	Mangrove Fan Palm	30
6	PL 06	*Dypsis lutescens*	Areca palm	50
7	PL 07	*Raphis excelsa*	Lady palm	150
8	PL 08	*Howea forsteriana*	Kentia palm	15
9	PL 09	*Cyrtostachys renda, C. lakka*	Lip Stick Palm	100
10	PL 10	*Chamaedorea elegans*	Good Luck Palm	125
11	PL 11	*Chamaedorea seifrizii, C. erumpens*	Seaforthia Palm, Cane palm	120
11	Total Nos			**631**
Island of Orchids				
1	OR 01	*Cymbidium finlaysonianum*	Cymbedium Orchid	48
2	OR 02	*Spathoglottis plicata*	Ground Orchid	52
3	OR 03	*Rynchostylis gigentia*	Fox Tail Orchid	140
4	OR 04	*Phalaenopsis hybrids assorted*	Moth Orchid Various Hybrids	42
5	OR 05	*Phalaenopsis hybrids yellow*	Phalaenopsis Yellow	150
6	OR 06	*Phalaenopsis hybrids white*	Phalaenopsis White	120

7	OR 07	*Phalaenopsis hybrids spotted*	Phalaenopsis Spotted	160
8	OR 08	*Phalaenopsis hybrids striped*	Phalaenopsis Striped	180
8	Total Nos			**892**
		Island of Nector		
1	NS 01	*Angelonia angustifolia dwarf*	Dwarf Angelonia	223
2	NS 02	*Angelonia grandiflora*	Common Angelonia	218
3	NS 03	*Asystasia coromandalina flava*	Asystasia Lemon Flowers	238
4	NS 04	*Crinum latifolium*	Sudarshan	71
5	NS 05	*Dracaena fragrans*	Dracaena Fragrans	83
6	NS 06	*Euphorbia pulcherrima fireball deep pink*	Poinsettia Fireball Deep Pink Dwarf	73
7	NS 07	*Euphorbia pulcherrima fireball white*	Poinsettia Fireball White Dwarf	47
8	NS 08	*Euphorbia pulcherrima tukai peach*	Poinsettia Peach Variety	74
9	NS 09	*Hydrangea macrophylla*	Hydrangea	53
10	NS 10	*Lilium x hybridum*	Hybrid Garden Lily	60
11	NS 11	*Pelargonium hortorum*	Geranium Hybrids	75
12	NS 12	*Strelitzia reginae*	Bird Of Paradise	125
12	Total Nos			**1340**
		Heliconia Island		
1	HL 01	*Heliconia bihai lobster claw red*	Heliconia Lobster Claw Red	50
2	HL 02	*Heliconia psittacorum fire flash*	Heliconia Fire Flash	120
3	HL 03	*Heliconia psittacorum lady di*	Heliconia Lady Diana	70
4	HL 04	*Heliconia rostrata*	Parrot Beak Heliconia	50
5	HL 05	*Heliconia psittacorum golden torch*	Heliconia Golden Torch	125
5	Total Nos			**415**
		Lily Pool		
1	AQ 01	*Nymphaea alba malaysian white*	Water Lily White	25
2	AQ 02	*Nymphaea purpurea, N. pubescens*	Water Lily Purple	25
3	AQ 03	*Nymphaea hybrida peach glow*	Water Lily Peach	45
4	AQ 04	*Nymphoides indica*	Water snow flakes	35
4	Total Nos			**130**
		Evergreen Plaza		
1	SH 01	*Musa cavendishii*	Banana	20
2	SH 02	*Musa x paradisiaca velchi*	Ilaichi banana	15
3	SH 03	*Monstera Deliciosa*	Swiss cheese plant	25
4	SH 04	*Ficus maccalendii*	Narrow Leaf Ficus	25
5	SH 05	*Schefflera arboricola*	Hawaiian Elf	6
6	SH 06	*Radermachera sinica*	China doll	15

7	SH 07	*Musa x paradisiaca red*	Red banana	25
8	SH 08	*Dracaena fragrans messengeana*	Cornstalk Plant	45
8	Total Nos			**176**
		Forest Canopy (Trees)		
1	TR 01	*Artocarpus altilis*	Bread Fruit	4
2	TR 02	*Pandanus species*	Screw Pine	4
3	TR 03	*Brassia actinophylla*	Octopus Tree	12
4	TR 04	*Ficus benjamina blackie*	Ficus Benjamina Black	25
5	TR 05	*Ficus lyrata*	Fiddle Leaf Fig	25
6	TR 06	*Ficus elastica*	Rubber tree	15
7	TR 07	*Ravenala madagascariensis*	Traveler's Palm	6
7	Total Nos			**91**
		Forest Canopy (Palms)		
1	P 01	*Licuala grandis*	Pritchardia Grandis, Ruffled Fan Palm	8
2	P 02	*Normanbya normanbyi*	Queensland Black Palm, Black Fox Tail Palm	6
3	P 03	*Ptychosperma elegans*	Solitare Palm, Alexander Palm	12
4	P 04	*Ptychosperma macarthurii*	Clumping Kentia, Macarthur Palm	12
5	P 05	*Veitchia merreilii*	Manila Palm, Christmas Palm	12
6	P 06	*Veitchia merrillii golden*	Golden Manila Palm	12
7	P 07	*Ohannesteijsamannia species*	Joey Palm	6
8	P 08	*Rhapis humilis*	Slender Lady Palm	60
9	P 09	*Rhapis subtilis*	Dwarf Lady Palm, Thailand Lady Palm	120
9	Total Nos			**248**
		Forest Floor (Ground Covers)		
1	GC 01	*Aglaonema commutatum malay beauty*	Aglaonema Malay Beauty	145
2	GC 02	*Aglaonema commutatum silver queen new*	Aglaonema Silver Queen New	164
3	GC 03	*Alpinia zurumbet*	Shell Ginger	170
4	GC 04	*Asplenium nidus*	Fern Birds Nest	13
5	GC 05	*Chlorophytum comosum*	Spider Plant Variegtaed	484
6	GC 06	*Epipremnum aureum goldii*	Money Plant Golden	221
7	GC 07	*Epipremnum pinnatum*	Sada monstera	8
8	GC 08	*Philodendron lacerum*	Philodendron lacerum	136
9	GC 09	*Philodendron selloum*	Philodendron Lacy Tree	103
10	GC 10	*Philodendron xanadu*	Xanadu	168
11	GC 11	*Polyscias balfouriana*	Aralia variegated	115
12	GC 12	*Syngonium macrophyllum*	Syngonium macrophyllum	366
13	GC 13	*Syngonium podophyllum albolineatum*	Syngonium Ordinary	374
14	GC 14	*Syngonium podophyllum white butterfly*	Syngonium White Butterfly	269
15	GC 15	*Philodendron wendlandii*	Birdnest Philodendron	158

16	GC 16	*Strelitzia reginae*	Bird of paradise	177
17	GC 17	*Calathea lutea*	Powder Leaf Calathea	36
18	GC 18	*Asparagus setaceus*	Asparagus Fern	216
19	GC 19	*Rhoeo spathacea compacta*	Moses-in-the-Cradle	186
20	GC 20	*Zamia fischeri*	Fern Zamia	35
21	GC 21	*Zamia furfurea*	Cardboard Palm	45
21	Total Nos			**3589**
Epiphytes				
1	EP 01	*Dioon spinulosum*	Giant dioon	15
2	EP 02	*Dioon edule*	chestnut dioon, Virgins Palm	12
2	Total Nos			**27**
Ferns				
1	FR 01	*Nephrolepis biserrata*	Giant sword fern	128
2	FR 02	*Nephrolepis acuminata*	Sword fern	136
2	Total Nos			**264**
Tropical Conservatory Plants				
1	PL 01	*Clivia miniata*	Natal lily	25
2	PL 02	*Aechmea fasciata*	Urn plant	45
3	PL 03	*Medinilla magnifica*	Rose grape	20
4	PL 04	*Hedychium gardnerianum*	Kahila garland-lily	35
5	PL 05	*Musa basjoo*	Japanese banana	15
6	PL 06	*Guzmania lingulata*	tufted airplant	15
7	PL 07	*Pavonia multiflora*	Brazilian Candles	9
8	PL 08	*Theobroma cacao*	Cacao Tree	4
9	PL 09	*Verschaffeltia splendida*	Seychelles Stilt Palm	8
10	PL 10	*Calathea warszewiczii*	Calathea Jungle Velvet	35
11	PL 11	*Capparis sandwichiana*	Hawaiian caper	5
12	PL 12	*Cyanea kuhihewa*	Limahuli Valley cyanea (hawaii)	15
13	PL 13	*Maxillariella tenuifolia*	coconut pie orchid	25
14	PL 14	*Oncidium Golden Shower*	Dancing-lady Orchid	45
15	PL 15	*Serenoa repens*	small palm	25
16	PL 16	*Justicia brandegeeana*	Mexican shrimp plant	45
17	PL 17	*Heliotropium arborescens*	common heliotrope	20
18	PL 18	*Aechmea retusa hybrid*	Urn Plant Hybrid	35
19	PL 19	*Calathea* 'Burle Marx'	Prayer Plant	15
20	PL 20	*Costus barbatus*	Red Spiral Ginger	15
21	PL 21	*Cryptanthus zonatus*	Earth Star	8
22	PL 22	Cryptanthus hybrid	Earth Star	35
23	PL 23	*Guzmania* hybrid	Guzmania hybrid	35

24	PL 24	Musa acuminata Zebrina	Blood Banana	15
25	PL 25	*Selaginella willdenowii*	peacock plants	25
26	PL 26	*Begonia pavonina*	Peacock begonia	45
27	PL 27	*Eucharis amazonica*	Amazon lily	25
28	PL 28	*Lilium asiatica*	Asiatic lily	45
29	PL 29	*Dichorisandra thyrsiflora*	Blue ginger	20
30	PL 30	Gloriosa superba	Gloriosa lily	35
31	PL 31	*Aristolochia gigantean*	Giant pelican flower	15
32	PL 32	*Alocasia amazonica*	Amazon Mask	8
33	PL 33	Alocasia odora	Upright elephant ears	35
34	PL 34	*Alpinia purpurata pink*	Pink ginger	45
35	PL 35	*Anthurium andreanum*	Flamingo flower	20
36	PL 36	*Averrhoa carambola*	Starfruit	5
37	PL 37	*Cyperus alternifolius*	Umbrella plant	15
38	PL 38	*Hedera helix*	English ivy	15
39	PL 39	Ficus pumila	Creeping fig	20
40	PL 40	*Spathiphyllum sensation*	Peace lily	35
41	PL 41	*Strobilanthes dyerianus*	Persian shield	15
41	Total Nos			**972**
External Plantation				
Medium Shrubs				
1	MS 01	*Ixora coccinea*	Ixora deep red	424
2	MS 02	*Nerium oleander petite salmon*	Peach nerium	196
3	MS 03	*Canna malawiensis variegata*	Canna yellow variegated	358
4	MS 04	*Jatropha integerrima*	Red jatropha	156
5	MS 05	*Stachytarpheta indica*	Indian Snakeweed	249
6	MS 06	*Hamelia patens*	Fire bush	312
7	MS 07	*Tecoma gaudichaudi*	Yellow Trumpet	169
8	MS 08	*Caesalpinia pulcherrima*	Peacock Flower	170
9	MS 09	*Cymbopogon flexuosus*	Lemon grass	278
10	MS 10	*Clerodendrum inerme*	Indian Privet, Glory Bower	201
11	MS 11	*Eranthemum tricolor*	Eranthemum tricolor	513
12	MS 12	*Pisonia alba*	Pisonia	347
13	MS 13	*Canna gernalis red*	Canna Red Leaved	368
14	MS 14	*Murrayya exotica*	Kamini	187
15	MS 15	*Dypsis lutescens*	Areca palm	51
16	MS 16	*Syzygium campanulatum*	Christina Plant	100
17	MS 17	*Crinum asiaticum*	Giant lily	95
18	MS 18	*Raphis excelsa*	Lady palm	96
19	MS 19	*Allamanda schotti compacta*	Allamanda dwarf	542
20	MS 20	*Justicia adhatoda*	Adulsi	
20	Total Nos			**4812**
Ground Covers				

1	GC 01	*Pandanus pygmaeus*	Pandanus mini	1984
2	GC 02	*Rhoeo spathacea compacta*	Moses-in-the-Cradle	1717
3	GC 03	*Hymenocallis littoralis*	Spider lily	1790
4	GC 04	*Verbena tenera*	Purple verbena	690
5	GC 05	*Asparagus densiflorus compacta*	Compact Asparagus	2547
6	GC 06	*Cyperus alternifolius*	Umbrella palm	665
7	GC 07	*Asystasia coromandalina flava*	Asystasia Lemon Flowers	1612
8	GC 08	*Cuphea hyssopifolia hybrid purple*	Cuphea dark purple	975
9	GC 09	*Chlorophytum comosum*	Spider Plant Variegtaed	1175
10	GC 10	*Zebrina pendula*	Wandering jew	1063
10	Total Nos			**14218**
Trees				
1	TR 01	*Sterculia foetida*	Jangli badam	9
2	TR 02	*Terminalia mantaly*	Madagascar almond	10
3	TR 03	*Bauhinia blackeana*	Dev kanchan	5
4	TR 04	*Gmelina arborea*	Sevan	3
5	TR 05	*Plumeria alba*	Champa	3
	Total Nos			**30**
Palms				
1	PL 01	*Wodyetia bifurcata*	Foxtail palm	10
2	PL 02	*Veitchia merreilii*	Manila Palm, Christmas Palm	7
	Total Nos			**17**

2.6.3 Shrubs/ GroundCovers

a) Shrubs and ground covers shall be twin or multi stemmed, full and bushy. The form or shape of the plants shall be typical to its species. Should be nursery grown in 12" growbags.

b) The size, colour and appearance of leaves shall be typical for the time of year and stage of growth of the plant species. Leaves shall not be damaged ordiscolored.

2.6.4 Hedges

2.6.5 PerennialOrnamentals

2.6.6 SeasonalOrnamentals

2.6.7 Climbers

2.6.8 Aquatic Plants (For duck pond, lily pond, lotus pond & adjacentareas)

2.6.9 Topiories

2.6.10 Medicinal and AromaticPlants

2.6.11 VegetableGarden

2.6.12 Green Wall PlantSpecies

2.6.13 Palms andBamboo

a) The Palms shall be field grown and transported balled and bur lapped to the nursery unless container grown palms areavailable.

b) Field grown palms shall be heeled at the contractor's temporary nursery until planting at their final locations if there is a delay of more than twenty-four hours between procurement and planting.

c) When inspected, the palms shall not show sign of pests, disease, infection, nutrient deficiencies or toxicities, and shall not be mechanically damaged. Palms shall be free from any attack of Red Palm Weevil and stem boringbeetles.

d) Palms shall have a straight single trunk, free of ragged or torn boots. Trunk shall be free from scarring caused by tearing off boots prematurely or injury caused by mishandling during transportation.

e) Petioles shall be cut clean and symmetrically at the trunk on any old leaf basesremaining.

f) Palms shall have no abrupt constrictions along the trunk diameter and shall have no cavities, gouges, depressed areas or other defects. Color of the trunk shall bebrown.

g) Palms shall have a vigorous root system, a healthy crown of new leaves, proper colour of leaves of an adult palm and sufficient hardiness. Offshoots will not beacceptable.

h) Prior to transporting for transplanting, all suckers, flowering and fruiting parts and approximately thirty percent of fronds shall be removed. The remaining fronds shall be sprayed with an anti-desiccant 24 hours prior to lifting. The fronds are to be lifted to enclose and protect the growing tip, wrapped in Hessian and securely tied in position. The roots shall be balled, and the Hessian securely tied. The root ball is to be secured using wire mesh and Hessian to contain the soil and retain maximum soilmoisture.

i) The Contractor shall take whatever steps he deems necessary and to the approval of the Engineer-in-charge to ensure the verticality of all palms. No additional payments shall be made for providing guys, stakes or any other necessary anchorages. Verticality shall be maintained within a tolerance of 1:25 unless otherwise instructed by theEngineer-in-charge.

2.7 Lawn

2.7.1 Heritage Areas: There demarcated grass lands shall be left naturally with protectiveirrigation.

They will be fenced off during construction.

2.8 TreeStakes

2.8.1 All stakes shall be double stakes of timber, straight, free of projections and pointed at one end. The stakes shall be pressure impregnated with non-injurious wood preservative to be applied at least two weeks beforeuse.

2.8.2 Stakes shall be stained green. A sample shall be submitted and approved by the Architect andEngineer-in-charge.

2.8.3 The tripod type tree guard/ tree stakes be made out of 3 no 50mm dia and approximate 2.5 mt long (2.0 mt above ground and 0.50 mt below ground) Eucalyptus/ Cedarstakes.

2.8.4 The tree guard stack shall be painted with bituminous paint at below ground portion plus 150mm above ground portion. The tree guard shall be installed vertically outside the root ball properly, so the tree grows in an upright position. The tree guard shall be maintained up to the tree become well set and as directed by architect andEngineer-in-charge.

2.8.5 For Climber, contractor shall provide vertical support (i.e., metal wire/ frame, jute thread, or similar kind of support suitable to type of species) as per site condition during plantation and as approved byEngineer-in-charge.

2.9 TreeTies

2.9.1 Tree stakes shall be tied to steam of planted tree with rubber tie/ patta of size 30mm x 10mm in twisted pattern as per drawing. Trees shall be supported by two stakes each and shall be fixed to the tree by a suitable rubbertie.

2.10 Temporary PlantingScreens

2.10.1 Whenever planting in an exposed position liable to extreme prevailing wind conditions and windbreaks shall be provided until such time as the planting is firmly established. The screens shall be 1750mm high shade cloth of 75% density supported on a firm wooden frame of adequate size and diameter so as not to disturb the growth of theplant.

2.11 Anti-desiccant

2.11.1 Anti-desiccant shall be an emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of water from plants. This is to be done duringtransplanting.

2.12 Mulch

2.12.1 Mulch shall be tree bark mulch or smooth river pebbles of the following random distribution size:

Length:	10mm -60mm
Width:	10mm -50mm

Thickness: 4mm -10mm

2.12.2 Certified product data and sample shall be submitted and approved by the Architect and Engineer-in-charge.

2.12.3 Mulch shall cover all shrub beds, in a 75mm layer, unless otherwise specified by the Architect andEngineer-in-charge.

2.13 PruningPaint

2.13.1 Pruning paint shall be waterproof, antiseptic, adhesive, elastic and free of kerosene, coal, tar, creosote and other substances harmful toplants.

2.14 Drainage layersystem

2.14.1 The Contractor shall install a gravel drainage layer, as per the Detail Drawings, on all in situ

planters with slab bases. The gravel drainage shall be 150mm washed river pebbles with a layer of geo textile placed on top and wrapped up the sides of the planters.

2.15 Soil Separator Membrane/Geo textileFabric

2.15.1 Non-woven, synthetic, continuous fiber isotropic felt 70% polypropylene 30% polyethylene, weight 125gms/sqm., thickness 1.0mm, with good permeability to water, resistant to all naturally occurring soil acidities and resistant to tearing and stress. To be laid with 300mm overlaps atjunctions.

3.0 EARTHWORKS

3.1 Settingout.

3.1.1 The Contractor's calculations for setting out from established points shall be available for inspection by theEngineer-in-charge.

3.1.2 The Contractor shall take all necessary precautions during the progress of the works to ensure that coordinated points are notdamaged.

3.2 SiteLevels

3.2.1 The Contractor shall check that the existing ground levels as indicated on the drawings are correct. Should there appear to be any discrepancies the Contractor shall agree the correct level with theEngineer-in-charge.

3.2.2 Prior to the commencement of any excavation or earthworks the Contractor shall furnish the Engineer-in-charge for his approval, drawings and / or schedules indicating the existing site levels on a suitablegrid.

3.3 Records

3.3.1 If the Engineer-in-charge requires foundation depths to be varied from those shown on the drawings it shall be the responsibility of the Contractor to ensure that proper records of the actual excavated levels arekept.

3.3.2 The Contractor shall ensure that the revised levels area measured in the

presence of the Engineer and are clearly identified, recorded, dated and signed as agreed by bothparties.

3.3.3 Where excavation meets the water table, detailed records of ground water levels, including any tidal variations shall bemaintained.

3.4 SiteInvestigation

3.4.1 SiteConditions

i). The Contractor shall be deemed to have satisfied himself as to the character of the site and all the various materials, strata, ground water levels etc., and of all items and things liable to affect or be encountered in the excavation andearthworks.

ii). Any site investigation reports included in the Contract Documents are provided solely for the guidance of the Contractor and no guarantee is given regarding their accuracy, nor it is guaranteed that similar condition apply elsewhere onsite.

iii). The Contractor is entirely responsible for informing himself to the conditions of the site and for carrying out such additional investigations at his own cost as he may consider necessary prior to submitting his tender or during the course of construction of theworks.

3.5 Special Requirements of StatutoryAuthorities

Prior to commencing excavation work the Contractor shall ascertain from the responsible departments whether any mains or services are to be diverted or cut off.

4.0 MATERAILS

4.1 Definitions

4.1.1 SuitableMaterial

Suitable material shall comprise all material that is acceptable in accordance with the contract for use in the works. Suitable material for earthworks shall be approved non-plastic soil obtained from excavations within the works, or from borrow pits approved by the Engineer-in- charge. It shall not contain an excess of fines or organic material where the material is to be placed below road or building construction it shall comply with 4.1.2 below

4.1.2 UnsuitableMaterial

Unsuitable material shall comprise

a) Organic material, stumps and other perishablematerial
b) Material susceptible to spontaneouscombustion
c) Cohesive materials of liquid limit exceeding 25% and plasticity index exceeding6.
d) Material with an excessive moisturecontent
e) Any other material which the Engineer may deem unsuitable forearthworks
f) Dredged material unless approved in writing by theEngineer
g) Stones larger than 10 mmdia.

4.1.3 EmbankmentFill

i Embankment fill shall imported form an area approved by theEngineer-in-charge.

ii It shall be the responsibility of the Contractor to locate suitable material and carry out such tests as the Engineer-in-charge may require to demonstrate the suitability of the fill to be supplied.

iii The fill shall have a maximum stone size of 75 mm liquid limit not exceeding 25% and plasticity index not exceeding 6. Total water-soluble salts shall not exceed3%.

iv Material shall have a CBR not less than 30% at 95% maximum drydensity.

4.1.4 Rock

Rock shall mean those geological strata or deposits so designated on the drawings and any hard, natural or artificial material requiring the use of approved pneumatic tools or blasting or its removal but excluding individual masses of less than 0.20 cubic meters.

5.0 PLANT FOREARTHWORKS

5.1 General

All plants and equipment used for earthworks shall be maintained in good working condition for the duration of the works. The Contractor shall supply adequate quantities and types of plant and equipment for the proper execution of the works in an expeditious manner.

5.2 Plant andEquipment

5.2.1 General

The main items of plant and equipment shall comply with the requirements detailed below. All plants shall be operated only by trained operators and banksmen shall be provided where

necessary.

5.2.2 Bulldozers

Bulldozers shall be tracked /pneumatic tyred vehicles equipped with a blade for earth moving/ leveling and ripper teeth where necessary. The blade level shall be hydraulicallycontrolled.

5.2.3 TractorShovel

Tractor shovel shall be tracked or pneumatic tyred vehicles equipped with a shovel for earthmoving. The shovel shall be hydraulically controlled.

5.2.4 RotaryCultivators

Rotary Cultivators shall be purpose designed to ensure proper pulverization and mixing of soil. Cultivators shall be equipped with metal teeth orplates.

5.2.5 MotorGraders

Motor graders shall be pneumatic tyred vehicles, equipped with hydraulically controlled blades, capable of both level and angular adjustment.

5.2.6 WaterSprinklers

Water sprinklers shall be mounted on pneumatic tyred trucks equipped with suitable pumping and water distribution equipment. The distributors shall be designed to add water to the soil uniformly and in controlled quantities.

5.2.7 Pneumatic TyredRollers

Pneumatic tyred rollers shall be equipped with tyres of equal size and diameter, uniformly inflated. The wheels shall be spaced such that one pass will achieve complete coverage equal to the rolling width of the machine. Pneumatic tyred rollers may be towed or self- propelled.

5.2.8 Steel WheeledRollers

Steel Wheeled rollers shall be one of the following types:

i Three wheeled rollers – shall be self-propelled and equipped with a reversing clutch, differential drive and have adjustable scrapers to keep the wheel surface clean. The wheels shall be spaced such that one pass will achieve complete coverage equal to the width of the machine.

ii Tandem rollers – shall be self-propelled and equipped with reversing clutches, a sprinkling system to spray front and rear rolls and adjustable spring scrapes fitted to eachroll.

iii Vibratory tender rollers – shall have a static weight of at least 5000 kg and a vibratory frequency between 1500 and 2000 cycles perminute.

iv Single drum vibratory rollers – shall be double axle, self-propelled rollers with rear axle equipped with pneumatic flotation tyres. The steel roll shall have a vibrating frequency between 1500 and 2000 cycles perminute

6.0 EXCAVATION

6.1 General

6.1.1 Line andLevels

Excavation shall be carried out to such lengths, widths, depths and profiles as are specified, or shown on the drawings plus any necessary allowance for working space for temporary works.

6.1.2 OversizedExcavations

Where excavations are taken out to greater depths, widths or lengths than required, the Contractor shall make good with concrete or other approved compacted material.

6.1.3 Support ofExcavations

The sides of excavations shall be adequately supported to prevent slips or subsidence and shall be closely sheeted where necessary to prevent the entry of running sand, mud etc.

6.1.4 FormationLevels

Where the excavated level forms the formation level for subsequent construction, the surface shall be suitably compacted to the satisfaction of the engineer prior to the commencement of any subsequent construction works. Compaction shall be to 95% maximum dry density.

6.2 Removal ofWater

6.2.1 Removal ofwater

The excavation shall at all times be kept free from standing water from whatever source arising by pumping or other means.

6.2.2 AdjacentStructures

The Engineer shall be informed should continuous or near continuous pumping be required. If necessary, arrangements shall be made for the prevention of withdrawal of support from adjacent structures.

6.3 SoftSpots

6.3.1 General

i The bottom of all excavations shall be proved, and any poor bearing area shall be reported to the Engineer, who will direct remedialwork.

ii Soft spots shall be cut out and filled with either approved compacted fill or concrete as directed by theEngineer.

6.4 Inspections:

6.4.1 Engineer-in-charge'sApproval

No excavation for foundations shall be filled in or covered with concrete until the Contractor has notified the Engineer that is ready for inspection and has received his sanction to proceed with the works. The Contractor shall give a minimum of 24 hours notice of any inspection.

7.0 FILLING

7.1 General

7.1.1 EngineersApproval

Excavations shall only be backfilled after the permanent works therein are approved by the

Engineer and after the removal of any building debris or deleterious material from the excavations. All final level formations shall be within a tolerance of (+) or (-) 25 mm.

7.1.2 SelectedMaterial

Selected excavated material shall normally be used for backfilling. Selected material shall comply with the requirements of 4.1.0 and 4.1.2 above. Where the excavated material is not considered suitable by the Engineer, selected material from an approved source shall be used.

7.1.3 BackfillGrades

The backfill shall be brought to a suitable level above grade to provide for anticipated settlement and unless indicated otherwise, shall be sloped away from structures.

7.2 Compaction

7.2.1 CompactionPlant

Compaction shall be approved compaction plant as scheduled in Section 5.0 or plate type vibrators, pedestrian operated vibrator rollers, small tandem rollers or other approved plant.

7.2.2 Placing andCompaction

Unless otherwise stated below, the procedure shall be as follows

i The material shall be placed in loose layers within the effective range of compaction plant; however, the maximum compacted layer thickness shall be limited to 150 mm irrespective of planttype.

ii The material shall be watered and mixed as necessary to ensure that prior to compaction the moisture content of the whole layer is within +2% of the optimum moisture content. Compaction of each layer shall continue until a density of at least 95% of the maximum dry density has been achieved, unless otherwise specified on thedrawings.

7.2.3 Fill below GroundSlabs

i The installation of cable ducts for service entries and service pipe work shall be completed before preparation of the fill to receive groundslabs.

ii The compacted material shall be shaped and trimmed to the required levels and dimensions and blinded with sand other approved find material which shall also be watered and compacted to provide a smoothsurface.

7.2.4 Sweet soil to PlantedAreas

i Where fill material is placed to areas designated for planting, the material shall be sweet soil as describedabove.

ii Sweet soil shall be compacted by the application of water only. No compaction plant shall be used.

iii The material shall be placed in layers not exceeding 200 mm well-watered and mixed to ensure fullsaturation.

iv Material shall be placed to achieve the contours shown on the drawings.

On completion of filing final profiling shall be carried out to avoid flat grades and abrupt changes of level or direction and to create a smooth, curved cross sectionalprofile.

7.3 Workmanship

7.3.1 Soil Grading andPreparation

7.3.2 Subsoil shall be excavated to achieve tolerances of (+) or (-) 25 mm specified for finished level of soil, and when reasonably dry and workable, graded to smooth, flowing contours with all minor hollows and ridgesremoved.

7.3.3 Non-cohesive, light subsoil shall be loosened with a three-time ripper, 300 mm deep at one- meter centers. Stiff clay and other cohesive subsoil shall be loosened with a single tine ripper to a depth of 450mm at one-metercenters.

All perennial weeds and undesirable plant and scrub growth shall be manually removed or treated with herbicides, and the period of time recommended by the manufacturer shall be allowed to elapse before grading. The contractor shall obtain approval from engineers before any plants are removed.

7.3.4 All weeds, rocks and other debris shall be removed and disposed of. Finished ground level adjoining buildings shall be kept 150 mm below the level of the damp-proofcourse.

7.4 Handling and Transportation ofPlants

7.4.1 Plant material shall be lifted or moved in such a manner that the roots are not disturbed. Plant material shall be lifted or moved by holding the container and not the stem orfoliage.

7.4.2 The root systems of all plants shall not be allowed to dry out at any time and shall not be exposed to excessive or artificial heat or to freezingtemperatures.

7.4.3 During transportation all plants shall be packed correctly to ensure protection from climatic or physical injuries. Tarpaulins or other covers shall be placed over plants when they are transported by trucks or in open freightcars.

7.4.4 Immediately prior to lifting, palm trees shall have their fronds reduced in length by 30%, sprayed with anti-desiccant and tied up with 3 layers of hessian to enclose the growing tip. The roots shall be pruned, and the root ball protected with three layers of hessian secured with wire and kept constantly moist with wet straw or other suitablematerial.

7.5 On-site Acclimatization andStorage

7.5.1 Plants shall be kept at the site nursery, in shaded areas until planted. Plant material shall be protected from wind exposure, and direct sunlight, and shall be wateredcorrectly.

7.5.2 All imported plant materials shall be delivered to the site nursery for

acclimatization within the first six months of the contract period, unless approved otherwise by the Architect and Engineer-in-charge and protected against drying at alltimes.

7.5.3 Palm trees shall be planted directly on arrival on site. If palms have to be held for longer than twenty-four hours before planting they should be 'heeled-in' in trenches which are kept moist at alltimes.

7.5.4 Soil, compost, fertilizes and other products shall be delivered to the site nursery, and stored in appropriate locations to avoid contamination, and wetting until the soil mixingoperations.

7.6 PlantingTiming

7.6.1 Planting shall take place before 1000 hours and after 1630 hours but can be carried out at other times if the Architect and Engineer-in-charge givesapproval.

7.6.2 Priortoplantingallgradingandripping,paving,layingofservicesandotherbuilder'swork shall be completed. The irrigation system shall, wherever possible, shall be operational and soil brought to field capacity.

7.7 MediumPreparation

7.7.1 Specified soil additives shall be mixed with sweet soil at the ratesspecified.

7.7.2 Application rates for ameliorants and soil mix components shall be checked and approved by the Architect and Engineer-in-charge and Client prior to mixing eachbatch.

7.7.3 The soil shall be mixed mechanically by an approved method to create a homogeneous mixture. Mixing of planting medium shall be accomplished at one centrally located section on a raised concrete slab to prevent contamination of field soil from diseases, weed seeds, and nematodes transported by run-offwater.

7.8 Planting

7.8.1 The sequence of planting shall be asfollows:

a) Grade soil asspecified.

b) Stake out the outline of planting areas and individual tree and shrub locations for approval by the Architect andEngineer-in-charge.

c) Excavate planting areas and individual pits to the sizes specified for palms, trees, shrubs, groundcovers, flowers and grass. Excavated sub-soil shall be removed from site and shall not be mixed with the planting medium or used to form berms around theplants.

d) Fill planting pit with irrigation water and ensure the water can drain away. In case of poor drainage, a percolation test shall be carried out and drainage holes augured ifrequired.

e) Backfill pit/beds, after having been tested for drainage with approved planting medium in layers not exceeding 300mm and water compact.

Allow for compaction/subsidence by overfilling by 100mm. Once placed the growing medium shall be covered with plastic sheeting and clearly marked to prevent disturbance until plantingcommences.
During backfilling place slow-release fertilizer tablets 25-30cm deep. For trees the tablets should be located approximately 1.0m from the trunk or adjacent to drip emitters as per site conditions.

f) Prior to planting tree stakes shall be driven into treepits.

g) At the time of planting a hole of size slightly bigger than the root ball shall be made into the pit/bed large enough to take the plants root ball. The planting hole shall be thoroughly watered prior toplanting.

h) Plants shall be carefully removed from containers. Plastic pots shall be split with a knife and plants removed with all the soil intact around the roots. Care shall be taken not to damage the roots or foliage of the plants. The plant shall be placed upright in the hole. Care shall be taken to ensure that the collar line (line of contact between soil and stem) is at the same level as the surroundingground.

i) Fill around the plant with planting medium in layers of 150mm, each layer separately firmed to eliminate all air pockets until final soil level isreached.

j) Trees shall be tied to the tree stakes with tree ties as specified. At least two pairs of ties per tree shall be used but other ties shall be provided if necessary to keep the stem straight. If a leader stake is required, this shall be 20mm round softwood stake slotted inside the tree tie loops.

k) A circular watering basin slightly larger than the planting hole shall be formed. During and after planting the plants shall be thoroughlywatered.

l) After planting the area surrounding the plant shall be restored to finished grade and excess soils and rubbish disposed ofproperly.

m) Immediately after planting all plants are to be pruned in accordance with accepted horticultural practices or as directed by the Architect and Engineer-in-charge. Pruning shall consist of carefully cutting back any damaged, dead or diseased branches and the removal of any weak or malformed growth, with the aim of forming each type of stock to the standard shape for its species. All pruning cuts greater than 20mm shall be treated with a pruning paint asspecified.

n) An aluminum label clearly marked with the Latin name shall be attached to or adjacent to every tenth tree, every twelfth shrub and every fifteenth groundcover.

o) Monitor all plants after planting for signs of windshake and loosening due to soil subsidence; firm and make good asnecessary.

p) The Contractor shall not add compost and fertilizer to palm pits at the time of planting and until so instructed by the Architect andEngineer-in-charge/Client.

7.8.2 Percolation testprocedure:

a) One day prior to the test the pit/bed shall be filled withwater.

b) A marker bar is placed in the pit/bed before the test isperformed

c) The pit/bed is half filled with water and the level is indicated with tape on the markerbar.

d) The test is monitored over a period of one hour. If the water level drops by 20mm or more within that time the pit/bedpasses.

e) If a pit/bed fails the percolation test, boreholes shall be augured (2 no/tree pit or 10m spacing in plantingbeds).

f) Tests should be repeated until a satisfactory result isachieved.

g) After auguring the boreholes shall be capped with wiregauze.

h) Percolation tests shall be carried out at a rate of 1 test per 50 plants. The Architect and Engineer-in-charge / Client may instruct additional tests on an exploratory basis in the event of unsatisfactory percolation beingevident.

7.8.3 Plantingpits:

a) Size of planting pit shall be asfollows:

1.	LargeTree/palmpit	1.3m x 1.3m x1.3m
2.	treepit	1.0m x 1.0m x1.0m
3.	shrubs/grasses/succulents	0.6m x 0.6m x0.6m
4.	lawnareas	0.3m minimumdepth

7.8.4 Grass Stolons andseeding

The procedure for planting grass stolons shall be as follows:

a) Prior to beginning planting operations, the irrigation system must be completely operational ensuring 100%coverage.

b) Bring the water content of the area to be planted to field capacity and allow water to percolate until standing waterdisappears.

c) Apply complete fertilizer as specified prior to plantingstolons.

d) Cultivate to a depth of200mm.

e) Keep dormant stolons refrigerated 0-3°C, until the area to be planted is prepared. Do not exceed two weeks of refrigeration. Soak stolons in water after removing from cold storage and prior toplanting.

f) Do not exceed two days of storage on the job site. Stolons are to be kept moist, shaded and ventilated during suchstorage.

g) Plant during the time of year when daytime temperatures do not exceed 38°C and nighttime temperatures are not below 15°C. Mean temperature should exceed 26°C. Water within 15 minutes of planting at 38°C, 30 minutes at 28°C, 60 minutes at 21°C, and 120 minutes at 16°C.

h) Sow at 200litres per 100 squaremeters.

i) Plant utilizing a disc to cut in stolons and followed by a culti packer roller, or other technique approved by the Architect andEngineer-in-charge.

j) Water is necessary to keep the stolon bed moist until germination. Once grass is up begin lengthening intervals betweenirrigation.

7.9 MowingStrips

7.9.1 The Contractor shall install mowing strips as per Detaildrawings.

8.0 COMPLETION ANDMAINTENANCE

8.1 SubstantialCompletion

8.1.1 At the date of Substantial Completion all plants shall be in their specified position and condition.

8.2 Plant EstablishmentPeriod

8.2.1 The Plant Establishment Period shall be for three months from the date of Substantial Completion and may run consecutively with the One Year Maintenance Period. Any plant material not showing acceptable levels of growth shall be replaced by the Contractor who shall bear all the associatedcosts.

8.3 Failure ofPlants

8.3.1 Any plants that are found to be missing, defective or not in good condition at any time during the contract period and maintenance period shall be immediately replaced by the Contractor, who shall bear all the associatedcosts.

8.4 MaintenancePeriod

8.4.1 The Maintenance Period shall run for a period of one calendar year from the date of Substantial Completion of the whole of theWorks.

8.4.2 The Contractor shall maintain insurances of relevant items as required by the Contract throughout the MaintenancePeriod.

8.4.3 The contractor shall carry out maintenance of the planting strictly in accordance with the Operations and Maintenance manual as approved by the Client. The Contractor is to provide all required labour, plant and materials to comply with the approvedprocedures.

8.4.4 During the Maintenance period the Contractor shall make adequate provision for irrigation and/or operate the irrigation system as required and maintain same for handover to the Client on completion of the Plant Establishment Period, comprehensively overhauled and in perfect workingorder.

8.4.5 The contractor shall keep necessary number of personnel (gardeners, laborers, irrigation supervisor) in proper uniform, full time at site, and shall be required to send additional manpower as and when required to carry

out special maintenance works like removing dry palm fronds, aeration, planting seasonal, replacing trees and all the treatments required for plantprotection.

8.4.6 A qualified and experienced agricultural engineer, approved by the Client, shall be required to inspect the site regularly for correct diagnosis of pests or diseases and to take timely remedial measures.

8.4.7 An experienced plumber will be deputed to the site on regular intervals to check the irrigation system and adjust/replace the equipment that is not working properly. Seasonal adjustments to the irrigation operation schedule and programming of controllers shall be done by a qualified irrigation engineer, prevailing according to the weather conditions and Client's requirements.

8.4.8 The contractor shall maintain, at all times, sufficient stock of regularly utilized fertilizers, chemicals, tools, spare parts and other consumables atsite.

8.4.9 Trimmings, cut branches, dry leaves and other waste shall be removed daily from the site and disposed of in the Municipalitydump.

8.4.10 The site shall be kept neat, tidy and in good condition at alltimes.

8.4.11 In the case of any horticultural staff designated by the Client, the Contactor shall fully train such staff for the duration of the Maintenance Period at no additionalcost.

8.5 Operations and MaintenanceManual

8.5.1 The Contractor shall compile a comprehensive Operations and Maintenance Manual which will include thefollowing:

a) Pesticide/fungicide/herbicide applications - including safety application rates and procedure, schedules ofpesticides/fungicides/herbicides.

b) Water application rates and maintenance procedures, including a detailed description of Irrigation and Storm water drainagemethods.

c) Fertilization - including fertilizer descriptions, application rates andprograms.

d) Salinity Control - including leaching methods and leaching programmonitoring.

e) Turf Grass Management - including mowing procedure, replacement of turf grass by stolon and sods and routine management procedures; aeration, top dressing, vertical mowing, thatch removal, cleaning, rolling and overseeding.

f) Propagation and replacement of seasonal flowers every 3 months maximum or when deemed necessary.

g) General Maintenance Monthly Operations Schedule - including pruning,

stakes and ties, berm work, replacement and clean-up, protective fencingetc.

h) Equipment Inventory, maintenance procedures and full manufacturers maintenancemanual.

i) Personnel

8.5.2 The Operation and Maintenance Manual for Soft Landscape shall be submitted to the Architect and Engineer-in-charge/Client by the Contractor for approval at least three months prior to the date for Substantial Completion of any part of the Works and must be approved prior to the commencement of the Plant Establishment Period. Three bound copies of the manual in A4 format shall be presented to theClient.

9.1 REFERENCES

9.2 Standards

9.1.1 The following Standards are referred to in thisspecification:

i. Pest Management in Horticultural crops, IIHRBangalore
ii. ProceedingoftheNationalconsultationSeminaronHorticulturalResearch&Developme nt,
IIHR Bangalore
iii. Neem Cake- An organic formulation for Insect Pest Management in Horticulture, IIHR Bangalore.