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USACE / NAVFAC / AFCEC UFGS-32 93 00 (August 2017)  
Change 1 - 08/21  
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Preparing Activity: NAVFAC Superseding  
UFGS-32 93 00 (February 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2024

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SECTION 32 93 00

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SECTION 32 93 00

EXTERIOR PLANTS  
08/17, CHG 1: 08/21

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NOTE: This guide specification covers the  
requirements for exterior planting.

Adhere to UFC 1-300-02 Unified Facilities Guide  
Specifications (UFGS) Format Standard when editing  
this guide specification or preparing new project  
specification sections. Edit this guide  
specification for project specific requirements by  
adding, deleting, or revising text. For bracketed  
items, choose applicable item(s) or insert  
appropriate information.

Remove information and requirements not required in  
respective project, whether or not brackets are  
present.

Comments, suggestions and recommended changes for  
this guide specification are welcome and should be  
submitted as a Criteria Change Request (CCR).

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NOTE: The following information must be shown on  
the project drawings:

1. All areas to be planted, with plant layout  
provided.
2. Plant list.
3. Subsurface drainage.
4. Planting accessories.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICANHORT (AH)

ANSI/ANLA Z60.1 (2004) American Standard for Nursery Stock

ASTM INTERNATIONAL (ASTM)

ASTM A580/A580M (2023) Standard Specification for Stainless Steel Wire

ASTM C602 (2023) Agricultural Liming Materials

ASTM D4427 (2018) Standard Classification of Peat Samples by Laboratory Testing

ASTM D4972 (2018) Standard Test Methods for pH of Soils

ASTM D5268 (2019) Topsoil Used for Landscaping Purposes

ASTM D5539 (2013) Seed Starter Mix

KOREAN INDUSTRIAL STANDARDS (KS)

KS D 3703 (2007; R 2022) Stainless Steel Wires

KS F 2103 (2024) Standard test method for pH of soils

L.H. BAILEY HORTORIUM (LHBH)

LHBH

(1976) Hortus Third

TREE CARE INDUSTRY ASSOCIATION (TCIA)

TCIA A300P1

(2017) ANSI A300 Part1: Tree Care  
Operations - Trees, Shrubs and Other Woody  
Plant Maintenance Standard Practices -  
Pruning

TCIA Z133

(2017) American National Standard for  
Arboricultural Operations - Pruning,  
Repairing, Maintaining, and Removing  
Trees, and Cutting Brush - Safety  
Requirements

U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42

(2022) Kellogg Soil Survey Laboratory  
Methods Manual, Soil Survey Investigations  
Report, No. 42, Version 6.0

## 1.2 RELATED REQUIREMENTS

Section 31 00 00 EARTHWORK, [Section 32 84 24 IRRIGATION SPRINKLER  
SYSTEMS,] [Section 32 96 00 TRANSPLANTING EXTERIOR PLANTS,] [Section  
32 92 19 SEEDING,] [Section 32 92 23 SODDING,] and Section 32 05 33  
LANDSCAPE ESTABLISHMENT applies to this section for pesticide use and  
plant establishment requirements, with additions and modifications herein.

## 1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions  
in Section 01 33 00 SUBMITTAL PROCEDURES and edit  
the following list, and corresponding submittal  
items in the text, to reflect only the submittals  
required for the project. The Guide Specification  
technical editors have classified those items that  
require Government approval, due to their complexity  
or criticality, with a "G." Generally, other  
submittal items can be reviewed by the Contractor's  
Quality Control System. Only add a "G" to an item  
if the submittal is sufficiently important or  
complex in context of the project.

For Army projects, fill in the empty brackets  
following the "G" classification, with a code of up  
to three characters to indicate the approving  
authority. Codes for Army projects using the  
Resident Management System (RMS) are: "AE" for  
Architect-Engineer; "DO" for District Office  
(Engineering Division or other organization in the  
District Office); "AO" for Area Office; "RO" for  
Resident Office; and "PO" for Project Office. Codes  
following the "G" typically are not used for Navy  
and Air Force projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy and Air Force projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

##### Time Restrictions and Planting Conditions

Indicate anticipated dates and locations for each type of planting.

#### SD-03 Product Data

Peat

Composted Derivatives

Organic Mulch Materials

Gypsum

Mulch; G

Ground Stakes

Recycled Plastic Edging

Fertilizer

Weed Control Fabric; G

Root Control Barrier; G

Staking Material

Wood Edging

Metal Anchors

Antidesiccants

Erosion Control Materials

Photographs; G

#### SD-04 Samples

##### Mulch; G

Submit 0.5 liter of mulch.

#### SD-06 Test Reports

Topsoil Composition Tests; ; Soil Test of proposed area; Soil Test location map

Percolation Test; ; Percolation Test of proposed area

#### SD-07 Certificates

##### Nursery Certifications

#### SD-10 Operation and Maintenance Data

##### Plastic Identification

When not labeled, identify types in Operation and Maintenance Manual.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Topsoil Composition Tests

Commercial test from an independent testing laboratory including basic soil groups (moisture and saturation percentages, Nitrogen-Phosphorus-Potassium (N-P-K) ratio, pH (ASTM D4972 or KS F 2103), soil salinity), secondary nutrient groups (calcium, magnesium, sodium, Sodium Absorption Ratio (SAR)), micronutrients (zinc, manganese, iron, copper), toxic soil elements (boron, chloride, sulfate), cation exchange and base saturation percentages, and soil amendment and fertilizer recommendations with quantities for plant material being transplanted. Soil required for each test must include a maximum depth of 450 mm of approximately one liter volume for each test. Areas sampled should not be larger than 0.4 hectare and should contain at least 6-8 cores for each sample area and be thoroughly mixed. Problem areas should be sampled separately and compared with samples taken from adjacent non-problem areas. The location of the sample areas should be noted and marked on a parcel or planting map for future reference.

#### 1.4.2 Nursery Certifications

- a. Indicate on nursery letterhead the name of plants in accordance with the LHBH or specified on the Standard Specifications for Landscape Consturction by Korea Land & Housing Corporation, including botanical common names, quality, and size.
- b. Inspection certificate.

#### 1.4.3 Plant Material Photographs

Contractor must submit nursery photographs, for government approval prior to ordering, for each tree larger than 600 mm box/ 50 mm caliper size.



#### 1.4.4 Percolation Test

Immediately following rough grading operation, identify a typical location for one of the largest trees and or shrubs and excavate a pit per the project details. Fill the pit with water to a depth of 300 mm. The length of time required for the water to percolate into the soil, leaving the pit empty, must be measured by the project Landscape Architect and verified by the Contracting Officer. Within six hours of the time the water has drained from the pit, the Contractor, with the Contracting Officer and project Landscape Architect present, must again fill the pit with water to a depth of 300 mm. If the water does not completely percolate into the soil within 9 hours, a determination must be made whether a drainage system or a soil penetrant will be required for each tree and or shrub being transplanted.

### 1.5 DELIVERY, STORAGE, AND HANDLING

#### 1.5.1 Delivery

##### 1.5.1.1 Branched Plant Delivery

Deliver with branches tied and exposed branches covered with material which allows air circulation. Prevent damage to branches, trunks, root systems, and root balls and desiccation of leaves.

##### 1.5.1.2 Soil Amendment Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to local laws. Instead of containers, fertilizer, gypsum, sulfur, iron, and lime may be furnished in bulk with a certificate indicating the above information. Store in dry locations away from contaminants.

##### 1.5.1.3 Plant Labels

Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct botanical and common plant name and variety as applicable and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels must be legible for a minimum of 60 days after delivery to the planting site.

#### 1.5.2 Storage

##### 1.5.2.1 Plant Storage and Protection

Store and protect plants not planted on the day of arrival at the site as follows:

- a. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.
- b. Heel-in bare root plants.
- c. Protect balled and burlapped plants from freezing or drying out by covering the balls or roots with moist burlap, sawdust, wood chips, shredded bark, peat moss, or other approved material. Provide covering which allows air circulation.

- d. Keep plants in a moist condition until planted by watering with a fine mist spray.
- e. Do not store plant material directly on concrete or bituminous surfaces.

#### 1.5.2.2 Fertilizer, Gypsum, pH Adjusters and Mulch Storage

Store in dry locations away from contaminants.

#### 1.5.2.3 Topsoil

Prior to stockpiling topsoil, eradicate on site undesirable growing vegetation. Clear and grub existing vegetation three to four weeks prior to stockpiling existing topsoil.

#### 1.5.2.4 Root Control Barrier and Weed Control Fabric

Store materials on site in enclosures or under protective covering in dry location. Store under cover out of direct sunlight. Do not store materials directly on ground.

#### 1.5.3 Handling

Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Handle boxed, balled and burlapped, balled and potted, processed balled, in-ground fabric bag grown or container plants carefully to avoid damaging or breaking the earth ball or root structure. Do not handle plants by the trunk or stem. Remove damaged plants from the site.

#### 1.5.4 TIME LIMITATION

Except for container-grown plant material, the time limitation from digging to installing plant material must be a maximum of 90 days. The time limitation between installing the plant material and placing the mulch must be a maximum of 24 hours.

### 1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

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**NOTE: Check with the local Agriculture County  
Extension Service Office for recommended planting  
dates for the project area. Allow for planting  
period in the construction completion time provided  
in the Additional General Paragraphs. Delete time  
restrictions for continuous growing conditions.**  
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#### 1.6.1 Restrictions

Do not plant when ground is frozen, snow covered, muddy, or when air temperature exceeds 32 degrees Celsius

#### 1.7 GUARANTEE

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**NOTE: This guarantee is premised on a fall planting**

season from approximately October 1 to December 15  
and a spring planting season from the time ground  
can be worked to May 15.

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**NOTE: Choose one of the following options.**

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All plants must be guaranteed for the period specified on Section 01 50 00  
TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS, AND MISCELLANEOUS  
PROVISIONS beginning on the date of inspection by the Contracting Officer  
to commence the plant establishment period, against defects including  
death and unsatisfactory growth, except for defects resulting from lack of  
adequate maintenance, neglect, or abuse by the Government or by weather  
conditions unusual for the warranty period.

At end of warranty period, replace planting materials that die or have 25  
percent or more of their branches that die during the construction  
operations or the guarantee period. Plant materials must have a minimum  
95 percent survival rate. If the overall survival rate is less than 95  
percent, the contractor is responsible for another full warranty period of  
365 days for the replaced plants.

#### 1.8 PLASTIC IDENTIFICATION

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**NOTE: The marking system indicated below is  
intended to provide assistance in identification of  
products for making subsequent decisions as to  
handling, recycling, or disposal.**

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Provide product data indicating polymeric information in Operation and  
Maintenance Manual.

Type 1: Polyethylene Terephthalate (PET, PETE).

Type 2: High Density Polyethylene (HDPE).

Type 3: Vinyl (Polyvinyl Chloride or PVC).

Type 4: Low Density Polyethylene (LDPE).

Type 5: Polypropylene (PP).

Type 6: Polystyrene (PS).

Type 7: Other. Use of this code indicates that the package in  
question is made with a resin other than the six listed above, or is  
made of more than one resin listed above, and used in a multi-layer  
combination.

## PART 2 PRODUCTS

### 2.1 PLANTS

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**NOTE: Check with local Agriculture County Extension**

Service Office for the species and varieties of plants recommended for the project area. Specify plants based on a xeriscaping approach, which utilizes indigenous plants and low maintenance plants tolerant of the site's existing soils and climate without supplemental irrigation or fertilization, once established. Indigenous plants typically will perform better than imported species and require less maintenance. It is advisable to sufficiently monitor imported species to determine the relative invasiveness. They can blend into the local ecosystem, but they can also overrun it, suffocating indigenous plants and crippling habitats.

Specify appropriate companion planting, seasonal mixes, and habitat vegetation. Companion planting takes advantage of complementary relationships between some plants such as parsley and roses. Seasonal mixes utilize plants that thrive at various times of the year. Seasonal mixes are closely related to providing habitat vegetation. Many birds, animals, and insects - especially migratory creatures - depend upon certain plants flowering or seeding at specific times of the year and in certain regions.

Existing vegetation must be evaluated for appropriateness to remain. Existing vegetation may be native and require little maintenance. Utilizing existing site features minimizes site disturbance, which reduces erosion and habitat destruction. Items on site such as excavated rocks may also be considered for use as landscaping features.

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#### 2.1.1 Regulations and Varieties

Furnish nursery stock in accordance with ANSI/ANLA Z60.1, except as otherwise specified or indicated. Each plant or group of planting must have a "key" number indicated on the nursery certifications of the plant schedule. Furnish plants, including turf grass, grown under climatic conditions similar to those in the locality of the project. . Plants of the same specified size must be of uniform size and character of growth. All plants must comply with all local Laws requiring inspection for plant diseases and infestation.

#### 2.1.2 Shape and Condition

Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and undamaged root system.

##### 2.1.2.1 Deciduous Trees and Shrubs

Symmetrically developed and of uniform habit of growth, with straight boles or stems, and free from objectionable disfigurements.

#### 2.1.2.2 Evergreen Trees and Shrubs

Well developed symmetrical tops with typical spread of branches for each particular species or variety.

#### 2.1.2.3 Ground Covers and Vines

Number and length of runners and clump sizes indicated, and of the proper age for the grade of plants indicated, furnished in removable containers, integral containers, or formed homogeneous soil section.

#### 2.1.3 Plant Size

Minimum sizes measured after pruning and with branches in normal position, must conform to measurements indicated, based on the average width or height of the plant for the species as specified in ANSI/ANLA Z60.1. Plants larger in size than specified may be provided with approval of the Contracting Officer. When larger plants are provided, increase the ball of earth or spread of roots in accordance with ANSI/ANLA Z60.1.

#### 2.1.4 Root Ball Size

All box-grown, field potted, field boxed, collected, plantation grown, bare root, balled and burlapped, container grown, processed-balled, and in-ground fabric bag-grown root balls must conform to ANSI/ANLA Z60.1. All wrappings and ties must be biodegradable. Root growth in container grown plants must be sufficient to hold earth intact when removed from containers. Root bound plants will not be accepted.

#### 2.1.5 Growth of Trunk and Crown

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**NOTE: The form of growth desired for specimen or  
special purpose plant material must be described.**  
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##### 2.1.5.1 Deciduous Trees

A height to caliper relationship must be provided in accordance with ANSI/ANLA Z60.1. Height of branching must bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees must not be "poled" or the leader removed.

- a. Single stem: The trunk must be reasonably straight and symmetrical with crown and have a persistent main leader.
- b. Multi-stem: All countable stems, in aggregate, must average the size specified. To be considered a stem, there must be no division of the trunk which branches more than 150 mm from ground level.

##### 2.1.5.2 Deciduous Shrubs

Deciduous shrubs must have the height and number of primary stems recommended by ANSI/ANLA Z60.1. Acceptable plant material must be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

#### 2.1.5.3 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material must have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. The coniferous evergreen trees must not be "poled" or the leader removed. Acceptable plant material must be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired must be as indicated.

#### 2.1.5.4 Broadleaf Evergreen Plant Material

Broadleaf evergreen plant material must have the height-to-spread ratio recommended by ANSI/ANLA Z60.1. Acceptable plant material must be well shaped and recognized by the trade as typical for the variety grown in the region of the project.

#### 2.1.5.5 Ground Cover and Vine Plant Material

Ground cover and vine plant material must have the minimum number of runners and length of runner recommended by ANSI/ANLA Z60.1. Plant material must have heavy, well developed and balanced crown with vigorous, well developed root system and must be furnished in containers.

### 2.2 TOPSOIL

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NOTE: If topsoil properties are included in another section of Division 31, delete this paragraph and include a cross-reference to the appropriate section. Otherwise, select appropriate paragraphs on topsoil. Check with the local Agriculture County Extension Service Office for soil properties appropriate for the plant materials to be planted. If existing topsoil is used, insert materials, if required, to properly condition for pH and friability. Where suitable topsoil is available within limits of the work area, include stripping and stockpiling of topsoil in the applicable section of Division 31 of the specification. If suitable topsoil is not available within the limits of the work area, consider whether it is more economical to treat the soil of the graded areas with fertilizer and supplements so as to be conducive for plant establishment and maintenance, to transport topsoil to the project site, or to use regionally native plants suited to the on-site soil. If treatment of the soil is more economical, include requirements for fertilizer and supplements. Prior to stockpiling topsoil, remove all weed-grasses. This should occur when the foliage is 150 to 250 mm high and approximately 4 to 6 weeks prior to stockpiling.

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#### 2.2.1 Existing Soil

Modify to conform to requirements specified in paragraph COMPOSITION.

#### 2.2.2 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to

meet the requirements specified for topsoil in paragraph COMPOSITION. When available topsoil must be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00 EARTHWORK.

#### 2.2.3 Off-Site Topsoil

Conform to requirements specified in paragraph COMPOSITION. Additional topsoil must be furnished by the Contractor.

#### 2.2.4 Composition

Evaluate soil for use as topsoil in accordance with ASTM D5268. From 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 19 mm, with maximum 3 percent retained on 6 mm screen. The pH must be tested in accordance with ASTM D4972 or KS F 2103. Topsoil must be free of sticks, stones, roots, plants, and other debris and objectionable materials. Other components must conform to the following limits:

Silt	7 to 17 percent
Clay	4 to 12 percent
Sand	70 to 82 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

#### 2.3 SOIL CONDITIONERS

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NOTE: Prior to including these provisions in project specifications, perform tests of on-site topsoil to determine its suitability and the possible need of pH adjusters or soil conditioners.  
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Provide singly or in combination as required to meet specified requirements for topsoil. Soil conditioners must be nontoxic to plants.

##### 2.3.1 Lime

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NOTE: Use ASTM C602 calcium carbonate equivalent (C.C.E.) as specified in Table 1: for burnt lime, C.C.E. must not be less than 140 percent; for hydrated lime, C.C.E. must not be less than 110 percent; and for limestone, C.C.E. must not be less than 80 percent.  
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Commercial grade hydrated or burnt limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than 110 percent for hydrate and 140 percent for burnt lime.

2.3.2 Aluminum Sulfate

Commercial grade.

2.3.3 Sulfur

100 percent elemental

2.3.4 Iron

100 percent elemental

2.3.5 Peat

Natural product of peat moss derived from a freshwater site and conforming to ASTM D4427 or ASTM D5539 as modified herein. Shred and granulate peat to pass a 12.5 mm mesh screen and condition in storage pile for minimum 6 months after excavation. Peat must not contain invasive species, including seeds.

2.3.6 Sand

Clean and free of materials harmful to plants.

2.3.7 Perlite

Horticultural grade.

2.3.8 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, invasive species, including seeds, and soil stabilized with nitrogen and having the following properties:

2.3.8.1 Particle Size

Minimum percent by weight passing:

4.75 mm (No. 4) screen	95
2.36 mm (No. 8) screen	80

2.3.8.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.9 Gypsum

Coarsely ground gypsum comprised of calcium sulfate dihydrate 80 percent, calcium 18 percent, sulfur 14 percent; minimum 96 percent passing through 850 micrometers, 100 percent passing thru 970 micrometers screen.

2.4 PLANTING SOIL MIXTURES

\*\*\*\*\*  
NOTE: Choose one of the following options.  
\*\*\*\*\*



100 percent topsoil as specified herein.

## 2.5 FERTILIZER

\*\*\*\*\*  
NOTE: Check with the local Agriculture County  
Extension Service Office for recommended fertilizer  
mixture for local conditions.  
\*\*\*\*\*

### 2.5.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

- 8 percent available nitrogen
- 4 percent available phosphorus
- 6 percent available potassium

### 2.5.2 Fertilizer Tablets

Organic, plant tablets composed of tightly compressed fertilizer chips forming a tablet that is insoluble in water, is designed to provide a continuous release of nutrients for at least 24 months and contains the following minimum percentages, by weight, of plant food nutrients:

- 20 percent available nitrogen
- 20 percent available phosphorus
- 5 percent available potassium

## 2.6 WEED CONTROL FABRIC

\*\*\*\*\*  
NOTE: Check with the local Agriculture County  
Extension Service Office for recommended type of  
membrane for the project area. Specify only one  
type of membrane for the project.  
\*\*\*\*\*

\*\*\*\*\*  
NOTE: Choose one of the following options.  
\*\*\*\*\*

### 2.6.1 Roll Type Polypropylene or Polyester Mats

Fabric must be woven, needle punched or non-woven and treated for protection against deterioration due to ultraviolet radiation. Fabric must be minimum 99 percent opaque to prevent photosynthesis and seed germination from occurring, yet allowing air, water and nutrients to pass thru to the roots. Minimum weight must be 0.11 kg per square meter with a minimum thickness of 0.50 mm with a 20 year (minimum) guarantee.

## 2.7 MULCH

\*\*\*\*\*  
NOTE: Check with the local Agriculture County  
Extension Service Office for recommended and locally  
available mulch material. Examine installations  
design guides if available for approve mulch list.

\*\*\*\*\*

Free from noxious weeds, mold, pesticides, or other deleterious materials.

\*\*\*\*\*

NOTE: Use inert mulch materials only when organic mulch is not available, or when site is located in a dry climate.

\*\*\*\*\*

#### 2.7.1 Organic Mulch Materials

\*\*\*\*\*

NOTE: Hydraulic mulch is an EPA designated product for recycled content. Recycled content percentages listed are recommended by EPA; additional information can be found on the EPA's "Comprehensive Procurement Guidelines (CPG)" page within EPA's website at <http://www.epa.gov>.

\*\*\*\*\*

Provide wood cellulose fiber, wood chips, shredded hardwood, shredded redwood bark, pine straw mulch, pine needles, or recycled from site when available. Wood cellulose fiber must be processed to contain no growth or germination-inhibiting factors, dyed with non-toxic, biodegradable dye to an appropriate color to facilitate visual metering of materials application. Paper-based hydraulic mulch must contain 100 percent post-consumer recycled content. Wood-based hydraulic mulch must contain 100 percent total recovered materials content.

#### 2.7.2 Recycled Organic Mulch

Recycled mulch may include compost, tree trimmings, or pine needles with a gradation that passes through a 65 by 65 mm screen. It must be cleaned of all sticks a minimum 25 mm in diameter and plastic materials a minimum 75 mm length. The material must be treated to retard the growth of mold and fungi.

### 2.8 STAKING AND GUYING MATERIAL

#### 2.8.1 Staking Material

##### 2.8.1.1 Tree Support Stakes

Rough sawn hard wood free of knots, rot, cross grain, bark, long slivers, or other defects that impair strength. Stakes must be minimum 50 mm square or 64 mm diameter by 2.4 m long, pointed at one end..

##### 2.8.1.2 Ground Stakes

Rough sawn hard wood or plastic, 50 mm square are by 0.91 m long, pointed at one end.

#### 2.8.2 Guying Material

##### 2.8.2.1 Guying Wire

12 gauge annealed galvanized steel, ASTM A580/A580M or KS D 3703.

#### 2.8.2.2 Guying Cable

Minimum five-strand, 5 mm diameter galvanized steel cable.

#### 2.8.3 Hose Chafing Guards

New or used 2 ply 19 mm diameter reinforced rubber or plastic hose, black or dark green, all of same color.

#### 2.8.4 Flags

White surveyor's plastic tape, or 12.70 mm diameter PVC pipe, 150 mm or 300 mm long, fastened to guying wires or cables.

#### 2.8.5 Turnbuckles

Galvanized or cadmium-plated steel with minimum 75 mm long openings fitted with screw eyes. Eye bolts must be galvanized or cadmium-plated steel with 25 mm diameter eyes and screw length 38 mm, minimum.

#### 2.8.6 Deadmen

\*\*\*\*\*  
**NOTE: Avoid the use of concrete or brick materials.**  
\*\*\*\*\*

100 by 200 mm rectangular or 200 mm diameter by 900 mm long, pine or fir wood material.

#### 2.8.7 Metal Anchors

##### 2.8.7.1 Driven Anchors

Malleable iron, arrow shaped, galvanized, sized as follows:

<u>Tree Caliper</u>	<u>Anchor Size</u>
50 mm	75 mm
75 to 150 mm	100 mm
150 to 200 mm	150 mm
200 to 250 mm	200 mm
250 to 300 mm	250 mm

##### 2.8.7.2 Screw Anchors

Steel, screw type with welded-on 75 mm round helical steel plate, minimum 10 mm diameter, 375 mm long.

## 2.9 EDGING MATERIAL

### 2.9.1 Wood Edging

\*\*\*\*\*  
NOTE: Indicate type of wood, e.g., Redwood, Cypress, Western Red Cedar, [\_\_\_\_\_]. If a decay resistant species is specified, preservative treatment will not be required. Specify decay-resistant species when feasible.  
\*\*\*\*\*

As specified in Section 06 10 00 ROUGH CARPENTRY. Redwood, Cypress or Western Red Cedar wood edging must be free of solvent at time of delivery. Minimum 200 by 13 mm . Anchoring stakes must be the same material as wood edging, 13 by 50 mm, 300 mm long.

\*\*\*\*\*  
NOTE: Plastic or rubber garden edging, and plastic lumber, are EPA designated products for recycled content. Recycled content percentages listed are recommended by EPA; additional information can be found on the EPA's "Comprehensive Procurement Guidelines (CPG)" page within EPA's website at <http://www.epa.gov>. Research shows that the product is commonly available via US national manufacturers meeting the percentage of recycled content listed below.  
\*\*\*\*\*

### 2.9.2 Recycled Plastic Edging

100 percent recycled polyethylene edging, resistant to insects, termites, boring worms, splintering and rotting, and must not absorb moisture or promote bacterial growth. Minimum 2 by 4 or 2 by 6 inch, capable of bending a minimum 36 radius, integrally colored brown with slip joint connections. Anchors and stakes must be of the same manufacturer and color as the edging.

### 2.9.3 Concrete Edging

Extruded or Cast-in-place 150 by 150 concrete mowstrip. Provide tooled or saw cut contraction joints to a depth of 19 mm after the surface has been finished. Provide joints every 1500 lineal mm. Provide 12.70 mm thick expansion joints at change of direction and where mowstrip abuts rigid pavement. Provide #4 reinforcement bar and other devices necessary to install and secure reinforcement. Provide a floated finish, then finish with a flexible bristle broom. 21 MPa compressive concrete strength at 28 days as specified under [Section 03 30 00 CAST-IN-PLACE CONCRETE] [Section 03 30 53 MISCELLANEOUS CAST-IN-PLACE CONCRETE].

## 2.10 ANTIDESICCANTS

Sprayable, water insoluble vinyl-vinledine complex which produce a moisture retarding barrier not removable by rain or snow. Film must form at temperatures commonly encountered out of doors during planting season and have a moisture vapor transmission rate (MVT) of the resultant film of maximum 10 grams per 24 hours at 70 percent humidity.

## 2.11 EROSION CONTROL MATERIALS

Erosion control material must conform to the following:

### [2.11.1 Erosion Control Blanket

100 percent agricultural straw stitched with a degradable nettings, designed to degrade within 12 months.

### ] [2.11.2 Erosion Control Fabric

Fabric must be knitted construction of polypropylene yarn with uniform mesh openings 19 to 25 mm square with strips of biodegradable paper. Filler paper strips must have a minimum life of 6 months.

### ] [2.11.3 Erosion Control Net

Net must be heavy, twisted jute mesh, weighing approximately 605 grams per meter and 1200 mm wide with mesh openings of approximately 25 mm square.

### ] [2.11.4 Hydrophilic Colloids

Hydrophilic colloids must be physiologically harmless to plant and animal life without phytotoxic agents. Colloids must be naturally occurring, silicate powder based, and must form a water insoluble membrane after curing. Colloids must resist mold growth.

### ] 2.11.5 Erosion Control Material Anchors

Erosion control anchors must be as recommended by the manufacturer.

## 2.12 ROOT CONTROL BARRIER

Flexible and permeable geotextile fabric with permanently attached time-released nodules. Color to be black or gray . Or pre-formed, round, tapered cylinder or linear barrier with integral vertical root deflecting ribs constructed of ultraviolet resistant polypropylene material. Color to be black .

## 2.13 WATER

\*\*\*\*\*

NOTE: When water is Government furnished, locate the source. Recycled or reclaimed irrigation water may be available through a tertiary treatment plant on or off site. It is preferred that this type of water be used for irrigation whenever possible. Check project specific conditions.

Unless otherwise directed, water must be the responsibility of the Contractor. Water source must be potable or non-potable. Non-potable is preferred. If non-potable edit specification accordingly. Source of water must be approved by the Contracting Officer and must be of suitable quality for irrigation, containing no elements toxic to plant life.

Coordinate information presented here with Section

**01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND  
CONTROLS.**

\*\*\*\*\*

Source of water to be approved by Contracting Officer and suitable quality for irrigation and must not contain elements toxic to plant life.

2.14 SOURCE QUALITY CONTROL

The Contracting Officer will inspect plant materials at the project site and approve them. Tag plant materials for size and quality.

PART 3 EXECUTION

3.1 EXTENT OF WORK

Provide soil preparation, including soil conditioners and/or soil amendments prior to planting. Provide tree, shrub, vine, groundcover, seed, and/or sod planting, post-planting fertilizer, edging, staking, guying, weed control fabric, erosion control material, root control barrier installation, and/or mulch topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.2 PREPARATION

3.2.1 Layout

Stake out approved plant material locations and planter bed outlines on the project site before digging plant pits or beds. The Contracting Officer reserves the right to adjust plant material locations to meet field conditions. Do not plant closer than 600 mm to a building wall, pavement edge, fence or wall edge and/or other similar structures.

3.2.2 Soil Preparation

\*\*\*\*\*

**NOTE: Elevation of subgrade will vary depending upon the needs for additional topsoil, mulch topdressing, or other treatment.**

\*\*\*\*\*

3.2.2.1 pH Adjuster Application Rates

\*\*\*\*\*

**NOTE: Check with the local Agriculture County Extension Service and specify amounts applicable for the project area.**

\*\*\*\*\*

Apply pH adjuster at rates as determined by laboratory soil analysis of the soils at the job site.

3.2.2.2 Soil Conditioner Application Rates

\*\*\*\*\*

**NOTE: Check with the local Agriculture County Extension Service and specify amounts applicable for**

the project area.

\*\*\*\*\*

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site.

### 3.2.2.3 Fertilizer Application Rates

\*\*\*\*\*

**NOTE: Check with the local Agriculture County  
Extension Service and specify amounts applicable for  
the project area.**

\*\*\*\*\*

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site.

### 3.2.3 Root Control Barrier

\*\*\*\*\*

**NOTE: Contact a local arborist or plant nursery  
person for projects involving root pruning of  
existing plant material to determine required amount  
of root structure to be removed.**

\*\*\*\*\*

Install geotextile fabric in the soil in a vertical, horizontal and/or surrounding application. Use appropriate holding device to assure fabric position. For vertical or horizontal application, a minimum 50 mm soil cover is required over the top surface. A minimum 450 mm extension of fabric beyond the structure area to be protected is required to prevent root growth from growing around fabric edges. Or install cylindrical or linear polypropylene barrier a minimum 12.70 mm above finish grade to prevent root growth over the barrier. Backfill the outside of the barrier with 19 to 25 mm gravel a minimum width of 50 mm. For linear barrier application use appropriate device to connect two pieces.

## 3.3 PLANT BED PREPARATION

Verify location of underground utilities prior to excavation. Protect existing adjacent turf before excavations are made. Where planting beds occur in existing turf areas, remove turf to a depth that will ensure removal of entire root system. Measure depth of plant pits from finished grade. Depth of plant pit excavation must be as indicated and provide proper relation between top of root ball and finished grade. Install plant material as specified in paragraph PLANT INSTALLATION. Do not install trees within 10 feet of any utility lines or building walls.

## 3.4 PLANT INSTALLATION

### 3.4.1 Individual Plant Pit Excavation

Excavate pits at least twice as large in diameter as the size of ball or container to depth shown.

### 3.4.2 Plant Beds with Multiple Plants

Excavate plant beds continuously throughout entire bed as outlined to

depth shown.

#### 3.4.3 Handling and Setting

Move plant materials only by supporting the root ball or container. Set plants on hand compacted layer of prepared backfill soil mixture 150 mm thick or set plants on native soil and hold plumb in the center of the pit until soil has been tamped firmly around root ball. Set plant materials, in relation to surrounding finish grade, 25 to 50 mm above depth at which they were grown in the nursery, collecting field or container. Replace plant material whose root balls are cracked or damaged either before or during the planting process.

Plant material must be set in plant beds according to the drawings. Backfill soil mixture must be placed on previously scarified subsoil to completely surround the root balls, and must be brought to a smooth and even surface, blending to existing areas.

##### 3.4.3.1 Balled and Burlapped Stock

Backfill with prepared soil mixture or topsoil to approximately half the depth of ball and then tamp and water. Carefully remove or fold back excess burlap and tying materials from the top a minimum 1/3 depth from the top of the rootball. Tamp and complete backfill, place mulch topdressing, and water. Remove wires and non-biodegradable materials from plant pit prior to backfill operations.

##### 3.4.3.2 Bare-Root Stock

Plant so roots are arranged in a natural position. Place roots in water a minimum of 30 minutes prior to planting. Carefully work prepared soil mixture or topsoil among roots. Tamp remainder of backfill, place mulch topdressing and water.

##### 3.4.3.3 Container Grown Stock

Remove from container and prevent damage to plant or root system.

##### 3.4.3.4 Ground Covers and Vines

\*\*\*\*\*  
**NOTE: Choose one of the following options. Choose  
the second option for NAVFAC SE projects.**  
\*\*\*\*\*

Plant after placing mulch topdressing. Do not remove plant materials from flats or containers until immediately before planting. Space at intervals indicated. Plant at a depth to sufficiently cover all roots. Start watering areas planted as required by temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to a depth of 150 mm without run off or puddling. Smooth planting areas after planting to provide even, smooth finish. Mulch as indicated.

##### 3.4.4 Earth Mounded Watering Basin for Individual Plant Pits

Form with topsoil around each plant by placing a mound of topsoil around the edge of each plant pit. Watering basins must be 150 mm deep for trees and 100 mm deep for shrubs. Construct watering basin in a 1.4 m diameter circle around specimen (not planted in a close group) trees and shrubs.



#### 3.4.5 Weed Control Fabric Installation

Remove grass and weed vegetation, including roots, from within the area enclosed by edging. Completely cover areas enclosed by edging with specified weed control fabric prior to placing mulch layer. Overlap cut edges 150 mm.

#### 3.4.6 Erosion Control Material

Install in accordance with manufacturer's instructions.

#### 3.4.7 Placement of Mulch Topdressing

Place specified mulch topdressing on top of weed control fabric covering total area enclosed by edging. Place mulch topdressing to a depth of 75 mm.

#### 3.4.8 Mulch Topdressing

Provide mulch topdressing over entire planter bed surfaces and individual plant surfaces including earth mound watering basin around plants to a depth of 75 mm after completion of plant installation and before watering. Keep mulch out of the crowns of shrubs. Place mulch a minimum 50 to 75 mm away from trunk of shrub or tree. Place on top of any weed control fabric.

#### 3.4.9 Installation of Edging

Uniformly edge beds of plants to provide a clear cut division line between planted area and adjacent lawn. Construct bed shapes as indicated. Install wood, plastic or concrete edging material as indicated and/or as per manufacturer's instructions. Install edging with minimum 25 mm left above ground level.

#### 3.4.10 Fertilization

\*\*\*\*\*  
NOTE: Fertilizer planting tablets are the most commonly used and convenient method of pre-planting fertilization. Other types of fertilizer including bone meal or other organic fertilizers or granular fertilizers may be specified when appropriate. Number of tablets or quantity of other fertilizers should be inserted in blanks and should be based on agronomist's recommendations.  
\*\*\*\*\*

##### 3.4.10.1 Fertilizer Tablets

Place fertilizer planting tablets evenly spaced around the plant pits to the manufacturer's recommended depth.

##### 3.4.10.2 Granular Fertilizer

Apply granular fertilizer as a top coat prior to placing mulch layer and water thoroughly.

#### 3.4.11 Watering

Start watering areas planted as required by temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to a depth of 300 mm without run off. Provide further temporary potable or non-potable water or permanent non-potable water irrigation systems during warranty period.

#### 3.4.12 Staking and Guying

##### 3.4.12.1 Staking

\*\*\*\*\*  
**NOTE: Select methods of staking each tree based on the size and species of the tree and local wind conditions.**  
\*\*\*\*\*

Stake plants with the number of stakes indicated complete with as detailed. Attach guy wire half the tree height but not more than 1.5 m high. Drive stakes to a depth of 0.80 to 0.91 m into the ground outside the plant pit. Do not injure the root ball. Use hose chaffer guards where guy wire comes in contact with tree trunk.

##### 3.4.12.2 Guying

\*\*\*\*\*  
**NOTE: Select methods of guying each tree based on the size and species of the tree and local wind conditions.**  
\*\*\*\*\*

Guy plants as indicated. Attach two strands of guying wire or guying cable around the tree trunk at an angle of 0.785 rad at approximately 1/2 of the trunk height as indicated. Protect tree trunks with chafing guards where guying wire or cable contacts the tree trunk. Anchor guys to deadmen wood blocks, wood ground stakes, malleable iron anchors or steel screw anchors. Fasten flags to each guying wire or cable approximately 2/3 of the distance up from ground level. Provide turnbuckles as indicated.

##### 3.4.12.3 Chafing Guards

Use hose chafing guards, as specified where guy wire or cable will contact the plant.

##### 3.4.12.4 Deadmen

Place deadmen minimum 450 mm below ground surface. Place equal distance from tree trunk and around the plant pit.

##### 3.4.12.5 Wood Ground Stakes

Drive wood ground stakes into firm ground outside of plant pit with top of stake flush with ground. Place equal distance from tree trunk and around the plant pit.

##### 3.4.12.6 Iron Anchors

Drive malleable iron anchors into firm ground outside of plant pit a

minimum 750 mm below finish grade. Place equal distance from tree trunk and around the plant pit.

#### 3.4.12.7 Steel Screw Anchors

Insert steel screw anchors as recommended in manufacturer's data. Place equal distance from tree trunk and around the plant pit.

#### 3.4.12.8 Flags

Securely fasten flags on each guy wire and/or cable approximately two-thirds of the distance up from ground level.

#### 3.4.13 Pruning

\*\*\*\*\*  
**NOTE: Check with the local Agriculture county  
Extension Service Office for recommended pruning  
season for the project area. Insert the dates in  
the subject paragraph.**  
\*\*\*\*\*

Prune in accordance with safety requirement of TCIA Z133.

#### 3.4.13.1 Trees and Shrubs

Remove dead and broken branches. Prune to correct structural defects only. Retain typical growth shape of individual plants with as much height and spread as practical. Do not cut central leader on trees. Make cuts with sharp instruments. Do not flush cut with trunk or adjacent branches. Collars must remain in place. Pruning must be accomplished by trained and experienced personnel and must be accordance with TCIA A300P1.

#### 3.4.13.2 Wound Dressing

Do not apply tree wound dressing to cuts.

### 3.5 RESTORATION AND CLEAN UP

#### 3.5.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation must be restored to original condition at the Contractor's expense.

#### 3.5.2 Clean Up

Excess and waste material must be removed from the installed area and must be disposed offsite at an approved landfill, recycling center, or composting center. Separate and recycle or reuse the following landscape waste materials: nylon straps, wire, ball wrap, burlap, or wood stakes, . Adjacent paved areas must be cleared.

-- End of Section --