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SECTION 32 92 23

SODDING

04/06, CHG 1: 08/21

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PART 1 GENERAL

1.1 REFERENCES

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.

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.

ASTM INTERNATIONAL (ASTM)

ASTM C602	(2020) Agricultural Liming Materials
ASTM D4427	(2018) Standard Classification of Peat Samples by Laboratory Testing
ASTM D4972	(2018) Standard Test Methods for pH of Soils

TURFGRASS PRODUCERS INTERNATIONAL (TPI)

TPI GSS	(1995) Guideline Specifications to Turfgrass Sodding
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U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0
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1.2 DEFINITIONS

1.2.1 Stand of Turf

100 percent ground cover of the established species.

1.3 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 26 SPRIGGING], [Section 32 93 00 EXTERIOR PLANTS], and Section 32 05 33 LANDSCAPE ESTABLISHMENT applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

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, Air Force, and NASA 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, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][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-03 Product Data

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

NOTE: In states that require certification, adjust
testing requirements to suit local conditions.

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

[Nursery][Sod farm]certification for sods. Indicate type of sod
in accordance with TPI GSS.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Sod Protection

NOTE: If sod is to be delivered in quantity over
considerable distance, specify trucking in vans
equipped with temperature control.

Protect from drying out and from contamination during delivery, on-site
storage, and handling.

1.5.1.2 [Fertilizer] [Gypsum] [Sulfur] [Iron] [and] [Lime] Delivery

Deliver to the site in original, unopened containers bearing
manufacturer's chemical analysis, name, trade name, trademark, and
indication of conformance to state and federal laws. Instead of
containers, [fertilizer] [gypsum] [sulphur] [iron] [and] [lime] may be
furnished in bulk with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Sod Storage

Lightly sprinkle with water, cover with moist burlap, straw, or other
approved covering; and protect from exposure to wind and direct sunlight
until planted. Provide covering that will allow air to circulate so that
internal heat will not develop. Do not store sod longer than 24 hours. Do
not store directly on concrete or bituminous surfaces.

1.5.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of
appropriate specified non-selective herbicide. Clear and grub existing
vegetation three to four weeks prior to stockpiling topsoil.

1.5.2.3 Handling

Do not drop or dump materials from vehicles.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

NOTE: Check with the local Agriculture County
Extension Service to determine proper planting
seasons for species specified.

1.6.1 Restrictions

Do not plant when the ground is [frozen,] [snow covered,] muddy, or when
air temperature exceeds [32] [_____] degrees Celsius [90] [_____] degrees
Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Sod

Place sod a maximum of thirty six hours after initial harvesting, in
accordance with TPI GSS as modified herein.

PART 2 PRODUCTS

2.1 SODS

NOTE: The specific species and varieties used
should be based on recommendations of the local
Agriculture County Extension Service Office. Modify
sod thickness as required for species specified.
State certified is usually more stringently
monitored than State approved, and therefore more
expensive.

2.1.1 Classification

Nursery grown, certified as classified in the TPI GSS. Machine cut sod at
a uniform thickness of 19 mm 3/4 inch within a tolerance of 6 mm 1/4 inch,
excluding top growth and thatch. Each individual sod piece shall be
strong enough to support its own weight when lifted by the ends. Broken
pads, irregularly shaped pieces, and torn or uneven ends will be
rejected.[Wood pegs and wire staples for anchorage shall be as recommended
by sod supplier.]

2.1.2 Purity

Sod species shall be genetically pure, free of weeds, pests, and disease.

2.1.3 Planting Dates

Lay sod from [_____] to [_____] for warm season spring planting and from
[_____] to [_____] for cool season fall planting.

2.1.4 Composition

2.1.4.1 Proportion

Proportion grass species as follows.

Botanical Name	Common Name	Percent
[_____]	[_____]	[_____]
[_____]	[_____]	[_____]

[2.1.4.2 Sod Farm Overseeding

At the sod farm provide sod with overseeding of [annual rye grass seed][_____][type recommended by seed producer].

]2.2 WILDFLOWER SOD

NOTE: The specified species and varieties used should be based on recommendations of the local Agriculture County Extension Service Office. State certified is usually more stringently monitored than State approved, and therefore more expensive.

2.2.1 Classification

[Certified,] [Field grown] wildflower sod, machine cut at a uniform thickness of [25] [_____] mm [one] [_____] inch within a tolerance of 6 mm 1/4 inch, excluding top growth. Top growth shall be a maximum height of [75] [_____] mm [3] [_____] inches. Each individual wildflower sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregular shaped pieces, and torn or uneven ends will be rejected. [Wood pegs and wire staples for anchorage on slope conditions, three to one or greater, shall be used as recommended by wildflower sod supplier.]

2.2.2 Composition

Proportion wildflower species as follows:

Botanical Name	Common Name	Percent
[_____]	[_____]	[_____]
[_____]	[_____]	[_____]

]2.3 TOPSOIL

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. Where suitable topsoil is available within limits of the work area, stripping and stockpiling of topsoil should be included in the applicable section of Division 31 of the specification. If suitable

topsoil is not available within the limits of the work area, it should generally be the Contractor's option to either treat the soil of the graded areas with fertilizer and supplements so as to be conducive to turf establishment and maintenance, or to transport topsoil to the project site. Modify pH range for specified turf and geographical requirements.

2.3.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section [31 00 00 EARTHWORK][31 23 00.00 20 EXCAVATION AND FILL].

2.3.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be [furnished by the Contractor] [obtained from topsoil borrow areas indicated].

2.3.3 Composition

Containing 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 3/4 inch, with maximum 3 percent retained on 6 mm 1/4 inch screen. The pH shall be tested in accordance with ASTM D4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	[25-50][7 to 17][_____] percent
Clay	[10-30][4 to 12][_____] percent
Sand	[20-35][70 to 82][_____] percent
pH	[5.5 to 7.0][_____]
Soluble Salts	[600] [_____] ppm maximum

2.4 SOIL CONDITIONERS

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.

Add conditioners to topsoil as required to bring into compliance with "composition" standard for topsoil as specified herein.

2.4.1 Lime

NOTE: Use ASTM C602 calcium carbonate equivalent (C.C.E.) as specified in Table 1: for burnt lime, C.C.E. shall not be less than 140 percent; for hydrated lime, C.C.E. shall not be less than 110 percent; and for limestone, C.C.E. shall not be less than 80 percent.

Commercial grade [hydrate] [or] [burnt] limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than [_____] percent.

2.4.2 Aluminum Sulfate

Commercial grade.

2.4.3 Sulfur

100 percent elemental

2.4.4 Iron

100 percent elemental

2.4.5 Peat

Natural product of [peat moss] derived from a freshwater site and conforming to [ASTM D4427] [as modified herein]. Shred and granulate peat to pass a 12.5 mm 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.4.6 Sand

Clean and free of materials harmful to plants.

2.4.7 Perlite

Horticultural grade.

2.4.8 Composted Derivatives

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

2.4.8.1 Particle Size

Minimum percent by weight passing:

4.75 mm	No. 4 mesh screen	95
2.36 mm	No. 8 mesh screen	80

2.4.8.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.4.9 Gypsum

Coarsely ground gypsum comprised of calcium sulfate dihydrate 91 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 850 micrometers 20 mesh screen, 100 percent passing thru 970 micrometers 16 mesh screen.

2.4.10 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 650 degrees C 1200 degrees F. Gradation: A minimum 90 percent shall pass a 2.36 mm No. 8 sieve; a minimum 99 percent shall be retained on a 0.250 mm No. 60 sieve; and a maximum 2 percent shall pass a 0.150 mm No. 100 sieve. Bulk density: A maximum 640 kilogram per cubic meter 40 pounds per cubic foot.

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

[_____] percent available nitrogen
[_____] percent available phosphorus
[_____] percent available potassium
[_____] percent sulfur
[[_____] percent iron]

2.6 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 shall be the responsibility of the Contractor. Water source shall be potable or non-potable. If non-potable edit specification accordingly. Source of water shall be approved by the Contracting Officer and shall 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 shall be approved by Contracting Officer and of suitable quality for irrigation containing no element toxic to plant life.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Extent Of Work

Provide soil preparation (including soil conditioners), fertilizing, and sodding 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.

3.1.2 Soil Preparation

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

Provide 102 mm 4 inches of [off-site topsoil][on-site topsoil] to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate [fertilizer] [pH adjusters] [soil conditioners] into soil a minimum depth of [100] [_____] mm [4] [_____] inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 19 mm 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

[3.1.2.1 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. For bidding purposes only apply at rates for the following:

- [Lime [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]
-][Sulfur [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]
-][Iron [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]
-][Aluminum Sulfate [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]
-][Peat [[_____] cubic meters per square meter cubic yard per acre]

[[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][Sand [[_____] cubic meters per square meter cubic yard per acre]
[[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][Perlite [[_____] cubic meters per square meter cubic yard per acre]
[[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][Compost Derivatives [[_____] cubic meters per square meter cubic yard per acre] [[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][Calcined Clay [[_____] cubic meters per square meter cubic yard per acre] [[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][Gypsum [[_____] cubic meters per square meter cubic yard per acre]
[[_____] cubic meters per 100 square meters cubic yards per 1000 square feet.]

][3.1.2.2 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. For bidding purposes only apply at rates for the following:

[Organic Granular Fertilizer [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]

][Synthetic Granular Fertilizer [[_____] kg per square meter pounds per acre] [[_____] kg per 100 square meters pounds per 1000 square feet.]

][3.2 SODDING

3.2.1 Finished Grade and Topsoil

NOTE: Coordinate the placement of topsoil with
Section 31 00 00 EARTHWORK. Coordinate the topsoil
requirements with Sections 32 92 19 SEEDING; 32 92 26
SPRIGGING; and 32 93 00 EXTERIOR PLANTS.

Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section [31 00 00 EARTHWORK][31 23 00.00 20 EXCAVATION AND FILL].

The prepared surface shall be a maximum 25 mm 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove from the surface debris and stones over a minimum 16 mm 5/8 inch in any dimension.

3.2.2 Placing

Place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS as modified herein.

3.2.3 Sodding Slopes and Ditches

For slopes 2:1 and greater, lay sod with long edge perpendicular to the contour. For V-ditches and flat bottomed ditches, lay sod with long edge perpendicular to flow of water. [Anchor each piece of sod with wood pegs or wire staples maximum 600 mm 2 feet on center.] [On slope areas, start sodding at bottom of the slope.]

3.2.4 Finishing

After completing sodding, blend edges of sodded area smoothly into surrounding area. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed and holes and missing corners shall be patched with sod.

3.2.5 Rolling

Immediately after sodding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding [134] [] kg per m [90] [] pounds for each foot of roller width.

3.2.6 Watering

Start watering areas sodded as required by daily temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to minimum depth of [150] [] mm [6] [] inches. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

[3.4 RENOVATION OF EXISTING TURF AREA

[3.4.1 Aeration

Upon completion of weed eradication operations and Contracting Officer's approval to proceed, aerate turf areas indicated, by approved device. Core, by pulling soil plugs, to a minimum depth of [] mm inches. [Leave all soil plugs, that are produced, in the turf area.] [Remove all debris generated during this operation off site.] [After aeration operations are complete, topdress entire area [6.35 mm 1/4 inch] [12.70 mm 1/2 inch] depth with the following mixture:

[[] percent sand

][[_____] percent humus
][[_____] percent gypsum
][[_____] percent organic fertilizer
][[_____] percent synthetic fertilizer
] Blend all parts of topdressing mixture to a uniform consistency throughout.]Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean all soil plugs off of other paving when work is complete.

][3.4.2 Vertical Mowing

Upon completion of aerating operation and Contracting Officer's approval to proceed, vertical mow turf areas indicated, by approved device, to a depth of [6 mm 1/4 inch] [13 mm 1/2 inch] above existing soil level, to reduce thatch build-up, grain, and surface compaction. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work is complete. Remove all debris generated during this operation off site.

][3.4.3 Dethatching

Upon completion of aerating operation and Contracting Officer's approval to proceed, dethatch turf areas indicated, by approved device, to a depth of [6 mm 1/4 inch] [13 mm 1/2 inch] below existing soil level, to reduce thatch build-up, grain, and surface compaction. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work is complete. Remove all debris generated during this operation off site.

][3.5 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --