ADDENDUM

Project: Wolf Trap Meetinghouse Oakton VA Stake | Project No.: 500900715010601 | Addendum No.: 1

Project Address: 1632 Crowell Road, Vienna VA 22182 | Date: 16 November 2018

Owner: Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole

From (Architect): L2M Architects

Instructions to Prospective Bidders:

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents and/or prior Addenda as noted below. All conditions, requirements, materials and workmanship are to be as described in the Contract Documents unless specifically stated otherwise. This Addendum consists of 1 page and attached specifications as outlined below.

1. Changes to prior Addenda:
    a. N/A
2. Changes to Bidding Requirements:
    a. Replace Bid Opening Information with the following:

        BID OPENING: Bid Opening: Bidders to ensure that Hardcopy Sealed Bids be received prior to **1:00pm**, Thursday **December 6th**, **2018** at the LDS Oakton Facility, 2719 Hunters Mill Road, Oakton VA 22124. Bids will be publicly opened after 1:00pm, Thursday December 6th, 2018 at same location.
3. Changes to Conditions of the Contract:
    a. N/A
4. Changes to Specifications:
    a. The following specifications sections are added to the specifications / project in their entirety as attached; 31-0000TC, 31-0501, 31-1100, 31-1123, 31-1413, 31-2213, 31-2216, 31-2316, 31-2310, 31-2323, 31-2500, 31-3116, 32-0000TC, 32-1216, 32-1713, 32-1723, 32-3113, 32-9001, 32-9120, 31-9121, 21-9122, 32-9219, 32-9223, 32-9300, 32-9413.
5. Changes to Drawings:
    a. N/A

End of Addendum

DIVISION 31: EARTHWORK

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SECTION 31 0501

COMMON EARTHWORK REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited to:
   1. General procedures and requirements for earthwork.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
   2. Pre-Installation conferences held jointly with Section 31 0501 as described in Administrative Requirements on Part 1 of this specification section:
   3. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other landscape related sections.

1.2 REFERENCES

A. Definitions:
   1. Aggregate Base: Layer of granular material immediately below concrete and asphalt paving or miscellaneous site concrete (sidewalks, curbs, etc) and below interior concrete slabs on grade.
   2. Base: See aggregate base.
   3. Building Grading: sloping of grounds immediately adjacent to building. Proper grading causes water to flow away from a structure. Grading can be accomplished either with machinery or by hand.
   4. Compacted Fill: Placement of soils on building site placed and compacted per Contract Documents. Used to replace soils removed during excavation or to fill in low spot on building site.
   5. Excavation: Removal of soil from project site or cavity formed by cutting, digging or scooping on project site.
   6. Fine Grading (FG): Preparation of subgrade preceding placement of surfacing materials (aggregate base, asphalt or concrete paving, and topsoil) for contour of building site required. Fine Grading is conducted to ensure that earth forms and surfaces have been properly shaped and subgrade has been brought to correct elevations. It is performed after rough grading and placement of compacted fill but before placement of aggregate base or topsoil.
   7. Finish Grading: Completed surface elevation of landscaping areas for seeding, sodding, and planting on building site.
   8. Natural Grade: Undisturbed natural surface of ground.
   9. Rough Grading (RG): Grading, leveling, moving, removal and placement of existing or imported soil to its generally required location and elevation. Cut and fill is part of rough grading.
   10. Subgrade (definition varies depending upon stage of construction and context of work being performed):
       a. Prepared natural soils on which fill, aggregate base, or topsoil is placed.
          or
       b. Prepared soils immediately beneath paving or topsoil.
   11. Topsoil Placement and Grading: Topsoil placement and finish grading work required to prepare site for installation of landscaping.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference for common earthwork sections:

a. Schedule conference after completion of site clearing but before beginning grading work.
b. Participate in pre-installation conference held jointly with following sections:
   1) Section 03 3111: 'Cast-In-Place Structural Concrete'.
   2) Section 31 1100: 'Clearing and Grubbing'.
   3) Section 31 1123: 'Aggregate Base'.
   4) Section 31 1413: 'Topsoil Stripping and Stockpiling'.
   5) Section 31 2213: 'Rough Grading'.
   6) Section 31 2216: 'Fine Grading'.
   7) Section 31 2316: 'Excavation'.
   8) Section 31 2323: 'Fill'.
   9) Section 32 1216: 'Asphalt Paving'.
   10) Section 33 3313: 'Sanitary Utility Sewerage'.
c. In addition to agenda items specified in Section 01 3100, review following:
   1) Review Geotechnical Evaluation Report.
   2) Review common earthwork schedule.
   3) Review protection requirements.
   4) Review cleaning requirements.
   5) Review safety issues.
   6) Review field tests and inspections requirements.
d. In addition to agenda items specified above, review following. These are items that will occur before pre-installation conference for landscape sections:
   1) Review clearing and grubbing requirements.
   2) Review topsoil stripping and stockpiling requirements.
   3) Review landscape grading requirements.
   4) Review landscape finish grade tolerance requirements.
   5) Review landscape and plant tolerances.
   6) Review surface preparation of landscape and planting areas.
   7) Review additional agenda items as specified in related sections listed above.

2. Participate in pre-installation conference for landscape sections as specified in Section 32 9001:
   a. Schedule pre-installation conference after completion of Fine Grading specified in Section 31 2216, but one (1) week minimum before beginning landscape work and held jointly with following sections:
      1) Section 32 8423: 'Underground Sprinklers'.
      2) Section 32 9120: 'Topsoil And Placement'.
      3) Section 32 9121: 'Topsoil Physical Preparation' (section included based on Topsoil Testing Report).
      4) Section 32 9122: 'Topsoil Grading'.
      5) Section 32 9223: 'Sodding'.
      6) Section 32 9300: 'Plants'.
   b. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following that these items have been installed correctly:
      1) Review topsoil placement requirements.
      2) Review topsoil surface preparation requirements.
      3) Review topsoil depth requirements.
      4) Review landscape finish grade tolerance requirements.
      5) Review surface preparation of landscape and planting areas.

B. Sequencing:
   1. General Earthwork:
      a. Excavation.
      b. Rough Grading.
      c. Fill.
      d. Fine Grading.
      e. Aggregate Base or Topsoil Grading.

1.4 QUALITY ASSURANCE

A. Testing And Inspection:

1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    a. Owner will employ testing agencies to perform testing and inspection as specified in Field Quality Control in Part 3 of this specification:
        1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
        2) See Section 01 1200: 'Multiple Contract Summary'.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
    1. Forty-eight (48) hours minimum before performing any work on site, contact **APPLICABLE UTILITY COMPANY** to arrange for utility location services.
    2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
    3. Perform investigative excavating ten (10) days minimum in advance of performing any excavation or underground work.
    4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within twenty-four (24) hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

3.2 PREPARATION

A. Protection:
    1. Spillage:
        a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
        b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
    2. Dust Control:
        a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
        b. Correct or repair damage caused by dust.
    3. Existing Plants And Features:
        a. Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain.
        b. Do not use heavy equipment within branch spread.
        c. Interfering branches may be removed only with permission of Architect.
        d. Do not damage other plants and features that are to remain.

3.3 REPAIR / RESTORATION

A. Adjust existing covers, boxes, and vaults to grade.

B. Replace broken or damaged covers, boxes, and vaults.

C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

3.4 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
   1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
      a. Quality Control is sole responsibility of Contractor. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform The Work or Contractors own Testing and Inspection services.
   2. Testing and inspection of earthwork operations is required.
   3. Field Tests and Laboratory Tests:
      a. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.
   4. Field Inspections:
      a. Notify Architect forty-eight (48) hours before performing excavation or fill work.
      b. If weather, scheduling, or any other circumstance has interrupted work, notify Architect twenty-four (24) hours minimum before intended resumption of grading or compacting.

B. Non-Conforming Work:
   1. If specified protection precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

END OF SECTION

SECTION 31 1100

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform clearing and grubbing as necessary to prepare site for rough grading and structure excavation as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: Common Earthwork Requirements:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
      c. Pre-installation conference held jointly with other landscape related sections.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conferences as specified in Section 31 0501.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Tree And Brush Removal:
   1. Cut off trees, shrubs, brush, and vegetative growth 12 inches (300 mm) maximum above ground.
   2. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with sharp axe. Make clean, smooth, sloping cuts.
   3. Cut roots 6 inches (150 mm) or larger in diameter only with Architect's written permission.

B. Grubbing:
   1. Grub out stumps and roots 12 inches (300 mm) minimum below original ground surface, except as follows:
      a. Under buildings, remove roots one inch and larger entirely.
      b. Entirely remove roots of plants that normally sprout from roots, as identified by Architect.

3.2 CLEANING

A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris and dispose of legally.

B. Do not bury cuttings, stumps, roots, and other vegetative matter or burnt waste material on site.

END OF SECTION

SECTION 31 1123

AGGREGATE BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install the following as described in Contract Documents:
      a. Aggregate Base:
         1) Interior concrete slabs-on-grade.
         2) Miscellaneous exterior concrete (sidewalks, curb, gutter and equipment pads).
         3) Asphalt paving.

B. Related Requirements:
   1. Section 01 1200: ‘Multiple Contract Summary’ for multiple contracts.
   2. Section 01 4523: ‘Testing and Inspecting Services’ for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 03 3111: 'Cast-In-Place Structural Concrete'.
   4. Section 31 0501: ‘Common Earthwork Requirements’:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
   5. Section 31 2213: ‘Rough Grading’.
   6. Section 31 2216: 'Fine Grading' for subgrade procedures.
   7. Section 31 2323: 'Fill' for compaction procedures and tolerances.
   8. Section 31 3116: 'Termite Control'.
   9. Section 32 1216: 'Asphalt Paving.

C. Products Installed But Not Furnished Under This Section:
   1. Vapor Retarder:
      a. Interior slabs on grade:
         1) Under-slab vapor retarder and seam tape.

D. Related Requirements:
   1. Section 07 2616: 'Below-Grade Vapor Retarders' for:
      a. Furnishing of vapor retarder and seam tape.

1.2 REFERENCES

A. Definitions:
   1. Aggregate (Asphalt Paving):
      a. Aggregate: A hard inert mineral material, such as gravel, crushed rock, slag, or sand.
      b. Coarse Aggregate: Aggregate retained on No. 8 (2.36 mm) sieve.
      c. Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.
      d. Fine Aggregate: Aggregate passing No. 8 (2.36 mm) sieve.
      e. Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like an aggregate in recycling of asphalt pavements.

B. Reference Standards:
   1. ASTM International:

a. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.
b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))'.
d. ASTM D1883-16, 'Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
e. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
f. ASTM D2419-14, 'Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
g. ASTM D4318-17, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
h. ASTM D6938-17, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.
i. ASTM E1643-18a, 'Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs'.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
1. Participate in MANADORY pre-installation conference as specified in Section 31 0501.
2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
a. Review requirements and frequency of testing and inspections.
b. Review termite control application requirements.
c. Review aggregate base installation requirements.
d. Review vapor retarder installation requirements.
e. Review proposed miscellaneous exterior concrete schedule.
f. Review proposed asphalt paving schedule.
g. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
1) Review frequency of testing and inspections.

B. Sequencing:
1. Compaction as described in Section 31 2216 'Fine Grading'.
2. Termite Control:
a. Termite application as described in Section 31 3116 'Termite Control':
1) Application OPTION A:
a) Apply termite protection on top of soil base before aggregate base and vapor retarder is installed.
2) Application OPTION B:
a) Install vapor retarder after application of termite protection on top of aggregate base.
3. Exterior Footings and Foundations are installed.
4. Vapor Retarder below interior concrete slabs on grade:
a. Install below-grade vapor retarder on top of aggregate base.
5. Aggregate Base:
a. Install aggregate base at location shown in Contract Drawings.
6. Concrete Slab is installed.

C. Scheduling:
1. Interior slab-on-grade concrete:
a. Notify Architect twenty-four (24) hours minimum before installation of concrete to allow inspection of vapor retarder installation.
b. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of interior concrete slabs to allow inspection of aggregate base.

c. Allow special inspector to review all sub grades and excavations to determine if building pad has been prepared in accordance with geotechnical report prior to placing any aggregate base.

2. Miscellaneous exterior concrete:
   a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters, etc.), footings, foundation walls, and building slabs to allow inspection of aggregate base.
3. Asphalt Paving:
   a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing aggregate base to allow inspection of aggregate base.

1.4 SUBMITTALS

A. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Testing and Inspecting Reports of aggregate base.

1.5 QUALITY ASSURANCE

A. Testing And Inspection:
   1. Owner will provide Testing and Inspection for aggregate base:
      a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
      b. Owner will employ testing agencies to perform testing and inspection for aggregate base as specified in Field Quality Control in Part 3 of this specification.
         1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
         2) See Section 01 1200: 'Multiple Contract Summary'.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Materials shall be delivered in original, unopened packages with labels intact.

1.7 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not perform work during unfavorable conditions as specified below:
      a. Aggregate Base:
         1) Presence of free surface water.
         2) Over-saturated sub base materials.
      b. Vapor Retarder:
         1) Unacceptable conditions for installation include presence of high winds which would tear or damage vapor retarder.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate Base:

1. Under Interior Slab-On-Grade Concrete (Section 03 3111 'Cast-In-Place Structural Concrete'):
   a. New Aggregate Base:
      1) Gravel: 3/4 inch 18mm minimum to one inch 25 mm maximum well-graded, clean gravel or crushed rock.
      2) Base type gravel or crushed rock, graded by weight as follows (three-quarter to one-inch clean gap-graded gravel):
         a) Road Base type gravel or crushed stone (slag not allowed), graded as follows:
            (1) Sieve — Percent of Weight Passing

(a)	1 inch	(25.4 mm)	100
(b)	3/4 inch	(19.0 mm)	90 - 80
(c)	1/2 inch	(12.7 mm)	20 - 40
(d)	3/8 inch	(9.5 mm)	5 - 10
(e)	No. 4	(4.750 mm)	0 - 12

2. Under Exterior Concrete excluding Concrete Paving (Section 03 3111 'Cast-In-Place Structural Concrete'):
   a. New Aggregate Base:
      1) Road Base to conform to State DOT Specifications.
3. Under Asphalt Paving (Section 32 1216 'Asphalt Paving'):
   a. New Aggregate Base:
      1) Road Base to conform to 1-1/2 inches (38 mm) minus State DOT Specifications and Gradations.
      2) Aggregate base shall be non-plastic.

PART 3 - EXECUTION

3.1 PREPARATION

A. Stockpiles:
   1. Provide area for each stockpile of adequate size, reasonably uniform in cross-section, well drained, and cleared of foreign materials.
   2. Locate piles so that there is no contamination by foreign material and no intermingling of aggregates from adjacent piles. Do not use steel-tracked equipment on stockpiles.
   3. Do not store aggregates from different sources, geological classifications, or of different gradings in stockpiles near each other unless bulkhead is placed between different materials.
   4. Do not use washed aggregates sooner than twenty-four (24) hours after washing or until surplus water has drained out and material has uniform moisture content.
   5. Do not stockpile higher than 15 feet (4.57 m). Cover or otherwise protect stockpiles for use in HMA to prevent buildup of moisture.

B. Surface Preparation (Miscellaneous Exterior Concrete):
   1. Subgrade:
      a. Finish grade to grades required by Contract Documents.
      b. Compact subgrade as specified in Section 31 2323.

C. Surface Preparation (Asphalt Paving):
   1. Subgrade:
      a. Finish grade parking surface area to grades required by Contract Documents.
      b. Aggregate base and paving must be placed before any moisture or seasonal changes occur to subgrade that would cause compaction tests previously performed to be erroneous. Recompact and retest subgrade soils that have been left exposed to weather.

D. Surface Preparation (Interior Slab-On-Grade Concrete):
   1. Vapor Retarder:
      a. Install vapor retarder in accordance with ASTM E1643 except where Contract Documents indicate otherwise and following instructions:
         1) Install vapor retarder over aggregate base over compacted subgrade so entire area under slab is covered.

2) Install vapor retarder in accordance with ASTM E1643 at interior stem walls.
3) Lap joints 6 inches (150 mm) minimum and seal with specified seam tape.
4) Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
5) Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures.

3.2 INSTALLATION

A. Aggregate Base:
1. General:
a. Do not place aggregate base material when subgrade is frozen or unstable.
b. Spread aggregate base material with equipment except in limited or restricted areas where use of hand spreading is allowed.
c. Spread aggregate base material in manner that does not break down material and eliminates segregation, ruts, and ridges.
d. Correct damage to aggregate base caused by construction activities and maintain corrected aggregate base until subsequent course is placed.
e. Do not allow traffic on aggregate base.
f. Remove all standing storm water.
2. Under interior concrete slab-on-grade aggregate base:
a. Place 4 inches (100 mm) minimum of aggregate base under vapor retarder, level, and compact with vibratory plate compactor.
3. Under miscellaneous exterior concrete aggregate base:
a. Except under mow strips, place 4 inches (100 mm) minimum of aggregate base, level, and compact as specified in Section 31 2323.
4. Asphalt paving aggregate base:
a. _____ thick minimum after compaction in accordance with Contract Drawings.
b. If roller is smaller than 8 ton (7260 kg), lay aggregate base and compact in two courses.
c. Compact as specified in Section 31 2323.
d. Priming: Prime aggregate base with application of 0.2 to 0.5 gallons (2 to 5 liters) of asphalt cement primer per square yard (meter) if pavement will be laid more than three days after compaction of aggregate base, or if precipitation is anticipated between completion of compaction of aggregate base and laying of asphalt paving.
e. Recompact unprimed aggregate base if it receives precipitation before pavement is laid.
f. Remove or repair improperly prepared areas as directed by Architect.

B. Tolerances:
1. Asphalt Paving Areas:
a. Aggregate base:
1) 0.00 inches (0.00 mm) high.
2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
3) Finished base course shall be true to line and grade within plus or minus 1/4 inch in 10 feet (6 mm in 3 meters).
4) Maximum variation from required grades shall be 1/10 of one foot (28 mm).

3.3 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
a. Quality Control is sole responsibility of Contractor.
1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

2. Aggregate Base:
   a. Interior slab-on-grade concrete areas:
      1) Testing Agency shall provide testing and inspection for interior aggregate base.
      2) Number of tests may vary at discretion of Architect.
      3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
         a) Building Slab Areas: One test for every 2,500 sq. ft. (232 sq. m) or less of building slab area but no fewer than three tests.
   b. Miscellaneous exterior concrete areas:
      1) Testing Agency shall provide testing and inspection for exterior aggregate base.
      2) Number of tests may vary at discretion of Architect.
      3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
         a) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.
   c. Asphalt paving area:
      1) Testing Agency shall provide testing and inspection for exterior aggregate base.
      2) Number of tests may vary at discretion of Architect.
      3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
      4) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.

3.4 PROTECTION

A. Interior Slab-On-Grade Concrete:
   1. Vapor Retarder:
      a. Do not allow water onto vapor retarder or aggregate base before placing concrete.
      b. Protect membrane from possible punctures caused by reinforcing bar supports before placing concrete.

END OF SECTION

SECTION 31 1413

TOPSOIL STRIPPING AND STOCKPILING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Strip and stockpile acceptable topsoil as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: 'Common Earthwork Requirements':
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
      c. Pre-installation conference held jointly with other landscape related sections.
   2. Section 31 1100: 'Clearing and Grubbing'.
   3. Section 31 2213: 'Rough Grading'.
   4. Section 31 2316: 'Excavation'.
   5. Section 32 9001: 'Common Planting Requirements'.
   6. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
   7. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
   8. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 REFERENCES

A. Definitions:
   1. Existing topsoil: Defined as total amount of soil stripped and stored for reuse, less vegetation layer stripped and disposed of as specified in Paragraphs below.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conferences as specified in Section 31 0501.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Strip existing vegetation layer depth, in conjunction with Geotechnical Engineering coordination on-site**,** from areas of site to receive buildings, landscaping, and paving and remove from site before stripping topsoil for storage and reuse.

B. After stripping vegetation layer, strip existing topsoil additional depth, in conjunction with Geotechnical Engineering coordination on-site**,** from areas of site to receive buildings and paving and store on site for later use.

1. Existing topsoil is property of Contractor with restriction that topsoil is to be used first for Project landscape topsoil requirements and second for non-structural fill and backfill.
2. After Project fill, backfill, and landscape topsoil requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Architect's written approval.

C. Screen existing topsoil to meet standards established as specified in Section 32 9120 ‘Topsoil And Placement’.

END OF SECTION

SECTION 31 2213

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform rough grading work required to prepare site for construction as described in Contract Documents.

B. Related Requirements:
   1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
   2. Section 03 3053: Miscellaneous Exterior Cast-In-Place Concrete.
   3. Section 31 0501: 'Common Earthwork Requirements' for:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
   4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
   5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
   6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
   7. Section 31 2316: 'Excavation'.
   8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
   9. Section 32 1216: 'Asphalt Paving'.
   10. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
   2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
      a. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
      b. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used for fill shall be as specified for backfill in Section 31 2323 'Fill'.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Verify elevations of rough grading are correct before compacted fill, fine grading, aggregate base or landscape grading are placed.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
   1. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand.
   2. Do not expose or damage shrub or tree roots.

3.3 PERFORMANCE

A. Subgrade (Natural Soils):
   1. Subgrade beneath compacted fill or aggregate base under asphalt or concrete paving shall be constructed smooth and even.

B. Special Techniques:
   1. Compact fills as specified in Section 31 2323 'Fill'.
   2. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.

C. Tolerances:
   1. Maximum variation from required grades shall be 1/10 of one foot (28 mm).

END OF SECTION

SECTION 31 2216

FINE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform fine grading of subgrade work required to prepare site for paving finish grading and for placement of topsoil as described in Contract Documents.
   2. Asphalt Paving:
      a. Prepare natural soil subgrade as described in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in this specification section for asphalt paving.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 31 0501: 'Common Earthwork Requirements' for:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
   4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
   5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
   6. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
   7. Section 31 2316: 'Excavation'.
   8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
   9. Section 32 1216: 'Asphalt Paving' for finish grading for asphalt paving.
   10. Section 32 9001: 'Common Planting Requirements'.
      a. Pre-installation conference held jointly with other common planting related sections.
   11. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
   12. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
   13. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501 and Section 32 9001.
   2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
      a. Review backfill requirements.
      b. Review geotechnical report.
      c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
         1) Review requirements and frequency of testing and inspections.

B. Scheduling:
   1. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
   2. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill, aggregate base or concrete.

3. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

1.3 SUBMITTALS

A. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

1.4 QUALITY ASSURANCE

A. Testing And Inspection:
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Testing and Inspection for fill / engineering fill:
      a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.
         1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
         2) See Section 01 1200: 'Multiple Contract Summary'.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection Of In-Place Conditions: Protect utilities and site elements from damage.

B. Surface Preparation:
   1. Landscaping and Planting Areas:
      a. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1-1/2 inches (38 mm) in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
      b. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.
   2. Asphalt Paving:
      a. Survey and stake parking surfaces to show grading required by Contract Documents.
      b. Subgrade (material immediately below aggregate base):
         1) Compact subgrade as specified in Section 31 2213 (natural soils) and Section 31 2323 (fill).
         2) Fine grade parking surface area to grades required by Contract Documents.
         3) Subgrade to be constructed smooth and even.

3.2 PERFORMANCE

A. Interface With Other Work: Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.

B. General:
1. Do not expose or damage existing shrub or tree roots.

C. Tolerances:
1. Site Tolerances:
a. Subgrade (material immediately below aggregate base):
1) 0.00 inches (0.00 mm) high.
2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
b. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
2. Aggregate Base (Asphalt Paving) Tolerances:
a. Aggregate base shall be 6 inches (150 mm) thick minimum after compaction, except where shown thicker on Drawings.
b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
3. Landscaping and Planting Tolerances:
a. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
b. To allow for final finish grades as specified in Section 32 9121 of planting areas, fine grade elevations before placing topsoil and mulch are:
1) Sod Areas: 7 inches (175 mm) below top of walk or curb.
2) Seeded Areas: 6 inches (150 mm) below top of walk or curb.
3) Ground Cover Areas: 7 inches (180 mm) below top of walk or curb.
4) Tree And Shrub Areas: 4 inches (100 mm) below top of walk or curb.
4. Slope grade away from building as specified in Section 32 9120.

3.3 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
a. Quality Control is sole responsibility of Contractor:
1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
2. Site Preparation:
a. Prior to placement of fill / engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
b. Footing subgrade: At footing subgrades, Certified Inspector is to verify that soils conform to geotechnical report.
3. Fill / Engineered Fill:
a. Testing Agency shall provide testing and inspection for fine grading.
b. Number of tests may vary at discretion of Architect.
c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.

END OF SECTION

SECTION 31 2316

EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform Project excavating and trenching as described in Contract Documents, except as specified below.
   2. Procedure and quality for excavating and trenching performed on Project under other Sections unless specifically specified otherwise.

B. Related Requirements:
   1. Section 31 0501: 'Common Earthwork Requirements' for:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
   2. Section 31 1100: Clearing and Grubbing.
   3. Section 31 1123: 'Aggregate Base'.
   4. Section 31 1413: 'Topsoil Stripping and Stockpiling'.
   5. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
   6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
   7. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
   8. Performance of excavating inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
   2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
      a. Review protection of existing utilities requirements.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Carefully examine site and available information to determine type soil to be encountered.
   2. Discuss problems with Architect before proceeding with work.

3.2 PREPARATION

A. Protection of Existing Utilities:
   1. Protect existing utilities identified in Contract Documents during excavation.
   2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

3.3 PERFORMANCE

A. Interface With Other Work:
1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.

B. Excavation:
1. Building Footings And Foundations:
   a. Under Building:
      1) Excavate in conjunction with Geotechnical Engineering coordination on-site**,** below existing grade and 5 feet (1.50 m) beyond perimeter of buildings and structures and as necessary for proper placement and forming of footings and foundations so that final grade allows for recommended depth of select fill below slab.
   b. Under Paving:
      1) Excavate in conjunction with Geotechnical Engineering coordination on-site**,** below existing grade so final grade allows for recommended depth of compacted fill below paving.
   c. Bottom of excavations to receive footings shall be undisturbed soil.
   d. Excavation Carried Deeper Than Required:
      1) Under Footings: Fill with concrete specified for footings.
      2) Under Slabs: Use specified compacted backfill material.
2. Pavement And Miscellaneous Cast-In-Place Concrete:
   a. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure. Remove vegetation and deleterious material and remove from site.
   b. Backfill over-excavated areas with compacted base material specified in Section 31 1123.
   c. Remove and replace exposed material that becomes soft or unstable.
3. Utility Trenches:
   a. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
   b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
   c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
   d. Pipe 4 Inches (100 mm) In Diameter Or Larger:
      1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
      2) Except where rock is encountered, take care not to excavate below depths indicated.
         a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches (100 mm) below required trench depths.
         b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
      3) Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.
4. If unusual excavating conditions are encountered, stop work and notify Architect.

3.4 REPAIR / RESTORATION

A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.5 CLEANING

A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 31 2319

DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install work of this Section as described in Contract Documents including:
      a. Labor, materials, equipment and all else necessary for full compliance with contract requirements, or as directed by Owner for removal of water from trench and foundation excavations.

B. Related Requirements:
   1. Section 31 0501: 'Common Earthwork Requirements'.
   2. Section 31 2323: 'Fill'.
   3. Section 31 2500: 'Erosion and Sedimentation Control'.

1.2 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Comply with provisions all applicable building codes and local regulations except where more stringent requirements are shown or specified.
      a. In case of conflict, strictest interpretation shall govern.

PART 2 - PRODUCTS

2.1 SYSTEMS

A. Design Criteria:
   1. Water level in trenches and other excavations shall be maintained 3 inch (76 mm) minimum of below bottom of excavation.
   2. If well point dewater system is required, system to be designed by licensed Professional Civil Engineer and submitted to Architect/Engineer for review and approval prior to installation.

B. Equipment:
   1. Pumps:
      a. Provide minimum of two (2) 3 inch (76 mm) pumps required on construction site during construction along with sufficient length of hose for proper disposal of pumped water.

PART 3 - EXECUTION

3.1 DEWATERING

A. Provide and maintain pumping equipment, dams, drains, ditches, flumes, wells, well points and other acceptable means for excluding and removing water from trenches and other excavations until such time that backfilling is complete.

B. Discharge water in such manner that mud and silt are not discharged directly into existing drainage systems and remove from such drainage facilities any mud, silt and/or debris which has accumulated and leave all drainage facilities in condition similar to that which existed prior to dewatering operations.

END OF SECTION

SECTION 31 2323

FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform Project backfilling and compacting as described in Contract Documents, except as specified below.
   2. Procedure and quality for backfilling and compacting performed on Project under other Sections unless specifically specified otherwise.

B. Related Requirements:
   1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
   2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
   3. Section 31 0501: 'Common Earthwork Requirements' for:
      a. General procedures and requirements for earthwork.
      b. Pre-installation conference held jointly with other common earthwork related sections.
   4. Section 31 1100: 'Clearing and Grubbing'.
   5. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
   6. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
   7. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
   8. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
   9. Section 31 2316: 'Excavation'.
   10. Section 31 2324: 'Flowable Fill'.
   11. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
   12. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
   13. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
   14. Division 32: Compaction of subgrade under walks and paving.
   15. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

C. Reference Standards:
   1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
      a. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))'.
      b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
      c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))'.
      d. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
      e. ASTM D2487-11, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
      f. ASTM D6938-15, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
   1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501.
   2. In addition to agenda items specified in Section 01 3100, Section 31 0501, and Section 31 2324 if Flowable Fill is included, review following:
      a. Review backfill requirements.
      b. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
         1) Review requirements and frequency of testing and inspections.

B. Sequencing:
   1. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.

C. Scheduling:
   1. Notify Testing Agency and Architect seventy-two (72) hours minimum before installation of fill / engineered fill to perform proctor and plasticity index tests on proposed fill or subgrade.
   2. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
   3. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill (or concrete).
   4. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

1.3 SUBMITTALS

A. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Testing and Inspection Reports:
            a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

1.4 QUALITY ASSURANCE

A. Testing and Inspection:
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Testing and Inspection for fill / engineering fill:
      a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.
         1) Owner’s employment of an independent Testing Agency does not relieve Contractor of Contractor’s obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
         2) See Section 01 1200: ‘Multiple Contract Summary’.

1.5 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not perform work during unfavorable conditions as specified below:
      a. Aggregate Base:
         1) Presence of free surface water.
         2) Over-saturated sub base materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Site Material:
   1. Existing excavated material on site is suitable for use as fill and backfill to meet Project requirements.

B. Imported Fill / Backfill:
   1. Well graded material conforming to ASTM D2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
      a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches (150 mm) diameter and ninety-five (95) percent minimum of fill shall be smaller than 1-1/2 inch (38 mm) in any direction.
      b. Under Landscaped Areas:
         1) Fill more than 36 inches (900 mm) below finish grade shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches (150 mm) diameter and ninety (90) percent minimum of fill shall be smaller than 1-1/2 inch (38 mm) in any direction.
         2) Fill less than 36 inches (900 mm) below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches (38 mm) in any direction and ninety (90) percent minimum of fill shall be smaller than 3/8 inch (4.7 mm) in any direction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
   1. Do not place fill or aggregate base over frozen subgrade.
   2. Under Building Slab and Equipment Pad Areas:
      a. Scarify subgrade 6 inches (150 mm) deep, moisture condition to uniform moisture content of between optimum and four (4) percent over optimum, and mechanically tamp 6 inches (150 mm) deep to ninety-five (95) percent minimum of relative compaction.
   3. Under Driveways And Parking Areas:
      a. Scarify subgrade 6 inches (150 mm) deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
   4. Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls
      a. Scarify subgrade 6 inches (150 mm) deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
   5. Landscape Areas:
      a. Compact subgrade to eighty-five (85) percent relative compaction.

3.2 PERFORMANCE

A. Interface With Other Work:
   1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
   2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
   3. Section 31 2324: 'Flowable Fill' for backfilling of piping systems and other utilities under paving'.

B. Fill / Backfill:
1. General:
a. Around Buildings And Structures: Slope grade away from building as specified in Section 31 2216. Hand backfill when close to building or where damage to building might result.
b. Site Utilities:
1) In Landscape Areas: Use backfill consisting of on-site soil.
2) Under Pavement and Concrete Site Elements: Extend excavatable flowable fill / backfill to elevation of subgrade. Do not place aggregate base material until excavatable flowable fill / backfill has cured seventy-two (72) hours.
c. Do not use puddling or jetting to consolidate fill areas.
2. Compacting:
a. Fill / Backfill And Aggregate Base:
1) All fill material shall be well-graded granular material with maximum size less than 3 inch (76 mm) and with not more than fifteen (15) percent passing No. 200 sieve.
2) Under Building Slab and Equipment Pad Areas:
a) Place in 8 inch (200 mm) maximum layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D698.
3) Under Driveways And Parking Areas:
a) Place in 8 inch (200 mm) maximum layers, dampen but do not soak, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D698.
4) Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls:
a) Place in 8 inch (200 mm) maximum layers, dampen but do not soak, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D698.
5) Utility Trenches:
a) Site:
(1) Place fill in 12 inch (300 mm) layers and moisture condition to plus or minus two (2) percent of optimum moisture content.
(2) Compact fill to ninety-five (95) percent minimum relative compaction to within 12 inches (300 mm) of finish grade.
(3) Compact fill above 12 inches (300 mm) to eighty-five (85) percent relative compaction.
b) Under Slabs:
(1) Under Slabs: Place fill in 6 inch (150 mm) layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and compact to ninety five (95) percent minimum relative compaction to within 4 inches (100 mm) of finish grade.
(2) Final 4 inches (100 mm) of fill shall be aggregate base as specified in Section 31 1123.
6) Fill Slopes: Compact by rolling or using sheepsfoot roller.
7) Backfill Under Footings if required by Geotechnical Evaluation Report.
8) Landscape Areas:
a) Compact fill to eighty-five (85) percent minimum relative compaction.
9) Other Backfills: Place other fills in 12 inch (300 mm) layers and compact to ninety five (95) percent relative compaction.
10) Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.

3.3 REPAIR / RESTORATION

A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
   a. Quality Control is sole responsibility of Contractor:
      1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
         a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
2. Fill / Engineered Fill:
   a. Testing Agency shall provide testing and inspection for fill.
   b. Number of tests may vary at discretion of Architect.
   c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.
   d. Prior to placement of engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
   e. Footing subgrade: At footing subgrades Certified Inspector is to verify that soils conform to geotechnical report.
   f. Testing Agency will test compaction of soils according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Lift thicknesses shall comply with geotechnical report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical report. Tests will be performed at following locations and frequencies:
      1) Paved Areas: At each compacted fill and backfill layer, at least one (1) test for every 10,000 sq. ft. (930 sq. m) or less of paved area but in no case less than three (3) tests.
      2) Building Slab Areas: At each compacted fill and backfill layer, at least on test for every 2,500 sq. ft. (232 sq. m) or less of building slab area but in no case less than three (3) tests.
      3) Foundation Wall/Continuous Footing Backfill: At each compacted backfill layer, at least one (1) test for each 40 linear feet (12 linear m) or less of wall length, but no fewer than two (2) tests.
      4) Trench Backfill: At each 12 inch (305 mm) compacted lift for each 100 linear feet (30.5 linear m) or less of trench length but no fewer than two (2) tests.
      5) Sidewalks, Curbs, Gutters, Exterior Pads: Minimum of one (1) test for each lift for each 40 lineal feet (12 linear m) or one (1) test for every 5,000 sq. ft. (465 sq. m) or less of pad area but no fewer than three (3) tests.
   g. Required verification and inspection of soils as referenced in 2015 IBC (or latest approved edition) Table 1704.7 'Required Verification And Inspection Of Soils'. Periodic and continuous inspections include:
      1) Verify materials below shallow foundations are adequate to achieve design bearing capacity (periodic).
      2) Verify excavations are extended to proper depth and have reached proper material (periodic).
      3) Perform classification and testing of compacted fill materials (periodic).
      4) Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill (continuous).
      5) Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly (periodic).

3.5 CLEANING

A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

END OF SECTION

SECTION 31 2500

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Provide permanent erosion and sedimentation controls as described in Contract Documents.

B. Related Requirements:
   1. Section 01 5700: Temporary Erosion and Sedimentation Control.
   2. Section 02 4113: Selective Site Demolition.
   3. Section 31 0501: Common Earthwork Requirements.
   4. Section 31 1100: Clearing and Grubbing.
   5. Section 31 1413: Topsoil Stripping And Stockpiling.
   6. Section 32 9300: Sections under heading 'Site Improvements'.

1.2 REFERENCES

A. References:
   1. United States Environmental Protection Agency:
      a. EPA Document 832/R-92-005 (Sep 1992), 'Storm Water Management for Construction Activities.'

1.3 SUBMITTALS

A. Informational Submittals:
   1. Delegated Design Submittals:
      a. Sediment and erosion control plan, specific to site, meeting following objectives:
         1) Prevent loss of soil, including soil stockpiled for reuse, by storm water runoff and wind erosion.
         2) Prevent sedimentation of storm sewers and receiving streams.
         3) Prevent air pollution by dust and particulate matter.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Sediment and erosion control shall conform to EPA Document 832/R-92-005, Chapter 3, or local erosion and sedimentation control standards, whichever is more stringent.

B. Qualifications:
   1. Supervisor of erosion control operations shall be thoroughly familiar with types of erosion control materials being installed and best methods for their installation. Supervisor shall be present when work of this Section is being performed and shall direct work performed under this Section.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Design Criteria:

1. Protect and maintain areas disturbed by the Work, so erosion is adequately controlled and silt and sediments are not allowed to flow into any watercourse, onto adjacent properties, or into storm drains.

B. Materials:
   1. Hay And Straw Mulch:
      a. General:
         1) Reasonably free from swamp grass, weeds, twigs, debris and other deleterious materials, and free from rot, mold, primary noxious weed seeds, and rough or woody materials.
         2) Mulches containing mature seed of species which would volunteer and be detrimental to permanent seeding, or would result in over-seeding, or would produce growth which is aesthetically unpleasing, is not permitted.
      b. Hay Mulch:
         1) Properly aired native hay, Sudan grass hay, broom sedge hay, legume hay, or similar hay or grass mowings.
         2) Apply at 2 to 3 tons (2.03 to 3.05 metric tons) per acre unnetted or stabilized, or at 1.5 tons (1.52 metric ton) per acre when net or mulch stabilizer is used. When air-dried and in loose state, contents of representative bale shall lose not more than 15 percent of resulting air-dry weight of bale.
      c. Straw Mulch:
         1) Threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed.
         2) Apply at 2 to 3 tons (2.03 to 3.05 metric tons) per acre unnetted or stabilized, or at 1.5 tons (1.52 metric ton) per acre (4 047 cu m) when net or mulch stabilizer is used.
      d. Matting:
         1) Jute Matting:
            a) Undyed and unbleached jute yarn woven into uniform open, plain weave mesh and furnished in rolled strips. Matting shall conform to following physical requirements:
            b) 48 inch (1 200 mm) wide, plus or minus one inch (25 mm).
            c) 78 warp ends per width of cloth.
            d) 41 weft ends per yard.
            e) 1.22 lbs to 1.80 lbs (0.55 kg to 0.82 kg) per lineal yard, plus or minus 5 percent.
      e. Excelsior Matting:
         1) Uniform web of interlocking wood excelsior fibers with a backing of mulch net fabric on one side only and furnished in rolled strips. Mulch net shall be woven of either twisted paper or cotton cord. Matting shall conform to following physical requirements:
            a) 36 inches (900 mm) wide, plus or minus one inch (25 mm).
            b) 0.8 lbs (0.36 kg) per sq yd, plus or minus 5 percent.
      f. Soil Erosion Matting:
         1) Type Two Acceptable Products.
            a) 'Enkamat Type 7020' by American Enka Company.
            b) Equal as approved by Architect before use. See Section 01 6200.
      g. Erosion Control Mulching Blanket:
         1) Type Two Acceptable Products.
            a) 'Hold/Gro' by Gulf States Paper Corp.
            b) Equal as approved by Architect before use. See Section 01 6200.
   2. Seed And Sod For Erosion Control:
      a. For Temporary Control: Annual or perennial ryegrass.
      b. For Permanent Control: See Sections under 32 9300 heading.
   3. Hay Bales For Erosion Control:
      a. Rectangular shaped bales of hay or straw, weighing at least 40 lbs (18 kg) per bale, free from primary noxious weed seeds and rough or woody materials.
   4. Silt Fences:
      a. Type Two Acceptable Products
         1) 'Geofab Silt Fence' by Mercantile Development Inc.
         2) 'Mirafi 100X by Celanese Fibers Marketing Co.
         3) Equal as approved by Architect before use. See Section 01 6200.

2.2 ACCESSORIES

A. For Mulch:
1. Mulch Stabilizers:
   a. Type Two Acceptable Products
      1) 'Curasol' applied at 40 gallons (152 liters) per acre (4 047 cu m).
      2) Dow 'Mulch Binder' applied at 45 gallons (170 liters) per acre (4 047 cu m).
      3) Asphalt binder meeting requirements of AASHTO M140, Type SS-1 or RS-1 as applicable and applied at 400 gallons (1 514 liters) per acre (4 047 cu m).
      4) Equal as approved by Architect before use. See Section 01 6200.
2. Temporary Type Mulch Nets: Paper yarn, approximately 0.05 inches (1.27 mm) in diameter, woven into net with openings of approximately 7/8 inch (22 mm) by 1/2 inch (12.7 mm) and weight of approximately 0.2 lbs (0.091 kg) per sq yd (0.84 cu m).
3. Permanent Type Mulch Nets:
   a. Type Two Acceptable Products:
      1) 'Vexar' or 'Erosion-Net' plastic or nylon mesh netting with openings of approximately 3/8 inch to 3/4 inch (9.5 mm to 19 mm).
      2) Equal as approved by Architect before use. See Section 01 6200.

B. For Matting / Blankets:
1. Staples: 11 ga (3.05 mm) minimum plain iron wire, made from 12 inch (305 mm) minimum lengths of wire bent to form 'U' of 1-1/2 inches to 2 inches (38 mm to 50 mm) in width with equal legs of 5 inch to 5-1/4 inches (125 mm to 133 mm). Use longer staples for loose soils or where otherwise required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Take every reasonable precaution to avoid erosion and to prevent silting of rivers, streams, lakes, reservoirs, impoundments, and drainage ditches and swales.
2. Keep exposure of uncompleted cut slopes, embankments, trench excavations, and site graded areas as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible.
3. Should it become necessary to suspend construction for any length of time, shape excavated and graded areas so runoff will be intercepted and diverted to points where minimal erosion will occur. Provide and maintain temporary erosion and sediment control measures, such as berms, dikes, slope drains, silt stops, and sedimentation basins, until permanent drainage facilities or erosion control features have been completed and are operative.
4. Handle and treat fine material placed or exposed during The Work so as to minimize possibility of it reaching surface waters. Use diversion channels, dikes, sediment traps, or other effective control measures.
5. Provide silt stops wherever erosion control measures may not be totally capable of controlling erosion, such as in drainage channels and where steep slopes may exist.
6. Before water is allowed to flow in any ditch, swale, or channel, install permanent erosion control measures in waterway so waterway will be safe against erosion.
7. Take precautions in using construction equipment to minimize erosion. Do not leave wheel tracks where erosion might begin.
8. Unless specifically required in Contract Documents, operation of mechanized equipment in watercourses is not permitted. Where work is required in watercourses, minimize movement of equipment in the water and remove false work, pilings, debris, and other temporary work as soon as construction will allow.
9. Wherever crossings of live streams are necessary, provide temporary culverts or bridges to allow equipment to cross them without fording. Disturbance of lands and waters outside limits of construction is prohibited, except as may be found necessary and approved in writing by Architect.

10. Mulching shall follow seeding operations by no more than 24 hours.
11. Continue erosion control measures until permanent measures have been sufficiently established and are capable of controlling erosion on their own.

B. Hay And Straw Mulching:
1. Install hay or straw mulch immediately after areas have been properly prepared.
   a. When permanent seed or seed for temporary erosion control is sown prior to placing mulch, place mulch on seeded areas within 24 hours after seeding.
   b. Architect may authorize blowing of chopped mulch provided that 95 percent of mulch fibers will be 6 inches (150 mm) or more in length and that mulch can be applied in so there will be a minimum amount of matting that would retard plant growth.
   c. Hay mulch should cover ground enough to shade it, but should not be so thick that a person standing cannot see ground through mulch.
   d. Remove matted mulch or branches.
2. Where mild winds that may blow mulch are probable, when ground slopes exceed 15 percent, or when otherwise required to maintain mulch firmly in place, apply a system of pegs and strings, a chemical stabilizer, or temporary type netting to mulch. Unless otherwise directed, remove strings and netting prior to acceptance of the Work.
3. Where high winds or heavy rainstorms are likely, where ground surfaces are steeper than 15 percent, or where other conditions require, apply temporary type netting over mulch and take whatever other measures are necessary to maintain mulch firmly in place.
4. Unless otherwise specified, use of permanent type netting is not permitted without prior written approval of Architect.

C. Matting:
1. General:
   a. Use of mulch with matting is not permitted. However, 4 to 6 inch (100 to 150 mm) overlap of mulch over edge of matting is allowed.
   b. Prepare surfaces of ditches and slopes to conform to grades, contours, and cross sections shown on Drawings. Finish to smooth, even condition with debris, roots, stone, and lumps raked out and removed. Loosen soil surface sufficient to permit bedding of matting. Unless otherwise noted, place seed prior to placement of matting.
   c. Unroll matting parallel to direction of water flow and loosely drape, without folds or stretching, so continuous ground contact is maintained.
   d. In ditches and swales and on slopes, place each upslope and each downslope end of each piece of matting in 6 inch trench, stapled at 12 inches (300 mm) on center, backfilled, and tamped. Similarly, bury edges of matting along edges of catch basins and other structures. Architect may require that other edges exposed to more than normal flow of water be buried in similar fashion.
   e. Tightly secure matting to soil with staples driven approximately vertically into ground, flush with matting surface. Do not form depressions or bulges in matting surface with staples.
   f. Increase specified spacing of staples when factors such as season of year or amount of water encountered or anticipated require additional anchoring.
2. Jute Matting:
   a. Where strips are laid parallel or meet, as in a tee, overlap 4 inches (100 mm) minimum. Overlap ends 6 inches (150 mm) minimum, shingle fashion.
   b. Space check slots built at right angles to direction of water flow so one check slot or one end occurs within each 50 feet (15 meters) of slope length. Construct check slots by placing tight fold of matting 6 inches (150 mm) minimum vertically into ground. Tamp these same as upslope ends.
   c. Press jute matting onto ground with light lawn roller or other satisfactory means.
   d. On slopes flatter than 4:1, place staples 36 inches (900 mm) apart maximum in three rows for each strip, with one row along each edge and one row alternately spaced down center. On grades 4:1 or steeper, place staples in the same three rows, but spaced 24 inches (600 mm) apart. On lapping edges, reduce spacing of staples by half. At ends of matting and at required check slots, space staples 12 inches (300 mm) apart. Staple matting placed adjacent to boulders or other obstructions with no spaces between staples.
   e. Spread additional seed over jute matting, particularly those locations disturbed by building of slots.
3. Excelsior Matting:

a. Where strips of excelsior matting are laid end-to-end, butt adjoining ends.
b. When adjoining rolls of excelsior matting are laid parallel to one another, butt matting snugly.
c. On slopes flatter than 4:1, place staples 36 inches (900 mm) maximum apart in three rows for each strip, with one row along each edge and one row alternately spaced down center. On grades 4:1 or steeper, place staples in same three rows, but spaced 24 inches (600 mm) apart. Space staples in ends of matting 12 inches (300 mm) apart. Staple matting placed adjacent to boulders or other obstructions with no spaces between staples.

4. Erosion Control Mulching Blanket:
   a. Where one roll ends and second roll begins, bring end of upslope piece over end of downslope roll so there is 12 inch (300 mm) overlap. Place overlap in 4 inch (100 mm) deep trench, staple at 12 inches (300 mm) on center, and backfill and tamp.
   b. On slopes where two or more widths of blanket are applied, overlap edges 4 inches (100 mm) and staple at 12 inch (300 mm) intervals along exposed edge of lap joint.
   c. Staple body of blanket in grid pattern with staples 36 inches (900 mm) on center, each way.

D. Seed For Erosion Control:
1. Seeding for permanent erosion control shall be carried out in accordance with appropriate Section under 32 9300 heading.
2. Areas that will be regraded or otherwise disturbed later during construction may be seeded with rye grass to obtain temporary control. Sow seed at one lb (0.45 kg) per 1,000 sq ft (93 sq m), on pure live seed basis.

E. Hay Bales And Silt Fences:
1. Provide hay bales or silt fences, as required, for temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, or entering catch basins, or damaging the Work.
2. Stake hay bales firmly in place. Use sufficient number of bales to accommodate runoff without causing flooding and to adequately store any silt, sediment, and debris reaching them.
3. Erect silt fences and bury bottom edge in accordance with Manufacturer's recommended installation instructions. Provide sufficient length of fence to accommodate runoff without causing flooding and to adequately store any silt, sediment, and debris reaching it.

3.2 REPAIR / RESTORATION

A. If any staple becomes loosened or raised, if any matting becomes loose, torn, or undermined, or if any temporary erosion and sediment control measures are disturbed, repair them immediately.

B. If seed is washed out before germination, repair damage, refertilize, and reseed.

C. Maintain mulched and matted areas, silt stops, and other temporary control measures until permanent control measures are established and no further erosion is likely.

END OF SECTION

SECTION 31 3116

TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete soils treatment with termiticide under and adjacent to building to provide uniform toxic barrier continuous treated zone in all routes of termite entry.

B. Related Requirements:
   1. Section 31: Earthwork.
      a. Section 31 0501: 'Common Earthwork Requirements'.
      b. Section 31 1123: 'Aggregate Base':
         1) Installation of below-grade vapor retarder.
      c. Section 31 2216: 'Fine Grading'.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate soil treatment application with excavation, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.
   2. Interior slab-on-grade concrete:
      a. Coordinate work so vapor retarder can be installed as soon as possible after application of termite protection on top of soil base or aggregate base.

B. Pre-Installation Conference:
   1. Participate in mandatory pre-installation conference.
   2. Schedule pre-installation conference for new Projects after completion of Fine Grading specified in Section 31 2216, but before beginning Aggregate Base as specified in Section 31 1123. This conference may be held jointly with pre-installation conference for Common Planting Requirements specified in Section 32 9001.
   3. In addition to agenda items specified in Section 01 3100, review following:
      a. Review Applicator Qualification requirements.
      b. Review Ambient Conditions for acceptability for application of termiticide products.
      c. Review Delivery, Storage, and Handling requirements.
      d. Review Examination, Preparation, and Application requirements as called out in Part 3 Execution.
      e. Review Field Quality Control and Protection requirements as called out in Part 3 Execution.

C. Sequencing:
   1. Application OPTION A:
      a. Apply termite protection on top of soil base before aggregate base and vapor retarder is installed.
   2. Application OPTION B:
      a. Install vapor retarder after application of termite protection on top of aggregate base.
      b. Increase application rate for volume as per Manufacturer's instruction.
      c. Install below-grade vapor retarder on top of soil base or aggregate base.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data:

a. Submit Chemical Manufacturer's printed literature regarding chemical composition, concentration, and rates and method of application.
b. Submit MSDS information.

B. Informational Submittals:
1. Certificates:
a. Provide certificates required by any authorities having jurisdiction (AHJ).
2. Design Data Submittals:
a. Certified Applicator's statement indicating total amount of chemical required for Project to provide required amount of mix solution at specified concentration and application rates.
b. Certified Applicator to submit take-off showing amounts of square foot and lineal foot application at specified application rate. Also indicate total amount of mix solution required for Project.
3. Manufacturers' Instructions:
a. Manufacturer's printed label on product regarding chemical composition, concentration, and rates and method of application.
4. Qualification Submittals:
a. Provide BASF Partner Number and evidence of license from authorities having jurisdiction (AHJ).

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Warranty Documentation:
1) Include copy of final, executed warranty.
b. Record Documentation:
1) Soil Treatment Application Report: After application of termiticide is complete, submit report including the following:
a) Date and time of application.
b) Moisture content of soil before application.
c) Termiticide brand name and batch number of concentrate.
d) Mix rate and quantity of diluted termiticide used.
e) Areas of application.
f) Weather at time of application.
g) Water source for application.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

B. Qualifications:
1. Applicator: Requirements of Section 01 4301 applies but not limited to the following:
a. Applicator shall be licensed pest professional according to regulations of authorities having jurisdiction (AHJ) with Manufacturer's Certification training in correct application methods to apply termite control treatment and products in jurisdiction where Project is located.
b. Applicator should be familiar with trenching, roddlng, short rodding, subslab injection, low-pressure banded surface applications, and foam delivery techniques.

C. Source Limitations:
1. Obtain termite control products from single source from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, Storage, and Handling:
1. Certified Applicator responsible for delivery, storage, handling, and dispose of specified products of this section.

B. Storage And Handling Requirements:
   1. Storage:
      a. Keep containers closed when not in use.
      b. Store unused product in original container only, out of reach of children and animals.
      c. Do not store near food or feed.
      d. Protect from freezing.
   2. Spills or leaks:
      a. General:
         1) In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent.
         2) Avoid skin contact.
         3) Remove residue to chemical waste area.
         4) Ensure adequate decontamination of tools and equipment following cleanup.
      b. All leaks resulting in application of this product in locations other than those prescribed must be cleaned up prior to leaving application site.
         1) DO NOT allow people or pets to contact contaminated areas until cleanup is completed.

C. Packaging Waste Management:
   1. Disposal:
      a. Dispose of empty containers in accordance with Manufacturer's and regulatory agency's requirements.
      b. Do not contaminate water, food, or feed by storage or disposal.

1.6 FIELD CONDITIONS

A. Ambient Conditions
   1. Comply with EPA-Registered Label and requirements of authorities having jurisdiction (AHJ) and Manufacturer’s written recommendations regarding environmental conditions under which termiticide shall be applied.

B. Environmental Limitations:
   1. To ensure penetration, do not treat soil that is water saturated or frozen.
   2. Do not treat soil (or aggregate base) while precipitation is occurring or movement from treatment area (site) is likely to occur.
   3. Do not treat soil (or aggregate base) while large precipitation is expected to occurring within two to four (2-4) hours after application.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Provide Manufacturer’s written warranty:
      a. Warranty shall guarantee effectiveness of treatment against subterranean termite infestation for five (5) years minimum from acceptance date of Project and be signed by applicator and Contractor as co-guarantors.
      b. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Termiticide:
   1. Description:
      a. Provide EPA-Registered termiticide, complying with requirements of authorities having jurisdiction (AHJ), in aqueous solution formulated to prevent termite infestation.

b. Provide quantity required for application at label volume and rate for maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

2. Design Criteria:
   a. Undetectable:
      1) Non-repellent or undetectable chemical technology.
   b. Transfer Effect:
      1) Slow-acting treatment allowing individual termite's ample time to transfer treatment to other termites as they come in contact within the colony.
   c. Service Life of Treatment:
      1) Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.
3. Mixes:
   a. Mix chemicals and water at Manufacturer's recommended printed requirements.
      1) To provide maximum control and protection against termite infestation, apply as per Manufacturer printed instructions including but not limited to the following:
         a) To maximize termiticide potency, product should be applied in manner to provide continuous treated zone to prevent termites from infesting wood to be protected.
         b) Product is labeled for use at 0.06 percent, 0.09 percent or 0.125 percent finished dilution. The 0.06 percent finished dilution should be used for typical control situations. Where severe termite infestations, problem soils, or difficult construction types are encountered, it may be advisable to use either 0.09 percent or 0.125 percent.
4. Category Four Approved Product. See Section 01 6200 for definitions of Categories. (No substitution of specified product or alteration of Manufacturer's application requirements is allowed):
   a. Termidor by BASF Professional Pest Control, Research Triangle Park, NC www.termidorhome.com, or www.pestcontrol.basf.us.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Evaluation And Assessment:
   1. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
   2. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
   1. Allow no disturbance of treated soil (aggregate base) between application of solution and placing of concrete. (Disturbed defined as removing fill and/or replacing fill).
   2. Protect neighboring property, water sources, and personnel on site from contamination.
      a. Use anti-backflow equipment or procedures.
      b. Do not treat soil beneath structures that contain wells or cisterns.
      c. Take extreme care to avoid runoff. Do not treat soil that is water-saturated or frozen.
   3. Maintain, on job site, empirical name of chemical, Manufacturer's precautions, and phone numbers of proper authorities to notify in case of spillage or other accident.

B. General Preparation:
   1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's written instructions for preparation before beginning application of termite control treatment.

2. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, trash, and construction waste wood from soil within and around foundations.
3. Do not apply application of termite control until location of air ducts, vents, water, and sewer lines are known and identified. Take extreme caution to avoid contamination of these structural elements and airways.

C. Soil Treatment Preparation:
1. Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.
2. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings.
3. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
4. Fit filling hose connected to water source at site with backflow preventer, complying with requirements of authorities having jurisdiction (AHJ).

3.3 APPLICATION

A. Interface With Other Work:
1. Interior slab-on-grade concrete:
   a. Installation of vapor retarder, geomembrane if used, and aggregate base.

B. General:
1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's EPA-Registered Label for products.
   a. Application Restrictions:
      1) Do not apply while precipitation is occurring or large precipitation is expected to occurring within two to four (2-4) hours after application'.
      2) Do not contaminate water, food or feed. Cover or remove all exposed food, feed and drinking water.
      3) Do not apply with 15 feet (4.50 m) of bodies of fresh water lakes, reservoirs, rivers, permanent streams, marshes, and natural ponds.
      4) Do not allow residents, children, other persons or pets into immediate area during application.
      5) Do not allow residents, children, other persons or pets into treated area until sprays have dried. After application, applicator is required to check for leaks resulting in deposition of treatment dilution in locations other than those prescribed.
2. Application OPTION B as specified in Sequencing of this specification in Part 1 General:
   a. Increase application rate for volume as per Manufacturer's instruction.

C. Applying Soil Treatment:
1. Mix treatment termiticide solution to a uniform consistency.
2. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
3. If impervious soils make reduction in volume of solution necessary, increase percentage of toxicant used in proportion to insure same amount of insecticide be used per linear or square foot (meter).
4. Apply overall treatment to entire surface to be covered by concrete slab.

D. Pre-Construction Treatment:
1. For Slab-on-Grade Construction:
   a. 4 gallons per 10 linear ft (15 liters per 3 000 linear mm) along outside of exterior foundation.
   b. 2 gallons per 10 linear ft (7.5 liters per 3 000 linear mm) in voids of unit masonry foundation walls or piers.

c. One gallon per 10 sq ft (3.5 liters per one sq m) as overall treatment under slab and attached porches.
d. 4 gallons per 10 linear ft (15 liters per 3 000 linear mm) along inside of exterior foundation walls, both sides of interior partition foundation walls, and around utility services and other features that will penetrate slab or where there will be break in concrete (grade changes, zip strips, cold joints, etc.).

3.4 RE-APPLICATION

A. Reapply treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 FIELD QUALITY CONTROL

A. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Applicator:
a. Substitution of specified product or alteration of Manufacturer's application requirements is considered defective or not complying with Contract Document requirements. Correct such work at no cost to the Owner.

3.6 PROTECTION

A. Allow sufficient time (12 hours minimum) for drying after application before resuming construction activities.

B. Keep off treated areas until completely dry. Do not allow workers or other personnel to enter treatment area until chemical has been absorbed into soil.

C. Protect application areas from precipitation as recommended by Manufacturer.

D. Protect temiticide solution, dispersed in treated soils and fill, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

E. Post signs in areas of application warning of poison application. Remove signs when areas with application are covered by other construction.

END OF SECTION

DIVISION 32: EXTERIOR IMPROVEMENTS

END OF TABLE OF CONTENTS

SECTION 32 1216

ASPHALT PAVING: Superpave Method

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
1. Furnish and install asphalt paving in driveways and parking areas as described in Contract Documents including the following, but not limited to:
   a. Asphalt Mix Design Criteria Summary:

1)	Asphalt Binder:	PG 64-28
2)	Nominal maximum size aggregate (Nmas):	3/8 inch
3)	Maximum size aggregate:	1/2 inch
4)	Mix Designator (compaction effort); Ndesign:	50
5)	Antistrip Agent:	If required by supplier's mix design (use 1 percent or greater lime slurry when required
6)	Asphalt Reinforcement Fibers:	Specified in Section 32 1217 as Alternate 'A'
7)	Reclaimed Asphalt Pavement (RAP):	Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used
8)	ROSP	Not allowed.
9)	Warm Mix Additive	If required by supplier's mix design
10)	Recycle Agent:	If required by supplier's mix design

   b. Design Air Voids:
      1) Three and one-half percent (3.5 percent).
   c. Tack coat: Application of asphaltic material to existing asphalt concrete or Portland concrete surfaces before asphalt concrete pavement.
   d. Blotter materials and procedures for absorbing excess asphalt as required.

B. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
3. Section 31 0501: 'Common Earthwork Requirements' for:
   a. General procedures and requirements for earthwork.
   b. Pre-installation conference held jointly with other common earthwork related sections.
4. Section 31 1123: 'Aggregate Base' for compaction of aggregate base.
5. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
7. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
8. Section 32 0113.01: 'Asphalt Paving Surface Treatment: Penetrating Seal'.
9. Section 32 1717: 'Asphalt Reinforcement Fibers'.
10. Section 32 1723: 'Pavement Markings'.

1.2 PRICE AND PAYMENT PROCEDURES

A. Alternates:
1. Provide alternate bid as specified in Section 01 2300: 'Alternates' and Section 32 1217: Asphalt Reinforcement Fibers' for asphalt reinforcement fibers to be added to asphalt mix. Owner's Representative will review bid and decide if asphalt reinforcing fibers will be included in Project:
   a. Alternate 'A': 'Asphalt Reinforcement Fibers'.

1.3 REFERENCES

A. Association Publications:
1. Asphalt Institute, 2696 Research Park Dr., Lexington, KY www.asphaltinstitute.org:
   a. MS-2, *'Mix Design Methods'* (7th Edition 2015).

B. Definitions:
1. Aggregate: Hard inert mineral material, such as gravel, crushed rock, slag, or sand.
   a. Coarse Aggregate: Aggregate retained on or above No. 4 (4.75 mm) sieve.
   b. Coarse-Graded Aggregate: Aggregate having predominance of coarse sizes.
   c. Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.
   d. Fine Aggregate: Aggregate passing No. 4 (4.75 mm) sieve.
   e. Fine-Graded Aggregate: Aggregate having predominance of fine sizes.
   f. Mineral Filler: Fine mineral product at least 70 percent of which passes a No. 200 (75µm) sieve.
2. Air Voids: Total volume of small air pockets between coated aggregate particles in asphalt cement concrete (ACC); expressed as percentage of bulk volume of compacted paving mixture.
3. Anti-Stripping Agent: Chemicals added to bitumen to improve the adhesion of the bitumen to hydrophilic aggregates
4. Asphalt Binder: Asphalt cement or modified asphalt cement that binds aggregate particles into dense mass.
   a. Asphalt Cement used in paving applications that has been classified according to the Standard Specification for Performance Graded Asphalt Binder, AASHTO Designation MP 320. It can be either unmodified or modified Asphalt Cement, as long as it complies with specifications.
5. Asphalt-Aggregate Designator: Alpha-numeric code that indicates nominal maximum size of aggregate, and type and grade of asphalt in aggregate-asphalt mix.
   a. Example: "12.5 PG70-28" means aggregate asphalt mix shall be composed of aggregate gradation with 1/2 inch nominal maximum size and performance grade asphalt binder designed to perform between temperatures of 158 deg F and -18.4 deg F.
6. Equivalent Single Axle Load (ESAL): Effect on pavement performance of any combination of axle loads of varying magnitude equated to number of 18,000-lb single-axle loads that are required to produce an equivalent effect.
7. Maximum Size (Superpave): One sieve larger than the nominal maximum size.
8. Ndesign (Superpave): Design number of gyrations used for design of Hot Mix Asphalt (HMA).
9. Nominal Maximum Size: One sieve size larger than first sieve size retaining more than 10 percent of Sample. Nominal maximum size sieve will retain minimum of 0 and maximum of 10 percent of sample. Maximum size is one sieve size larger than nominal maximum size.
10. Performance Graded Asphalt Binder (PGAB): Asphalt binder designed to produce HMA that meets certain performance standards. Designations for performance-graded asphalt binders are prefixed with PG. Each grade designation also includes two sets of numbers that denote temperature range. This is a range of climate temperatures to which road may be exposed and still be expected to give superior performance. PG numbers do not indicate viscosity as in conventional liquid asphalt designations.
11. Pre-emergent Herbicide: Chemical that is applied before weeds emerge. It acts by killing weed seedlings and /or establishing layer of chemical on or near soil surface that is toxic to germinating seeds and young seedlings.
12. Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like aggregate in recycling of asphalt pavements.
13. Subgrade (definition varies depending upon stage of construction and context of work being performed):
   a. Prepared natural soils on which fill, aggregate base, or topsoil is placed.
   or
   b. Prepared soils immediately beneath paving.
14. Tack Coat: Very light application of liquid asphalt, or asphalt emulsion diluted with water.

C. Reference Standards:
1. American Association of State and Highway Transportation Officials:

a. AASHTO T 304-11: ‘Standard Method of Test for Uncompacted Void Content of Fine Aggregate’.
b. AASHTO T 322-07(2011), ‘Standard Method of Test for Determining the Creep Compliance and Strength of Hot-Mix Asphalt (HMA) Using the Indirect Tensile Test Device.

2. ASTM International:
a. ASTM C29/C29M-16, ‘Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate'.
b. ASTM C88-13, ‘Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate'.
c. ASTM C117-13, ‘Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing'.
d. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine’.
e. ASTM C142/C142M-10, ‘Standard Test Method for Clay Lumps and Friable Particles in Aggregates'.
f. ASTM D242/D242M-09(2014), ‘Standard Specification for Mineral Filler For Bituminous Paving Mixtures'.
g. ASTM D977-13, 'Standard Specification for Emulsified Asphalt’.
h. ASTM D979/D979M-15, 'Practice for Sampling Bituminous Paving Mixtures'.
i. ASTM D2041/D2041M-11, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures’.
j. ASTM D2172/D2172M-11, ‘Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures’.
k. ASTM D2256/ D2256M-10, ‘Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method’.
l. ASTM D2397/D2397M, 'Standard Specification for Cationic-Emulsified Asphalt’.
m. ASTM D2419-14, ‘Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
n. ASTM D2950/D2950M-14, ‘Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods'.
o. ASTM D3203/D3203M-11, ‘Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures'.
p. ASTM D3549/D3549M-11, ‘Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens’.
q. ASTM D3665-12, ‘Standard Practice for Random Sampling of Construction Materials’.
r. ASTM D4318-10, ‘Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
s. ASTM D4552/D4552M-10, ‘Standard Practice for Classifying Hot-Mix Recycling Agents'.
t. ASTM D4759-11, ‘Standard Practice for Determining the Specification Conformance of Geosynthetics'.
u. ASTM D4791-10, ‘Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
v. ASTM D5444-15, ‘Standard Method for Mechanical Size Analysis of Extracted Aggregate'.
w. ASTM D5821-13, ‘Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate’.
x. ASTM D6307-10, ‘Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method'.
y. ASTM D6932/D6932M-08(2013), ‘Standard Guide for Materials and Construction of Open-Graded Friction Course Plant Mixtures’.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:
1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501 ‘Common Earthwork Requirements’:
2. In addition to agenda items specified in Section 01 3100 ‘Project Management and Coordination’ and Section 31 0501 ‘Common Earthwork Requirements’, review following:
a. Review surveying and staking of parking areas and installation of sleeves.
b. Review proposed aggregate base schedule.

c. Review rough grading elevations before placing paving fill.
d. Review fine grading elevations of subgrade fine grading operations before placing aggregate base and paving.
e. Review proposed asphalt paving schedule.
f. Review asphalt paving mix design.
g. Review pre-emergent herbicide protection of adjoining property and planting area on site requirements, schedule and application requirements.
h. Review schedule of mandatory asphalt paving surface treatment to be applied after placement of asphalt paving.
i. Review schedule of paint stripes to be applied after asphalt paving surface treatment.
j. Review safety issues.
k. Review Section 01 4523 'Testing and Inspecting Services' for administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
    1) Review requirements and frequency of testing and inspections.
    2) Review Contractor Testing Agency Qualifications.

B. Scheduling:Notify Testing Agency and Architect twenty-four (24) hours minimum before placing asphalt paving.

1.5 SUBMITTALS

A. Action Submittals:
1. Product Data:
    a. Pre-Emergent Herbicide:
        1) Manufacturer's published product data on pre-emergent herbicide.

B. Informational Submittals:
1. Certificates:
    a. Require mix plant to furnish delivery/load tickets for each batch of asphalt. Keep delivery tickets at job-site for use of Owner's Representative. Tickets shall show following:
        1) Name of mix plant.
        2) Date.
        3) Name of contractor.
        4) Name and location of Project.
        5) Serial number of ticket.
        6) Asphalt mix type.
        7) Time loaded.
        8) Identity of truck.
    b. Installer to provide Manufacturer's Certificate of Compliance stating material authenticity and properties for review and acceptance by Architect before product use.
2. Design Data:
    a. Hot Mix Asphalt:
        1) Design Criteria:
            a) Develop mix design according to current Asphalt Institute MS-2 'Asphalt Mix Design Methods' for Superpave Method.
            b) Submittal format:
                (1) Design mix submittal shall follow format as indicated in current Asphalt Institute MS-2, *'Mix Design Methods.*
        2) Mix design of asphalt paving must meet Design Criteria minimum requirements and show conformance to the following:
            a) Location and name of hot mix asphalt concrete production facility.
            b) Date of mix design. If older than two (2) years, recertify mix design.
            c) Asphalt mix type.
            d) Mix design method used.
            e) Mix density.
            f) Design air voids (three and one half (3.5) percent.
            g) Asphalt content in percent.
            h) Performance grade of asphalt binder.
            i) Nominal maximum size of aggregate.

j) Maximum size of aggregate.
k) Aggregate source and gradation.
l) Mix properties and design parameters.
m) Temperature of mix at plant and in the field for optimum field compaction.
n) Amount of recycled asphalt pavement (RAP).
o) Mineral fillers, antistrip, and recycle agent percentages.
p) Identify if warm mix technologies will be used and how much warm mix additive will be used.

3) Within thirty (30) days prior to asphalt construction, submit actual design mix to Architect, Civil Engineering Consultant of Record and Independent Testing Laboratory for review and approval.

3. Test And Evaluation Reports:
   a. Hot Mix Asphalt:
      1) Contractor's Testing Agency copies of Field Test results to show compliance with all contract requirements and quality control for quality of asphalt mixture and asphalt installation.
      2) Owner's Testing Agency copies of Field Tests and Inspections used to validate or determine discrepancies with testing by Contractor.
4. Manufacturer Instructions:
   a. Pre-Emergent Herbicide:
      1) Application instructions for pre-emergent herbicide.
5. Qualification Statement:
   a. Installer:
      1) Provide Qualification documentation if requested by Owner's Representative.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800 ‘Closeout Submittals’:
      a. Record Documentation:
         1) Manufacturer’s documentation:
            a) Pre-emergent herbicide documentation.
            b) Asphalt paving design.
            c) Test reports.
            d) Certificates from mix plant of delivery/load tickets.
            e) Manufacturer’s Certificate of Compliance.
         2) Testing and Inspection Reports:
            a) Testing Agency Testing and Inspecting Reports of asphalt paving.

1.6 QUALITY ASSURANCE

A. Qualifications. Requirements of Section 01 4301 ‘Quality Assurance - Qualifications’ applies but not limited to following:
   1. Asphalt Paving:
      a. Foreman of asphalt paving crew has completed at least three (3) projects of similar size and nature.
      b. Upon request, submit documentation.
   2. Pre-emergent herbicide:
      a. Applicator:
         1) Pre-emergent herbicide shall be applied by applicator certified by State in which Project is located as an applicator of agricultural chemicals.

B. Testing and Inspection:
   1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
   2. Owner will provide Testing and Inspection for asphalt paving:
      a. Owner will employ testing agencies to perform testing and inspection for asphalt paving as specified in Field Quality Control in Part 3 of this specification.

1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
2) See Section 01 1200: 'Multiple Contract Summary'.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
1. Asphalt Material:
a. Each shipment must:
1) Be uniform in appearance and consistency.
2) Show no foaming when heated to specified loading temperature.
b. Do not supply shipments contaminated with other asphalt types or grades than those specified:
1) Do not use petroleum distillate as a release agent.
2. Pre-emergent herbicide:
a. Materials shall be delivered in original, unopened packages with labels intact.

B. Storage And Handling Requirements:
1. Pre-emergent herbicide:
a. Do not freeze. Store in at temperatures above 41 deg F.
b. Follow Manufacturer's storage and handling requirements.

1.8 FIELD CONDITIONS

A. Ambient Conditions:
1. Pre-emergent herbicide:
a. Follow printed Manufacturers instruction for environmental hazards:
b. Follow printed Manufacturers instruction ambient conditions for application of product.
2. Tack Coat:
a. Apply only when air and roadbed temperatures in shade are greater than 40 deg F. Temperature restrictions may be waived only upon written authorization from Architect or Civil Engineer.
b. Do not apply to wet surfaces.
c. Do not apply when weather conditions prevent tack coat from adhering properly.
3. Asphalt paving:
a. Do not perform work during following conditions:
1) Ambient temperature is below 45 deg F or will fall below 45 deg F during placement.
2) Temperature of aggregate base below 50 deg F.
3) Cold Weather Asphalt Paving Plan: If asphalt pavement is placed outside of these temperature limits or those identified in MINIMUM Temperature Degrees, a plan is required which includes:
a) Haul times.
b) Placement details.
c) Compaction aids used in production.
d) Owner does not assume responsibility for asphalt when placed outside temperature limits.
4) Presence of free surface water or weather is unsuitable.
5) Wind or ground cools mix material before compaction.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. General:
1. Follow current Asphalt Institute MS-2 'Asphalt Mix Design Methods' for Superpave Method.

B. Asphalt Mix:
1. Asphalt Binder:
a. Performance Graded Asphalt Binder:
1) Use performance graded asphalt binder identified under Asphalt Mix Design Criteria.
2. Aggregates:
a. Use clean, hard, durable, angular, sound, consisting of crushed stone, crushed gravel, slag, sand, or combination.
b. Use nominal maximum size aggregate and maximum size aggregate per Asphalt Mix Design Criteria. Aggregate gradation to meet **Table 1** - **MASTER GRADING BANDS** requirements:

Table 1 - MASTER GRADING BANDS

Sieve (mm)		Nominal Maximum Aggregate Size	
		12.5 mm	9.5 mm
Control Sieves	19	100	-
	12.5	100	100
	9.5	< 90	90 – 100
	4.75	--	< 90
	2.36	28 – 58	32 – 60
	0.075	2 – 10	2 – 10
Restricted Zone	2.36	39.1	47.2
	1.18	25.6 – 31.6	31.6 – 37.6
	0.6	19.1 – 23.1	23.5 – 27.5
	0.3	15.5	18.7

NOTES:
1. It is assumed fine and coarse aggregate have same bulk specific gravity.
2. Gradation is expressed in percent passing by weight, ASTM C136. Percentage of fines passing 0.075 mm control sieve determined by washing, ASTM C117.

c. Provide aggregate material properties to meet **Table 2 – AGGREGATE PHYSICAL PROPERTIES** requirements:

Table 2 –AGGREGATE PHYSICAL PROPERTIES

Property		ASTM	ESAL	Min	Max
Coarse Aggregate (does not pass No. 4 sieve)					
Angularity (fractured faces), percent		D5821	less than 0.3	55	--
			0.3 to 3.0	75	--
			greater than 3.0	85/80	--
Wear (hardness or toughness), percent		C131/C131M	less than 0.3	--	40
			0.3 to 3.0	--	35
			greater than 3.0	--	35
Flats or elongates (3:1 length to width), percent, maximum		D4791	--	--	20
Fine Aggregate (passing No. 4 sieve)					
Angularity (uncompacted void content), percent (AASHTO T304)		--	less than 0.3	--	--
			0.3 to 3.0	40	--
			greater than 3.0	45	--
Sand equivalent, percent		D2419	less than 0.3	40	--
			0.3 to 3.0	40	--
			greater than 3.0	45	--
Friable particles, percent		C142	--	--	2
Plastic limit, maximum	Liquid limit	D4318	--	--	25
	Plastic limit	D4318	--	--	6

Notes:
1. ESAL in millions.
2. Angularity by weight retained above 9 mm sieve, with at least one fractured face. 85/80 denotes 85 percent coarse aggregate has one fractured face and 80 percent has two or more fractured faces.
3. Wear of aggregate retained above 2.36 mm sieve unless specific aggregates have higher values are known to be satisfactory.
4. Flats or elongates retained above 4.75 mm sieve.
5. Friable particles passing No. 4.75 mm sieve.
6. Plasticity, passing No. 4.75 sieve. Aggregate is no-plastic even when filler material is added to aggregate.

Blended Physical Properties				
Dry-rodded unit weight, lb/ft^3, minimum	C29/C29M	-	75	--
Weight loss (soundness), percent, maximum	C88		--	16
Clay content or cleanliness (sand equivalent), percent	D2419	less than 0.3	45	--
		more than 0.3	60	--

Notes:
1. Weight loss using sodium sulfate.
2. Sand equivalent value is after going through dryer or before drum mixer. The sand equivalent requirement is waived for RAP aggregate but applies to remainder of aggregate blend.
3. Friable particles of clay lumps, shale, wood, mica, and coal passing 4.75 sieve.

3. Admixture:
   a. Antistrip: Heat stable, cement slurry, lime slurry, dry lime, or liquid antistrip:
      1) Add if mix is moisture sensitive as determined by 'Moisture Susceptibility' paragraph below.
   b. Mineral Filler: Comply with requirements of ASTM D242/D242M.
   c. Recycle Agent: Comply with requirements of ASTM D4552/D4552M.

2.2 MATERIAL

A. Aggregate Base: Conform to applicable requirements as specified in Section 31 1123: 'Aggregate Base'.
B. Asphalt Paving Surface Treatment:
   1. Include mandatory Asphalt Paving Surface Treatment to be applied no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project:
      a. Asphalt Based Penetrating Seal as specified in Section 32 0113.01 'Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal'.

C. Pre-Emergent Herbicide:
   1. Design Criteria:
      a. Selective type pre-emergence control chemical containing forty (40) percent Trifluralin minimum for control of annual grasses and broadleaf weeds.
      b. Non-oil based sterilant.
      c. Labeled for under-pavement use.
   2. Type Two Acceptable Products:
      a. Treflan E.C. by Monterey AgResources, Fresno, CA www.montereyagresources.com (available in western United States).
      b. Trust 4EC by WinField Solutions LLC (Agrilsolutions), St Paul, MN www.agrisolutionsinfo.com (available in United States).
      c. Equal as approved by Architect before installation. See Section 01 6200.

D. Reclaimed Asphalt Pavement (RAP). Aggregate: Restrictions include:
   1. Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used.

E. Tack Coat:
   1. Emulsified asphalt meeting requirements of ASTM D977, Grade SS-1H, CQS-1H, or ASTM D2397/D2397M, Grade CSS-1H.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Approved Applicators. See Section 01 4301 'Quality Assurance - Qualifications':

3.2 PREPARATION

A. General:
   1. Aggregate base and paving must be placed before any moisture or seasonal changes occur to subgrade that would cause compaction tests previously performed to be erroneous. Re-compact and retest subgrade soils that have been left exposed to weather.

B. Protection Of In-Place Conditions:
   1. Pre-emergent herbicide:
      a. Take necessary precautions to protect adjoining property and areas designated for planting on building site.
      b. Do not contaminate any body of water by direct application, cleaning of equipment or disposal of wastes.
   2. Asphalt Paving:
      a. Protect all structures, including curb, gutter, sidewalks, guard rails and guide posts.
      b. Protect neighborhood, storm drains and down-stream fish habitat.

C. Surface Preparation:
   1. Survey and stake parking surfaces to show grading required by Contract Documents.

2. Subgrade (soil below aggregate base):
   a. Prepare natural soil subgrade as specified in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in Section 31 2216 'Fine Grading'.
3. Aggregate base:
   a. Finish grade parking surface area to grades required by Contract Documents.
   b. Compact aggregate base as specified in Section 31 1123 'Aggregate Base'.
   c. Tolerances:
      1) Elevation of aggregate base shall be 0.00 inches high and no more than 1/2 inch low.
      2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
4. Tack coat:
   a. Clean surface of all materials such as mud, dirt, leaves, etc. that prevent tack from bonding to existing surfaces.
      1) If flushed, allow surface to dry.
5. Asphalt paving:
   a. Area shall be clean and tack coat applied before placing of asphalt paving.
      1) Remove all moisture, dirt, sand, leaves, and other objectionable material from prepared surface before placing asphalt.
      2) Locate, reference, and protect all utility covers, monuments, curb, and gutter and other components affected by asphalt paving operations.
      3) Allow sufficient cure time for tack coat before placing asphalt.

3.3 APPLICATION

A. Interface With Other Work:
   1. Section 31 1123: 'Aggregate Base' for compaction of aggregate base.
   2. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
   3. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
   4. Section 31 2323: 'Fill' for compaction procedures and tolerances.

B. Pre-Emergent Herbicide:
   1. Asphalt paving areas:
      a. Follow Manufacturer's printed application requirements:
      b. Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended amount of chemical will be applied to every 1000 sq ft and liquid will penetrate minimum of 2 inches.
      c. Application shall be no more than one (1) day before installation of aggregate base.

C. Tack Coat:
   1. General:
      a. Tack coat vertical surfaces or existing asphalt cement concrete or portland cement concrete that will be in contact with asphalt paving.
      b. Use tack coat diluted to a 2:1 (concentrate water) ratio.
      c. Use pressure distributor to apply in uniform, continuous spread.
      d. Cover all tacked surface areas with surfacing materials same day of application.
   2. Application rate. Typically, as follows:
      a. Emulsions, 0.08 to 0.15 gallons per sq yd of diluted material:
         1) Apply sufficient to achieve ninety-five (95) percent or better coverage of existing surfaces.
         2) Above application rates may vary according to field conditions. Obtain approval from Civil Engineer for quantities, rate of application, temperatures, and areas to be treated before any application.

D. Asphalt Paving:
   1. General:
      a. Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch higher than concrete.
      b. Surface texture of hand worked areas shall match texture of machine-laid areas.

c. Surface shall be uniform with no 'birdbaths'. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch.
d. Cross Slope: 1/4 inch in 10 feet perpendicular to centerline except at cross section grade breaks.
e. Grade: 1/8 inch in 10 feet parallel to centerline.
f. Do not place on frozen aggregate base or during adverse climatic conditions such as precipitation or when roadway surface is icy or wet.
g. Uniformly mix materials so aggregate is thoroughly coated with asphalt.
h. Place at temperatures established by the mix design with self-propelled laydown machine.
i. Use **Table 3 – MINIMUM TEMPERATURE, DEGREES** as guide:

Table 3 – MINIMUM TEMPERATURE, DEGREES

Ambient Air Temperature Deg F.	Ambient Air Temperature Deg C.	Compacted Paving Mat Thickness					
		3/4" (19 mm)	1" (25 mm)	1 1/2" (38 mm)	2" (50 mm)	3" (75 mm)	4" + (100 mm) +
45 – 50	7 – 10	---	---	---	---	280	265
50 – 59	10 – 15	---	---	---	280	270	255
60 – 69	16 – 20	---	---	285	275	265	250
70 – 79	21 – 79	285	285	280	270	265	250
80 - 89	27 - 31	280	275	270	265	260	250
90+	32+	275	270	265	260	250	250

j. Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.

2. Compaction:
a. Compact asphalt paving to ninety-four (94) percent plus or minus two (2) percent of theoretical maximum specific gravity, ASTM D2041/D2041M (Rice Method - maximum theoretical density).
b. Roll with powered equipment capable of obtaining specified density while providing required smoothness.
c. Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum.
d. Complete handwork compaction concurrently with breakdown rolling.
e. Execute compaction so visibility of joints is minimized:
f. Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm.
g. Do not use vibration for finish rolling.

3. Lift Thickness:
a. Preferred Method:
1) For pavements 3-1/2 inch or thinner apply asphalt paving in single lift.
2) For pavements greater than 3-1/2 inch, use alternate method below.
b. Alternate Method:
1) Asphalt paving may be applied in two (2) lifts, first 2 inches thick minimum and second 1 1/2 inches thick minimum following temperature recommendations of following paragraph.
2) Surface of first lift shall be clean and provide tack coat between first and second lifts.
3) Provide not less than two (2) times maximum aggregate size in compacted asphalt concrete mixes.

E. Asphalt Paving Surface Treatments:
1. Apply mandatory Asphalt Paving Surface Treatment no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project. Do not apply prior to asphalt curing (refer to 'Asphalt, Concrete and Pervious Concrete Maintenance Guidelines'):
a. Asphalt Based Penetrating Seal as specified in Section 32 0113.01 'Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal'.

F. Paint Stripes:
1. Apply paint stripes after asphalt paving surface treatment has been applied to asphalt paving.

3.4 FIELD QUALITY CONTROL

A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
   a. Quality Control is sole responsibility of Contractor:
      1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
         a) Testing and inspections will be responsibility of Contractor to be performed by an independent entity.
      2) Contractor bears full responsible for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.

B. Field Tests (Provided by Contractor):
1. General:
   a. Contractor bears full responsibility for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.
   b. Testing and Inspection Reports to be distributed as specified in Section 01 4523 'Testing And Inspection Services'.
2. Compaction Tests:
   a. Contractor to provide compaction tests of asphalt being placed to establish rolling patterns and installation procedures.
   b. Compaction tests by Contractor are independent of compaction tests being provided by Owner. See Section 01 4523 'Testing And Inspection Services'.
   c. Asphalt paving shall be compacted to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) plus three (3) percent or minus two (2) percent. Determine percent compaction by ASTM D2041/D2041M.
3. Thickness Tests:
   a. Determine thickness of paving being placed, no less than one (1) test per 10,000 sq. ft. of paving or portion thereof, three (3) tests minimum.

C. Field Tests And Inspections (Provided by Owner):
1. General:
   a. Compaction tests provided by Owner will be used to validate or determine discrepancies with testing by Contractor.
   b. Civil engineer applies pay factor for Gradation/Asphalt Content, In-Place Density. Civil engineer computes pay factor for each lot.
   c. Opening paved surface to traffic does not constitute acceptance.
   d. Unless required by the Owner's Representative, Testing Agency is to base compaction testing on Contractor's submitted mix design for theoretical maximum specific gravity (Rice) or Marshall specific gravity (Bulk) values.
   e. Asphalt-aggregate mix sampling as per ASTM D979/D979M.
      1) Test for:
         a) Air voids as per ASTM D3203/D3203M.
         b) Asphalt binder content as per ASTM D6307.
         c) Aggregate gradation as per ASTM D5444.
   f. Lot size: 10,000 sq. ft. or part thereof.
   g. Sub lot size: 5,000 sq. ft. or part thereof.
2. At Site Testing and Inspection:
   a. Asphalt Paving:
      1) Testing Agency shall provide full time nuclear density testing and inspection for asphalt paving during asphalt paving operations (nuclear density testing is informational testing only and does not constitute acceptance by Owner).
      2) Inspection to include:

a) Aggregate coating.
b) Compaction control and effort required.
c) Suitability of spreading and asphalt paving equipment.
d) Temperature of mix as delivered and placed.
(1) Reject mixes exceeding 325 deg F in transport vehicle as required in Non-Conforming Work below.
(2) Dispose of cold mix in paver hopper as thin spread underlay.

3) Field Tests:
a) When tested with 10 foot straight edge, surface of completed work shall not contain irregularities in excess of 1/4 inch.
b) Determine percent compaction per ASTM D2950/D2950M unless other nondestructive nonnuclear methods such as sonar are used.
c) Provide written nuclear density testing, or other nondestructive nonnuclear methods such as sonar, of asphalt paving at minimum rate of one (1) per 2,500 sq. ft. Select test locations by ASTM D3665 and sample per ASTM D979/D979M before compaction. Minimum of three (3) tests required.
d) Compact asphalt paving to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) plus three (3) percent or minus two (2) percent.
e) Maximum average total air voids in completed hot mix asphalt shall be eight (8) percent but more than three (3) percent as determined by ASTM D2041/D2041M.
f) Determine thickness of paving being placed, no less than one (1) test per 10,000 sq. ft. of paving or portion thereof, three (3) tests minimum.

3. At Laboratory Testing:
a. General:
1) Provide at least one (1) laboratory test series for every 10,000 sq. ft. or part thereof (minimum of one (1) test):
a) Test reports will show compliance with Contract Documents regarding type and depth of aggregate base, depth and density of asphalt paving, asphalt content, aggregate gradation, flow and stability, bulk specific gravity and maximum specific gravity.
b) Reports will also give test procedures used by testing laboratory.

b. Compaction and Final Density:
1) Pavement thickness and final density to be determined by results of coring. Provide one (1) core per 10,000 sq. ft. or part thereof. Minimum of three (3) tests required if under 30,000 sq. ft.
a) Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.
b) At Project Manager's discretion, after consulting with Design Team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.
c) Select test locations by ASTM D3665 and sample per ASTM D979/D979M after compaction.

c. Compaction Pay Factor:
1) Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.
2) At Project Manager's discretion, after consulting with design team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.
3) Average Density, in percent as shown in **Table 4 – COMPACTION PAY FACTORS**:

Table 4 – COMPACTION PAY FACTORS (94 percent of theoretical maximum specific gravity – Superpave (Rice) (ASTM D2041/D2041M plus three (3) or minus two (2) percent)		
Pay Factor	Density, in Percent	
	Average	Lowest Test
0.70	More than 96	---
1.00	92 to 96	89 or Greater
0.90	92 to 96	Less than 89
Reject	Less than 92	---
Notes: 1. At Contractor's discretion and expense, do Hamburg wheel track test (AASHTO T 304) on 3 additional random core samples from non-complying sub-lot of 5,000 sq. ft. Sub-lot will be accepted if average rut depth is less than 10 mm at 20,000 passes.		

d. Pavement Thickness:
   1) Pavement thickness and final density to be determined by results of coring. Provide one (1) core per 10,000 sq. ft.. Minimum of three (3) tests required if under 30,000 sq. ft.
      a) Acceptance will be based on the average of all thickness tests.
      b) At Project Manager's discretion, after consulting with design team, payment may be made for areas deficient in thickness by more than 0.75 inches at fifty (50) percent. If not, remove and replace at no additional cost to the Owner as shown in **Table 5 – THICKNESS PAY FACTORS**:

Table 5 – THICKNESS PAY FACTORS	
Pay Factors	Thickness Deficiency, in Inches (ASTM D3549/D3549M)
1.00	0.00 to 0.25
0.90	0.26 to 0.50
0.70	0.51 to 0.75
Reject	0.76 to 1.00

e. Air Voids:
   1) Basis of evaluation is laboratory compacted samples (not field compacted samples).
   2) Air voids will be mix design target plus or minus one (1) percent.
   3) If test results are not within this Section's limits, options include correction of production procedures or alternate mix design acceptable to Civil Engineer.

D. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Asphalt Paving:
      a. Deficient asphalt paving thickness:
         1) Place additional material over deficient areas. Do not skin patch. Mill for inlay if necessary. Correct deficient asphalt paving thickness at no additional cost to the Owner.
      b. Rejection and Removal of Asphalt Paving:
         1) Remove asphalt paving found defective after installation and install acceptable product at no additional cost to the Owner.
      c. Removal of Asphalt Paving:
         1) Remove spatter, over-coat, or mar at no additional cost to the Owner.
         2) Remove asphalt from borrow pits or gutters at no additional cost to the Owner.
      d. Repair of Asphalt Paving:

1) Repair or replace defective joints, seams, edges at no additional cost to the Owner.

3.5 PROTECTION

A. Tack Coat:
   1. Protect all surfaces exposed to public view from being spattered or marred. Remove any spattering, over-coating, or marring at no additional cost to Owner.
   2. Traffic:
      a. Do not permit traffic to travel over tacked surface until tack coat has cured and dried.

B. Asphalt Paving:
   1. Protect hot mixed asphalt (HMA) pavement from traffic until mixture has cooled enough not to become marked.

3.6 CLEANING

A. Waste Management:
   1. Pre-emergent herbicide:
      a. Follow Manufacturer's recommendations for disposal of product at approved waste disposal facility.
         1) Do not reuse empty containers.

END OF SECTION

SECTION 32 1713

PARKING BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install parking bumpers as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM A615/A615M-15a, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement'.
      b. ASTM A1064/A1064M-15, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
      c. ASTM C33/C33M-13, 'Standard Specification for Concrete Aggregates'.
      d. ASTM C150/C150M-15, 'Standard Specification for Portland Cement'.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Precast Concrete:
   1. Cement: ASTM C150/C150M, Type II.
   2. Aggregates: ASTM C33/C33M.

B. Reinforcing:
   1. Bars: ASTM A615/A615M, Grade 60.
   2. Reinforcing Mesh: ASTM A1064/A1064M.

C. Sealants:
   1. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      a. Dow Corning Corp, Midland, MI www.dowcorning.com:
         1) Primer: 1200 Prime Coat.
         2) Sealant: 790 Silicone Building Sealant.
      b. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/siliconesPrimer: SS4044 Primer.
         1) Primer: SS4044 Primer.
         2) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.

D. Pins: Epoxy coated No. 4 bar, 24 inches long.

2.2 FABRICATION

A. Precast Concrete Parking Bumpers:
   1. 3000 psi concrete minimum.
   2. Chamfered edges.
   3. Smooth finish free from pits and rock pockets.
   4. Cast openings for pins.

5. Cast in two (2) bars, No. 3 minimum, full length of bumper less coverage requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install level with paving and aligned with sidewalks.

B. Recess anchoring pins 1/2 inch below top of bumper. Install sealant in hole to top of bumper.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish acrylic paint and apply pavement and curb markings as described in Contract Documents including:

1.2 REFERENCES

A. Reference Standards:
   1. Federal Specifications and Standards:
      a. FED-STD-595C, 'Federal Standard: Colors Used in Government Procurement' (16 Jan 2008).
      b. FED TT-P-1952F, 'Paint, Traffic and Airfield Marking, Waterborne' (17 Feb 2015).
   2. U.S. Department of Transportation Federal Highway Administration:
      a. FHWA MUTCD-10, 'Manual on Uniform Traffic Control Devices'.

1.3 SUBMITTALLS

A. Action Submittal:
   1. Product Data:
      1) Manufacturer's published product data and certification that product supplied meets requirements of this specification.

B. Informational Submittal:
   1. Test And Evaluation Reports:
      a. Acrylic Paint:
         1) Provide reports showing compliance to FED TT-P-1952F.

C. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Manufacturer's Documentation:
            a) Product data.
            b) Specification compliance documentation.
         2) Testing and Inspection Reports:
            a) Reports showing compliance.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Paint must meet requirements of FED TT-P-1952-F and local regulations for VOC.
   2. Paint handicap spaces to conform to ADA Standards and local code requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Materials shall be delivered in original, unopened containers with labels intact.

a. Labels to include:
1) Manufacturer's name and address.
2) TT-P-1952F reference.
3) Classification Type.
4) Color.

B. Storage And Handling Requirements:
1. Follow Manufacturer's storage and handling requirements.
2. Protect stored material from freezing at temperatures above 35 deg F or above 115 deg F.
3. Do not invert or roll containers.

1.6 FIELD CONDITIONS

A. Ambient Conditions:
1. Acrylic Paint:
a. Apply only on dry clean surfaces, during favorable weather (not excessively windy, dusty, or foggy), and when damage by rain, fog, or condensation not anticipated.
b. Paving surface and Ambient temperature shall be minimum 50 deg F and rising.
c. Temperature shall not drop below 50 deg F within twenty four (24) hour period following application.
d. Acetone based paints that are one hundred (100) percent acrylic shall not drop below 32 deg F within twenty four (24) hour period following application.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Acrylic Paint:
1. Description:
a. Low VOC, ready-mixed, one- component, acrylic waterborne traffic marking paint suitable for application on concrete, asphalt, sealers, and previously painted areas of these surfaces.
2. Design Criteria:
a. General:
1) Traffic Paint.
2) Non-volatile portion of vehicle for all classification types shall be composed of one hundred (100) percent acrylic.
3) Meet FED TT-P-1952F specification requirements.
4) Fast drying when applied at ambient conditions requirement.
5) Low VOC.
6) Non-Reflectorized.
7) Traffic paints not intended for use as floor paints. Do not use on pedestrian walkways or large surfaces such as ramps, floors and stairs which may become slippery when wet.
b. Classification:
1) Type I for use under normal conditions.
c. Composition:
1) Non-volatile portion for all types shall be composed of one hundred (100) percent acrylic polymer as determined by infrared spectral analysis.
2) Prohibited material:
a) Product does not contain mercury, lead, hexavalent chromium, toluene, chlorinated solvents, hydrolysable chlorine derivatives, ethylene-based glycol ethers and their acetates, nor any carcinogen.
d. Qualitative Requirements:
1) Meet FED TT-P-1952F requirements for:
a) Abrasion resistance.
b) Accelerated package stability.

c) Accelerated weathering.
d) Appearance.
e) Color requirements:
(1) Color Match (all colors except white and yellow).
(2) Daylight directional reflectance.
(3) Yellow color match.
f) Condition in container.
g) Dry-through (early washout) for Type II only.
h) Flexibility.
i) Freeze/thaw stability.
j) Heat-shear stability.
k) Scrub resistance.
l) Skinning.
m) Titanium dioxide content.
n) Water resistance.

e. Quantitative requirements:
1) Meet FED TT-P-1952F requirements (Table 1).
2) Acetone based paints that are one hundred (100) percent acrylic and have exempt status under Federal law are exempt from meeting FED TT-P-1925F requirements.

3. Colors:
a. General:
1) Traffic Paint will be furnished in white and any Federal Standard 595 color in accordance to FED-STD-595C:
a) Yellow: 33538.
b) Blue: 35180.
c) Red: 31136.
b. White (Yellow may be used at Owner Representative's discretion):
1) Lane lines, edge lines, transverse lines, arrows, words, symbol markings, speed bump markings, parking space markings.
c. Yellow:
1) Cross-hatching in medians, cross hatching in safety zones separating opposing traffic flows, crosswalk stripes, safety markings, centerlines, edge lines along left edge of one-way roadway or one way ramp.
d. Blue And White:
1) In parking spaces specifically designated as reserved for disabled.
e. Red:
1) Fire lanes, no parking zones, special raised pavement markers that are placed to be visible to "wrong-way" drivers.

4. Type Two Acceptable Products:
a. Any product meeting design criteria of this specification as approved by Architect/Owner's Representative before application. See Section 01 6200.

PART 3 - EXECUTION

3.1 PREPARATION

A. Acrylic Paint:
1. Asphalt Surfaces:
a. Do not apply paint until asphalt has cooled.
b. Allow new seal coated surfaces to cure for at least twenty four (24) hours before applying paint.
2. Concrete Surfaces:
a. Do not apply paint to new concrete surfaces until concrete has cured seven (7) days minimum.

B. Surfaces shall be dry and free of grease and loose dirt particles.

C. Perform layout with chalk or lumber crayon only.

3.2 APPLICATION

A. General:
1. Mix in accordance and apply as per Manufacturer's instructions.
2. Apply at locations and to dimensions and spacing as shown on Contract Drawings.

B. Tolerances:
1. General: Make lines parallel, evenly spaced, and with sharply defined edges.
2. Line Widths:
   a. Plus or minus 1/4 inch variance on straight segments.
   b. Plus or minus 1/2 inch variance on curved alignments.

C. Coverage:
1. Paint stripes added to new asphalt and concrete surfaces:
   a. Apply single coat.
2. Apply traffic paint at rate of 13 to 15 mils minimum wet thickness, 8 to 9 mils dry thickness. Application at more than 15 mils may result in extended dry times and may cause lifting or cracking on some asphalt surfaces.

3.3 FIELD QUALITY CONTROL

A. Non-Conforming Work:
1. Replace or correct defective material not conforming to requirements of this specification or any work performed that is of inferior quality at no cost to Owner.

3.4 CLEANING

A. General:
1. Remove drips, overspray, improper markings, and paint material tracked by traffic by sand blasting, wire brushing, or other method approved by Architect/Owner’s Representative before performance.

B. Waste Management:
1. Remove debris resulting from work of this Section. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

END OF SECTION

SECTION 32 3113

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install complete fence and gates as described in Contract Documents.

B. Related Requirements:
   1. Section 03 3111: 'Cast-In-Place Structural Concrete' for mow strips at fencing and setting sleeves in concrete retaining walls.
   2. Section 05 0503: 'Shop-Applied Metal Coatings' for priming and galvanizing repair.
   3. Section 05 0523: 'Metal Fastening' for welding requirements.

1.2 REFERENCES

A. Association Publications: / Organizations:
   1. Chain Link Fence Manufacturers Institute (CLFMI), Columbia, MD www.chainlinkinfo.org.
      a. WLG 2445, *'Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing*' (2012).
      b. CLF-SFR0111, *'Chain Link Fence Manufacturers Institute Security Fencing Recommendations'*.
      c. CLF-PM0610, *'Field Inspection Guide'*.
      d. CLF-TP0211, *'Tested and Proven Performance of Security Grade Chain Link Fencing Systems'*.

B. Reference Standards:
   1. ASTM International:
      a. ASTM A123/A123M-15, 'Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products'.
      b. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
      c. ASTM A392-11a, 'Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric'.'
      d. ASTM A1011/A1011M-15, 'Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength'.
      e. ASTM C1107/C1107M-13, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)'.
      f. ASTM F1043-17, 'Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework'.
      g. ASTM F1083-16, 'Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures'.
      h. ASTM F3000/F3000M-13, 'Standard Specification for Polymer Privacy Insert Slats for Chain Link Fabric and Privacy Chain Link Fabric Manufactured Containing Pre-Installed Privacy Slats'.

1.3 SUBMITTALS

A. Action Submittals:
   1. Product Data: Manufacturer literature or cut sheets on fence components.
   2. Samples: Types of vision slats and colors for Architect's selection.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Warranty Documentation:
1) Vision Slats:
a) Final, executed copy of Warranty.

1.4 WARRANTY

A. Vision Slats:
1. Manufacturers twenty-five (25) year, pro-rata limited Warranty.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

A. Materials:
1. Fabric:
a. Chain Link Fabric of 9 ga (3.7 mm) wire, galvanized before or after weaving with 1.2 ounce (34 grams) zinc coating conforming to requirements of ASTM A392, Class I.
b. Mesh:
1) With Visual Privacy / Security Slats:
a) 2 inch (50 mm) square mesh required by specified vision slat.
c. Knuckle both selvages.
2. Framework:
a. Posts and Rails shall be roll-formed, self-draining shapes meeting strength requirements of ASTM F1043, Table 3, and with 2 ounce (56.7 grams) zinc coating per 1 sq ft (0.0929 sq meter) of surface area conforming to ASTM A123/A123M.
b. Line Posts:
1) Line Posts 8 feet (2.45 m) and under:
a) 1.875 by 1.625 inch (48 by 41 mm) C-section roll formed from steel conforming to ASTM A1011/A1011M, Grade 45, with minimum theoretical bending strength of 247 lbs (112 kg) under 6 foot (1.80 m) cantilever load.
b) 2.375 inch (60 mm) outside diameter Schedule 40 tubular section weighing 3.65 lbs (1.6 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
c) 2.375 inch (60 mm) outside diameter Schedule 40 tubular section weighing 3.12 lbs (1.42 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
c. Terminal And Gate Posts:
1) Gate Posts and gate posts for gate leaves under 6 feet (1.80 m) wide:
a) 3.5 by 3.5 inch (89 by 89 mm) roll formed section with minimum theoretical bending strength of 486 pounds (220.5 kg) under 6 foot (1.80 m) cantilever load.
b) 3 inch (76 mm) outside diameter Schedule 40 pipe weighing 5.79 lbs (2.63 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
c) 3 inch (76 mm) outside diameter Schedule 40 tubular section weighing 4.64 lbs (2.11 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.
2) Gate Posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths over 6 feet (1.80 meter):

Leaf Width	Post Outside Diameter	Lbs / lin ft (305 mm)
Over 6 ft (1.80 m) to 13 ft (3.96 m)	4 inches (100 mm)	9.11 (4.13 kg)
Over 13 ft (3.96 m) to 18 ft (5.49 m)	6.625 inches (168 mm)	18.97 (8.60 kg)
Over 18 ft (5.49 m)	8.925 inches (227 mm)	28.55 (12.95 kg)

d. Top And Brace Rail:

1) 1.625 by 1.25 inch (41 by 32 mm) roll formed section of 45,000 psi (310 MPa) yield strength channel shaped rail with minimum theoretical bending strength of 247 lbs (112 kg) on 10 foot (3.050 m) midpoint load.
2) 1.660 inch 42 mm outside diameter Schedule 40 pipe weighing 2.27 lbs (1.03 kg) per lineal 1 ft (305 mm) meeting requirements of ASTM F1083.
3) 1.660 inch 42 mm outside diameter Schedule 40 tubular section weighing 1.84 lbs (0.83 kg) per lineal 1 ft (305 mm) formed from steel meeting requirements of ASTM A1011/A1011M.

e. Fittings:
1) Pressed steel or malleable iron, hot-dip galvanized conforming to ASTM A153/A153M.
2) Tie wires shall be 12 ga (2.05 mm) minimum galvanized steel or 9 ga (3 mm) minimum aluminum wire.

f. Tension Wire: 7 ga (3.66 mm) minimum galvanized spring steel.

3. Gate Leafs Wider Than 6 Feet (1.80 Meters):
a. Fabricate perimeter frames from metal and finish to match fence framework. Assemble frames by welding or with special fittings and rivets, for rigid connections, providing security against removal or breakage connections.
1) Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretchers bars to frame at not more than 15 inches (380 mm) on center.
2) Install diagonal cross-bracing consisting of 3/8 inch (9.5 mm) diameter adjustable length truss rods to ensure frame rigidity without sag or twist.

b. Swing Gates: Fabricate perimeter frames of minimum 1.90 inches (48.26 mm) OD pipe.
c. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A153/A153M, and in accordance with following:
1) Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 foot (1.80 m) nominal height.
2) Latch At Paving: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

d. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
e. Double Gates:
1) Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar.
2) Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

f. Sliding Gates: Provide Manufacturer's standard heavy-duty inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.

B. Mixes:
1. Post Foundation Concrete:
a. One cu ft cement, 2 cu ft (0.0566 cu m) sand, 4 cu ft (0.1132 cu m) gravel, and 5 gallons (18.93 liters) minimum to 6 gallons (22.71 liters) maximum water.
b. Mix thoroughly before placing.

2.2 ACCESSORIES

A. Post Setting Grout at Sleeves:
1. Commercial nonshrink grout conforming to requirements of ASTM C1107/C1107M, Type B or C.
2. Type Two Approved Products:
a. Normal Construction Grout A by W R Bonsal, Charlotte, NC www.bonsal.com.
b. Advantage 1107 Grout by Dayton Superior, Miamisburg, OH www.daytonrichmond.com.
c. NS Grout by Euclid Chemical Co, Cleveland, OH www.euclidchemical.com.
d. 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT www.fivestarproducts.com.
e. Duragrout by L&M Construction Chemicals Inc, Omaha, NE www.lmcc.com.
f. Masterflow 713 Pre-mixed Grout by Master Builders, Cleveland, OH www.masterbuilders.com.

g. Tamms Grout 621 by TAMMS Industries, Mentor, OH www.tamms.com.
h. U S Spec MP Grout by U S Mix Products Co www.usspec.com.
i. CG-86 Grout by W R Meadows, Elgin, IL www.wrmeadows.com.
j. Equal as approved by Architect before use. See Section 01 6200.

B. Vision Slats And Fabric:
1. Manufacturer Contact List:
a. *Privacy*Link, Hyde Park, UT www.eprivacylink.com.
2. Description:
a. High-density polyethylene (HDPE), double-walled, self-locking or with locking feature that prevents slats from being removed
b. Slats pre-woven and pre-inserted into chain link fabric.
3. Design Criteria:
a. Meet ASTM F3000/F3000M requirements for pre-installed privacy slats.
b. Provide slats with ultra violet (UV) inhibitors.
4. Visual Privacy / Security:
a. Near-Total Privacy:
1) Description:
a) When installed, slats will provide 98 percent minimum visual privacy/security.
b) Mesh: 2 inch x 2 inch (50 mm x 50 mm).
2) Pre-inserted Slats:
a) Double-wall with wings on each side of slat that wedge slats tightly into mesh and secured in place at both top and bottom of fence by flexible round tubes.
3) Type Two Acceptable Product:
a) Noodle Link Plus by *Privacy*Link.
b) Equal as approved by Architect before installation. See Section 01 6200.
5. Color:
a. Slats:
1) As selected by Architect from Manufacturer's standard colors.
b. Flexible round tubes:
1) Galvanized Grey.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fence shall be installed by mechanics skilled and experienced in erecting fences of this type and in accordance with Contract Documents.
1. When general ground contour is to be followed, make changes of grade in gradual, rolling manner.
2. Evenly space posts in line of fence a maximum of 10 feet (3.050 meter) center to center.

B. Post Foundations:
1. Except atop retaining walls, set posts with concrete post foundations as specified below:
a. Line Posts:
1) Diameter 8 inch (200 mm)
2) Depth 36 inch (915 mm).
b. Gate, End, And Corner Posts:
1) Diameter 12 inch (305 mm)
2) Depth 42 inch (1 065 mm).
c. At mow strips, set top of post foundation below grade sufficient to allow for placing of mow strip. Measure post foundation depth from top of mow strip.
d. Where fences are incorporated into slabs, measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post. At existing slabs, install fence outside perimeter of slab.
e. For fences on retaining walls, provide 12 inch (305 mm) long sleeves to be cast into retaining wall. Set pipe in sleeve and grout space between sleeve and post full.

C. Fence:
   1. After posts have been permanently positioned and concrete cured for one (1) week minimum, install framework, braces, and top rail. Join top rail with 6 inch (150 mm) minimum couplings at not more than 21 foot (6.40 meter) centers.
   2. Stretch fabric by attaching one end to terminal post and supplying sufficient tension to other end of stretch so slack is removed.
      a. Fasten fabric to line posts with tie wires. Pass ties over one strand of fabric and hook under line post flange.
      b. Place one tie as close to bottom of fabric as is possible with additional ties equally spaced between top and bottom band on approximately equal spacing not to exceed 14 inches (355 mm) on center.
      c. Attach fabric to roll formed terminals by weaving fabric into integral lock loops formed in post. Attach fabric to tubular terminals with tension bars and bands.
      d. Hold fabric approximately 2 inches (50 mm) above finish grade line.
      e. On top rail, space tie wires at no more than 24 inches (610 mm) on center.
      f. Securely attach fittings and firmly tighten nuts.

D. Gates:
   1. Weld gate frames and provide for free and easy operation.
   2. Provide gate latching device with padlocking capabilities. Provide cane bolt to engage sleeve set in concrete at double gates.
   3. Align top bar of gates with top rail of fence.
   4. Gates shall be plumb and on same plane as fence, both vertically and horizontally.
   5. Set gate stops and other catches in concrete.

3.2 CLEANING

A. Spread dirt from foundation excavations evenly around surrounding area unless otherwise directed. Leave area free of excess dribbles of concrete, pieces of wire, and other scrap materials.

END OF SECTION

SECTION 32 9001

COMMON PLANTING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Common procedures and requirements for landscaping work.
   2. Provide maintenance for new landscaping as described in Contract Documents.

B. Related Requirements:
   1. Pre-Installation conferences held jointly with Section 32 9001 as described in Administrative Requirements on Part 1 of this specification section:
   2. Section 01 4301: 'Quality Assurance – Qualifications'.
   3. Section 31 0501: ‘Common Earthwork Requirements’.
   4. Section 31 1100: ‘Clearing and Grubbing’.
   5. Section 31 1413: ‘Topsoil Stripping And Stockpiling’.
   6. Section 31 2213: ‘Rough Grading’.
   7. Section 31 2216: 'Fine Grading'.
   8. Section 31 2316: ‘Excavation’.
   9. Section 31 2323: ‘Fill’.
   10. Section 32 8423: 'Underground Sprinklers'.
   11. Section 32 9120: ‘Topsoil And Placement’.
   12. Section 32 9121: ‘Topsoil Physical Preparation’ (section included based on Topsoil Testing Report).
   13. Section 32 9122: ‘Topsoil Grading’.
   14. Section 32 9219: 'Seeding'.
   15. Section 32 9223: 'Sodding'.
   16. Section 32 9300: 'Plants'.
   17. Section 32 9413: 'Landscape Edging'.

1.2 REFERENCES

A. Definitions:
   1. Landscape Management Plan (LMP): LMP is an Owner’s Representative’s quick reference maintenance document. It is a combination of Irrigation Sections from 32 8000 and Planting Sections from 32 9000. The LMP document is created from Operations and Maintenance Data, Warranty Documentation, and Record Documentation
   2. Landscape Final Acceptance: Inspection, no less than (30) days following substantial completion, when all work has been completed, demonstrated, and approved by the Landscape Architect. Coordinate with Sections 32 8423 and Sections under 32 9000 ‘Planting’.
   3. Plant Establishment Period: Time required for plants to successfully develop root systems into surrounding soil. Following this period, irrigation run times are typically modified. For purposes of this contract, the plant establishment period is assumed to be one (1) year from date of Substantial Completion.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference and held jointly with following sections:
      a. Section 32 8423: 'Underground Sprinklers'.
      b. Section 32 9120: ‘Topsoil And Placement’.
      c. Section 32 9121: ‘Topsoil Physical Preparation’ (section included based on Topsoil Testing Report).

d. Section 32 9122: ‘Topsoil Grading’.
e. Section 32 9219: 'Seeding'.
f. Section 32 9223: 'Sodding'.
g. Section 32 9300: 'Plants'.
h. Section 32 9413: 'Landscape Edging'.

2. In addition to agenda items specified in Section 01 3100, review the following:
   a. Site Visits:
      1) Landscape Architect to visit site five (5) times during project construction.
      2) If site conditions necessitate additional visits, Landscape Architect can schedule addition site visits with approval from Architect prior to bid.
      3) During construction, addition site visits may be approved in writing by Architect or Owner for special considerations before commencement.
      4) Site visits caused by lack of work progress by Landscape Subcontractor shall reimburse Landscape Architect amount determined by Architect or Owner for additional site visits.
   b. Coordination:
      1) Landscape Subcontractor and Landscape Architect to coordinate site visits and include Architect and General Contractor in communications.
   c. Landscape Maintenance:
      1) Establish responsibility for maintenance of new landscaping during all phases of construction period.
   d. Percolation Test:
      1) Prepare two (2) typical landscape planting excavations and conduct percolation test to verify that water drains away within two (2) hours.
      2) Discuss results of percolation tests with Architect and Owner's Representative.
   e. Review additional agenda items as specified in related sections listed above.
3. Approved Site Visits:
   a. Site Visit No. 1:
      1) Description:
         a) Landscape pre-installation Conference.
      2) Schedule: Conduct pre-installation conference after completion of Fine Grading specified in Section 31 2216, but one (1) week minimum before beginning landscape work.
      3) Required Attendees:
         a) Project Manager, Facilities Manager, Architect, General Contractor, Landscape Subcontractor, Excavator, and Landscape Architect.
         b) Include Landscaping Subcontractor Foreman and those responsible for installation of landscaping to be in attendance.
      4) Related Sections:
         a) Section 31 0501: 'Common Earthwork Requirements'.
         b) Section 32 8423: 'Underground Sprinklers'.
         c) Section 32 9120: ‘Topsoil And Placement’.
         d) Section 32 9121: ‘Topsoil Physical Preparation’ (section included based on Topsoil Testing Report).
         e) Section 32 9122: ‘Topsoil Grading’.
         f) Section 32 9219: 'Seeding'.
         g) Section 32 9223: 'Sodding'.
         h) Section 32 9300: 'Plants'.
      5) Notes:
         a) Verify project site conditions and review scope of work before installation begins.
         b) Verify appropriate sub-grades have been established.
   b. Site Visit No. 2:
      1) Description:
         a) Irrigation system pressure test compliance, main line inspection, valve inspection.
      2) Schedule: Conduct site visit one (1) week minimum after notification before beginning irrigation system pressure test.
      3) Required Attendees:
         a) General Contractor, Landscape Subcontractor, Landscape Architect.
      4) Recommended Attendees:
         a) Project Manager, Facilities Manager.
      5) Related Sections:
         a) Section 32 8423: 'Underground Sprinklers'.

b) Section 32 9120: 'Topsoil And Placement'.
c) Section 32 9122: 'Topsoil Grading'.

6) Notes:
a) Verify finish grading in preparation for planting.

c. Site Visit No. 3:
1) Description:
a) Inspect and approve plant quality, plant quantity, plant pits, plant pit backfill, planting depths, and removal of packaging/distribution materials, wire, and ties.
2) Schedule: Conduct site visit one (1) week minimum after notification from Contractor before beginning site visit no. 3.
3) Required Attendees:
a) General Contractor, Landscape Subcontractor, Landscape Architect.
4) Recommended Attendees:
a) Project Manager, Facilities Manager.
5) Related Sections:
a) Section 32 9300: 'Plants'.
6) Notes:
a) Inspect irrigation system installation, inspect weed barrier fabric.

d. Site Visit No. 4:
1) Description:
a) Comprehensive Substantial Completion inspection prior to beginning thirty (30) day Landscape Subcontractor maintenance period.
2) Schedule: Conduct site visit one (1) week minimum after notification before beginning site visit no. 4.
3) Required Attendees:
a) Project Manager, Facilities Manager, Architect, General Contractor, Landscape Subcontractor, Landscape Architect.
4) Related Sections:
a) Section 32 8423: 'Underground Sprinklers'.
b) Section 32 9300: 'Plants'.
5) Notes:
a) Verify contract requirements have been followed including but not limited to: planting compliance, irrigation system coverage and irrigation system operation.

e. Site Visit No. 5:
1) Description:
a) At the end of thirty (30) day Landscape Subcontractor maintenance period, verify deficient items have been corrected and verify no others exist.
2) Schedule: Conduct site visit one (1) week minimum after notification before beginning site visit no. 5.
3) Required Attendees:
a) Project Manager, Facilities Manager, Architect, General Contractor, Excavation Subcontractor, Landscape Subcontractor, Landscape Architect.
4) Related Sections:
a) Section 32 8423: 'Underground Sprinklers'.
b) Section 32 9300: 'Plants'.
5) Notes:
a) Review Landscape Management Plan (LMP) with Owner's Representative. Provide landscape maintenance training.

1.4 SUBMITTALS

A. Informational Submittals:
1. Certificates:
a. Landscape Architect will provide certificate acknowledging 'Plant Establishment Period' commencement:
1) Certificate will include name and signature of Contractor, Contractor's company, Contractor's telephone number, and date.

2) Certificate will include name and signature of Owner's Representative, Owner's Representative's Group name, Owner's Representative Group telephone number, and date.
3) Certificate will acknowledge date when Establishment Period begins and that it extends one (1) year from that time.

2. Special Procedure Submittals:
   a. Installer to provide two (2) copies of following recommendations to be included in Closeout Submittals:
      1) Landscape maintenance recommendations.
      2) Individual landscape maintenance recommendations.
      3) Plant establishment maintenance recommendations.
      4) Post-plant establishment maintenance recommendations.
3. Qualification Statement:
   a. Landscape Subcontractor:
      1) Provide Qualification documentation if requested by Landscape Architect or Owner.
   b. Installer:
      1) Provide Qualification documentation if requested by Landscape Architect or Owner.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800 (combine with sections of 32 8000 and sections of 32 9000 if applicable):
   a. Record Documentation:
      1) Submit one (1) copy certificate for 'Plant Establishment Period' acknowledgement.
      2) Submit one (1) copy of recommendations specified in Special Procedure Submittals.
      3) Record Drawings:
         a) As installation occurs, prepare accurate record drawings. Submit one (1) full size copy prior to final inspection. Drawing shall include:
            (1) Detail and dimension changes made during construction.
            (2) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
   b. Landscape Management Plan (LMP):
      1) Landscape Section:
         a) Submit one (1) copy certificate for 'Plant Establishment Period' acknowledgement.
         b) Submit one (1) copy of recommendations specified in Special Procedure Submittals.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
1. Post-Emergent Weed Control:
   a. Products shall be recognized for intended use by AHJ.

B. Qualifications:
1. Landscape Subcontractor. Requirements of Section 01 4301 applies, but not limited to following:
   a. Company specializing in performing work of this section.
   b. Minimum five (5) years' experience in landscaping installations.
   c. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
   d. Upon request, submit documentation.
2. Installer:
   a. Planting shall be performed under direction of foreman or supervisor with minimum three (3) years' experience in landscape installations similar in size, scope, and complexity.
   b. Foreman or supervisor required to attend pre-installation conference.
   c. Use trained personnel familiar with required planting procedures and with Contract Documents.
   d. Upon request, submit documentation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:
   1. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer.
   2. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition.
   3. Protect materials from deterioration during delivery.

B. Storage And Handling Requirements:
   1. Store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.
   2. Protect materials from deterioration while stored at site.

PART 2 - PRODUCTS

2.1 POST-EMERGENT WEED CONTROL

A. Type Two Acceptable Products:
   1. Enide by Upjohn.
   2. Dymid by Elanco.
   3. Treflan or Surflan by Dow Agrosciences.
   4. Eptan by Syngenta.
   5. Equal as approved by Architect before use. See Section 01 6200.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Acceptable Installers:
   1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

3.2 EXAMINATION

A. Verification Of Conditions:
   1. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities.

3.3 PREPARATION

A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
   1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
   2. All planting indicated on Contract Documents is required unless indicated otherwise.

B. Protection:
   1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
   2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
   3. Keep site well drained and landscape excavations dry.

3.4 INSTALLATION

A. Interface With Other Work:
   1. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Section 31 2216 and Section 32 8423 has been completed and approved.

B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

C. Hand excavate as required.

D. Maintain grade stakes until parties concerned mutually agree upon removal.

E. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

3.5 FIELD QUALITY CONTROL

A. Field Inspection:
   1. Landscape Architect will inspect landscaping installation at Substantial Completion.

B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
   1. Replace damaged plantings within (10) days of notification at no additional cost to Owner.
   2. Repair damage to irrigation, ground lighting, utilities, paving, concrete curb and gutters and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

3.6 CLEANING

A. Waste Management:
   1. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

3.7 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:
   1. Include following training:
      a. Review Landscape Management Plan (LMP):
         1) Review maintenance recommendations.
      b. Review Maintenance as specified at the end of this specification.
   2. Establishment Period Acknowledgement (coordinate with 32 8000 section):
      a. Landscape Architect will acknowledge Establishment Period commencement.

3.8 PROTECTION

A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.

B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

3.9 MAINTENANCE

A. General:

1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection.
2. Maintain landscaping for thirty (30) days minimum after Substantial Completion Meeting. Areas sodded or seeded after November 1st will accepted following spring approximately one (1) month after start of growing season, May 1st or as determined by Architect, if specified conditions have been met.
3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Architect before end of maintenance period. Make replacements within ten (10) days of notification. Lawn being replaced shall be guaranteed and maintained an additional thirty (30) days from date of replacement.

B. Seeded Lawn:
1. Seeded lawn areas will not be accepted as complete and thirty (30) day maintenance period will not begin until uniform stand of grass at least 3 inches (75 mm) tall has been obtained.
2. After grass is established and 3 inches (75 mm) tall, mow lawn areas at least weekly to a height of 2 inches (50 mm). During this period, perform work necessary to maintain a full, even stand of grass.
3. At end of thirty (30) days of maintenance period, fertilize lawns as specified in Section 32 9113.
4. Apply weed killers as necessary in order to obtain weed free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F (10 and 27 deg C).

C. Sodded Lawn:
1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches (75 to 100 mm) deep.
3. Cut grass first time when it reaches 3 inches (75 mm) high. Continue to mow at least once each week throughout maintenance period. Remove clippings.
4. Apply weed killer as necessary to maintain weed-free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between 50 and 80 deg F (10 and 27 deg C).
5. At end of thirty (30) day maintenance period, fertilize lawns as recommended in Section 32 9122.

D. Trees, Shrubs, And Plants:
1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

END OF SECTION

SECTION 32 9120

TOPSOIL AND PLACEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform topsoil evaluation and placement required prior to topsoil grading as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: 'Common Earthwork Requirements':
   2. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
   3. Section 31 2216: ‘Fine Grading’ for landscaping and planting areas.
   4. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other common planting related sections.
   5. Section 32 9121: ‘Topsoil Physical Preparation’ for physical preparation of topsoil (section included based on Topsoil Testing Report).
   6. Section 32 9122: ‘Topsoil Grading’ for preparation of topsoil and addition of amendments prior to landscaping.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D1557-12, ‘Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))’.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.
   2. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following:
      a. Review finish grade elevation and tolerance requirements.
      b. Review surface preparation requirements including disking, tilling, ripping, or aerating.
      c. Review Attachment 'Topsoil Testing Report' including:
         1) Landscape Architect, Contractor, Testing, and Soil Testing Laboratory Instructions.
      d. Review Field Quality Control testing requirements for 'Topsoil Testing Report' including:
         1) Corrections required for topsoil not meeting requirements of this specification.
         2) Approval requirement of ‘Topsoil Testing Report’ by Landscape Architect.
         3) Submittals required as identified in Closeout Submittals.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Testing And Evaluation Reports:
      a. Use ‘Topsoil Testing Report’ attachment to this specification for Topsoil Testing as specified in 'Field Quality Control' in Part 3 of this specification for imported and site topsoil and account of recent use:
         1) Owner will pay for one (1) final test.
         2) Additional test(s) if necessary will be paid by Contractor.

3) Submit two (2) copies of Final 'Topsoil Testing Report' approved by Landscape Architect to be included with Closeout Submittals.

2. Field Quality Control Submittals:
   a. Submit report stating location of source of imported topsoil and account of recent use.
   b. Submit delivery slips indicating amount of physical amendments delivered to Project site.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
   a. Record Documentation:
      1) Submit one (1) copy Final approved 'Topsoil Testing Report'.
      2) Provide report stating location of source of imported topsoil and account of recent use.
   b. Landscape Management Plan (LMP):
      1) Landscape Section:
         a) Submit one (1) copy in LMP Landscape Section Final approved 'Topsoil Testing Report'.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
1. Design Criteria:
   a. Topsoil used in landscaped areas, whether imported, stockpiled, or in place, shall be weed free, fertile, loose, friable soil meeting following criteria:
      1) Chemical Characteristics:
         a) pH 5.5 to 8.0.
         b) Soluble Salts: less than 3.0 mmhos/cm.
         c) Sodium Absorption Ratio (SAR): less than 6.0.
         d) Organic Matter: greater than one percent.
      2) Physical Characteristics:
         a) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
            (1) Sand: 15 to 60 percent.
            (2) Silt: 10 to 60 percent.
            (3) Clay: 5 to 30 percent.
         b) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than or equal to 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
         c) Soil (Coordinate screening as specified in Section 31 1413 'Topsoil Stripping And Stockpiling' to meet these characteristics):
            (1) Soil shall not contain more than five (5) percent by volume of rocks measuring over 1/4 inch (6 mm) in largest size.
            (2) Soil shall be topsoil in nature.
            (3) Soil resembling road base or other like materials are not acceptable.
2. Project Topsoil Requirements:
   a. It is anticipated that following percentages of material will be required to meet topsoil requirements of Project site:
      1) Imported Topsoil: Percent of landscape area, as determined in conjunction with Geotechnical Engineering coordination on-site**.**
         a) Lawn Areas: Percent of imported topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site**.**
         b) Shrub / Tree Areas: Percent of imported topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site**.**
         c) Native Grass / Shrub / Tree Areas: Percent of imported topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site**.**
      2) Stockpiled Topsoil: Percent of landscape area, as determined in conjunction with Geotechnical Engineering coordination on-site**.**

a) Lawn Areas: Percent of stockpiled topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site.
b) Shrub / Tree Areas: Percent of stockpiled topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site.
c) Native Grass / Shrub / Tree Areas: Percent of stockpiled topsoil.

3) In-Place Topsoil: Percent of landscape area, as determined in conjunction with Geotechnical Engineering coordination on-site.
a) Lawn Areas: Percent of in-place topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site.
b) Shrub / Tree Areas: Percent of in-place topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site.
c) Native Grass / Shrub / Tree Areas: Percent of in-place topsoil, as determined in conjunction with Geotechnical Engineering coordination on-site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Do not commence work of this Section until grading tolerances specified in Section 31 2216 are met.
2. Do not commence work of this Section until coordination with Section 32 9121 'Physical Preparation' and Section 32 9122 ‘Topsoil Grading’ and if required by these specifications prior to placement.
3. Receive approval from Landscape Architect of subgrade elevations prior to commencement of this Work.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
1. Protect utilities and site elements from damage.

B. Surface Preparation:
1. Surfaces to receive Imported and Stockpiled Topsoil:
a. Disk, till, rip, or aerate with approved agricultural aerator to depth of 6 inches (150 mm).
b. Place specified and approved topsoil on prepared surface.

3.3 PERFORMANCE

A. General:
1. After Surface Preparation requirements are completed, limit use of heavy equipment to areas no closer than 6 feet (1.80 meter) from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than 6 feet (1.80 m).
2. Do not expose or damage existing shrub or tree roots.

B. Topsoil Depth/Quantity:
1. Total topsoil depth of 5 inches (125 mm) minimum in lawn and groundcover planting areas.
2. No topsoil as defined in this Section is required over tree and shrub planting areas or native grass, shrub, or tree areas as long as what is in place is not excessively rocky or otherwise unfavorable to healthy plant growth.
3. Provide no less than quantity required to achieve tolerance described in Section 32 9122 'Topsoil Grading' along with additional soil amendments required in Section 32 9121 'Topsoil Physical Preparation' and in Section 32 9122 ‘Topsoil Grading’. Installer of this section responsible for providing sufficient topsoil material.

C. Imported Topsoil:
1. Place tested and approved topsoil:
a. Before placing topsoil, remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
b. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
c. Do not place topsoil when subgrade is either wet or frozen enough to cause clodding.

D. Stockpiled Topsoil:
1. Redistribute tested and approved existing topsoil stored on site as result of work of Section 31 1413 'Topsoil Stripping And Stockpiling'.
a. Before placing topsoil, remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
b. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
c. Do not place topsoil when subgrade is either wet or frozen enough to cause clodding.

E. In Place Topsoil:
1. At locations where topsoil can remain in place and has been tested and approved, perform the following:
a. Remove existing vegetation as required in preparation for new landscaping.
b. Remove vegetative layer, roots, organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.

F. Grading:
1. Slope grade away from building for 12 feet (3.60 m) minimum from walls at slope of 1/2 inch in 12 inches (13 mm in 300 mm) minimum unless otherwise noted.
a. High point of finish grade at building foundation shall be 6 inches (150 mm) minimum below finish floor level.
b. Direct surface drainage in manner indicated on Contract Documents by molding surface to facilitate natural run-off of water.
c. Fill low spots and pockets with topsoil and grade to drain properly.

3.4 FIELD QUALITY CONTROL

A. Testing And Inspections:
1. Topsoil Testing:
a. Test topsoil for project suitability using Owner supplied ‘Topsoil Testing Report,’ attachment to this specification:
1) Testing requirements:
a) If testing report shows topsoil does not meet topsoil Design Criteria and ‘Topsoil Testing Report: Soil Test Data’ requirements, topsoil is non-conforming. Corrections and re-testing are required until topsoil meets requirements.
b) Use new ‘Topsoil Testing Report’, each time topsoil is tested.
c) After topsoil testing is approved by Landscape Architect, submit two (2) copies of Final ‘Topsoil Testing Report as specified in Part 1 ‘Submittals’ of this specification.

B. Non-Conforming Work:
1. If topsoil does not meet topsoil Design Criteria and ‘Topsoil Testing Report: Soil Test Data’ requirements topsoil will be re-tested at no cost to Owner.
a. Correction procedures:
1) Topsoil not meeting specified physical characteristics of sand, silt, and clay shall be removed from site.
2) Topsoil not meeting specified organic or fertility specifications may be amended in place with materials recommended in Topsoil Testing Report.
3) If amendments are necessary, submit proposed amendments and application rates required to bring topsoil up to minimum specified requirements.

4) Re-test topsoil and remove and amend as required until it meets minimum specified requirements.

b. Submit report to Landscape Architect for approval.

c. Receive approval from Landscape Architect prior to planting.

END OF SECTION

ATTACHMENTS

Topsoil Testing Report

Project	Name		Property Number
	Site Street Address, City, State/Province		
Person Submitting Test	Name	Date Requested	Phone
	Address, City, State/Province		Fax
Soil Testing Laboratory	Name	Date Submitted	Phone
	Address, City, State/Province		Fax

General

1. Owner will pay for pre-bid testing and one (1) final top-soil test.

Landscape Architect Instructions

1. Landscape Architect shall determine by investigation quality and quantity of topsoil on site before landscape design. Add physical and fertility recommendations from laboratory recommendations to relevant Church specifications.

Contractor Instructions

1. Test installed topsoil. Installed topsoil shall comply with Project Specifications.
2. If installed topsoil does not comply, Contractor will enhance and test at no cost to Owner until installed topsoil complies with Project Specifications.

Testing Instructions

1. Collect at least two (2) samples of on-site topsoil and each anticipated topsoil source. If site soil profile or borrow pit are not uniform, additional samples shall be taken. Uniform composite samples may also be used if properly acquired and documented.
2. Submit required soil samples to soil testing laboratory along with all required (for this report and laboratory) information.

Soil Testing Laboratory Instructions

1. This report must be completely filled out and provide soil interpretation and amendment, fertilizer, and soil conditioner recommendations for use by Landscape Architect. These recommendations should consider lawn areas, tree and shrub areas, and native plant areas.
2. Provide appropriate times for fertilizing.
3. Return completed Topsoil Testing Report to person submitting the test.

SOIL SAMPLE LOG

Soil Sample No.	Description of location where sample was taken	History of use of the soil

Existing Conditions Test Report

("Acceptable Levels" refers to the allowable soil specifications prior to being amended)

SOIL TEST DATA

Sample No.	pH(1)	EC[1] Mmhos/cm	SAR[1]	% Sand	% Silt	% Clay	Text[2] Class	%[3] OM	NO3-N[4] ppm	P[5] ppm	K[5] ppm	Fe[5] Ppm
Acceptable Level(s)	5.5 - 8.4	<3.0	<6.0	15-60	10-60	5-30	(2)	>1.0	>20	>11	>130	>10

[1] Saturated soil paste 1:1 soil:water method (please Indicate)

[2] Hydrometer method (Acceptable soil- sand:15-60 percent, silt:10-60 percent, clay-5-30 percent)

[3] Potassium dichromate method (Walkey-Black) or loss of ignition

[4] Chromotropic acid method

[5] AB-DTPA method

If other methods are used for NO3-N, P, K, and Fe, then note.

ROCKS (Coarse Fragments)		
Sample No.	Percent > 1/4 inch (6.4 mm)	Rocks Present ≥ 1.5 inch (38 mm) Indicate as present or not present
	percent	
	percent	
Acceptable Level	≤ 5.0 percent	< 1.5 inch (38 mm)

Landscape Area Description

Lawn Areas: Receive 5 inch (125 mm) topsoil plus recommended amendments and fertilizers.

Shrub/Tree Areas: Unless otherwise indicated, plant pits are to be backfilled with three (3) parts native soil and one part compost or other recommended amendments. Additionally, contractor will add recommended fertilizer.

Native Grass/Shrub/Tree Areas: Planting to receive minimum recommended amendments and fertilizers for establishment.

INFILTRATION RATE	
Documented Infiltration rate of test sample(s) based on texture at 90 percent relative density (to nearest 1/10th of an inch)	
Sample No.	Rate
	Inches/Hour
	Inches/Hour

Interpretation Summary of Test Results:

Soil Amendments, Fertilizer and Soil Conditioner – Recommendations:

Lawn Areas

Shrub/Tree Areas

Native Grass/Shrub/Tree Areas

Long Term (5 Year) Fertilizer and Soil Conditioner – Recommendations:

Lawn Areas

Shrub/Tree Areas

Native Grass/Shrub/Tree Areas

SECTION 32 9121

TOPSOIL PHYSICAL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform soil preparation work as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: 'Common Earthwork Requirements' for common site construction requirements.
      a. General procedures and requirements for earthwork.
   2. Section 31 1413: 'Topsoil Stripping And Stockpiling'.
   3. Section 31 2213: 'Rough Grading'.
   4. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other common planting related sections.
   5. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
   6. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.
   2. In addition to agenda items specified in Section 01 3100, review the following:
      a. Review physical soil amendments.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Physical Soil Amendments:
   1. Incorporate following soil amendments if required by Topsoil Testing Report analysis into topsoil used for Project:
      a. Sand: Percent recommended, in conjunction with Geotechnical Engineering coordination on-site**.**
      b. Silt: Percent recommended, in conjunction with Geotechnical Engineering coordination on-site**.**
      c. Clay: Percent recommended, in conjunction with Geotechnical Engineering coordination on-site**.**

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Physical Soil Amendments:
   1. Add specified soil amendments at specified rates to topsoil as directed by Soil Testing Laboratory.
   2. Roto-till or otherwise mix amendments evenly into topsoil.

END OF SECTION

SECTION 32 9122

TOPSOIL GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform topsoil grading required to prepare site for installation of landscaping as described in Contract Documents.
   2. Perform topsoil placement and finish grading work required to prepare site for installation of landscaping as described in Contract Documents.
   3. Furnish and apply soil amendments as described in Contract Documents.

B. Related Requirements:
   1. Section 31 0501: ‘Common Earthwork Requirements’:
   2. Section 31 1413: ‘Topsoil Stripping And Stockpiling’ for stripping and storing of existing topsoil.
   3. Section 31 2216: ‘Fine Grading’ for landscaping and planting areas.
   4. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other common planting related sections.
   5. Section 32 9120: ‘Topsoil And Placement’ for topsoil evaluation and placement required for topsoil grading.
   6. Section 32 9121: ‘Topsoil Physical Preparation’ for physical preparation of topsoil (section included based on ‘Topsoil Testing Report’).

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.
   2. In addition to agenda items specified in Section 01 3100, review the following:
      a. Review compost requirements to be within acceptable range as per Attachment 'Compost Quality Guidelines For Landscaping' and 'Compost Verification Report' in this specification.
      b. Review soil fertility amendments and fertilizer requirements as per Attachment 'Topsoil Testing Report' in Section 32 9120.

1.3 SUBMITTALS

A. Action Submittals:
   1. Material Data:
      a. Soil Amendments and Fertilizer:
         1) Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
         2) Proposed application rates necessary to bring topsoil up to specified requirements.
         3) Source location of products.
         4) Submit to Landscape Architect for approval prior to installation.
   2. Samples:
      a. Soil Fertility Amendments and Fertilizer:
         1) Soil conditioner sample for approval before delivery to site.
         2) Product analysis.

B. Informational Submittals:
   1. Testing And Evaluation Reports:
      a. ‘Compost Verification Report’:
         1) Provide signed copy certifying that compost meets requirements of this specification.
   2. Field Quality Control Submittals:

a. Soil Fertility Amendments and Fertilizer:
1) Delivery slips indicating amount of soil amendments, compost, conditioner, and fertilizer delivered to Project site.

C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Submit ‘Compost Verification Report’.
2) Submit delivery slips indicating amount of physical amendments delivered to Project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Amendments:
1. Incorporate following soil amendments into topsoil used for Project:
a. Acceptable Soil Amendments, Soil Conditioners, And Application Rates.
1) 'Soil Pep': In conjunction with Geotechnical Engineering coordination on-site.
2) ‘Compost’: In conjunction with Geotechnical Engineering coordination on-site.
3) Other amendments and conditioners as specified by topsoil Testing Report, such as lime, gypsum, Axis, etc: In conjunction with Geotechnical Engineering coordination on-site.
4) Equals as approved by Architect before use. See Section 01 6200.
b. Acceptable Fertilizers And Application Rates:
1) In conjunction with Geotechnical Engineering coordination on-site.
2) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Do not commence work of this Section until imported, stockpiled and in place topsoil are placed as specified in Section 32 9120 'Topsoil And Placement'.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
1. Protect utilities and site elements from damage.

B. Surface Preparation:
1. Surfaces that meet specified topsoil elevations.
a. Seven (7) days maximum before beginning seeding and planting:
1) Loosen topsoil 6 inch (150 mm) deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
2) Rake area to remove clods, rocks, weeds, roots, debris or other material 1-1/2 inches (38 mm) or more in any dimension.
3) Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
2. Addition of Soil Amendments:
a. Add specified soil amendments at specified rates to topsoil as directed by Topsoil Testing Report found in Section 32 9120 'Topsoil And Placement'.

b. Add specified fertilizers at specified rates into topsoil as directed by Soil Testing Laboratory, In conjunction with Geotechnical Engineering coordination on-site.
c. Roto-till or otherwise mix soil amendments evenly into topsoil, In conjunction with Geotechnical Engineering coordination on-site.
d. Incorporate and leach soil amendments which require leaching, such as gypsum, within such time limits that soil is sufficiently dry to allow proper application of fertilizer and soil conditioners, in conjunction with Geotechnical Engineering coordination on-site.

3.3 PERFORMANCE

A. General:
1. Limit use of heavy equipment to areas no closer than 6 feet (1.80 meter) from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than 6 feet (1.80 m).
2. Do not expose or damage existing shrub or tree roots.

B. Finish Grade Tolerances (As shown on General Planting Details in Contract Documents):
1. Finish topsoil grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
a. Ground Cover Areas: 2 inches (50 mm) below.
b. Seeded Areas: One inch (25 mm) below.
c. Sodded Areas: 2 inches (50 mm) below.
d. Tree and Shrub Areas (not individual trees): 4 inches (100 mm) below.

C. Placed Topsoil:
1. At locations where topsoil has been placed as per Section 32 9120 'Topsoil And Placement', perform the following:
a. Remove existing vegetation as required in preparation for new landscaping.
b. Remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.

D. Grading:
1. Coordinate grading as described in Section 32 9120 'Topsoil And Placement'.

E. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs (45 to 135 kg), depending on soil type.

F. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

3.4 PROTECTION

A. After landscape areas have been prepared, take no heavy objects over them except lawn rollers.

END OF SECTION

ATTACHMENTS

COMPOST QUALITY GUIDELINES FOR LANDSCAPING

[Source: Von Isaman MS, President of QA Consulting and Testing LLC, Dr. Rich Koenig, USU Cooperative Extension Soils Specialist, and Dr. Teresa Cerny, USU Cooperative Extension Horticulturalist, 3 March 2003]

Category	pH[a]	Soluble Salts[a] dS/m or mmho/cm	Sodium Adsorption Ratio[a] (SAR)	Carbon Nitrogen Ratio[b] (C:N)	Percent Moisture[c]	≥ 98 percent Coarse Material Passing (dry wt basis)
Ideal	6 to 8	≤ 5	< 10	≤ 20:1	25 to 35	3/8 inch (9.5 mm)
Acceptable	5-6, 8-9	≤ 10	≤ 20	21:1 to 30:1	< 25, > 35	3/4 inch (19 mm)
Suspect	< 5, > 9	> 10	> 20	<10:1, > 30:1	< 20, > 50	< 98 percent 3/4 inch (19 mm)

[a] 1.5 Compost: Water Slurry on Coarse Material passing 3/8 inch (9.5 mm).
[b] on Coarse Material passing 3/8 inch (9.5 mm).
[c] on Total Sample

For composts with biosolid feedstocks, biosolids must meet EPA 503 Class A standard.

Acceptable level Soluble Salts and/or SAR composts should not exceed 3 cu yds (2.29 cu m) /1,000 sq ft (93 sq m) for every 3 inches (76 mm) of soil depth.

COMPOST VERIFICATION REPORT

	pH[a]	Soluble Salts[a] dS/m or mmho/cm	Sodium Adsorption Ratio[a] (SAR)	Carbon Nitrogen Ratio[b] (C:N)	Percent Moisture[c]	≥ 98 percent Coarse Material Passing (dry wt basis)
Results						

See Compost Quality Guidelines for Landscaping for footnote references.

I hereby certify that the Compost meets Ideal or Acceptable requirements as set forth in COMPOST QUALITY GUIDELINES FOR LANDSCAPING as listed with the COMPOST VERIFICATION STATEMENT. If Compost does not fall within this range, explain why and justify.

_____

_____

_____

_____

Signature: _____ Printed Signature: _____

Date: _____

SECTION 32 9219

SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install seeded lawn as described in Contract Documents.

B. Related Requirements:
   1. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other common planting related sections.
   2. Section 32 9120: ‘Topsoil And Placement’.
   3. Section 32 9121: ‘Topsoil Physical Preparation’ (section included based on Topsoil Testing Report).
   4. Section 32 9122: ‘Topsoil Grading’.
   5. Section 32 9300: 'Plants'.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conference as specified in Section 32 9001.

1.3 SUBMITTALS

A. Informational Submittals:
   1. Certificates:
      a. Written certification confirming lawn seed mix and quality:
         1) Include all species used.
         2) Include percent germination.
         3) Include percent weed seed.
         4) Include name and contact information of supplier.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Record Documentation:
         1) Submit one (1) copy certificate for lawn seed quality and mix.
      b. Landscape Management Plan (LMP):
         1) Landscape Section:
            a) Submit one (1) copy certificate for lawn seed quality and mix.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Approval Requirements:
   1. Deliver seed in original sealed, labeled, and undamaged containers.
   2. Be certain shelf life or date for seed is shown on label.
   3. Be certain label verifies seed mixture required by Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:
1. Type and mix shown on Drawings.
2. Seed Grade: Certified Turf Quality.
3. Application Rate: 2.5 lbs/1000 sf (1.134 kg/93 sq m).
4. Purchase seeds that bear this season's certification of weight, purity, and germination from reputable seed company.

B. Top Dressing:
1. Peat moss.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
1. Do not commence work of this Section until work of Sections 32 9122 and 32 9300 has been completed and approved.

B. Tolerances:
1. Final grade of soil after seeding of lawn areas is complete shall be one inch (25 mm) below top of adjacent pavement of any kind.

C. Seeding:
1. After lawn areas are graded, sow seed evenly at specified rate with adequate equipment at time when little or no wind is blowing.

D. Top Dressing:
1. After seeding, rake or broom seed in gently and roll area to firm in seed.
2. Peat moss:
   a. After rolling, cover area evenly with top dressing of peat moss at rate of two (2) 4 cu ft (0.1132 cu m) bales per 1,000 sq ft (93 sq m) of area.

E. After Top Dressing:
1. Thoroughly water seeded areas.
2. Reseed areas that do not show prompt germination at fifteen (15) day intervals until an acceptable stand of grass is assured.

3.2 FIELD QUALITY CONTROL

A. Field Inspection:
1. Seeded areas will be accepted at Project closeout if:
   a. Seeded areas are properly established.
   b. Lawn is free of bare and dead spots and is without weeds.
   c. No surface soil is visible when grass has been cut to height of 2 inches (50 mm).
   d. Seeded areas have been mowed a minimum of twice.

END OF SECTION

SECTION 32 9223

SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install sodded lawn as described in Contract Documents.

B. Related Requirements:
   1. Section 32 8423: Irrigation system.
   2. Section 32 9001: Common Planting Requirements:
      a. Pre-installation conference held jointly with other common planting related sections.
   3. Section 32 9120: 'Topsoil And Placement'.
   4. Section 32 9121: 'Topsoil Physical Preparation' (section included based on Topsoil Testing Report).
   5. Section 32 9122: 'Topsoil Grading'.

1.2 REFERENCES

A. Definitions:
   1. Crop Coefficients and Hydro-Zones: Crop coefficients (Kc) are used with ETo to estimate specific plant evapotranspiration rates. The crop coefficient is a dimensionless number (between 0 and 1.2) that is multiplied by the ETo value to arrive at a plant ET (ETc) estimate. Plants grouped by water needs, organized into one irrigation zone.
   2. Eco-Region Irrigation Design: A bio-regional approach to irrigation and planting design that is relevant to the geographic area for which the planting plan and irrigation system is designed. These geographic areas are defined by the Environmental Protection Agency and have been modified by the LDS church into 15 geographical areas throughout North America, and the Hawaiian Islands.
   3. Hardiness Zone: A hardiness zone is a more precisely geographically-defined zone within an Eco-Region in which a specific category of plant life is capable of growing, as defined by temperature hardiness, or ability to withstand the minimum temperatures of the zone. Hardiness Zones may be defined by one of two sources:
      a. Sunset Western Garden Book Maps.
      b. USDA Hardiness Zone Map.

      Plant Hardiness zone sources shall be listed by the architect through the planting and irrigation design process.
   4. Hydro-Zone: Plants grouped by water needs (similar Crop Coefficients (Kc), organized into one irrigation zone.
   5. Reference Evapotranspriation (ETo): The total water lost from the soil (evaporation) and from the plant surface (transpiration) over some period.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conference as specified in Section 32 9001.

1.4 SUBMITTALS

A. Informational Submittals:
   1. Certificates:

a. Written certification confirming sod seed mix and quality:
1) Include all species used.
2) Include name and contact information of supplier.

B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
a. Record Documentation:
1) Submit one (1) copy certificate for sod seed quality and mix.
b. Landscape Management Plan (LMP):
1) Landscape Section:
a) Submit one (1) copy certificate for sod seed quality and mix.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Approval Requirements:
1. Harvest, deliver, store, and handle sod in accordance with requirements of Turfgrass Producers International (TPI) (formally American Sod Producers Association) Specifications for Turfgrass Sod Materials and Transplanting / Installing.
2. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
a. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
b. Do not deliver small, irregular, or broken pieces of sod.

B. Storage And Handling Requirements:
1. Cut sod in pieces approximately 3/4 to one inch (19 to 25 mm) thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.
2. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
3. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Description:
1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
a. Assure satisfactory genetic identity and purity.
b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
2. Sod shall be composed of three varieties minimum of **<INSERT GRASS TYPE>**.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
1. Do not commence work of this Section until work of Sections 32 9122 and 32 9300 has been completed and approved.

B. Tolerances:
1. Final grade of soil after sodding of lawn areas is complete shall be one inch (25 mm below top of adjacent pavement of any kind.

C. Laying of Sod:
   1. Lay sod during growing season and within 48 hours of being lifted.
   2. Lay sod while top 6 inches (150 mm) of soil is damp, but not muddy. Sodding during freezing temperatures or over frozen soil is not acceptable.
   3. Lay sod in rows perpendicular to slope with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
   4. Lay sod flush with adjoining existing sodded surfaces.
   5. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.

D. After Laying of Sod Is Complete:
   1. Roll horizontal surface areas in two directions perpendicular to each other.
   2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
   3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 6 inches (150 mm) of topsoil.

3.2 FIELD QUALITY CONTROL

A. Field Inspection:
   1. Sodded areas will be accepted at Project closeout if:
      a. Sodded areas are properly established.
      b. Sod is free of bare and dead spots and is without weeds.
      c. No surface soil is visible when grass has been cut to height of 2 inches (50 mm).
   2. Sodded areas have been mowed a minimum of twice.

END OF SECTION

SECTION 32 9300

PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install landscaping plants as described in Contract Documents.

B. Related Requirements:
   1. Section 32 8423: 'Underground Sprinklers' for irrigation system.
   2. Section 32 9001: 'Common Planting Requirements' for:
      a. Pre-installation conference held jointly with other common planting related sections.
   3. Section 32 9120: ‘Topsoil And Placement’.
   4. Section 32 9121: ‘Topsoil Physical Preparation’ (section included based on Topsoil Testing Report).
   5. Section 32 9122: ‘Topsoil Grading’.
   6. Section 32 9219: 'Seeding'.
   7. Section 32 9222: 'Hydro-Seeding'.
   8. Section 32 9223: 'Sodding'.

1.2 REFERENCES

A. Definitions:
   1. Crop Coefficients and Hydro-Zones: Crop coefficients (Kc) are used with ETo to estimate specific plant evapotranspiration rates. Crop coefficient is dimensionless number (between 0 and 1.2) that is multiplied by ETo value to arrive at plant ET (ETc) estimate. Plants grouped by water needs, organized into one irrigation zone.
   2. Eco-Region Irrigation Design: Bio-regional approach to irrigation and planting design that is relevant to geographic area for which planting plan and irrigation system is designed. These geographic areas are defined by Environmental Protection Agency and have been modified by the LDS Church into 15 geographical areas throughout North America, and Hawaiian Islands.
   3. Hardiness Zone: Hardiness zone is more precisely geographically-defined zone within an Eco-Region in which specific category of plant life is capable of growing, as defined by temperature hardiness, or ability to withstand minimum temperatures of zone. Hardiness Zones may be defined by one of two sources:
      a. Sunset Western Garden Book Maps.
      b. USDA Hardiness Zone Map.

      Plant Hardiness zone sources shall be listed by Landscape Architect through planting and irrigation design process.
   4. Hydro-Zone: Plants grouped by water needs (similar Crop Coefficients (Kc), organized into one irrigation zone.
   5. Landscape Management Plan (LMP): See Section 32 9001 for definition.
   6. Plant Establishment Period: See Section 32 9001 for definition.
   7. Reference Evapotranspriation (ETo): Total water lost from the soil (evaporation) and from plant surface (transpiration) over some period.

B. Reference Standards:
   1. American Nursery & Landscape Association / American National Standards Institute:
      a. ANLA / ANSI Z60.1-2004, 'American Standard for Nursery Stock.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in MANDATORY pre-installation conference as specified in Section 32 9001.

1.4 SUBMITTALS

A. Action Submittals:
   1. Samples:
      a. Top dressing mulch for approval before delivery to site.

B. Closeout Submittals:
   1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
      a. Operations And Maintenance Data:
         1) Submit one (1) copy of recommendations specified in Special Procedure Submittals.
      b. Warranty Documentation:
         1) Include written warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
   2. Do not prune before delivery, except as approved by Landscape Architect.
   3. Protect bark, branches, and root systems from sun scald, drying, whipping, and other handling and tying damage.
   4. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
   5. Provide protective covering during delivery.

B. Storage And Handling Requirements;
   1. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
   2. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
   3. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Landscape Architect.
   4. Do not remove container-grown stock from containers before time of planting.
   5. Do not store plant material on pavement.
   6. Water root systems of trees and shrubs stored on site with fine spray. Water as often as necessary to maintain root systems in moist condition. Do not allow plant foliage to dry out.

1.6 WARRANTY

A. Special Warranty:
   1. Provide written warranties as follows:
      a. Warranty shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for 90 days minimum from date of Substantial Completion and meet or exceed material standards set forth in Materials heading of Part 2 of this specification.
      b. Warranty trees to live and remain in strong, vigorous, and healthy condition and meet or exceed material standards set forth in Materials heading of Part 2 of this specification for one year from date of Substantial Completion.
      c. When trees are completely accepted at end of warranty period, remove staking.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants:
1. Conform to requirements of Plant List and Key on Contract Documents and to ANLA / ANSI Z60.1.
2. Nomenclature:
   a. Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear tag showing genus, species, and variety of at least 10 percent of each species delivered to site.
3. Quality:
   a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
   b. Do not prune plants or top trees prior to delivery.
   c. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character.
   d. Bare root trees are not acceptable.
   e. Provide plant materials from licensed nursery or grower, certified, approved, etc, by governing authority..
4. Measurements:
   a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Contract Documents or Plant List.
   b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches (375 mm) in widest direction and 9 inches (225 mm) in narrowest would be classified as 12 inch (300 mm) stock.
   c. Plants properly trimmed and transplanted should measure same in every direction.
   d. Measure caliper of trees 6 inches (150 mm) above surface of ground.
   e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
   f. Plant materials larger than those specified may be supplied, with prior written approval of Landscape Architect, and:
      1) If complying with Contract Document requirements in all other respects.
      2) If at no additional cost to Owner.
      3) If sizes of roots or balls are increased proportionately.
5. Shape and Form:
   a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
   b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

2.2 ACCESSORIES

A. Planting Mix:
1. Mixture of three (3) parts excavated soil and one part well rotted composted manure, approved commercial mix, or other amendment recommended in 'Topsoil Testing Report'.

B. Fertilizer:
1. Fertilizer as recommended on ‘Topsoil Testing Report’.

C. Tree Stakes:
1. Type Two Acceptable Products:
   a. 2 inch (50 mm) diameter Lodgepole Pine, Douglas Fir, White Fir, or Hemlock Fir.
   b. Equal as approved by Landscape Architect before installation. See Section 01 6200.

D. Tree Staking Ties:
1. Type Two Acceptable Products:
a. 32 inch (800 mm) Cinch-Tie tree ties by V.I.T. Products Inc, Escondido, CA www.vitproducts.com.
b. Equal as approved by Landscape Architect before installation. See Section 01 6200.

E. Tree Guys:
1. Type Two Acceptable Products:
a. Duckbill Model 68DTS guying kit.
b. Equal as approved by Landscape Architect before installation. See Section 01 6200.

F. Pre-Emergent Herbicide:
1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
a. Chipco Dimension Granular by The Andersons Inc, Maumee, IL www.andersonsinc.com.
b. Elanco XL2G granular by Crop Data Management Systems, Marysville, CA www.cdms.net.
c. Ronstar G granular by Bayer Crop Science, Monheim, Germany www.bayercropscience.com.
d. Surflan AS liquid by United Phosphorous Inc, Trenton, NJ www.upi-usa.com.
e. Oryzalin 4 A.S. liquid by FarmSaver, Seattle, WA www.farmsaver.com.

G. Weed Barrier:
1. Type Two Acceptable Products:
a. DeWitt 4.1 oz (116 g) 20 year woven polypropylene weed barrier.
b. Hanes Pro-Platinum 4.1 oz (116 g) 20 year woven polypropylene weed barrier.
c. Equal as approved by Landscape Architect before bidding. See Section 01 6200.

H. Bark Or Wood Top Dressing Mulch:
1. Type Two Acceptable Products:
a. Medium size Fir bark.
b. Medium or large size Redwood bark.
c. Shredded pine bark.
d. Shredded Cedar.
e. Equal as approved by Landscape Architect before installation. See Section 01 6200.

I. Rock Mulch:
1. Type Two Acceptable Products:
a. In conjunction with Geotechnical Engineering coordination on-site:
1) Size:
a) No rock should be less than 3/4 inch (19 mm) in size.
b) For slopes 3:1 or less 3/4 inch (19 mm) to 1-1/2 inches (38 mm).
c) For steep slopes greater than 3:1: Size can be larger than 1-1/2 inches (38 mm).
2) Equal as approved by Landscape Architect before installation. See Section 01 6200.
b. Decomposed granite (in conjunction with Geotechnical Engineering coordination on-site)
1) Size:
a) No rock should be less than size as determined in conjunction with Geotechnical Engineering coordination on-site.
b) Not to be placed on slopes greater than 3:1: Size to be larger than 1-1/2 inches (38 mm).
2) Equal as approved by Landscape Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Evaluation And Assessment:
1. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with work of this Section.

2. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Contract Documents. All planting indicated on Contract Documents is required unless indicated otherwise.
3. Do not commence with this Work until grading tolerances specified in Section 32 9122 'Topsoil Grading' are met.

3.2 PREPARATION

A. Plant Approval:
   1. Compliance:
      a. Prior to any plant installation, evaluate plants for compliance with material standards.
      b. Remove plants from site that do not comply.
   2. Inspection:
      a. Prior to any tree installation, inspect one (1) extra deciduous tree and one (1) extra evergreen tree for root health.
      b. In presence of Landscape Architect or by video recording, remove root container/packing material and inspect root balls for soil depth, firmness and root structure by washing soil off of roots.
      c. If delivered plants exhibit soil 1 inch (25 mm) or more above root collar, demonstrate that all trees have had excess soil removed prior to planting or that they meet standard.
      d. Remove and replace tree plant material if roots are loose, significantly circling, significantly asymmetrical or damaged.
      e. Continue inspection process until trees meet standard.

B. Layout individual tree and shrub locations and areas for multiple plantings:
   1. Stake locations and outline areas.
   2. Secure Landscape Architect's approval before planting.
   3. Make minor adjustments as may be requested.

3.3 INSTALLATION

A. Interface With Other Work:
   1. Do not commence work of this Section until work of Section 32 9122 has been completed and approved.

B. Excavation:
   1. If underground construction work or obstructions are encountered in excavation of planting holes, Landscape Architect will select alternate locations.
   2. Plant Excavation Size:
      a. Diameter: Twice diameter of root ball or container minimum.
      b. Depth: Equal to container or rootball depth.
   3. Unless excavated material meets topsoil requirements as specified in Section 32 9113, remove from landscape areas and do not use for landscaping purposes.
   4. Roughen sides and bottoms of excavations.
   5. With approval of Landscape Architect, select five (5) typical planting excavations throughout site for drainage testing.
      a. Fill selected excavations with water and verify that water drains away at rate of 3 inches (75 mm) per hour minimum. Inform Landscape Architect in writing of excavations where water does not drain properly.
      b. Select three (3) excavations approximately 5 feet (1 500 mm) away from each non-draining excavation and repeat tests. Continue testing process until non-draining areas have been identified.
      c. In excavations located in identified non-draining areas, auger 6 inch (150 mm) diameter hole 4 feet (1 200 mm) deep in low point of each excavation and fill with tamped planting mix.
      d. Do not plant trees or shrubs in holes that do not properly drain.

C. Planting:
   1. Removing Binders And Containers:

a. Remove top one / third of wire basket and burlap binders.
b. Remove plastic and twine binders from around root ball and tree trunk.
c. Remove plastic containers.
d. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.

2. Plant immediately after removing binding material and containers:
   a. Place tree and shrub root balls on undisturbed soil.
   b. After watering and settling, top of tree root balls shall be approximately two inches (50 mm) higher than finished grade and trunk flare is visible.
   c. Shrub root balls shall be approximately one inch (25 mm) higher than finished grade.
3. Properly cut off broken or frayed roots.
4. Center plant in hole, remove remaining wire basket and burlap taking care not do damage root ball:
   a. Replace damaged material.
   b. Backfill with specified planting mix.
   c. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
5. Add fertilizer in plant pit as per 'Topsoil Testing Report' and during proper season.
6. Fill landscape excavations with tamped planting mix and recommended fertilizer:
   a. Compact in 6 inch (150 mm) lifts.
   b. Settle by watering to ensure top of root ball is 2 inches (50 mm) higher for trees and one inch (25 mm) higher for shrubs than surrounding soil following compaction and settling.
7. Do not use muddy soil for backfilling.
8. Make adjustments in positions of plants as directed by Landscape Architect.
9. Thoroughly water trees and shrubs immediately after planting.
10. At base of each tree, leave 36 inch (900 mm) diameter circle free of any grass.

D. Supports for New Trees:
1. Provide new supports for trees noted on Contract Documents to be staked.
   a. Remove nursery stakes delivered with and attached to trees.
   b. Support shall consist of at least two (2) tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet (900 mm) of stake length is below finish grade.
   c. Deciduous Trees:
      1) Place tree ties 6 to 12 inches (150 to 300 mm) below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches (450 to 600 mm) above finish grade, if directed by Landscape Architect.
      2) Remove tops of tree stakes so top of stake is 6 inches (150 mm) below main tree canopy to prevent damage to tree branches and canopy growth.
   d. Evergreen Trees:
      1) Place tree ties 2/3's of height of tree up from root ball.
2. Provide root guying kits to support 24 inch (600 mm) box, 3 inch (75 mm) caliper and larger trees.
3. Staking and guying should allow some tree movement.

E. Vines:
1. Remove from stakes, untie, and securely fasten to wall or fence next to which they are planted.

F. Ground Covers:
1. Container-grown unless otherwise specified on Contract Documents. Space evenly to produce a uniform effect, staggered in rows and intervals shown.

G. Post Planting Weed Control:
1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
2. Areas shall be weed free prior to Landscape Final Acceptance.

H. Weed Barrier Fabric:
1. After planting and application or herbicide in shrub beds, apply covering of specified weed barrier fabric.
2. Achieve 100 percent coverage over ground areas while allowing space for growth from root ball.

3. Overlap seams 6 inches (150 mm) minimum.
4. Staple at 5 feet (1500 mm) on center each way and within 3 inches (75 mm) of edge of shrub bed, with two (2) at each corner.

I. Mulching:
1. After application of herbicide, mulch shrub and ground cover planting areas with 3 inches (75 mm) deep layer of specified top dressing or rock mulch.
2. Cover grass-free area at tree bases with 3 inches (75 mm) of top dressing mulch or rock mulch.
3. Place mulch to uniform depth and rake to neat finished appearance.

END OF SECTION

SECTION 32 9413

LANDSCAPE EDGING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install landscape edging and headers as described in Contract Documents.

B. Related Requirements:
   1. Section 32 9001: 'Common Planting Requirements':
      a. Pre-installation conference held jointly with other common planting related sections.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conference as specified in Section 32 9001.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Edging And Headers:
   1. 3/16 inch (5 mm) thick steel headers. Shop primed and finish painted in color selected by Architect from Manufacturer's standard colors.
   2. Type Two Acceptable Products:
      a. Border Guard by Border Concepts, Charlotte, NC www.borderconcepts.com.
      b. Ryerson Steel Edging.
      c. Any metal fabricator or manufacturer providing material meeting specified requirements as approved by Architect before installation. See Section 01 6200.
   3. Stakes: No. 4 rebar 12 inches (300 mm) long or Manufacturer's steel stakes.

B. Wood Edging And Headers:
   1. Headers And Stakes: No. 1 common grade rough Redwood or Cedar.
   2. Nails: Aluminum or hot dip galvanized box nails.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Metal Edging And Headers:
   1. Extend headers one inch (25 mm) above grade and hold in place with specified stakes extending into solid earth full length. Set top of stakes 1/2 inch (13 mm) below top of header.
   2. Attach stake to header by arc welding both sides of stake to header. Attach sections of header by overlapping 4 inches (100 mm) and arc welding.

B. Wood Edging And Headers:
   1. Provide 2x6 (38 by 140 mm) headers (or two pieces 1x6 (19 by 140 mm) laminated where curve is shown) to separate lawn areas from planting areas unless shown otherwise on Drawings.

2. Extend headers 1/2 inch (13 mm) above grade and hold in place with 1x2 (19 by 38 mm) stakes of length necessary to extend into solid earth 12 inches (300 mm) minimum. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes not to exceed 4 feet (1 200 mm) on center. Set top of stakes 1/2 inch (13 mm) below top of header and cut at angle to slope away from header top.

C. Compact backfill on both sides of headers to density of undisturbed adjoining earth.

END OF SECTION