
PART 1 GENERAL**1.1 DESCRIPTION****A. Section Includes:**

1. Furnishing and installing Modular Suspended Paving System, including, but not limited to: geotextile, geogrids, aggregates, sub base material, backfill, drainage system, root barrier, concrete retainers and installation of planting soil.

B. Related work specified elsewhere includes:

1. Section 32 11 23 LANDSCAPE AGGREGATE BASE COURSE
2. Section 32 14 40 SAND & MORTAR-SET PAVING
3. Section, 32 84 00 PLANTING IRRIGATION
4. Section, 32 91 13 PLANTING SOIL PREPARATION

1.2 DEFINITIONS

- A. Aggregate Sub Base (below Cell frame): Aggregate material between the bottom of the Cell frame and the compacted subgrade below. Designed to distribute loads from the frame to the subgrade, including subgrade drainage as shown.
- B. Aggregate Base Course (above Cell deck): Aggregate material between the paving and the top of the Cell deck designed to distribute loads across the top of the deck.
- C. Backfill: The earth used to replace or the act of replacing earth in an excavation beside the Cell frames to the excavation extents.
- D. Bridging Slab: Bridging slabs are to be used in locations where spacing larger than 3 inches (75 mm) is necessary between Cell frames.
- E. Compost: Organic material subjected to composting processes
- F. Finish Grade: Elevation of finished surface of planting soil or paving.
- G. Geogrid: Net-shaped synthetic polymer-coated fibers that provide a stabilizing force within soil structure as the fill interlocks with the grid.
- H. Geotextile: A geosynthetic fabric, applied to either the soil surface or between materials, providing filtration, separation, or stabilization properties.
- I. Inspection Riser for Drainage: Vertical, perforated pipe installed at tree openings to allow access for visual inspection of water levels at base of Modular Suspended Pavement system.
- J. Inspection Riser for Soil: Vertical pipe installed as shown to allow access for visual inspection of soils moisture within the Modular Suspended Pavement system. Inspection riser to occur in each tree cutout as accepted by Owner's Representative.
- K. Irrigation: as required within the soil of the Modular Suspended Pavement system.
- L. Planting Soil: as required by Specification, 32 91 13, PLANTING SOIL PREPARATION.
- M. Root Barrier: Plastic root diversion device.
- N. Root package (rootball): The earthen package containing the root system of the tree as shipped from the nursery.
- O. Silva Cells (Modular Suspended Pavement System): Plastic structural cellular system with posts, beams and decks designed to be filled with planting soil for tree rooting and support of vehicle loaded pavements.
- P. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.

- Q. Strongback: Modified Silva Cell frame designed to be attached to top of Silva Cells for stability while installing planting soil and backfill.
- R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- S. Zip Tie: A tensioning device or tool used tie similar or different materials together with a specific degree of tension.

1.3 SUBMITTALS

- A. Upon Thirty (30) days prior to start of installation of items in this section, the Contractor shall provide submittals required in this section to the Owner's Representative for review and approval.
 - 1. Schedule of work and coordination with other trades
 - 2. Installer qualifications, including name and work experience of field supervisor.
- B. Product Data: For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications, including but not limited to:
 - 1. Modular Suspended Pavement System,
 - 2. Anchoring Spikes,
 - 3. Solid and perforated drain lines,
 - 4. Inspection risers and caps,
 - 5. Geogrid,
 - 6. Geotextile,
 - 7. Aggregate sub base,
 - 8. Aggregate base course,
 - 9. Backfill Materials,
 - 10. Root barrier,
 - 11. Manufacturer's product warranty.
 - 12. For bulk materials, including soils and aggregates, include analysis as required by Specifications.
- C. Testing of mock up results
 - 1. Compaction testing log
- D. Modular Suspended Pavement System manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
- E. Modular Suspended Pavement System Mock Up:
 - 1. Prior to the installation, construct a mock up of the complete installation at the site. The installation of the mock up shall be in the presence of the Owner's Representative and the Modular Suspended Pavement System Representative.
 - 2. The mock up shall be a minimum of 100 square feet in area and include the complete system installation with sub base compaction, drainage installation, base course aggregate and geotextile as required, geogrids, backfill, planting soil with compaction, decks, top geotextile and all necessary accessories.
 - 3. The mock up area may remain as part of the installed work at the end of the project provided that it remains in good condition and meets all the conditions of the specifications.
- F. Compaction testing results: Submit results of all compaction testing required by the specifications including the bulk density test of the mock up and installed soil to the Owner's Representative for approval.
- G. Qualification Data: Submit documentation of the qualifications of the Modular Suspended Pavement System installer sufficient to demonstrate that the installer meets the requirements of paragraph "Quality Assurance".

1.4 SEQUENCING AND SCHEDULING

- A. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- B. Schedule all utility installations prior to beginning work in this section.

- C. Where possible, schedule the installation of Modular Suspended Pavement Systems after the area is no longer required for use by other trades and work. Protect installed Modular Suspended Pavement Systems from damage in the event that work must occur over, through, or adjacent to the completed Modular Suspended Pavement Systems.

1.5 QUALITY ASSURANCE

A. Reference Standards:

- 1. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the above codes, regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship or construction of a better quality, higher standard than is required by the above mentioned codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.

B. Coordination:

- 1. A minimum of two weeks prior to beginning construction of the Modular Suspended Pavement System Mock Up, notify and coordinate with the Owner and the Modular Suspended Pavement System Manufacturer, observation of the excavation, subgrade preparation, installation of the cell frame, backfilling, etc.

C. Installer Qualifications: Modular Suspended Pavement Systems and related products shall be installed by a qualified installer whose work has resulted in successful installation of planting soils and planter drainage systems, underground piping, chambers and vault structures.

- 1. Submit list of completed projects of similar scope and scale to the Owner's Representative, demonstrating capabilities and experience.
- 2. The installer and the field supervisor shall have a minimum of five years successful experience with construction of similar scope in dense urban areas.
- 3. Installer's Field Supervision: Installer is required to maintain an experienced full-time supervisor on Project site when work is in progress. This person shall be identified during the Pre-installation Conference, with appropriate contact information provided, as necessary. The same supervisor shall be utilized throughout the Project, unless a substitution is submitted to and approved in writing by the Owner's Representative.

1.6 LAYOUT AND ELEVATION CONTROL

- A. Provide layout and elevation control during installation of Modular Suspended Pavement Systems. Utilize grade stakes, benchmarks, surveying equipment and other means and methods to assure that layout and elevations conform to the layout and elevations indicated on the plans.

1.7 PERMITS AND CODE COMPLIANCE

- A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary permits/approvals from all such authorities.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, if applicable. Protect materials from deterioration during delivery and while on the project site.

B. Bulk Materials:

- 1. Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.
- 2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material.

- C. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.

- D. Modular Suspended Pavement Systems: Protect Modular Suspended Pavement Systems from damage during delivery, storage and handling.
1. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week. Storage should occur on smooth surfaces, free from dirt, mud and debris
 2. Handling is to be performed with equipment appropriate to the size (height) of Cells and site conditions, and may include, hand, handcart, forklifts, extension lifts, or small cranes, with care given to minimize damage to Modular Suspended Pavement System frames, decks and adjacent Modular Suspended Pavement Systems.

1.9 PROJECT CONDITIONS

- A. Verification of Existing Conditions and Protection of New or Existing Improvements: Before proceeding with work in this section, the Installer shall carefully check and verify all dimensions, quantities, and grade elevations, and inform the Owner's Representative immediately of any discrepancies.
1. Carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging. Verify the location of all aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system, and take proper precautions as necessary to avoid damage to such improvements and plants.
 2. In the event of conflict between existing and new improvements notify the Owner's Representative in writing and obtain written confirmation of any changes to the work prior to proceeding.
 3. When new or previously existing utility lines are encountered during the course of excavation, notify the Owner's Representative in writing and make recommendations as to remedial action. Proceed with work in that area only upon approval of appropriate remedial action. Coordinate all work with the appropriate utility contractors, utility company or responsible public works agency.
- B. Weather Limitations: Do not proceed with work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.
- C. Protect partially completed Modular Suspended Pavement System installation against damage from other construction traffic with highly visible construction tape, fencing, or other means until construction is complete. Prevent all non-installation related construction traffic over the completed Modular Suspended Pavement System installation; allowing only loads less than the design loads.

1.10 PROTECTION

- A. Protect open excavations and partially completed Modular Suspended Pavement System installation from access and damage when work is in progress, and following completion with highly visible construction tape, fencing, or other means until all construction is complete.

1.11 WARRANTY

- A. Modular Suspended Pavement System manufacturer's product warranty shall apply. Submit manufacturer's product warranty.

1.12 PROJECT WORK

- A. Coordinate installation with all other work that may impact the completion of the work.

1.13 PRECONSTRUCTION MEETING

- A. Prior to the start of the installation of Modular Suspended Pavement Systems, meet at the site with the Owner's Representative, general contractor and the Modular Suspended Pavement Systems installer to review installation layout, procedures, means and methods.

PART 2 PRODUCTS

2.1 MODULAR SUSPENDED PAVEMENT SYSTEMS

- A. Silva Cells, Manufacturer: DeepRoot Partners, L.P. (Deep Root); 530 Washington Street, San Francisco, CA 94111; 415.781.9700; 800.458.7668; fax 415.781.0191; www.deeproot.com.

- B. Fiberglass-reinforced polypropylene structures including frames and decks designed to support sidewalk loads and designed to be filled with soil for the purpose of growing tree roots, and rainwater filtering, detention and retention.
- C. Silva Cell Frames: 400 mm x 600 mm x 1200 mm (16 inches x 24 inches x 48 inches).
- D. Silva Cell Deck: 5 cm x 600 mm x 1200 mm (2 inches x 24 inches x 48 inches). Deck to include manufactured installed galvanized steel tubes.
- E. Silva Cell Strongback: 400 mm x 600 mm x 150 mm (24 inches x 48 inches x 6 inches) modified Modular Suspended Pavement System Frame units designed to stiffen and align the frames as planting soil and backfill material is placed. Strongbacks are to be removed prior to placing decks. They are to be reused as the work progresses.
- F. Silva Cell Deck Screws: Manufacturer's supplied stainless steel screws to attach decks to frames.

2.2 ANCHORING SPIKES

- A. 10" (250 mm) long X 19/64" (8 mm) diameter, spiral, galvanized timber spikes. Utilize 4 spikes in each frame on the first layer of Silva Cells to anchor the frames to the aggregate sub base.

2.3 SOLID AND PERFORATED DRAIN LINES

- A. Any solid or perforated drain lines to be specified ..

2.4 INSPECTION RISER FOR DRAINAGE (where applicable):

- A. Rigid, PVC schedule 40 pipe, 4" diameter.
- B. Cap: Cast Iron solid threaded cleanout designed to fit standard PVC schedule 40 pipe-fittings with concrete collar set flush in pavement surface as accepted by Owner's Representative.
 - 1. Products meeting this specification: Zurn Z 1440, Cast Iron Adjustable Cleanout, Zurn, 1801 Pittsburgh Avenue, Erie, PA 16502, 1-877-ZURN-NOW. <http://www.zurn.com/>

2.5 INSPECTION RISER FOR SOIL (where applicable):

- A. Rigid, PVC schedule 40 pipe, 6" diameter.
- B. Cap: Cast Iron solid threaded cleanout designed to fit standard PVC schedule 40 pipe-fittings.
 - 1. Products meeting this specification: Zurn Z 1440, Cast Iron Adjustable Cleanout, Zurn, 1801 Pittsburgh Avenue, Erie, PA 16502, 1-877-ZURN-NOW. <http://www.zurn.com/>

2.6 INSPECTION RISER FOR SOIL LOCATED IN TREE WELL

- A. Rigid, Perforated PVC schedule 40 pipe, 4" diameter.
- B. Cap: PVC solid threaded cleanout designed to fit standard PVC schedule 40 pipe-fittings. Cap painted color to match Granite Pavers as accepted by Owner's Representative.

2.7 GEOGRID

- A. Geogrid shall be woven polyester fabric with PVC coating, Uni-axial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, acids.
 - 1. Tensile strength at ultimate: 1850 lbs/ft (27.0 kN/m) minimum by ASTM D6637 test method
 - 2. Creep reduced strength: 1000 lbs/ft (14.6 kN/m) minimum by ASTM D5262 test method
 - 3. Long term allowable design load: 950 lbs/ft (13.9 kN/m) minimum by GRI GG-4 test method
 - 4. Grid aperture size (MD): 0.8 inch (20 mm) minimum
 - 5. Grid aperture size (CD): 1.28 inch (32 mm) maximum
 - 6. Roll size: 6' (1.8m) width is preferred, up to 18' (5.4m)
- B. Products meeting this specification:

1. Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA, <http://www.tencate.com> (Distributed by Geosynthetic Systems in Ontario)
2. Fortrac 35 Geogrid as manufactured by Huesker, Charlotte, NC, <http://www.hueskerinc.com/>
3. SF 20 Biaxial Geogrid, as manufactured by Synteen, Lancaster, SC, <http://www.synteen.com>
4. Stratagrid SG 150, by Strata, Cumming, GA, <http://www.geogrid.com>

2.8 GEOTEXTILE

- A. Geotextile shall be nonwoven polypropylene fibers, inert to biological degradation and resistant of naturally occurring chemicals, alkalis and acids.
1. Grab tensile strength: 200 lbs (900 N) minimum (ASTM D 4632 test method)
 2. Elongation: 50% maximum (ASTM D 4632 test method)
 3. Trapezoid tear strength: 80 lbs (350 N) minimum (ASTM D 4533 test method)
 4. Mullen burst strength: 350 psi (2400 kPa) minimum (ASTM D 3786 test method)
 5. Puncture strength: 110 lbs (490 N) minimum (ASTM D 4833 test method)
 6. CBR puncture strength: 500 lbs (2225 N) minimum (ASTM D 6241 test method)
 7. Apparent opening size: 80 sieve (0.18mm) maximum (ASTM D 4751 test method)
 8. Flow rate: 95 gal/min/ft² (3870 l/min/m²) minimum (ASTM D 4491 test method)
 9. UV Resistance (at 500 hours): 70% strength retained
- B. Products meeting this specification:
1. Mirafi 180 N as manufactured by Ten Cate Nicolon, Norcross, GA, <http://www.tencate.com> (Distributed by Geosynthetic Systems in Ontario)
 2. Geotex 801 as manufactured by Propex Geosynthetics, Chattanooga, TN, <http://www.geotextile.com> (Distributed by Nilex in Canada)

2.9 AGGREGATE SUB BASE (Drain Rock) BELOW CELL FRAME

- A. Aggregate subbase below Modular Suspended Pavement System frame to provide Modular Suspended Pavement System support and subsurface drainage: 3/4" X 1/4" clean, hard, durable virgin crushed rock meeting Caltrans Section 68 Submit Sample along with material analysis for approval.

2.10 CONCRETE BASE COURSE FOR NON-POROUS PAVEMENT (ABOVE CELL DECK)

- A. Refer to project's SECTION 32 14 40, SAND & MORTAR-SET PAVING

2.11 SETTING BED FOR UNIT PAVERS (ABOVE CELL DECK)

- A. Refer to project SECTION 32 14 40, SAND & MORTAR-SET PAVING Specifications for setting bed material requirements.

2.12 BACKFILL MATERIAL (ADJACENT TO MODULAR SUSPENDED PAVEMENT SYSTEMS):

- A. Clean, compactable, coarse grained fill soil meeting the requirements of the Unified Soil Classification system for soil type GW, GP, GC with less than 30% fines, SW, and SC with less than 30% fines. Backfill material shall be free of organic material, trash and other debris, and shall be free of toxic material injurious to plant growth.
- B. Submit supplier certificate for material meeting this specification.

2.13 PLANTING SOIL: (See Specification Section 32 91 13 PLANTING SOIL PREPARATION for Modular Suspended Pavement Systems)

2.14 ROOT BARRIER

- A. Root Barrier shall be DeepRoot; Tree Root Barriers; UB 18-2, manufactured by DeepRoot Partners, L.P. (Deep Root); 530 Washington Street, San Francisco, CA 94111; 415.781.9700; 800.458.7668; fax 415.781.0191; www.deeproot.com.
- B. Material: Black, injection molded panels, 0.080"(2.03mm) wall thickness in modules 24" (61cm) long by 18" (46cm) deep; manufactured with a minimum 50% post-consumer recycled polypropylene plastic with UV inhibitors; recyclable. Integrated zipper joining system providing for instant assembly by sliding one panel into another.

PART 3 EXECUTION**3.1 LAYOUT APPROVAL**

- A. Prior to the start of work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the Modular Suspended Pavement Systems and required drainage features in the correct locations.

3.2 EXCAVATION

- A. Excavate to the depths and shapes indicated on the drawings. Base of excavation shall be smooth soil, level and free of lumps or debris.
- B. Do not over-excavate existing soil beside or under the limits of excavation required for the installation. If soil is over-excavated, install compactable fill material in lifts not more than 8 inches (200 mm) deep and compact to the required density.
- C. Confirm that the depth of the excavation is accurate to accommodate the depths and thickness of materials required throughout the extent of the excavation.
- D. Confirm that the width and length of the excavation is a minimum of 6 inches (150 mm), in all directions, beyond the edges of the Modular Suspended Pavement Systems.

3.3 SUBGRADE COMPACTION

- A. Check compaction of the subgrade below the Modular Suspended Pavement Systems and confirm that the subgrade soil is compacted to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method.
- B. Proof compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
- C. Apply additional compaction forces at optimum water levels.

3.4 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

- A. Where indicated on drawings, install geotextile over compacted subgrade.
- B. Removal of the geotextile as a standard component of the Modular Suspended Pavement System system must be determined by professional civil or geotechnical engineer.
- C. Install the geotextile with a minimum joint overlap of 18 inches (450 mm) between sections of material. Ensure geotextile is laid flat with no folds or creases.

3.5 INSTALLATION OF INSPECTION RISERS FOR DRAINAGE

- A. Cut PVC pipe to fit vertically to finish surface.
- B. Manually perforate riser. Pipe should be rigid at level of pavement section, and perforated through level of Modular Suspended Pavement System system.
- C. Wrap pipe in geotextile and secure with zip ties. Brace riser for the remainder of installation to secure its location and elevation.
- D. Install caps on top of each riser flush with grade. PVC caps shall be painted chocolate brown color using exterior grade paint.

3.6 INSTALLATION Of AGGREGATE SUB BASE BELOW MODULAR SUSPENDED PAVEMENT SYSTEM FRAME

- A. Install aggregate sub base and subbase drainage system to the depths indicated on the drawings, under the first layer of Modular Suspended Pavement System frames. Sub base aggregate shall extend a minimum of 6 inches (150mm) beyond the edge of the Cell frames.

- B. Compact aggregate sub base layer to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method. Compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.
- C. The maximum slope on the surface of the sub base shall be 5%. Where proposed grades on finished paving are greater than 5%, the Cells shall be stepped to maintain proper relationships to the finished grade.
- D. The grade and elevations of the base under the Modular Suspended Pavement Systems shall be approved by the Owner's Representative prior to proceeding with the installation of the Modular Suspended Pavement Systems.
- E. Note that the Modular Suspended Pavement System does not fully meet H-20 loading until the final paving is installed. No equipment shall be used on top of the Cell system until paving installation has been completed.

3.7 INSTALLATION OF MODULAR SUSPENDED PAVEMENT SYSTEMS, PLANTING SOIL, GEOGRID, AND BACKFILL

- A. Identify the outline layout of the structure and the edges of paving around tree planting areas on the floor of the excavation, using spray paint or chalk line.
- B. Lay out the first layer of Modular Suspended Pavement System frames on the sub base. Verify that the layout is consistent with the required locations and dimensions of paving edges to be constructed over the Modular Suspended Pavement Systems. Coordinate with drainage of sub base.
- C. Check each Modular Suspended Pavement System frame unit for damage prior to placing in the excavation. Any cracked or chipped unit shall be rejected.
- D. Place frames no less than 1 inch (25 mm) and no more than 3 inches (75 mm) apart at base. In the event that spacing between Cells exceeds 3 inches (75 mm), bridging slab details and methods shall be used to span these gaps.
- E. Install Modular Suspended Pavement System frames around, over, or under existing or proposed utility lines as indicated on plans.
- F. Where any two adjacent Modular Suspended Pavement System frames must be installed at different elevations, the upper frame shall be supported by aggregate sub base with a maximum slope of 1:1. This may require installation of aggregate sub base within the adjacent lower Cell frame. No two frames shall differ in elevation by more than 15 inches (375 mm).
- G. Assure that each frame sits solidly on the surface of the sub base. Frames shall not rock or bend over any stone or other obstruction protruding above the surface of the sub base material. Frames shall not bend into dips in the sub base material. The maximum tolerance for deviations in the plane of the sub base material under the bottom of the horizontal beams of each Modular Suspended Pavement System frame shall be 1/4 inch (6 mm) in 4 feet (1200 mm).
- H. Adjust sub base material including larger pieces of aggregate under each frame to provide a solid base of support.
 - 1. Anchor each Modular Suspended Pavement System into sub base with four-10 inch (250 mm) spikes, driven through the molded holes in the Cell frame base. The purpose of the anchoring system is to maintain cell spacing and layout during the installation of planting soil and backfill.
 - 2. For applications where cells are installed over waterproofed structures, develop a spacing system consistent with requirements of the waterproofing system. Do not use anchoring nails that will come within 6" or less of any waterproofing material.
- I. Install the second layer of Modular Suspended Pavement System frames on top of the first layer. Comply with manufacturer's requirements to correctly register and connect the Cell frames together.
- J. Register each frame on top of the lower frame post. Rotate each frame registration arrow in the opposite direction from the frame below to assure that connector tabs firmly connect. Each frame shall be solidly seated on the one below.
- K. Build layers as stacks of frames set one directly over the other. Do not set any frame half on one Cell frame below and half on an adjacent frame.

- L. Install Strongbacks on top of the Modular Suspended Pavement System frames prior to installing planting soil and backfill.
1. Strongbacks are required only during the installation and compaction of the planting soil and backfill.
 2. Strongbacks should be moved as the work progresses across the installation.
 3. Strongbacks shall be removed prior to the installation of Modular Suspended Pavement System decks.
- M. Install planting soil, geogrid and backfill as indicated on the drawings. The process of installation requires that these three materials be installed and compacted together in several alternating operations to achieve correct compaction relationships within the system.
- N. Where required, place the geogrid curtain along the outside of the limit of the Modular Suspended Pavement System frames.
1. Geogrid curtains are required between the edge of the Modular Suspended Pavement Systems and any soils to be compacted to support paving beyond the area of Modular Suspended Pavement Systems. Do not place geogrid curtains between the edge of the Cells and any planting area adjacent to the Cells.
 2. Pre-cut the geogrid to allow for 6 inches (150 mm) minimum under lapping below backfill, and 12 inches (300 mm) minimum overlapping top of Modular Suspended Pavement System stack.
 3. Where Modular Suspended Pavement System layout causes a change direction in the plane of the geogrid, slice the top and bottom flaps of the material so that it lies flat on the top of the cell deck and aggregate base course along both planes.
 4. Provide a minimum of 300 mm (12 inch) overlaps between different sheets of geogrid.
 5. Place the geogrid in the space between the Modular Suspended Pavement System frames and the sides of the excavation. Attach the geogrid to the Modular Suspended Pavement System frames using 3/16 inch x 14-inch (5x350 mm) zip ties. Attach with zip ties at every cell and at Cell Deck.
- O. Install no more than two layers of Modular Suspended Pavement System frames before beginning to install planting soil and backfill. Compact the planting soil within the Modular Suspended Pavement System frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both planting soil and backfill.
- P. Install and compact backfill material in the space between the Modular Suspended Pavement Systems and the sides of the excavation in lifts that do not exceed 8 inches (200 mm).
1. Compact backfill to 95% of maximum dry density using a powered mechanical compactor. Use a pneumatic compacting tool or narrow foot jumping jack compactor for spaces less than 12 inches (300 mm) wide and a 12-inch wide jumping jack compactor or larger equipment in wider spaces.
 2. Maintain the geogrid curtain between the Modular Suspended Pavement Systems frames and the backfill material.
 3. Install backfill in alternating lifts with the planting soil inside the Modular Suspended Pavement Systems.
- Q. Fill the first layer or layers of frames with planting soil, specified in Section 32 94 56 Planting Soil for Modular Suspended Pavement Systems.
1. Bring planting soil to the site using equipment and methods that do not overly mix and further damage soil peds within the soil mix. Soil mixes shall not be blown or pumped into the Cells using soil blowing equipment.
 2. Install in lifts that do not exceed 16 inches (400 mm). Lightly compact the soil inside the frames at each lift to remove air pockets and settle the soil within the frames.
 3. Do not compact greater than 80% of maximum dry density. Check the soil compaction with a penetrometer or densiometer to achieve similar compaction levels provided in the mock up.
 4. If the planting soil becomes overly compacted, remove the soil and reinstall. Use hand tools or other equipment that does not damage the Modular Suspended Pavement System frames.
 5. Do not walk directly on horizontal beams of the frames.
 6. Work soil under the horizontal frame beams of the second level of Cell frames and between columns eliminating air pockets and voids. Fill each frame such that there is a minimum of 10 inches (250 mm) of soil over the top of horizontal frame beams before beginning compaction.
 7. The top 1-2 inches (25-50 mm) of each frame post should remain exposed above the soil to allow the placement of the next frame or deck.

- R. After the first two layers of Modular Suspended Pavement System frames have been installed, filled with planting soil and backfilled, proceed to install the third layer, if required, of Modular Suspended Pavement Systems frames. Comply with manufacturer's requirements to correctly register and connect the Cell frames together.
- S. Remove the strongbacks. Sweep any soil from tops before adding the next layer of frames.
- T. Register each frame on top of the lower frame post. Rotate each frame registration arrow in the opposite direction from the frame below to assure that connector tabs firmly connect. Each frame shall be solidly seated on the one below.
- U. Build layers as stacks of frames set one directly over the other. Do not set any frame half on one Cell frame below and half on an adjacent frame.
- V. Install Strongbacks on top of third layer of Modular Suspended Pavement Systems.
- W. Continue to install and compact the specified planting soil within the Modular Suspended Pavement System frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both soils.
- X. Obtain final approval by the Owner's Representative of soil installation prior to installation of the Modular Suspended Pavement System deck.
- Y. Remove Strongbacks after planting soil and backfill has been compacted to the top of the entire set of Modular Suspended Pavement Systems.
- Z. Install 3 inches (75 mm) of compost, or leave 1-inch (25 mm) air space, below Modular Suspended Pavement System Deck as indicated on the drawings.

3.8 IRRIGATION SYSTEM INSTALLATION

- A. Install irrigation as shown and per project specifications. Irrigation shall be installed within the entire soil system, under both pavement and metal grate systems.

3.9 MODULAR SUSPENDED PAVEMENT SYSTEM DECK INSTALLATION

- A. Install the Modular Suspended Pavement System Decks over the top of each frame stack. Clean dirt from the tops of the Modular Suspended Pavement System frame columns. Register the deck and make connections as recommended by the manufacturer to secure the deck to the top of the Modular Suspended Pavement System Frame. Secure each deck at the four corners with screw fasteners as recommended by the manufacturer. Assure that each deck is seated firmly on the frame top with all connectors attached.
- B. Install and compact remaining backfill material such that the soil outside the limits of the Modular Suspended Pavement Systems is flush with the top of the installed deck.

3.10 INSTALLATION OF GEOTEXTILE, GEOGRID, INSPECTION RISER FOR SOIL, AND AGGREGATE OVER THE DECK

- A. Overlap geogrid from the sides of the Modular Suspended Pavement Systems over the top of the Modular Suspended Pavement System Decks, with minimum of 12 inches (300mm) overlap.
- B. Place geotextile over the top of the deck and where indicated on the drawings, extending beyond the outside edge of the excavation by at least 18 inches (450 mm). Any joints must be overlapped by a minimum of 18 inches (450 mm).
- C. Install inspection risers for soil above geotextile as indicated on drawings.
 - 1. Cut PVC pipe to fit vertically from Modular Suspended Pavement System deck to finish surface.
 - 2. Align riser with slots in Modular Suspended Pavement System deck or as shown.
 - 3. Wrap pipe in geotextile and secure with zip ties. Cut geotextile to overlap deck minimum 12".
 - 4. Cut geotextile inside the pipe to allow access. Do not cut or otherwise damage Modular Suspended Pavement System deck.
 - 5. Install painted caps on top of each riser flush with final paving surface.

- D. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics and inspection risers. Work the aggregate from one side of the deck to the other to assure that the fabric and aggregate conforms to the cell deck contours. Do not apply aggregate in several positions at the same time.
 - 1. Aggregate base course shall be a minimum of 4 inches (100mm) thick under pored in place concrete paving.
 - 2. Aggregate base course shall be a minimum of 12 inches (300mm) thick under unit pavers, asphalt paving, or porous paving.
- E. Load the aggregate from equipment that is outside the limits of the excavated area. Work over material already in place.
- F. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Modular Suspended Pavement System manufacturer.
- G. Compact aggregate base course(s) in lifts not to exceed 6" in depth, to 95% of maximum dry density. Utilize a roller or plate compactor with a maximum weight of 1000 pounds. Make sufficient passes with the compacting equipment to attain the required compaction.

3.11 INSTALLATION OF PAVING ABOVE THE MODULAR SUSPENDED PAVEMENT SYSTEM

- A. Place paving material over Modular Suspended Pavement System per project specifications. Take care when placing paving or other backfill on top of Modular Suspended Pavement System not to damage the system components.
- B. Turn down edge of all concrete paving to Cell deck along the edges of all planting areas to retain the aggregate base course.

3.12 INSTALLATION OF BRIDGING SLABS (WHERE APPLICABLE)

- A. Bridging slabs are to be used in locations where spacing larger than 3 inches (75 mm) is necessary between Modular Suspended Pavement System frames.
- B. Replace aggregate base course material with a minimum 4 inch (100 mm) concrete slab beneath paving. The paving shall extend beyond the gap between Cells at a minimum of 24 inches (610 mm).
- C. If spacing (gap) between Cells is larger than 12 inches (300 mm), the concrete slab must be increased to 6 inch (150 mm) thickness. If spacing (gap) between Cells is larger than 18 inches (450 mm), steel reinforcing shall be added to the slab. Reinforcing is to be designed by the project structural engineer. In no case shall the space between Cells be greater than 30 inches (750 mm).

3.13 INSTALLATION OF ROOT BARRIERS

- A. Install root barrier in accord with manufacturer's reviewed installation instructions.

3.14 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

- A. Prior to planting trees, install additional planting soil, to the depths indicated, within the tree opening adjacent to paving supported by Modular Suspended Pavement Systems.
- B. Remove all rubble, debris, dust and silt from the top of the planting soil that may have accumulated after the initial installation of the planting soil within the Modular Suspended Pavement Systems.
- C. Assure that the planting soil under the tree root ball is compacted for the entire soil depth to 85-90% to prevent settlement of the root ball.
- D. The planting soil within the tree opening shall be similar in texture to the soil in the adjacent Modular Suspended Pavement Systems.

3.15 REPAIR OF CUT GEOTEXTILE

- A. In the event that any geotextile over subgrades or the Modular Suspended Pavement System decks must be cut during or after installation, repair the seam with a second piece of geotextile that overlaps the edges of the cut by a minimum of 12-inches in all directions prior to adding aggregate material.

3.16 PROTECTION

- A. Ensure that all construction traffic is kept away from the limits of the Modular Suspended Pavement Systems until the final surface materials are in place. No vehicles shall drive directly on the Modular Suspended Pavement System deck or aggregate base course.
- B. Provide fencing and other barriers to keep vehicles from entering into the area with Modular Suspended Pavement System supported pavement.
- C. Maintain a minimum of 4 inches (100 mm) of aggregate base course over the geotextile material during construction.
- D. When vehicle must cross Modular Suspended Pavement Systems that does not have final paving surfaces installed, use construction mats designed to distribute vehicle loads to levels that would be expected at the deck surface once final paving has been installed. Use only low impact track vehicles with a maximum surface pressure under the vehicle of 4 pounds per square inch, on top of the mats over Modular Suspended Pavement Systems prior to the installation of final paving.

3.17 CLEAN UP

- A. Perform cleanup during the installation of work and upon completion of the work. Maintain the site free of soil and sediment, free of trash and debris. Remove from site all excess soil materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

END OF SECTION