

SECTION 02010 - PHYSICAL CONDITIONS - SURVEYS AND REPORTSPART ONE - GENERAL

1.01 SUMMARY

- A. Section includes explanation of information available and procedures for dealing with unforeseen physical conditions.

1.02 EXISTING UTILITIES

- A. The location and elevation of existing pipelines, underground and above ground utilities, and structures and obstructions shown on the drawings are taken partly from old records, partly from utility company data, and partly from measurements in the field and are approximate only. This information is shown to assist Owner's Representative in the preparation of the Drawings. Additional underground structures and obstructions may also exist. Contractor shall determine in his own way the obstructions and difficulties to be encountered in the prosecution of the work under this Contract. Contractor shall take all measures necessary to protect the existing underground and above ground utilities and structures from damage during the performance of his work. Any damage to the existing underground and above ground utilities as a result of the Contractor's work shall be repaired at no cost to the Owner or Owner's Representative.

1.04 UNFORESEEN PHYSICAL CONDITIONS

- A. Promptly notify Owner and Owner's Representative in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents.
- B. Owner's Representative will promptly investigate those conditions and advise Owner in writing if further surveys or subsurface tests are necessary.
- C. Promptly thereafter, Owner will obtain the necessary additional surveys and tests and furnish copies to Owner's Representative and Contractor.
- D. If Owner's Representative finds that the results of such surveys or tests indicate that there are subsurface or latent physical conditions which differ materially from those indicated in the Contract Documents, and which could not reasonably have been anticipated by Contractor, a Change Order shall be issued incorporating the necessary revisions.

PART TWO - PRODUCTS

NOT USED

PART THREE - EXECUTION

NOT USED

END OF SECTION 02010

SECTION 02011 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART ONE - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Temporary Utilities: Electricity, telephone service, water, and sanitary facilities.
2. Temporary Controls: Barriers, enclosures and fencing, protection of the Work and water control.
3. Construction Facilities: Access roads, parking, and temporary buildings.

1.02 RELATED SECTIONS

- A. General Requirements
- B. Special Requirements

1.03 TEMPORARY ELECTRICITY

- A. Contractor shall utilize and remove upon completion of the project, a new temporary electric distribution system for temporary light and power during construction, if necessary.
- B. Contractor will pay for all electrical energy consumed for construction purposes for all trades.
- C. OSHA regulations require that employers shall use either ground fault circuit interrupters or an assured equipment grounding conductor program in addition to other regulations for equipment grounding conductors.

1.04 TELEPHONE SERVICE

- A. Provide, maintain and pay for telephone service to field office at time of project mobilization if needed.

1.05 TEMPORARY WATER AND SANITARY FACILITIES

- A. The Contractor shall furnish, install, and maintain ample sanitary facilities for the workers. As the need arises a sufficient number of enclosed portable toilets shall be conveniently placed, as required, by the sanitary codes of the state and local government. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory type of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations and paid for by the Contractor.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.07 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.08 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work areas to minimize damage.
- C. Prohibit traffic on landscaped areas.
- D. Prohibit traffic on proposed rain garden planting areas with exception of the area located in the staging area.

1.09 SECURITY

- A. Provide security and facilities to protect Work, and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.10 ACCESS ROADS

- A. See site access plan for location and layout of proposed site access roads.
- B. A traffic control, site access, and bridging plan shall be submitted, by the contractor, for approval prior to any construction. This plan shall include (but not limited to):
 - 1. Access road depth and proposed material
- C. Post construction road improvements to off-site roads damaged, rutted or otherwise altered as a result of hauling or construction shall be performed. Such repair and restoring, including drainage facilities and other appurtenances, shall be performed to the satisfaction of the City of Madison Engineering Department. Repaving/patching road repair shall be considered incidental to the cost of the Work.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.
- B. Clean and repair damage caused by installation or use of temporary work.

1.12 DUST CONTROL

- A. The Contractor is responsible for performing all measures, including procurement of water in sufficient quantities, to control dust on the site.
- B. The cost of the water and dust control operations shall be considered as incidental to the cost of the Work.

PART TWO - PRODUCTS

NOT USED

PART THREE - EXECUTION

NOT USED

END OF SECTION 02011

SECTION 02105 - TREE AND PLANT PROTECTION

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Measures necessary for the protection of existing vegetation and proposed rain gardens to be provided as specified.
- B. Description of the Work
 - 1. The Contractor shall provide, erect, maintain and remove temporary fencing required to protect all existing vegetation identified by the Owner's representative.
 - 2. The Contractor shall confine work to areas within contract limit lines and maintain barrier fences in good condition throughout construction of the project.
 - 3. The Contractor shall be responsible for any violation as established by this section and shall be subject to the fines as stated in the Schedule of Fines.
 - 4. Clearing and grubbing shall be limited to the area within the construction limits or identified in the field by the Owner's representative. See Section 02110, Site Preparation, for clearing and grubbing. Clearing and grubbing or construction shall not commence before completion of and Owner's representative approval of protective barrier.

1.02 QUALITY ASSURANCE

- A. Qualifications
 - 1. All assessments or treatment of damaged plants shall be done by a company specializing in landscape appraisal and arboriculture.
 - 2. All Contractors shall be approved by the Owner's representative.
- B. All materials and work shall comply with applicable sections of: A Guide for Estimating Value of Trees and Other Plants, Council of Tree and Landscape Appraisers, latest edition.

1.03 DEFINITIONS

- A. Protective Barrier: A fence installed as a temporary device for the purpose of preventing unauthorized access during the full period of construction and/or to protect existing vegetation and proposed rain gardens from damage and disturbance.

- B. **Damage:** Physical change to the site or its vegetation caused by equipment, material, labor or grading operations which has occurred after a Notice to Proceed has been issued.
 - C. **Disturbance:** Visual change to the site or vegetation caused by equipment, material, labor or grading operations which has occurred after a Notice to Proceed has been issued.
 - D. **Trespass:** Any encroachment into protected areas caused by equipment, material, labor or grading operations which has occurred after a Notice to Proceed has been issued.
 - E. **Drip Line:** The point where the foliage cover concentrates main water on the ground. This line follows the general configuration of the outermost edge of a tree or shrub formed by its leaves and branches.
 - F. **Fine:** The dollar value established in the schedule of this section to be assessed the Contractor for each violation sighted by the Owner's representative from the day of sighting each violation.
 - G. **Existing Vegetation:** Any existing tree, shrub, groundcover, wildflower, grass or weed mass which presently occurs on the site indicated to remain.
 - H. **Protection:** Means of protecting existing site features from trespass, damage or disturbance by the use of barriers or other means necessary to prevent such trespass, damage or disturbance.
 - I. **Site:** The area as shown on the survey belonging to the Owner including areas where construction occurs or access to the site is granted.
 - J. **Violation:** Trespass, disturbance or damage caused by any construction, delivery or transportation vehicle; construction material through storage or usage; solid or liquid debris; or litter observed by the Owner's representative who conveys the observed violation to the Contractor verbally, if possible, and in writing within 7 days of a violation. The written notice shall include the date, the approximate time, the general location and type of violation as indicated in the Schedule of Fines.
 - K. **Contract Limit Lines:** Construction limits defined as shown and as identified in the field by the Owner's representative.
 - L. **Initial Clearing Zone:** Area within the construction limit lines, but not areas enclosed by protective barriers.
 - M. **Rain Garden:** Area within proposed limits as defined in the Construction Drawings.
- 1.04 SITE CONDITIONS

- A. The site was formerly used as community gardens and at present has been vacant for over one year.
- B. Clearing, grubbing and mass grading shall be confined to the initial clearing zone.

1.05 TEMPORARY FENCE

- A. Protection: Prior to commencing clearing operations, vegetation to be saved shall be protected by erecting a barrier in the location indicated and as approved in the field by the Owner's representative. The barrier shall be at the edge of grading or at the drip line of each tree, whichever is smaller. The barrier shall be placed at the edge of the Rain Garden or at the top of slope. The barriers shall remain in place until the Owner's representative approves its removal.
- B. Material: Protection barriers shall be constructed of wood and wire snow fence or chain link fabric. Fence shall be a minimum of 4 feet in height. Material shall be approved by the Owner's representative. Fencing shall be strung on 6 foot steel posts set at a maximum spacing of 8 feet center to center.

1.06 CONSTRUCTION AROUND PROTECTED AREAS

- A. Contractor shall not park vehicles or store debris within the drip-line or trees or in rain garden areas, and shall minimize all disturbance to these areas.
- B. Contractor shall not cut any roots greater than 2" diameter during utility installation.

1.07 SCHEDULE OF FINES

- A. Disturbed or damaged trees shall be attended by a tree surgeon approved by the Owner's representative. All costs incurred shall be paid by the Contractor if found to be in violation of the requirement of this Section. The Contractor shall be assessed a fine based on a damage appraisal made in accordance with the latest edition of A Guide for Estimating the Value of Trees and Other Plants by an arborist approved by the Owner's representative.
- B. Trees damaged shall be measured for size of trunk diameter according to the American Standard for Nursery Stock as prepared by the American Association of Nurserymen, Inc.
 - 1. The caliper of the trunk shall be taken 6 inches above ground level for trees larger than 4 inches, up to and including 12 inch caliper.
 - 2. The caliper of the trunk shall be taken 4 feet, 6 inches above ground level for trees larger than 12 inch caliper.

END OF SECTION 02105

SECTION 02110 - SITE PREPARATION

PART ONE - GENERAL

1.01 SUMMARY

- A. Miscellaneous site removals, salvage items, debris removal and disposal, and fencing, as shown on drawings and specified herein.

1.02 QUALITY ASSURANCE

- A. Permits and Regulations

1. All demolition and site clearance is subject to all provisions of applicable local ordinances and regulations.
2. All local codes, rules and regulations governing the respective utilities shall be observed in executing all work under this section.

1.03 JOB CONDITIONS

- A. Protection

1. Protect from damage existing items indicated to remain by the erection of barriers or by other means approved by the Owner.
2. All open depressions, excavations, pits, and the like, shall be barricaded. Adequate barricades shall be provided at all times. Barricades shall be constructed of materials which must conform to local safety regulations and must be acceptable to the Owner. Remove barricades and fences when no longer required.
3. Keep all public highways and roads clean of spillage at all times. All potholes, ruts, pavement damage shall be repaired by the contractor immediately.
4. It is the intent that barricades placed by the Contractor for safety or protection purposes be constructed of materials of the Contractor's choice, in accordance with applicable codes and regulations.

B. Utility Protection

1. The Contractor shall protect all existing utilities from damage resulting from his operations.

C. Pavement Protection

1. The Contractor shall protect all existing pavement from damage resulting from operations.
2. All pavement and curb and gutter to be removed shall be sawcut.

D. Shoring and Bracing

1. Shore and brace excavations as required to prevent cave-ins. Shoring and bracing shall be constructed of sound material, accurately placed, and securely braced. The Contractor shall assume full responsibility for adequate construction of shoring and bracing and shall be responsible for the safety of all persons occupying excavated sites.
2. Provide shoring, including soldier beams and wood lagging or other protective measures, as may be necessary to protect at all times adjacent structures, facilities, and utilities. Assume the responsibility for the adequacy of the design, installation, and effectiveness of all shoring and other protective methods utilized, and repair damage resulting from failure to take adequate measures for protection of persons and adjacent property (including, but not limited to, land, structures, facilities, pavements, utilities, and grades). Remove shoring when no longer required.
3. Prior to installation, make every effort to determine the presence of existing underground conditions not indicated. If unknown services or obstructions are discovered, the Contractor shall notify the Owner before proceeding.
4. Remove all shoring and bracing prior to backfilling.

E. Environmental Protection

1. When necessary, wet down materials or use other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.

F. Historic Structures

1. If archeological materials, including submerged features, artifacts, or structural materials are encountered, halt construction activities. Report the discovery to the Owner immediately.

G. Clear and Grub

1. The material to be cleared and grubbed shall be chipped on-site.

PART TWO - PRODUCTS

2.01 GENERAL FILL

- A. General Fill shall be excavated materials from on-site grading operations free of deleterious foreign matter. All backfill shall be free of vegetable matter, debris, frozen matter and concrete or stone larger than 3 inches in its greatest dimension.
- B. Imported general fill shall be embankment material as described in the State of Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction, Latest Edition.

PART THREE - EXECUTION

3.01 UTILITY ADJUSTMENTS OR ABANDONMENT

A. General

1. All cutting, blocking, and discontinuance of utilities shall be done in a permanent and workmanlike manner to the full satisfaction of utility companies and the Engineer.
2. Diggers Hotline, and all utility companies involved shall be immediately notified by the Contractor so that construction operations may proceed without danger to, or interruption of, said services for other property owners or liability to the Owner.

3.02 WOOD CHIPS

- A. Wood chips shall be delivered to Troy Gardens Farm north of the railroad row. Exact location to be determined at time of delivery.

3.03 DEMOLITION

- A. All materials designated by plans to be removed shall be removed and disposed off site except items that have been designated to remain or to be salvaged for re-use.

3.04 CLEAN UP AND DISPOSAL

- A. Debris
 - 1. Remove all debris found on the site or accumulated during performance of the work, including loose branches, stumps, furnishings, miscellaneous concrete items, building debris, and salvaged or broken stones of unusable size.
 - 2. Items to be removed shall become the property of the Contractor and shall be legally disposed of off the site.
 - 3. Debris or other materials shall not be offered for sale on the project site.
 - 4. Burning of debris will not be permitted on the site.

END OF SECTION 02110

SECTION 02200 - SITE EARTHWORK

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Cutting, filling and grading as indicated on drawings and specified herein.

1.02 REFERENCES

- A. Codes and Standards
 - 1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Reference Specifications
 - 1. State Specifications: "State of Wisconsin DOT, Division of Highways, Standard Specifications for Highway and Structure Construction," 2003 Edition, State of Wisconsin Department of Transportation, including Amendments.

1.03 SUBMITTALS

- A. Field Test Reports: During construction, submit field test reports in accordance with testing schedule.
- B. Manufacturer's Data: Submit manufacturer's descriptive literature, detailed specifications, performance data, instructions and recommendations for installation for proposed geotextile fabrics.

1.04 QUALITY CONTROL

- A. Testing and Inspection Service
 - 1. Contractor will engage soil testing and inspection service to perform sampling and testing of soil materials proposed for use in the work.
 - 2. Laboratory Tests
 - a. Make soil classification tests in accordance with ASTM D2487.

- b. Make moisture-density tests of each type of soil material the Contractor proposes to use under pavement areas in accordance with ASTM D698.
- c. Determine the bearing capacity of the soil under foundations by calibrated penetrometers.
- d. After testing, the testing laboratory will inform the Owner's Representative in writing of their recommendations for compaction of the soil samples submitted for testing. One copy of each report will be sent to the Contractor and Owner's Representative. The Contractor shall comply with such recommendations.

3. Field Control Tests

- a. The soil testing laboratory will make field control tests for density of soil in place of subgrade for cut and for compacted fill areas.
- b. When, in the judgment of the Owner's Representative, there is reasonable doubt that a fill or backfill material exhibits characteristics of the material which has been proposed for use, a field-conducted one point proctor test will be performed. If the moisture-density coordinates of the one point proctor test do not fall on the curve which has been established by laboratory tests, a sample of that material will be tested in the laboratory for conformance to the specifications.
- c. Density of soil in place test in accordance with ASTM D698, sand cone method, or ASTM D2922 nuclear method, will be made for each 5,000 square feet of subgrade and each compacted layer of backfill and fill 24 inches or less in depth and as directed by the Owner's Representative.
- d. One copy of each report will be submitted to the Contractor. Reports will designate the location of the work tested.

1.06 DELIVERY AND STORAGE

- A. Deliver and store materials in a manner to prevent contamination or segregation.

1.07 SITE CONDITIONS

- A. Site Information

1. Examine the site to ascertain the state and conditions under which the work is to be done.
- B. Protection of Persons and Property
1. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
 2. Protect utilities, pavements, and other facilities from damages caused by settlement, lateral movements, undermining, washout, and other hazards created by excavation operations.

PART TWO - PRODUCTS

2.01 SOIL MATERIALS

- A. In general, soil materials shall be free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, frozen, deleterious, or objectionable materials.
1. General Fill: General fill material shall be friable soil conforming to the general requirements for soil materials.
 - a. General fill shall possess the characteristics required for compaction to the values of soil density herein specified for the location of intended use. Maximum particle size shall be 3 inches in longest dimension.
 - b. General fill shall be an unclassified excavated soil material from the site.
 - c. Imported general fill shall be embankment material as described in the State of Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction, latest edition.
 2. Topsoil shall be in accordance with Section 02911.
 3. Rain garden mixtures shall be as defined in plans.

PART THREE - EXECUTION

3.01 INSPECTION

- A. Examine work in place on which this work is dependent. Defects that may influence satisfactory completion and performance of this work shall be corrected in accordance with the requirements of the applicable section of work prior to commencement of the work. Commencement shall be construed as work in place being acceptable for satisfying the requirements of this section.

3.02 EXCAVATION

- A. Stockpiling excavated Material Suitable for Filling or Backfilling
 - 1. Stockpile excavated materials in an approved location, until required for backfill or fill.
 - 2. Locate and retain fill materials away from edges of excavations.
- B. Drainage and Dewatering
 - 1. Ground adjacent to excavations shall be graded to prevent surface water from flowing into excavations.
 - 2. Remove water accumulating in excavations to prevent softening of foundation bottoms or soil changes detrimental to stability of the subgrade.
 - 3. Provide and maintain sufficient dewatering devices such as: pumps, hoses, strainers, and other appurtenances required to convey the water away from excavations.
 - 4. Water shall be discharged a sufficient distance from the excavations to prevent backflow. Dewatering operations shall be maintained until backfill is placed.
 - 5. Water discharged from excavations shall be discharged into a temporary sedimentation basin, portable dewatering basin, or equivalent devise. Any individual sedimentation basin shall have a depth of 3 ft and provide a maximum surface settling rate of 1500 gallons per square foot per day. No water shall be discharged directly into the Lake or City storm sewer system.

C. Unauthorized Excavations

1. Care shall be taken not to excavate below the depths indicated. Excessive or unauthorized excavations shall be filled at no cost to the Owner.
2. Unauthorized excavation under site structures and footings shall be filled with compacted granular fill.
3. Unauthorized excavation in other locations shall be filled with compacted granular fill or fill material approved by the Owner's Representative.

D. Stability of Excavations

1. Slope the sides of excavations to comply with local codes and ordinances having jurisdiction. Sheet, shore, and brace where sloping is not possible either because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition per OSHA requirements until completion of backfilling.

E. Shoring and Bracing

1. Provide sheeting, shoring and bracing as required by OSHA to prevent cave-ins and to comply with local codes and ordinances having jurisdiction.
2. Provide shoring, protective measures as may be necessary to protect, at all times, adjacent structures, facilities, and utilities. Assume the responsibility for the adequacy of the design, installation and effectiveness of all shoring and other protective methods utilized, and repair damage resulting from failure to take adequate measures for protection of person and adjacent property.
3. Shoring and bracing shall be constructed of sound material, accurately placed and securely braced. Maintain during period excavation is open. Remove when no longer required.

F. Frost Protection

1. Protect trenches and bottoms of excavations against freezing by means of insulating materials and/or heat as approved.

G. Additional Excavation

1. When excavation has reached required subgrade elevations, notify the Owner's Representative who will make an inspection of conditions.
2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Owner's Representative.
3. Removal of unsuitable material and its replacement as directed will be paid on the basis of contract conditions relative to changes in the work.

H. Excavation for Structures

1. Excavate for site structures.
2. Trim excavation bottoms to required lines and grades, leaving a solid base to receive fill materials or finish surface materials.
3. Excavations shall extend a sufficient distance away from footings to permit placing and removal of forms, inspection of work, and installation of other work.

3.03 FILL

A. Placing Fill

1. Do not place fill material upon a frozen surface.
2. During fill material placing operations, remove roots, trash, debris, and all stones larger than 3 inches in longest dimension.
3. Maintain the entire surface of a section under construction in such condition that construction equipment can travel on all parts of all sections. Fill ruts in surface before proceeding with compaction operations.
4. After completion of site rough grading the surface under proposed pavements shall be proofrolled by at least four passes of a vibratory roller which shall exert a minimum of 150 pounds per square inch. Areas that are noted by the Owner's Representative to be soft or not respond to continued surface compaction shall be undercut to the waterline or original grade and filled with compacted granular fill.

B. Compaction of Fill Layers

1. Compact each layer of fill material within ± 4 percent of optimum moisture content to the density specified under "Compaction Requirements." Prior to compaction operations, the layer of fill material shall be scarified, disked, harrowed, or pulverized sufficiently to break down oversized clods.

C. Temporary Suspension of Work

1. If work is suspended on a section receiving fill more than 24 hours, the Owner's Representative may, as a protective measure, direct that the area be graded and compacted to prevent loss of moisture and to facilitate drainage. Before work is resumed in the area, surface shall be scarified, watered, or allowed to dry as required, and recompacted.
2. If compaction is in the fall or early winter and operations stopped during the winter, the surface shall be rolled with a flatwheel roller, recompacted, and sloped to allow runoff of surface water. No equipment shall be placed on the surface after the completion of the above operations until it is dry enough that rutting and remolding of the surface will not occur.

3.04 GENERAL GRADING

- A. Grade excavated and filled sections, including transition areas, to provide positive drainage. Reshape graded areas over underground mechanical and electrical utilities provided under mechanical work and electrical work and areas rutted or otherwise disturbed during construction operations to obtain uniform transition to adjacent areas or finish grades as indicated.
- B. Grades not otherwise indicated shall be uniform levels or slopes between points where elevations are given, or between such points and existing grades. The finish surface shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as otherwise specified. The finished surface shall be not more than 1 foot above or below the established grade on steep slopes (3 horizontal to 1 vertical or steeper) and 0.1 foot above or below the established grade or cross section in flatter areas. Hand-grade areas immediately adjacent to walls and other structures to slope down away from structure for proper drainage.
- C. Protect newly graded areas from traffic and erosion. Before final acceptance of the work, repair, and reestablish grades in settled, washed away, or rutted areas.

3.05 COMPACTION REQUIREMENTS

- A. Site compacted areas are defined as all areas that receive fill.
- B. Moisture-Density
 - 1. The compacted density at optimum moisture content as determined by moisture-density test specified, shall be:
 - a. 98 percent of maximum dry density for site compacted areas.
 - b. 90 percent of maximum dry density for all other areas.
 - 2. The maximum variation in minimum density of the first 3 feet of depth of compacted fill in pavement compacted areas shall be 4 percent.
 - 3. The maximum variation in moisture content in the compacted material, at the time of compaction, from the optimum moisture content for the material shall be as follows.
 - a. 3 percent over optimum when atmospheric conditions would tend to decrease the moisture content.
 - b. 3 percent under optimum when atmospheric conditions would tend to increase the moisture content.
- C. Moisture Control
 - 1. Prior to compaction operations, provide the necessary equipment for adding moisture to the subgrade material and to each layer of backfill and fill material.
 - 2. If moisture is required to be added to the surface of the subgrade or layer of backfill or fill material, water shall be uniformly applied and accurately measured, and application of water shall be controlled so that free water will not appear on the surface during or subsequent to compaction operations.
 - 3. Material that is too wet to permit compaction to the specified density shall be permitted to dry, assisted by disking, harrowing or pulverizing, if necessary, until the moisture content is reduced to within the maximum variation from optimum.

3.06 DISPOSAL OF SURPLUS MATERIAL

A. Unsuitable Material, Debris and Refuse

1. Excavated material unsuitable for filling or grading operations, and debris and refuse shall be disposed offsite at the Contractor's expense.

END OF SECTION 02200

SECTION 02210 - EARTHWORK FOR UTILITIES

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Excavation, bedding, and backfill for all buried utilities and removal and replacement of sidewalk, pavement or other surface materials.

1.02 REFERENCES

- A. Performance and material requirements shall meet specific reference standards as referred to hereinafter as:
 - 1. ASTM - American Society for Testing and Materials Standards
 - 2. Wisconsin Department of Transportation (WDOT) "Standard Specifications for Highway and Structure Construction", Latest Edition.

1.03 SUBMITTALS

- A. Certified Test Reports: Prior to construction, submit certified test reports for all Contractor-supplied materials.
- B. Field Test Reports: During construction, submit field test reports in accordance with the testing schedule.

1.04 QUALITY CONTROL

- A. Testing and Inspection Service
 - 1. The Owner shall engage a soil testing and inspection service to perform sampling and testing of soil materials proposed for use in the work, and field testing facilities for quality control during earthwork operations.
 - 2. Laboratory Tests
 - a. Test granular bedding and backfill materials for gradation prior to use. When site excavated material is to be used, test at least one sample for every 500 linear feet of trench. When Contractor-provided material is to be used, test at least one sample for each material source.
 - b. Test granular bedding backfill and site backfill materials for maximum compacted density and optimum moisture content in accordance with

ASTM D1557. Test frequency shall be the same as the above paragraph.

- c. After testing, the testing laboratory shall inform the Owner's representative in writing of its recommendations for compaction of the soil samples submitted for testing. One copy of each report will be sent to the Contractor and Owner's representative. The Contractor shall comply with such recommendations.

B. Field Control Tests

1. Perform in-place density tests in randomly selected locations and in accordance with ASTM D1556 (sand cone method), or ASTM D2922 and ASTM D3017 (nuclear methods) as follows:

<u>Material Type</u>	<u>Test Frequency</u>
Bedding	one per lift per 50 lineal feet of line
Granular Backfill	one per lift per 50 lineal feet of line
Site Backfill	one per lift per 50 lineal feet of line

1.05 DELIVERY AND STORAGE

- A. Deliver and store materials in a manner to prevent contamination or segregation. Storage areas will be as designated by Owner's representative.

1.06 SITE CONDITIONS

A. Site Information

1. Examine the site to ascertain the state and conditions under which the work is to be done.
2. Log of test borings, if available, will be furnished upon request, but is not part of the contract documents.
 - a. The data on indicated subsurface conditions are not intended as representations or warranties of the accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations of conclusions drawn therefrom by the Contractor.
 - b. Additional test borings and other exploratory operations may be made by the Contractor at no cost to the Owner.

3. The Contractor shall assume full responsibility for interpreting boring data and for the conclusions drawn from the information furnished and from inspection of available information at the site.
- B. Protection of Persons and Property
1. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
 2. Protect utilities, pavements and other facilities from damages caused by settlement, lateral movements, undermining, wash-out and other hazards created by excavation operations.

PART TWO - MATERIALS

2.01 SOIL MATERIALS

- A. Topsoil: As specified in Section 02911
- B. Bedding Material: As specified in Section 02500
- C. Granular Backfill: As specified in Section 02500
- D. General Site Backfill:
 1. Material excavated onsite during performance of the Work.
 2. Other Imported Material, Submitted by the Contractor, Approved in writing by the Engineer.

PART THREE - EXECUTION

3.01 SHORING AND SHEETING

- A. Provide temporary shoring, bracing, cribbing or sheeting as required to prevent undermining of structures, utilities, pavements and slabs, and to provide a safe work area in accordance with OSHA safety regulations. The Contractor is responsible for the design of all shoring and sheeting including utility supports.

3.02 EXCAVATION

- A. Shall be to the elevations and dimensions indicated or otherwise specified. Keep excavations free from water while construction is in progress. Notify the Owner immediately if it becomes necessary to remove hard, soft, weak or wet material to a depth greater than indicated.
- B. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of top of the pipe, conduit or duct.
- C. Excavate large rock, boulders or hard material to an overdepth at least 4 inches below the bottom of the pipe, conduit, duct and appurtenances unless otherwise indicated or specified.
- D. Use bedding material to refill overdepths to the proper grade and place in 6 inch maximum layers. At the option of the Contractor, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified.
- E. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe, conduit, duct or structure on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded and dimension as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Dimensions shall be as shown on the drawings.

3.03 BEDDING

- A. Bedding for utility lines and utility line structures shall be of the materials indicated above and depths shown on the drawings. Sanitary and storm sewer bedding shall conform to Class B Bedding as defined in the Standard Specifications for Sewer and Water Construction in Wisconsin, Section 3.2.6.
- B. Place bedding in 6 inch maximum loose lifts. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints. No frozen bedding material is to be used.

3.04 DEPTH OF COVER

- A. Trenches for electrical utilities shall be of a depth as indicated on drawings and as required in Article 300-5 or the 1993 NEC.
- B. Trenches for water, sewer and gas utilities shall be of a depth as required by State of Wisconsin Codes.

- C. All underground cables, raceways and pipe utilities shall have clean sand fill for a depth of 2-inches all around. Provide orange plastic marker ribbon 1'-0" below final grade.

3.05 BACKFILLING

- A. Shall be as shown on the drawings and as specified.
- B. Surround pipes, conduits, ducts with bedding or backfill as indicated. Ensure that backfill is placed completely under pipe haunches. No frozen backfill is to be used. Ensure that no damage is done to structures or protective coatings thereon.
- C. Place granular backfill in 6 inch maximum loose lifts to 1 foot above pipe or other utility unless otherwise specified. Bring up evenly on each side and for the full length of the structure.
- D. Place general site backfill in all non-pavement areas. Backfill shall be placed in 12-inch maximum loose lifts unless otherwise specified.
- E. Compact each loose lift as specified in Paragraph 3.06, Compaction, before placing the next lift.
- F. Do not backfill in freezing weather where the material in the trench is already frozen or is muddy, except as authorized.
- G. Where unacceptable settlements occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
- H. Coordinate backfilling with testing of utilities. Testing for the following shall be complete before final backfilling: water distribution, and sanitary sewer systems.

3.06 COMPACTION

- A. Use hand-operated plate-type vibratory or other suitable hand tampers in areas inaccessible to larger rollers or compactors. Be careful to avoid damaging utilities and protective coatings. Compaction shall be in accordance with the following unless otherwise specified.
 1. Compaction of Bedding: Compact to 95 percent of ASTM D1557 maximum density.
 2. Compaction of Granular Backfill: Surrounding pipes, cables, conduits or ducts shall be to 95 percent of ASTM D1557 maximum density.

3. Compaction of General Site Backfill: General site backfill shall be compacted to 90 percent of ASTM D1557 maximum density except as modified below.

3.07 SPECIAL EARTHWORK REQUIREMENTS

- A. Manholes and Other Appurtenances: Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove unstable soil that is incapable of supporting the structure to an overdepth of 1 foot and refill with compacted bedding material to the proper elevation. Replace the subgrade materials in accordance with applicable portions of Sections 3.04 and 3.05 above.
- B. Roads, Streets, Walkways and Other Areas to be Paved: Place backfill in 6 inch maximum loose lifts. Compact bedding and granular backfill surrounding pipes, ducts, conduits and other structures as specified above. Granular backfill is to be used for the entire excavation up to the subbases (no site backfill unless site material meets Granular backfill requirements). Backfill in a manner to permit the rolling and compacting of the completed excavation with the adjoining material to provide the specified density so that paving of the area can proceed immediately after backfilling has been completed.

3.08 FINISH OPERATIONS

- A. Grading: Shall be to finished grades indicated within 1/10 foot. Grade areas to drain water away from structures. Existing grades which are to remain, but are disturbed by the Contractor's operations, shall be graded as directed.
- B. Disposition of Surplus Material: Surplus or other soil material not required or suitable for filling, backfilling or grading shall be removed from the project site.
- C. Protection of Surfaces: Protect newly graded areas from traffic, erosion and settlements that may occur. Repair or reestablish damaged grades, elevations or slopes.

END OF SECTION

SECTION 02215 - SOIL EROSION AND SEDIMENTATION CONTROL

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. Erosion and sedimentation control on project site.

1.02 REFERENCES

- A. State Specifications: "State of Wisconsin DOT, Division of Highways, Standard Specifications for Highway and Structure Construction," 2003 Edition, State of Wisconsin Department of Transportation, including Amendments.

1.03 EROSION AND SEDIMENTATION CONTROL PRACTICES

- A. Erosion and sedimentation control measures shall be utilized throughout the construction site to prevent erosion during construction and after construction until vegetation is established.
- B. Erosion and sedimentation control measures shall be appropriate to the site. The following general practices shall be used where applicable:
 - 1. Uncover the smallest practical area of land.
 - 2. Use temporary vegetation, mulch or other cover to protect areas during construction. Utilize dikes, hay bales or silt fence to trap sediment.
 - 3. Reduce volume and velocity of water crossing disturbed areas by utilizing diversion dams, hay bales, berms or other facilities.
 - 4. Install final plant cover as soon as possible or as directed by the Owner's Representative.

PART TWO - MATERIALS

2.01 GENERAL

- A. All materials shall be as indicated on the drawings, in compliance with WDOT 628 Erosion Control. All material proposed for use shall be subject to approval and modification by the Owner's Representative and the City of Madison.

PART THREE - EXECUTION

3.01 GENERAL

- A. Silt fence and erosion control measures shall be established prior to exposing any erodible material. Site grading and drainage operations are to be conducted in a manner to prevent or lessen excessive soil erosion of the construction site work area.
- B. The Owner's Representative has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing excavation, material placement operations and to direct the Contractor to provide immediate temporary or permanent erosion control measures. The Contractor shall incorporate all permanent erosion control features into the project at the earliest practicable time to minimize the need for temporary controls.

3.02 TEMPORARY PROTECTION OF THE SOIL

- A. Temporary soil protection shall be provided and maintained over the winter after the initial growing season.
- B. The following methods shall be used at the locations shown on the plans unless directed to otherwise by the Owner's Representative.
 - 1. Silt Fence: Perimeter of disturbed areas.
 - 2. Anti-Tracking Pads: All construction entrances.
- C. After establishment of permanent vegetation, silt fences shall be removed off site, at the Contractors expense.
- D. The temporary erosion control system installed shall be properly maintained as directed by the Owner's Representative and the City of Madison to control siltation at all times during the life of the contract. If the Contractor fails to maintain the temporary erosion control systems as directed by the Owner's Representative, the Owner's Representative may at the expiration of the period of 48 hours, after having given written notice, proceed to maintain the system as deemed necessary, and the cost thereof shall be deducted from any compensation due, or which may become due the Contractor under this contract.
- E. Remove soil and debris from structures, roadways, pipes, ditches, and other appurtenances to restore proper functioning.

3.03 ADDITIONAL CONTROL MEASURES

- A. Any soil loss control measures, in addition to those outlined in these documents and deemed necessary by the City of Madison shall be implemented immediately.

Contractor shall notify Owner's Representative immediately upon notification from the City of Madison that additional control measures will be required.

END OF SECTION 02215

SECTION 02270 - CRUSHED AGGREGATE BASE COURSE**PART 1 - GENERAL**

1.01 Work Includes:

- A. Provide all labor, material and equipment as required to properly complete all crushed aggregate base course operations.

1.02 Safety Codes and Standards

- A. Perform all work in compliance with applicable requirements of governing authorities having jurisdiction.

1.03 References

- A. State Specifications: "State of Wisconsin DOT, Division of Highways, Standard Specifications for Highway and Structure Construction," 1996 Edition, State of Wisconsin Department of Transportation, including Amendment of Supplemental Specifications, 2000 Edition.
- B. ASTM C136 – Sieve Analysis for Fine and Coarse Aggregate.
- C. ASTM D2922 – Test Method for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (shallow depth).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The materials incorporated into the work for the roadway, parking lots concrete curb or sidewalk identified as compacted aggregate shall meet the requirements of Section 304 of the "State Specifications." The material shall be Gradation No. 2 as identified in Section 304.2.6, in combination with the salvaged materials that exist in the roadway and parking lot.
- B. The materials incorporated into the work for areas where no aggregate presently exists, and as identified as 3" breaker run shall meet the requirements of Section 401 of the "State Specification."

PART 3 - EXECUTION

3.01 CONSTRUCTION OF AGGREGATE BASE COURSE

- A. Subgrade Preparation
 - 1. Before placing this work, inspect subgrade surfaces for line, grade, and compaction.

2. Subgrade surface found to be unsuitable shall be brought up to grade and reconditioned as specified under Section 02200, Earthwork, including the necessary fine grading, to ensure that the minimum specified depth of paving will bring the surface to the indicated elevations. If the Engineer finds the subgrade surface unsuitable, such surface shall be struck off with approved graders, scarified and wetted, and finally rolled with the addition of sufficient moisture to prevent drying out prior to the placing of the aggregate material.

B. Equipment

1. Equipment for construction of aggregate base courses is subject to approval by the Engineer and shall be maintained in satisfactory working condition at all times.
2. Placing of the aggregate base courses shall be by means of a moving vehicle equipped with spreader box, mechanical spreader, or other approved equipment capable of laying the courses so that the finished layer will be of the proper gradation and thickness.
3. Compaction equipment shall consist of self-propelled tamper or pneumatic-tired rollers of vibrating compactors, and three-wheeled or tandem rollers weighing from 6 to 10 tons and having a weight of not less than 200 pounds or more than 325 pounds per inch width of roller. Equipment shall be capable of obtaining the required density throughout the entire depth of the layer being compacted.

C. Placing Aggregate

1. Place aggregate on the subgrade by using approved placing equipment in a uniform layer to the required contour and shape and in layers not more than 4 inches (compacted) in thickness. Total thickness after compaction shall not be less than indicated. Segregation of large or fine particles will not be acceptable and packets of segregated material shall be removed and replaced with a satisfactory mixture, or shall be remixed as directed and approved by the Engineer.

D. Compaction

1. After placing, compact the material by approved means. Rolling shall begin at edges of the area to be compacted and shall proceed towards the center. Areas not accessible to rollers shall be compacted by mechanical tampers.
2. Material shall be compacted to at least 95 percent of maximum unit weight. The moisture content shall be maintained within a tolerance of plus or minus 3 percent of optimum until the prescribed unit weight is obtained, as determined by ASTM D1557.

3. Compact each layer until the maximum unit weight is attained before placing the succeeding layer.

E. Density

1. During the construction of aggregate base courses, field density tests will be made as specified under Article 1.04, Quality Control.
2. If density tests indicate that the base course does not comply with specified density requirements, additional wetting, if necessary, and rolling will be required until the specified density is obtained. Moisture shall be added to the material during compaction only when it is necessary to increase the percentage of moisture to obtain the specified density.

F. Finished Surfaces

1. Finished surfaces of the parking lots and roadway shall be smooth, even and true to the lines, grades and cross sections indicated. When testing with a 10-foot straight-edge parallel to the center line of the surfaces area, finished surface shall not show a deviation in excess of $\frac{1}{4}$ inch in 10 feet.

END OF SECTION 02270

SECTION 02500 - GENERAL PROVISIONS FOR UTILITY WORK

PART ONE - GENERAL

1.01 SECTION INCLUDES

- A. General provisions and materials for utility work.

1.02 REFERENCES

- A. All work is to be installed per City of Madison standards and specifications. In case of a discrepancy(ies) between sewer authority standards and the technical specifications outlined in this section, the City's standards shall prevail.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Utility work shall comply with referenced chapters and sections of "Standard Specifications."

1.04 SUBMITTALS

- A. Test Results:
 - 1. Submit sieve analysis of bedding material and cover material materials prior to delivery.
- B. Submit in accordance with General Conditions.

1.05 PROJECT/SITE CONDITIONS

- A. Location of Underground Facilities:
 - 1. CONTRACTOR shall become acquainted with location of underground facilities which may be encountered or affected by Work. Contractor shall verify location and existence of utilities prior to beginning work. All existing utility information contained in the plan is approximate and based on the Digger's hotline locates and a field survey completed over two years ago and may not be representative of actual existing facilities.
 - 2. Locations of underground structures shown on Drawings are based on available records furnished to OWNER and ENGINEER by owners of such underground facilities or by others, and were used by ENGINEER to prepare Contract Documents, but are not guaranteed to be complete or correct, and are given only to assist CONTRACTOR in making determination of location of underground structures.

B. Drainage:

1. Do not obstruct drainage.
2. When necessary, lay continuous pipe or timber drain of ample capacity to carry off storm water.
3. Keep pipe or drain open and free of obstruction.
4. Convey storm water or groundwater to be removed from site, to inlet of storm or combined sewer, or when approved by ENGINEER, to some other point of disposal.
5. Convey sanitary sewage by closed pipe or hose to inlet of sanitary or combined sewer or, when approved by ENGINEER, to some other point of disposal.
6. Prevent excessive quantities of clay, sand or silt from entering existing sewers.
7. Restore disturbed existing structures to condition at least equal to original.

C. Haul Routes:

1. Clean up material dropped or fallen from trucks in transit.
2. Material not cleaned up will be cleaned up by OWNER with cost charged to CONTRACTOR.

D. Storage of Materials:

1. Place materials neatly and compactly along or near site.
2. Do not place materials within 20 ft of hydrant, pedestrian crossing or intersection.
3. Place materials to cause least inconvenience to property owners and ensure safety of general public.

E. Dust Palliative:

1. Furnish and apply dust palliative on trench surfacing and temporary roadways.
2. Apply uniformly and repeat as necessary.

F. Lot Corners and Survey Monuments:

1. Protect lot corners and survey monuments which exist throughout Project site.
2. If corners and monuments are damaged by CONTRACTOR, replacement shall be made by Registered Land Surveyor.

G. Thawing Frozen Ground:

1. Any method must be proposed to Engineer in writing and approved prior to beginning.

1.06 QUALITY ASSURANCE

A. CONTRACTOR shall employ and pay for services of testing laboratory approved by OWNER to perform specified services and testing as described in Specifications.

1. Employment of laboratory shall, in no way, relieve CONTRACTOR'S obligations to perform Work of Contract.

B. Qualification of Laboratory:

1. Meet basic requirements of ASTM E329 .
2. Authorized to operate in state in which Project located.
3. Testing Equipment:
 - a. Calibrated at reasonable intervals by devices of accuracy traceable to either:
 - 1) National Bureau of Standards.
 - 2) Accepted values of natural physical constants.

C. Laboratory Duties:

1. Cooperate with ENGINEER and CONTRACTOR; provide qualified personnel to perform Work after due Notice to Proceed.
2. Perform specified inspections, secure samples, and test materials.
 - a. Comply with specified standards.
 - b. Ascertain compliance of materials with Contract Documents.
3. Promptly notify ENGINEER and CONTRACTOR of observed irregularities or deficiencies of Work, equipment or material.
4. Promptly submit written report of each test and inspection; one copy each to ENGINEER, OWNER, material supplier, and CONTRACTOR, and one copy to record document file. Each report shall include following.
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name, address, and telephone number.
 - d. Name and signature of laboratory inspector.
 - e. Date and time of sampling or inspection.

- f. Record of temperature and weather conditions, if test is performed in field.
 - g. Date of test.
 - h. Identification of product and Specification section.
 - i. Location of sample or test in Project.
 - j. Type of inspection or test.
 - k. Results of tests and compliance with Contract Documents.
 - l. Interpretation of test results, when requested by ENGINEER.
5. Perform additional tests as required by ENGINEER or CONTRACTOR.
- D. Laboratory Not Authorized to:
- 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of Work.
 - 3. Perform duties of CONTRACTOR.

PART TWO - PRODUCTS

2.01 MATERIALS

- A. Per City of Madison Specifications.

PART THREE - EXECUTION

3.01 PREPARATION

- A. Inform ENGINEER of source of bedding material, and granular backfill prior to start of construction. If source is changed, notify ENGINEER 48 hrs prior to initial hauling from that source.

3.02 GENERAL WORK PROVISIONS

- A. Sections 2.1.1, 2.1.2, and 2.1.3 of "Standard Specifications," except as modified below.
 - 1. Delete first and last paragraphs of Section 2.1.1.

3.03 SHEATHING AND BRACING

- A. If sheathing is driven below spring line of pipe, sheathing shall be cut off maximum of 3 ft above pipe and lower section left in-place.

3.07 UNSTABLE TRENCH BOTTOM AND CRUSHED STONE STABILIZATION

- A. Remove undesirable material below trench bottom, such as organic soils, which cannot adequately support sewer and replace with crushed stone.

3.08 UTILITY CROSSINGS

- A. Provide 3 working days notice to above ground utility such as electric power, telephone, and telegraph companies to relocate or reinforce poles, ties or anchors which may be on line of proposed utility or weakened by excavation for utility.
- B. Expose utilities crossing proposed facility prior to construction to allow ENGINEER to check for conflicts. Protect utilities from disturbance throughout Work.
- C. Backfill:

1. Use aggregate slurry backfill material to support sewers, building sewers, water mains, and utilities crossing trenches under pavement.
2. Use granular backfill to support utility trenches outside of pavement.
3. Compact granular material to minimum 95% maximum density as determined by ASTM D1557, Method D (Modified Proctor).
4. At CONTRACTOR'S choice, CONTRACTOR may substitute limestone chips or aggregate slurry backfill for granular backfill material.
5. CONTRACTOR may, with written approval of ENGINEER, substitute reinforced concrete beams as shown on File No. 2 of "Standard Specifications."

3.09 BREAKING PAVEMENT

- A. Installation of utility work may encounter buried or exposed concrete pavement as indicated on the plans. Utility trench may be placed through concrete pavement by breaking and removing the pavement. Saw cutting will be required. Broken concrete removed from trenching operations shall be disposed offsite at no cost to the Owner.

3.10 DRAINAGE AND DEWATERING

- A. Protect adjacent properties from damage due to dewatering operation.
- B. Dewatering:
 1. Keep construction site free-draining.
 2. Keep excavations free from water.
 3. Maintain groundwater minimum of 12 in. below excavations.
 4. Remove soil disturbed by pressure or flow of groundwater and replace with free-draining material.
 5. Maintain dewatering systems to preventing uplifting of structures.
- C. Obtain DNR, Private Water Supply Section, approval if dewatering operations exceed 70 gpm for wells.

3.11 EXCAVATED MATERIAL

- A. Per City of Madison Specifications and including the following:
 1. OWNER has first right to excavated material not used as backfill. Dispose of excess excavated material offsite at no cost to the OWNER.
 2. Remove material not required by OWNER from site.
 3. Do not place excess excavated material, debris, rock, sand or other pollutant in state waters, including wetlands, without prior written approval of Wisconsin DNR, Southern District Office.

- B. Dispose of concrete and pavement rubble material offsite at no cost to the OWNER.
- C. Obtain approval for use of disposal sites.

3.12 BACKFILLING

- A. Backfill in accordance with City of Madison Specifications except as indicated below.
 - a. Use excavated material meeting requirements of Section 6.43.5 of "Standard Specifications" to backfill trenches, except where granular backfill is required. If there is deficiency of excavated material due to rejection of excavated material, furnish additional quantity of material conforming to requirements for excavated material.
 - b. Where material excavated from trench is suitable as granular backfill and granular backfill is specified, ENGINEER reserves right to order, in writing, use of this excavated material in lieu of granular backfill specified.
 - c. Backfill Compaction:
 - 1. Keep trench free of visible water during backfilling and compaction work.
 - 2. Initial compacted lift shall be 1 ft.
 - 3. Adjust actual thickness of each subsequent lift so entire lift compacted to specified compactive effort.
 - 4. Consolidate granular backfill to minimum 95% maximum density as determined by ASTM D1557, Method D (Modified Proctor).
 - 5. Consolidate excavated material backfill to minimum 95% compaction as determined by ASTM D698.
 - 6. Consolidate backfill by mechanical compaction.

3.13 FIELD QUALITY CONTROL

- A. Testing Bedding and Cover Materials, and Backfill:
 - 1. Provide sieve analysis for each source of bedding material, cover material, and granular backfill.
 - 2. Provide mix design for aggregate slurry backfill.
- B. Compaction Tests:
 - 1. Take 3 tests every 400 ft of trench. Test when trench is 1/3 and 2/3 backfilled and when completely backfilled.
 - 2. Recompect and retest areas of backfill tested which do not meet minimum requirements.

END OF SECTION 02500

SECTION 02580 - PAVEMENT MARKINGS

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Pavement markings and parking stall lines as shown on the drawings and specified herein.

1.02 QUALITY ASSURANCE

- A. Qualifications of Applicator: The applicator shall be experienced in this type of work. The applicator shall submit evidence of such experience, including a list of projects in which the work was similar in scope and quality to that specified.

1.03 JOB CONDITIONS

- A. Existing Conditions: Examine work in place on which this work is dependent. Defects which may influence satisfactory completion and performance of this work shall be corrected in accordance with the requirements of the applicable section of work prior to commencement of the work. Commencement shall be construed as work in place being acceptable for satisfying the requirements of this section.
- B. Protection: Protect the work and adjacent work against damage during progress of the work. Construction equipment which will damage existing or new pavement shall not be used.

PART TWO - MATERIALS

2.01 PAVEMENT MARKING PAINT

- A. Traffic pavement marking paint shall conform to Section 646.22 of the "State Specifications."
- B. Color shall be white, unless otherwise noted.

PART THREE - EXECUTION

3.01 PREPARATION

- A. Surfaces to be painted shall be clean and dry. Remove dirt, oil, grease, stains and other foreign substances. Protect surfaces from dampness before application of paint.

3.02 APPLICATION

- A. Lines shall be mechanically painted on bituminous paving with one coat of traffic paint in the locations shown on the drawing.
- B. Apply traffic paint to a minimum net film thickness of 15 mils in lines 4 inches wide.
- C. Wavy or lines with ragged edges will not be accepted.

3.03 PROVING PERIOD

- A. Proving period shall be as specified for paint in Section 646.3.3.4 of the "State Specifications."

END OF SECTION 02580

SECTION 02870 - SITE FURNISHINGS

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Bench, bike racks, car stops, and stone wall.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for all items.
- B. Shop Drawings: Submit shop drawings for bench, bike racks, and car stops.

PART TWO - MATERIALS

2.01 BENCH

- A. Bench shall be Victor Stanley, Inc. Model no. C-138.
 - 1. 6 foot length
 - 2. Recycled plastic slats, color: Cherry
 - 3. Fabricated metal shall be properly cleaned and powder coated in shop.
 - 4. Metal color: Black

2.02 BIKE RACKS

- A. Bike Rack shall be inverted-U as detailed on drawings.
- B. Racks shall be designed for surface mount.
- C. Fabricated metal shall be galvanized.

2.03 CAR STOPS

- A. Car stop shall be recycled plastic; UV, moisture, oil and temperature resistant.
- B. Car stops shall be predrilled to be secured by at least 3 spikes, 12" long.
- C. Color: Grey

2.04 STONE WALL

- A. Stone wall shall meet the City of Madison typical fieldstone retaining wall, standard detail 5.6.3.
- B. Stones shall be greater than 8" diameter and sizes shall vary to 36" in largest dimension.
- C. End stones shall be roughly 36" x 36" x 36" placed to provide a flat top for sitting.

PART THREE - EXECUTION

3.01 BENCH

- A. Install bench on concrete pad location as indicated on drawings. Surface mount bench on concrete pad per manufacturer's specifications. Benches shall be level and legs vertical.

3.02 BIKE RACKS

- A. Locate the bike racks as shown on drawings.
- B. Install bike racks secured in concrete pad.

3.03 CAR STOPS

- A. Car stops shall be secured according to manufacturer's recommendations.

3.04 STONE WALL

- A. Wall shall be installed to be secure in place.
- B. All stone shall be dry set.

3.05 ADJUSTMENTS

- A. It is understood and agreed that should minor changes and deviations from the locations established on the drawings be required by the Owner's representative, this shall be done by the Contractor at no additional cost thereto.

END OF SECTION 02870

SECTION 02911 - TOPSOIL

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: This section specifies all soil materials designated as "Topsoil" on the drawings or in the specifications. Topsoil for landscape work will be supplied from on-site sources.

1.02 SUBMITTALS

- A. Sample: Provide 1 quart samples for each soil unit composing the topsoil source. Each sample to be a composite of five to seven subsamples taken the full depth of proposed source. On stockpiles, discard upper 6 inches of soil before sampling.

Place samples in plastic bags, seal and place in second paper bag, and label.

Submit samples to Owner's representative for testing.

- B. Test Reports: Prior to starting work, submit two certified copies of soil test reports to Owner's representative for approval.

1.03 QUALITY ASSURANCE

- A. All soil sampling and testing shall comply with procedures specified in U.S.D.A. Ag. Handbook 60, Diagnosis and Improvement of Saline and Alkali Soils.

- B. Testing Laboratories: Use certified facilities normally engaged in agronomic soil testing as approved by the Owner's representative.

C. Required Topsoil Tests

1. Fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium, zinc, iron, manganese.
2. Physical properties: organic content and particle size distribution.

PART TWO - PRODUCTS

2.01 TOPSOIL

- A. Topsoil for landscape work shall be a fertile, friable, sandy, loamy surface soil without admixture of subsoil and free of stones, stumps, root, trash, debris, and other materials deleterious to plant growth.
- B. The pH range shall be 6.5 to 8.4. Topsoil that does not meet this pH range will be amended by the addition of pH adjusters approved by the Owner's representative.
- C. Nutrient data to be given in parts per million (ppm) dry soil.
- D. Organic content shall not be less than 3 percent and not greater than 10 percent determined by loss through ignition.
- E. Gradation:

1. <u>Sieve Designation</u>	<u>Percent Passing</u>
1 inch screen	100
1/4 inch screen	97 - 100
No. 10 U.S.S. mesh sieve	95 - 100
No. 140 U.S.S.	15 - 35

2. Clay content determined by Bouyoucous Hydrometer Test shall range between 5 percent and 15 percent.

END OF SECTION 02911

SECTION 02920 - LAWNS

PART ONE - GENERAL

1.01 SUMMARY

- A. Section Includes: Placing topsoil, finish grading, seeding and maintenance operations as indicated on plans and specified herein.

1.02 SUBMITTALS

- A. Certification of Conformance or Compliance: Seed and Fertilizer
- B. Certified Test Reports: Topsoil (See Section 02911)

1.03 QUALITY ASSURANCE

- A. Contractor's Qualifications: The work of this section shall be performed by a Contractor specializing in seeding or landscape installations.

1.04 FINAL ACCEPTANCE

- A. General: Final inspection and acceptance will be at the end of the turf establishment period. Acceptance will be based upon a satisfactory stand of turf having 100 percent ground cover of species established.
- B. Areas which do not meet the contract requirements shall be reseeded. Repair rejected areas of turf within acceptable planting dates as directed by Owner's representative.

PART TWO - MATERIALS

2.01 TOPSOIL - REFER TO SECTION 02911

2.02 SEED

- A. Lawn seed shall be fresh, clean, dry new-crop seed composed of varieties, mixed in proportions, and tested for minimum percentages of purity and germination as follows by weight.
- B. Lawn seed shall be City of Madison "Sun Terrace Mix" as described below:

Variety	Formulation	%Purity	% Germination
Dawson Red Fescue	30%	95	85

Puccinella Distans	30%	99	85
Geronimo Kentucky Bluegrass	30%	95	85
SR 4000 Perennial Rye Grass	10%	98	90

2.03 MULCHES

A. Straw

1. Provide stalks from oats, wheat, rye, barley or rice that are free of weeds, mold or other objectionable material.
2. Straw shall be in an air dry condition and suitable for placing with commercial mulch blowing equipment.

B. Cellulose Fiber

1. Provide cellulose fiber for use with hydraulic application of grass seed and fertilizer consisting of specially prepared wood cellulose fiber, processed to contain no growth or germination-inhibiting factors, and dyed an appropriate color to facilitate visual metering of the application of materials. On an air-dry weight basis, provide wood cellulose fiber containing not more than 12 percent moisture, plus or minus three percent at the time of manufacture, with a pH range from 3.5 to 5.0. Provide wood cellulose fiber manufactured so that:
 - a. After addition and agitation in slurry tanks with fertilizers, grass seeds, water and other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry.
 - b. When hydraulically sprayed on the ground, the material will form a blotterlike cover impregnated uniformly with grass seed.
 - c. The cover will allow the absorption of moisture and allow rainfall or applied water to percolate to the underlying soil.

2.04 TACKIFIER

- A. Binding agent used to hold mulch material in place shall be a clear non-staining latex based tackifier or a water-soluble polymer such as Curasol, Terra Tack or Fibrex Spray Sod.

2.05 FERTILIZER

- A. Fertilizer shall be a complete fertilizer, part of the elements of which are derived from organic sources. The percentages by weight shall be 10-10-10 or as determined by soil tests.

- B. Fertilizer to be delivered in manufacturer's original unopened containers bearing the manufacturer's guaranteed analysis. Store in a dry location.

2.06 EROSION CONTROL MATERIALS

- A. Provide erosion control net material constructed of heavy, woven jute mesh with open plain weave of unbleached single jute yarn averaging 130 pounds per spindle of 14,400 yards. The yarn shall be constructed of loosely twisted fibers having an average twist of not less than 1.6 turns per inch, and shall not vary in thickness by more than half its normal diameter. The width of the mesh shall be 48 inches, plus or minus 1 inch.
- B. Fasteners for jute mesh shall be 11 gauge steel wire, formed into a "U" shaped staple 6 inches long.

PART THREE - EXECUTION

3.01 FINISH GRADING

- A. Subgrade Preparation
 - 1. Maintain rough grades in the areas to be topsoiled in a uniform condition so as to prevent future depressions. Prior to placing topsoil, repair disturbances to previously graded areas and remove surplus subgrade material associated with any landscape construction. Scarify areas to a depth of 12 inches prior to topsoil placement. Scarifications to have a maximum 2 foot separation and be cut in two directions, one perpendicular to the other.
- B. Placing Topsoil
 - 1. Uniformly distribute topsoil on lawn areas in sufficient quantity to provide full depth of soil after compaction and finish grading indicated on the drawings. Topsoil shall be spread, cultivated and lightly compacted to prevent future settlement, dragged and graded to finished grade.
 - 2. Topsoil, when placed, shall be dry enough so as not to puddle or bond. Do not place topsoil when the subgrade is frozen, excessively wet, extremely dry or in a condition otherwise detrimental to proper grading or lawn operation.
- C. Finished Grades
 - 1. Finished grades shall slope to drain, be free of depressions or other irregularities after thorough settlement and compaction of soil, and shall be uniform in slope between grading controls and the elevations indicated.

2. Finished grade for lawn areas shall meet existing grades at contract limits and be 1/2 inch below top of curbs and walk paving.
3. Topsoil for seeded lawns shall be graded to within 1/2 inch below finished grade.

3.02 LAWN INSTALLATION

A. Grade Preparation

1. Immediately before seeding or sodding, scarify, loosen, float and drag topsoil as necessary to bring it to the proper condition. Remove foreign matter larger than 1 inch in diameter.
2. If the prepared grade is eroded or compacted by rainfall prior to fertilizing, rework the surface as specified.

B. Fertilizing

1. Uniformly distribute fertilizer by mechanical means at the rate determined by soil tests.

Work fertilizer into the top 3 inches of soil. Cultivating equipment shall be set so that the fertilizer will not penetrate into the soil more than 3 inches. Do not apply fertilizer when there is a possibility of rain before lawn areas can be seeded or sodded.

3.03 SEEDING

- A. Sow seed during the months of April, May, August and September, unless otherwise approved by the Owner's representative. Do not sow seed when weather conditions are unfavorable, such as during drought or high winds.
- B. Perform drill seeding using approved equipment such as cultipacker seeders and grass seed drills.
- C. Drill the seed uniformly to an average depth of 1/2 inch and at a rate of 3 pounds per 1,000 square feet. All areas shall be seeded in at least two directions. Turfgrass seeds shall not be covered by more than 1/4 inch of soil. The seeding device shall lightly roll the seed bed to provide good moisture contact between the seed and soil.
- D. Water thoroughly and immediately with a fine mist until soil is soaked to a depth of 3 inches. Maintain soil in a moist condition until seeds have sprouted and reached a height of 1 inch. Water thereafter at least once every 14 days unless natural rainfall has provided equivalent watering.
- E. Spread mulch evenly at the rate of 1 1/2 tons per acre. Place all mulch on given areas within 48 hours after seeding. A mechanical blower may be used to apply mulch

material, provided the machine has been specifically designed and approved for this purpose. Anchor the mulch by either using a light serrated disc. If a spraying tackifier is used, it may be applied either simultaneously or in a separate application. Take precautionary measures to prevent tackifier materials from marking or defacing structures, pavements, utilities or plantings.

3.04 HYDROSEEDING (WET APPLICATION METHOD)

- A. Apply seed and fertilizer by spraying them on the previously prepared seed bed in the form of an aqueous mixture, and by using the methods and equipment specified. The rate of seed application shall be 4 pounds per 1,000 square feet (0.49 kg per 100 sq. M). Apply the seed, fertilizer and water mixture at a rate not less than 1,000 gallons per acre (3,741 L per 4,000 sq. M).
- B. Water used shall be obtained from fresh water sources, and shall be free from injurious chemicals and other toxic substances at all times. Identify to the Owner's representative all sources of water at least two weeks prior to use. The Owner's representative, at this direction, may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. Use no water from a source which is disapproved by the Owner's representative following such tests.
- C. Mixtures shall be constantly agitated from the time they are combined until they are finally applied to the seed bed. Once combined, mixtures shall be used within 8 hours; portions not used within 8 hours shall be wasted and disposed of at locations acceptable to the Owner's representative.
- D. Direct application nozzle sufficiently upward so that the mixture falls to the ground in a uniform shower. Never direct spray toward the ground in a manner that produces erosion or runoff.
- E. Apply uniformly and at the prescribed rate, avoiding misses and overlapped areas, gauging quantities of mixture to measured application areas. Checks on the rate and uniformity of application may be made by observing the degree of wetting, or by distributing test sheets and observing the quantity of material deposited thereon.
- F. The spray method shall not be used during periods of high winds.
- G. Seed and commercial fertilizer applied by the spray method need not be raked into the soil.
- H. Mulch all seeded areas at the following rates and stabilize with tackifier at rate recommended by the manufacturer.
 - 1. Straw at 2 tons per acre.
 - 2. Wood cellulose at 1,500 pounds per acre.

3.05 EROSION CONTROL MATERIAL

- A. Install erosion control material on slopes in accordance with details indicated on plans and:
 - 1. Jute mesh shall be rolled out in place in the direction of the slope fall line. The material shall be applied without stretching and shall lie smoothly but loosely on the soil surface. Installers shall minimize walking directly on the seed or topsoil bed either before or after the jute is applied.
 - 2. Wherever jute ends are buried, the trench shall be firmly tamped after closing.
 - 3. In cases where roll ends join, the up-slope piece shall overlap the down-slope piece by at least 18 inches.
 - 4. Staple edges, overlaps and ends at 12 inch intervals, and the center of each panel on 3 foot intervals.
 - 5. Spread topsoil over the up-slope ends of the jute to allow for smooth entry of water.

3.06 CLEANING, REMOVAL AND REPAIR

- A. Paved areas over which hauling operations have been conducted shall be kept clean. Promptly remove materials spilled on pavement.
- B. Upon completion of lawn installation, remove from the site and legally dispose of the following:
 - 1. Surplus subgrade material.
 - 2. Stone and foreign matter.
- C. Excess topsoil not required for lawns or planting shall be stockpiled on site for future use as directed by the Owner's representative.
- D. Repair existing lawns damaged by operations under the contract. Repair shall include finish grading, seeding or sodding as required to match existing grade and lawn, and maintenance of repaired areas.

3.07 MAINTENANCE

- A. Maintain lawns for at least three mowings after installation or until the substantial completion inspection of the entire landscape, whichever is greater. Maintenance to include watering, weeding, reseeding, resodding, mowing, trimming and edging. Each mowing shall occur when the grass has reached a height of 3 1/2 inches. Mow to a

height of 2 inches. Sodded areas shall be rolled with a 200 pound roller within 30 days after installation.

- B. Fill any depressions or settlement that occurs within 90 days following installation. Reseed or resod as directed by the Owner's representative, bare spots which occur during the maintenance period.
- C. Keep lawns clean and protected from damage during the maintenance period. Debris which accumulates shall be removed from the site. Promptly repair damaged lawns except those damaged by major storms.
- D. Irrigate as required to supplement natural rainfall so that all lawn areas receive sufficient water for normal plant growth. Furnish all irrigation equipment needed for watering and be responsible for securing adequate supply of water.
- E. Refertilization shall be repeated after the first two lawn mowings have been made or as otherwise directed by the Owner's representative. Use the same analysis commercial fertilizer as required by soil test, applied at 0.5 pounds of actual N per 1,000 square feet.

END OF SECTION 02920

SECTION 02922 – NATIVE SEEDING MATRIX

PART ONE - GENERAL

1.01 SECTION INCLUDES

- B. Supply of seed materials.
- C. Site preparation, seeding and establishment maintenance as indicated on plan and specified herein.

1.02 SUBMITTALS

- A. Certificates of Conformance or Compliance
 - 1. Within two weeks following notification to proceed, submit for approval to Owners Representative, a written description of the seed mixes indicating the following:
 - a. Name and address of seed supplier.
 - b. Geographic origin and harvest date of each species.
 - c. Statement of purity and germination for each species.
 - d. Estimated number of seeds per pound of each species.
- B. Schedule
 - 1. Within two weeks following contract award, submit seeding schedule indicating dates for layout, seed bed preparation, seed delivery, equipment calibration and seeding.
 - 2. Within two weeks following contract award, submit description of and schedule for maintenance (refer to Part 3.03 for maintenance requirements).
- C. Sampling and testing
 - 1. All seed, except for native forbs, shall be tested by an approved testing agency in conformance with the Federal Seed Act and Wisconsin Seed Law. Acceptance shall be based on receipt and approval of certification covering tests for each seed lot supplied.
 - 2. The Owners Representative has the option of randomly sampling seed mixed during installation, taking adequate samples to test each seed type

or lot. Seed not meeting these specifications shall be replaced or supplemented at no additional cost.

1.03 QUALITY ASSURANCE

A. Contractor's Qualifications

1. The work of this section shall be performed by a pre-qualified contractor specializing in seeding and maintenance procedures for native plant species.
2. Contractor shall have a minimum of three years experience in seeding and maintaining similar projects.
3. Contractor shall retain the services of the seed supplier to train Contractor's native seed installers and to oversee all aspects of the native seeding operation.

B. Seed Supplier Qualifications

1. Seed supplier shall be specialized in native seed collection, storage, drying, cleaning, handling, and installation. Seed supplier shall have facilities and staff knowledgeable in handling of native seed to provide seed quality as defined in this section.
2. Prequalified seed suppliers include the following:
 - a. Genesis Nursery
Tampico, Illinois
815 438-2220
 - b. Prairie Moon Nursery
Winona, Minnesota
(507) 452-1362
 - c. Prairie Nursery
Westfield, Wisconsin
(800) 476-9453

C. All seed shall comply with and, where specified, be tested in accordance with applicable sections of the following references:

1. U.S.D.A. Federal Seed Act, current edition.

D. Source Quality Control

1. All grass seed shall be provided in the supplier's sealed containers labeled in accordance with the Federal Law.
2. All native forb seed shall be provided in the supplier's sealed containers labeled with the supplier's name, botanical name of species and the weight or percent by weight of each species contained.

E. Substitutions

1. If specified seed is unavailable, Owners Representative shall identify alternative sources and substitutions. Adjustments will be made at no cost to Owner.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Seed shall be packaged in accordance with standard commercial practice.
- B. All seed shall be kept dry and protected from temperature extremes to maintain dormancy and viability while in transit, storage or during planting operations.

1.05 JOB CONDITIONS

A. General

1. Prior to beginning work, the Contractor shall examine and verify the acceptability of the project site and notify the Owners Representative of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected or resolved in writing by the Owners Representative.
2. Where planting occurs in close proximity to other site improvements, adequate protection shall be given to all features prior to commencing work. Any items damaged during planting operations shall be promptly repaired to their original condition at no cost to the Owner or Owners Representative.

B. Utilities: Have all underground utilities located by servicing agencies. In the vicinity of utilities, hand excavate to minimize possibility of damage to underground utilities.

C. On-site sources of water may or may not be available. Confirm prior to commencing work.

D. Excavation: When conditions detrimental to plant growth are encountered such as adverse drainage conditions or obstructions, notify the Owners Representative before planting.

E. Planting Season

1. Materials shall be installed during planting seasons normally recognized in the job locality for the species being utilized.
2. If special conditions exist which warrant installation outside the normal planting season, submit a written request to the Owners Representative describing conditions and stating the propose variance. Permission for the variance will be given only if, in the opinion of the Owners Representative, the variance is warranted.

1.06 GUARANTEE

A. General

1. Warrant all seed to be true to botanical name.
2. After Provisional Acceptance, maintain all seeding as specified and warrant against unsatisfactory growth and improper maintenance for a period of two years.
3. Contractor shall not be responsible for defects resulting from Owners Representative negligence, damage by others or unusual phenomena beyond the Contractor's control.

B. Replacement

1. During the Guarantee Maintenance Period, reseed at no expense to the Owners Representative, all areas that the Owners Representative determines are unacceptable or poorly established. Contractor shall assume a minimum of 25% of cover crop material will require replacement at the end of the first year.
2. All reseeding shall be in accordance with the original specifications and installed during the next available seeding season following notification to reseed.

PART TWO - PRODUCTS

2.01 SEED

- A. Seed shall be fresh, clean, dry, new crop seed tested for purity and germination, and mixed in proportions by weight per acre in PLS (pure live seed) as indicated in seed mix schedules on drawing sheet L-1.

2.02 EROSION CONTROL MAT

- B. Refer to Section 02215, Soil Erosion and Sedimentation Control.

PART THREE - EXECUTION

3.01 PREPARATION

A. Finish Grading

- 1. Confirm established grades with Owners Representative prior to installing seed.

B. Layout

- 1. Refer to plan document for seeding locations. Flag and review areas to be seeded with Owners Representative's prior to installation.

3.02 PLANTING

A. Timing

- 1. Install seed mix in areas specified on the plans as final topsoil placement is completed, and as the areas become available. Waiting for the entire site to be ready prior to the commencement of seed installation will not be permitted.
- 2. Do not sow seed in adverse weather conditions, such as during high winds exceeding 5 miles per hour, or extremely wet or muddy conditions.

B. Equipment

- 1. General

- a. All equipment shall be inspected and approved by the Owners Representative.
- b. Prior to start of work, calibrate all equipment to the satisfaction of the Owners Representative. Recalibration during seeding may be requested by the Owners Representative.

2. Approved Equipment Types

- a. Tillage equipment shall be in good repair and adjustable to control tillage depth.
- b. Use seeding equipment specifically designed to uniformly plant highly diverse native grasses and forbs. The device shall lightly roll the seed bed to provide good contact between the seed and the soil. On slopes exceeding 3:1, broadcasting is the preferred seeding method.
- c. If a rangeland grass drill or no-till grass drill is used, rolling of the seed bed shall not be required. The rangeland grass drill will be used to install the permanent grass and forb seeds except where slopes, permanently saturated soils or size constraints prohibit the use of the rangeland grass drill.
- d. Broadcast Seeding/Hydroseeding – broadcast seed onto surface of exposed soil using the minimum amount of hydromulch to identify the area that has been seeded. The tank shall have a mechanical agitator powerful enough to keep all material in a uniform suspension in the water.

If the contractor has another method for hydroseeding, the contractor shall submit this method to the Owners Representative for evaluation approval 30 days prior to the scheduled start date.

C. Installation

1. Initiate the installation as soon as possible after the topsoil has been laid.
2. Do not fertilize areas to be planted.
3. Uniformly seed all areas with their appropriate mixes at their supplier specified rates.

4. All areas shall be seeded in at least two directions or with equipment that drops seed randomly rather than in row. Soil cover over the seed shall be 1/8 inch in depth.
5. Erosion Control Mat - Install erosion control mat on slope locations and as indicated on the plans and details. (Also see Section 02215 Soil Erosion and Sedimentation Control)
6. Watering
 - a. Water immediately and thoroughly with a fine mist until soil is wet to a depth of three inches.
 - b. Maintain soil in this moist condition, watering every other day for the first four weeks, or until seeds have germinated and reached a height of 2-3 inches. Water thereafter at least once every 10 days unless natural rainfall has provided equivalent watering.
 - c. Reoccurring overly dry or overly wet conditions resulting in poor seedling germination or plant establishment shall be grounds for rejection.
 - d. Water shall not be applied with a force that will displace seed or soil, or cause soil erosion.

3.03 MAINTENANCE

- A. During early spring of the first growing season, the Owners Representative shall have the option to request overseeding of all native seeding areas with annual cover crop seed mix.
- B. Seeded areas impacted by erosion (gullies, rivulets) will be filled with soil and topdressed with the annual cover crop and the appropriate native seed mix, and covered with erosion control mat per Section 02215, Soil Erosion and Sedimentation Control during the two year maintenance period.

3.04 ACCEPTANCE

- A. Provisional Acceptance
 1. Notify the Owners Representative in writing upon completion of seeding.
 2. Within 10 days of notification, the Owners Representative will inspect the work and issue a Notice of Provisional Acceptance, along with a punchlist of any items requiring completion or correction.
 3. Issuance of the Notice of Provisional Acceptance shall constitute the start of the two year Guarantee Maintenance Period.

B. Final Acceptance

1. Establish a dense cover of planted species and maintain these areas until Final Acceptance of the work.
2. Acceptance of the work will be granted following a field inspection by the Owners Representative at the end of two growing season.
3. Acceptance inspection will include random survey plots to determine species occurrence, relative abundance and percent cover.
4. Total cover shall be defined as 95 percent cover consisting primarily of cover crop at the end of the first year. If 40 percent of the specified species are present in each plot and each plot has 90 percent groundcover at the end of two years, than the work will be accepted. Bare spots of 5 square feet or more will not be acceptable. If not accepted, the Contractor will replant to fulfill contract responsibility at no cost to the Owner.

3.05 CLEANING, REMOVAL AND REPAIR

A. Clean Up

1. Excess and waste material shall be removed daily during construction.
2. When planting in an area has been completed, the area shall be cleared of all debris, soil piles, and containers.

B. Repairs

1. Any damage to existing landscape or other features as a result of work related to this contract shall be repaired by the responsible Contractor to its original condition.

C. Protection

1. Protect landscape work and materials from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace plants as directed.

END OF SECTION 02922

SECTION 02950 - TREES, SHRUBS AND OTHER PLANTINGS**PART 1 - GENERAL**

1.01 SUMMARY

- A. These specifications, along with contract drawings and lists of plant materials, apply to those items necessary for and incidental to the preparation, execution, completion and maintenance of the landscape planting activities (excluding lawn areas) specified in the contract. The scope includes the planting of trees, shrubs, ground covers, and perennials, and the maintenance activities of fertilizing, pruning and watering.
- B. Related Sections: Applicable provisions of Division 1 shall govern all work under this section.

1.02 REFERENCES

- A. *American Standards for Nursery Stock, ANSI Z60.1*, current edition. American Association of Nurserymen, Inc.
- B. *Standardized Plant Names, Second Edition (1942)*. American Joint Committee on Horticulture Nomenclature, Horace McFarland Company, Harrisburg, PA.
- C. *American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance-Standard Practices, ANSI A300*, current edition.
- D. State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, hereafter termed D.O.T.

1.03 QUALITY ASSURANCE

- A. All plant material shall conform to the *American Standards for Nursery Stock*, unless noted otherwise herein.
- B. All plant material shall be true to the species and variety/hybrid/cultivar specified, and nursery-grown in accordance with good horticultural practices, and under climatic conditions similar to those of the site location. Specimens nursery-dug to be replanted shall have been freshly dug and properly prepared for planting.
- C. Trees and shrubs: Shall be trained in development and appearance as to be superior in form, compactness and symmetry. Trees with multiple leaders, unless specified otherwise, and shrubs with damaged or cut mainstem(s), will be rejected.
- D. Trees and shrubs: With a damaged, cut or crooked leader, abrasion of bark, sunscald, frost crack, disfiguring knots, insects (including eggs and larvae) or insect damage, cankers/cankeros lesions or fungal mats, mold, prematurely-opened buds, or cuts of limbs over 3/4" (1.9 cm) diameter that are not completely callused will be rejected.
- E. Trees and shrubs: Shall have healthy, well-developed root systems, and be free from physical damage or other hindrances to healthy growth.
- F. Balled and burlapped plants shall be dug with solid balls of a diameter not less than that recommended by the *American Standards for Nursery Stock*, and of sufficient depth to include both fibrous and feeding roots. Balls shall be securely

wrapped with burlap, and tightly bound with rope or twine. No plant shall be bound with rope or wire in such manner as to damage bark or break branches. The root flare should be within the top 2" (5.1 cm) of the soil ball. Balled and burlapped plants will not be accepted if the ball is dry, cracked, or broken before or during planting.

- G. Containerized plants are to be well-established within the container, with a root system sufficiently developed to retain its shape and hold together when removed from the container. Soil within the container should be held together by the roots, in form and whole. Plants shall not be pot-bound, nor have kinked, circling, or bent roots.
- H. Bare root plants are to have a healthy, well-branched, and adequately-spreading root system characteristic of the species.
- I. Herbaceous perennials shall only be supplied from nurseries certified by state plant inspectors. Substitutes or collected material may be used if approved by Owners Project Representative or Landscape Architect.

1.04 MEASUREMENT

- A. Plants shall conform to the measurements specified within the contract documents. Specified height and spread dimensions will refer to the main body of the plant, and not from branch tip to branch tip. Plants meeting a specified measurement, but judged to lack the balance between height and spread characteristic of the species will be rejected.
- B. Plants shall be measured when branches are in their normal position.
- C. No plant shall be less than the minimum size specified, and no less than fifty (50) percent of the plants shall be as large as the maximum size specified.
- D. Caliper measurements shall be taken 6" (1.4 m) above ground level.
- E. Containerized shrubs shall be measured by height and width for conformity with the plant list.
- F. Herbaceous perennials shall be measured by pot size, not by top growth.
- G. All other measurements, such as number of canes, ball sizes, and quality designations, shall conform to *American Standards for Nursery Stock*.

1.05 INSPECTIONS

- A. Plants are to be inspected on delivery to the project site, and the Landscape Architect or Project Representative may reject any specimens no longer meeting the specified standards or that have been damaged in transit.
- B. A representative of the Contractor shall be present at all inspections by the Landscape Architect or Owner's Project Representative.

1.06 SUBSTITUTIONS

- A. The substitution of plant materials is not permitted unless authorized in writing by the Owner. If written proof is submitted by the Contractor that a plant of specified species, variety or size is unavailable, consideration will be given towards the nearest available size or variety, or towards an alternate species selection, with a corresponding adjustment of the contract price.

- B. Larger plants than those specified can be used upon approval of the Landscape Architect or Owner's Project Representative. The use of larger plants shall not increase the contract price. The root ball, root spread and container size of the larger specimen shall be proportionally increased, relative to the specified size.

1.07 DELIVERY, STORAGE AND HANDLING

- A. The Contractor is to arrange for the acceptance and unloading of plants at the project site.
- B. All plants are to be labeled by plant name and size. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.
- C. All plant materials, shipments and deliveries shall comply with current state and federal laws and regulations governing the inspection, shipping, selling and handling of plant stock. If required by law or regulation, a certificate of inspection, or a copy thereof, for injurious insects, plant diseases, and other plant pests shall accompany each shipment or delivery of plant material. The certificate shall bear the name(s) and address(es) of the source of the plant stock.
- D. During transport, no plant shall be bound with rope or wire in a manner that damages trunks or breaks branches. Plants shall also not be dragged, lifted or pulled by the trunk, branches or foliage in a damaging way. No plant shall be thrown off of a truck or loader to the ground.
- E. Prior to installation, all plants must be protected from sun and drying winds.
- F. Containerized or balled and burlapped plants not being installed immediately must be kept in a shaded area, well-covered with wood chips, soil, or other approved material, and kept well-watered. Install all plants within three (3) days of delivery.
- G. Cover roots of bare root plants with a moist tarp, burlap, sphagnum moss, or mulch while being transported to, or while being held at the project site. Soak the bare roots overnight in water before planting. Just before planting, extend the roots carefully into a natural position, free of bunching, kinking or circling. Cut back all broken or damaged roots to a point clean and free of rot. No additional root pruning is allowed. Carefully work backfill mix among the roots while simultaneously watering.
- H. Fertilizer shall be delivered to the site in original, sealed containers, and stored in a waterproof space. Containers shall bear the manufacturer's name, analysis, trademark and guarantee as per standards of the Wisconsin Department of Agriculture.

1.08 JOB CONDITIONS

- A. Contractor shall protect all plants, lawns, and grass areas from damage at all times. Damaged plants, lawns or grass areas shall be replaced or treated as required to conform with specifications herein for fresh stock.
- B. Work areas shall be kept clean and orderly during the installation period. Under no condition shall debris from planting activities result in a safety hazard on-site or to adjacent off-site property.

- C. Damage to lawns or grass areas incurred as a result of replacement operations shall be repaired by Contractor at no cost to Owner.

1.09 GUARANTEE

- A. All plants shall be guaranteed to be in healthy and flourishing condition by June 30 after the end of one full growing season. The guarantee shall not cover damage from vandalism, animals, freezing rains, or winds of sixty (60) miles per hour or greater, if the Contractor burlaps or otherwise protects any plants that he/she feels could be damaged during the guarantee period.
- B. At any time during the guarantee period, the Contractor shall remove or replace, without cost to the Owner, all plants not in a healthy and flourishing condition as determined by the Landscape Architect or Owner's Project Representative.
- C. Replacement plants shall be subject to the same specified requirements of the contract. The guarantee of replacement plants shall extend until June 30 after the end of one full growing season. In the event that a replacement plant is not acceptable during, or at the end, of the said guarantee extension period, the Owner may choose between subsequent replacement or credit for that item.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Plant Materials: A complete list of plant materials, including a schedule of quantities, sizes, and other requirements, shall be included in the contract documents. If discrepancies occur between the printed plant list, and the contract drawings, the printed list will take precedent.
- B. The Owner may request a written list of the proposed sources of nursery stock within seven (7) days after the bid opening. This list may not be added to or otherwise altered without the consent of the Owner's Project Representative.
- C. Topsoil: Naturally fertile, agricultural soil, capable of sustaining vigorous growth, of uniform composition throughout, without admixtures of subsoil, free of clay, stones larger than 1" (2.5 cm) in diameter, roots, trash and debris of any kind, supplied by Contractor at his/her expense, and subject to approval by the Project Representative or Landscape Architect.
- D. Planting Mixture: Material used in tamping around balls and roots during the planting operation shall be prepared on site by mixing four (4) parts native topsoil from project site to one (1) part peat. Conform to alternate mixes as specified for beds of certain ornamental plants. All mixing shall be done by mechanical means subject to the approval of the Project Representative or Landscape Architect.
- E. Fertilizer: Granular, non-burning product composed of not less than fifty (50) percent organic slow-acting, guaranteed analysis professional fertilizer. Commercial fertilizer shall conform to Wisconsin State Statutes, Section 94.64, and meet the standards of the Wisconsin Department of Agriculture as to registration and labeling. Fertilizer shall be specified in the contract documents as to composition, but is subject to revision to suit project site conditions.
- F. Mulch: One year old well rotted, shredded hardwood bark mulch, free of material detrimental to healthy plant growth. Bark mulch shall not be larger than 4" in length and ½" in width, free of woodchips and sawdust.

- G. Anti-desiccant: If required as protection for leaf surfaces, anti-desiccant shall be permeable to permit transpiration, and mixed and applied in accordance with manufacturer's specifications.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Stake all planting areas and notify Digger's Hotline (1-800-242-8511 statewide) to verify location of all underground utilities prior to excavation.
- B. Excavate planting areas as shown in the contract drawings.
- C. Adequately barricade with proper warning devices any planting pit left open when planting work is not in progress, and that poses a hazard to vehicles and/or pedestrians.
- D. Notify the Owner's Project Representative in writing of any soil conditions, obstructions, or concerns about water drainage deemed detrimental to healthy plant growth. These conditions or obstructions shall be detailed, along with any suggestions for correction, removal or relocation. Where soil conditions, poor drainage or other obstructions are encountered that cannot be easily remedied, the Project Representative will designate alternate locations, and will bear the additional costs of such relocation.
- E. The planting pit for containerized and balled and burlapped plants shall be at least 2.5 to 3 times the diameter of the soil ball, or to a dimension otherwise specified.
- F. The planting pit for a single shrub shall be 12" (30.5 cm) wider than the root ball.
- G. Loosen the soil beyond the edge of the planting pit. The soil at the base of the planting pit is to remain undisturbed, the depth of which shall correspond to the distance from the bottom of the soil ball to the root flare, or slightly less.
- H. Planting pits for bare root plants shall be only broad enough to receive the full extension of the roots when the plant is set, and only deep enough to set the uppermost roots just below existing grade.
- I. For a shrub mass planting, the entire bed area is to be tilled to a depth of 4-6" (10.2 -15.2 cm) prior to the installation of topsoil. Excavate individual shrub pits to the proper depth.

3.02 PLANTING OF TREES AND SHRUBS

- A. Remove plant containers by cutting or carefully inverting the container. For plants grown in plastic containers slash the edges of the root ball from top to bottom with vertical 1" (2.5 cm) cuts using a sharp blade.
- B. Root balled plants shall have rope, string, wire baskets, burlap and other wrapping material removed from the top half of the ball after the plant has been

set in the hole. Remaining wrappings, other than those made from plastic or synthetic material, may be left around the bottom half of the ball.

- C. If deciduous species are planted in leaf, they may be sprayed with an approved anti-desiccant prior to planting when so directed by the Owner's Project Representative.
- D. Trees and shrubs grown using root containment material shall have the containment bag removed prior to setting.
- E. Set trees and shrubs straight and upright, and in the center of the planting hole and on the unexcavated base of the planting pit, with the most desirable face towards the most prominent view.
- F. Root-balled shrubs are to be carried and set in the hole by the root ball.
- G. Backfilling: Backfill pits with excavated soil. No soil in frozen or muddy condition shall be used for backfilling.
- H. When pit is approximately two-thirds backfilled, tamp down and water to eliminate air pockets. After initial watering, add remainder of the soil to the top of pit, water without puddling, and firmly tamp without overcompacting. Form a 2-3" (5.1 - 7.6 cm) high saucer around the outer rim of the pit prior to mulching.

3.03 FINISHING

- A. Finish-grade planting areas to required elevations after plants have fully settled.
- B. No soil is to cover the top of the root ball. All plants shall be completely mulched over the root system with a 2" (5.1 cm) layer of specified mulching material immediately after planting. Pull back mulch no less than 3" (7.6 cm) and no more than 6" (15.2 cm) from the trunk.
- C. Thoroughly water plants immediately after planting and before mulching, primarily within and filling the saucer.
- D. Prune any dead or broken branches. Prune newly-planted hedges as directed by the Landscape Architect or Project Representative.
- E. Remove all twine and rope after planting, along with any labels attached around trunks or branches.

3.04 PLANTING OF GROUND COVERS AND PERENNIALS

- A. Loosen soil of the planting bed to a depth of 4-6" (10.2 - 15.2 cm) by mechanical or hand tilling while soil is dry.
- B. After soil is loosened, till organic material into the soil across the planting bed to a uniform depth of 2" (5.1 cm) for peat moss or 1" (2.5 cm) for compost.
- C. Fertilizer, at amounts determined by the soil test, shall be topdressed to the soil.
- D. Apply approved mulch uniformly across the entire planting bed to a depth of 2" (5.1 cm).
- E. Unless otherwise specified, install plants no closer than 12" (30.5 cm) to the trunks of trees or shrubs within planting bed, and to within 6" (15.2 cm) of the edge of the bed.

- F. Prior to planting, biodegradable plant containers shall be split and non-biodegradable containers removed. The root systems of all such plants shall be split or crumbled by hand.

3.05 INSPECTION & ACCEPTANCE

- A. Owner's Project Representative shall perform inspections with the Contractor of all plant material at one (1) week and three (3) week intervals after the original planting to note and correct any discrepancies from the contract. Plants that are alive and healthy following the three (3) week inspection shall be accepted.
- B. Acceptance of plant material by Owner shall reflect general conformity with the *American Standards for Nursery Stock* as to specified size, character and quality. Acceptance shall not relieve the Contractor of responsibility for full conformity to the contract documents and the guarantee period. Any defects or imperfections appearing in whole or any part of the work caused by or due to any fault or negligence on the part of the Contractor shall be corrected before the work is accepted.
- C. Planting work may be accepted in stages when the Contractor and Owner's Project Representative deem that practice to be in their mutual interest. Acceptance of planting work in stages shall not waive any other provisions of the contract.

3.06 CLEANING

- A. Soil, branches, binding and wrapping material, rejected plants, or other debris resulting from plant installation shall be promptly cleaned up and removed. New landscape construction in and around the planting areas are to be especially well-cleaned.

3.07 MAINTENANCE

- A. Fertilizing: Any and all chemical applications are to be performed in accordance with current federal, state and local laws, through EPA-registered materials and application techniques, and performed under the supervision of a licensed certified applicator. Apply fertilizer to planted areas at the specified rate, and as per manufacturer's recommendations.
- B. Watering: All plant materials installed under the contract shall be watered within the first 24 hours of initial planting and not less than twice weekly until final acceptance by Owner.
- C. Water used shall be of sufficient quality for irrigation and free of materials harmful to plant growth.
- D. Pesticide: Any use of pesticides during the contracted maintenance period, as determined by the Owner, shall utilize the minimum amount of approved pesticide needed to control pests on plant materials installed under the contract. Pesticide applications are to be performed in accordance with current federal, state and local laws, through EPA-registered materials and application techniques, and performed under the supervision of a licensed certified applicator. Apply at the specified rate, and as per manufacturer's recommendations.

3.08 PRUNING

- A. Prune in accordance with current *American National Standards (ANSI) for Tree Care Operations*. Perform all pruning work in a manner consistent with the landscape design intent. Plants overhanging and blocking pedestrian and/or vehicular paths shall be pruned as needed to allow the desired clearance.
- B. Except in the cases of hedges, or to conform to some design intent, all pruning of ornamental trees, shrubs and ground covers should aim to retain their natural shapes. With multiple leader plants, preserve the leader that best promote the plant's symmetry. Prune branches of deciduous stock to improve the branch structure of the plant.
- C. Trim oaks, honey locusts, and elms while dormant to reduce disease risk. Other trees may be trimmed at other times of the year, except during leaf-out, or at the time of leaf drop. If oaks, elms or honey locust are specified for pruning during the non-dormant period the Contractor must seal completely all pruning wounds immediately after each cut with a wound dressing approved or designated by Owner.
- D. Plants that flower before late spring should be pruned immediately after flowering. Those that flower in summer or fall should be pruned in winter or spring before new growth emerges.
- E. Prune evergreens only to remove dead, broken or damaged branches. Prune yews, junipers, hemlocks and arborvitae after new growth has hardened off in late summer.
- F. Prune using scissors-style cutting devices, and not anvil-style handpruners, pole pruners or loppers.
- G. The Contractor shall remove all trimmed branches and other debris from the site at the end of each work day.

SECTION 03300 - CAST-IN-PLACE CONCRETE**PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. The work required under this section consists of furnishing all labor, materials and equipment necessary to properly complete cast-in-place concrete operations, as indicated on the Drawings.

1.02 RELATED WORK

- A. Carefully coordinate all cast-in-place concrete activities with the schedules of other work, in order to insure orderly progress of the total work.

1.03 QUALITY CONTROL

- A. Provide at least one person who shall be present at all time during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed, the referenced standards, and the requirements for this work, and who shall direct all work performed under this section.
- B. Redi-Mix Concrete Supplier: Employing experienced personnel regularly engaged in producing redi-mix concrete.
- C. Codes and Standards
 - 1. All referenced standards are to be their most recent edition.
 - 2. Comply with the applicable provisions of the following standards published by the American Concrete Institute:
 - a. ACI 301 – Specifications for Structural Concrete for Buildings.
 - b. ACI 315 – Details and Detailing of Concrete Reinforcement.
 - c. ACI 318 – Building Code Requirements for Reinforced Concrete.
 - d. ANSI/ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement
 - e. ANSI/ASTM A497 – Welded Deformed Steel Wire Fabric for Concrete Reinforcement
 - f. ASTM 615 – Deformed and Plain Billet Steel for Concrete Reinforcement
 - g. ACI 347 – Recommended Practice for Concrete Formwork.
 - 3. Where provisions of pertinent codes and standards conflict with the requirements of this Section of these Specifications, the provisions requiring the higher level of performance shall govern.

1.04 PRODUCT HANDLING

- A. Protect cast-in-place concrete materials before, during, and after installation.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

1.05 SUBMITTALS

- A. Submit to the Owner for Approval, proposed mix designs and supporting data within 20 days of receipt of notice to proceed.
- B. Furnish reinforcing steel shop drawings in accordance with AC1301 and General Conditions.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. To be clean, straight, and free from deformations detrimental to the appearance of the concrete surface.

2.02 CONCRETE REINFORCEMENT

- A. All concrete reinforcing shall be new, free from rust, and shall comply with the following reference standards:
 1. Bars for reinforcement: ASTM A615, Grade 60, deformed.
 2. Welded wire fabric: ASTM A185, plain type, uncoated finish.

2.03 CONCRETE

- A. Mixes
 1. Mixture proportions shall be determined either from previous test records, or by trial mixtures, as described in ACI 301.
 2. All concrete shall have the minimum compressive strengths as follows within 28 days and shall be proportioned within the following limits:

Min. psi@ <u>28 days</u> 4,000	Max Size <u>Aggregate</u> 3/4	Max W/C <u>Ration by Wt.</u> 0.45	<u>Max Slump</u> 4"
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- B. Portland Cement: ASTM C 150 Type 1, and the product of one manufacturer.

- C. Aggregates, ASTM C33. Fine: Natural Sand. Coarse: Crushed stone or gravel.
- D. Water: Clean and free from deleterious matter.
- E. Air Entraining Admixtures: Use in all concrete exposed to the weather or to freezing temperatures. Admixture shall conform to ASTM C 260. Air entrained concrete shall contain $6\% \pm 1\%$ air by volume.
- F. Fly Ash: ASTM C618 Class C and loss on ignition not exceeding 6%. Fly ash content shall not exceed 25% of Portland Cement by weight.
- G. Admixtures:
 - 1. Water-Reducing: ASTM C 494, Type A, and containing not more than 0.1% chloride ions.
 - 2. High-Range Water-Reducing (Super Plasticizer): ASTM C 494, Type F or Type G, and containing not more than 0.1% chloride ions.
 - 3. Other admixtures may be used if specifically approved by Owner.
 - 4. Calcium chloride or admixtures containing more than 0.1% chloride ions will not be permitted.
- H. Expansion Joint Material
 - 1. Pre-molded filler, bitumous fiber type, ASTM D 1752 for exterior work.
 - 2. Unless shown otherwise, provide $\frac{1}{2}$ " thickness x depth of slab.
- I. Joint sealants shall be specified in Section 07920 – Joint Sealants.

2.04 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of cast-in-place concrete, shall be as selected by the Contractor subject to the approval of the Owner.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that all items to be embedded in concrete are in place.

- C. Verify that concrete may be placed to the lines and elevations indicated on the Drawings, with all required clearance from reinforcement.
- D. Do not proceed with installation in areas of discrepancy until unsatisfactory conditions are corrected.

3.02 FORMWORK

- A. General
 - 1. Construct forms in accordance with ACI 347.
 - 2. Construct all required forms to be substantial, sufficiently tight to prevent leakage or mortar, and able to withstand excessive deflection when filled with wet concrete.
 - 3. Form for all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings. Direct forming against stone or steel vertical surfaces permitted only when approved by Engineer.
 - 4. Coat forms in accordance with manufacturer's recommendations, prior to placing reinforcing, to provide for removal of forms without damaging surface of finished concrete that will be exposed.
 - 5. Design of forms, shoring and bracing is the responsibility of the Contractor.
- B. Formwork Removal (ACI 301, Paragraph 4.5)
 - 1. Forms shall be removed in such a manner as to insure the complete safety of the structure.

3.03 PLACING REINFORCING

- A. Reinforcing shall be held securely in place with suitable supports and ties sufficient to prevent displacement during placing of concrete. Reinforcing shall be positioned to a tolerance of $\pm \frac{1}{4}$ ".
- B. Clearance shall be 2" unless otherwise indicated on the drawings.
- C. Notify Owner when reinforcing is in place so that a review of reinforcement placement can be made prior to placement of concrete.
- D. Bars may be moved to avoid interference with other reinforcing steel, conduits or embedded items. If moved more than one bar diameter, consult with Owner to determine final placement.
- E. Splicing

1. Where splices occur, provide lap sufficient to develop full strength of bars. Stagger splices. Comply with splicing requirements of ACI 318.
2. Welded wire mesh: 6 inch lap for ends and sides.

3.04 MIXING

- A. Adhere strictly to ASTM C 94 for ready-mixed concrete.
- B. Deliver and place concrete in the work within one hour subsequent to the charging into the mixing drum, regardless of whether such mixing drum is part of a central plant or a transit mixer. Decrease this time when air temperatures are unusually high or the ingredients are such that an unusually quick time of set or loss of plasticity will occur, or during cold weather when loss of heat occurs to such an extent that the concrete will not be of proper temperature when placed in forms.
- C. Retempering of partially hardened concrete is not permitted.
- D. Addition of water to concrete at site allowed only with approval of the Owner and only if maximum water-cement ratio and minimum slump is not exceeded.
- E. Only loads of "ready-mixed-concrete" which arrive in satisfactory condition and which carry a delivery ticket may be incorporated in the work.

3.05 CONCRETE PLACEMENT

- A. Deposit concrete as nearly as practicable in its final position so as to avoid segregation and so as not to move the reinforcing. Proceed at such a rate that the concrete is at all times plastic and flows readily into spaces between bars. Do not use partially hardened concrete, concrete contaminated by foreign material, or retempered concrete.
- B. Thoroughly compact by means of approved vibrators of the internal high frequency vibration type.
- C. Cure in accordance with ACI 301.
- D. Concrete surface shall be free from dust, dirt, oil or other foreign substances before application of hardener or sealer (where specified). Apply concrete finishes in accordance with manufacturer's directions.
- E. In joining fresh concrete to concrete that has already set, the following procedure should be implemented:
 1. Scrub with wire brushes and thoroughly clean all loose and foreign material from set concrete.

2. After set concrete surface has been cleaned and immediately before placing new concrete, a thin coating of Portland cement bonding grout shall be scrubbed into the dry prepared surface. Care should be exercised to insure that all surfaces receive a thorough even coating and that no excess grout is permitted to collect in pockets. The rate of progress in applying grout shall be limited so that grout does not become dry before it is covered with new concrete.

3.06 WEATHER CONDITIONS

A. Protection

1. Provide adequate protection against rain, sleet and snow before and during placement and finishing of concrete.
2. Provide adequate protective measures to maintain the temperature of the concrete as specified.

B. Cold Weather Concreting

1. Do not place concrete when the atmospheric temperature is below 40° F, or when the concrete is likely to be subjected to freezing temperatures within 24 hours after it has been deposited unless adequate temporary heating is provided. Maintain concrete temperature no less than 50° F or more than 80° F for the first three days after placing. Protect from freezing for the next five days.
2. Use no frozen materials or materials containing ice in concrete.
3. Do not use salt or other chemicals to prevent freezing.
4. Perform all cold weather concreting in accordance with ACI 306 – “Recommended Practice for Cold Weather Concreting”.

3.07 JOINTS IN CONCRETE

- A. Locate construction joints as indicated on drawings, or as approved by the Owner. Refer to Drawings for type of expansion or contraction joint.

3.08 FINISHING

A. All Concrete

1. Provide medium broom finish.
2. Portions of project are supplied as precast units. Cast-in-place concrete finish shall match precast finish. If finish is not acceptable to the Owner, he shall at his discretion reject the cast-in-place work and require the work be removed and replaced by the Contractor at his cost.

3.09 CURING

- A. Protect concrete from premature drying. Follow finishing operations with curing measures within two hours. Use curing membrane or keep concrete continuously moist for 7 days.

3.10 FIELD QUALITY CONTROL

- A. Make concrete test cylinders in accordance with AC 301, Chapter 16, so as to provide for one strength test (minimum 4 cylinders) for each 50 cubic yards or fraction thereof placed in any one day.
- B. Make cylinders with an identification number and record date, class of concrete, location in project, slump, truck ticket numbers, air temperature, and other data the Engineer may require.
- C. Measure and record air content when required by Engineer.

3.11 MEASUREMENT AND PAYMENT

- A. All concrete work shall be bid as lump sums, as shown on the bid form, for the complete job as specified herein and the Contract Drawings.

END SECTION 03300

SECTION 05520 - HANDRAILS AND RAILINGS

PART ONE - GENERAL

1.01 SUMMARY

A. Section Includes

1. This section includes fabrication and installation of all steel handrails and railings as indicated on plans and as specified herein.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for products and processes used in handrails and railings, including finishes and grout.

B. Shop Drawing: Submit shop drawings for fabrication and erection of handrails and railings. Include plans, elevations and details of fittings, connections and anchorages to other work. Provide templates for anchor and bolt installation by others.

1. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural details, material properties and other information needed for review.

1.03 QUALITY ASSURANCE

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.04 SYSTEM PERFORMANCES

A. Structural Performances: Provide railing and handrail assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1. Handrails and Toprails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 pounds applied at any point in any direction.
 - b. Uniform load of 50 pounds per linear foot applied simultaneously in both vertical and horizontal directions.

2. Guards: Intermediate rails, balusters and panel fillers capable of withstanding a uniform load of 25 pounds per square foot of gross area of guard, including any open areas of which they are a part.
 - a. Above load need not be assumed to be acting concurrently with uniform horizontal loads on top rails of railing assembly in determining stress on guard supporting members.

PART TWO - MATERIALS

2.01 PRODUCTS

- A. Steel
 1. Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A501.
 2. Steel Plates, Shapes and Bars: ASTM A48, Class 30.
 3. Gray Iron Castings: ASTM A48, Class 30.
 4. Malleable Iron Castings: ASTM A47, grade as recommended by fabricator for type of use indicated.
- B. Non-Shrink Non-Metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- C. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, and as required for color match, strength and compatibility in fabricated items.
- D. Fasteners: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
 1. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work, except where otherwise indicated.
 2. Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.
- E. Anchors and Inserts: Provide anchor of proper type, size and material for type of loading and installation conditions shown, as recommended by manufacturer, unless otherwise indicated. Use non-ferrous metal of hot-dipped galvanized anchors and

inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

- F. Primer Paint for Ferrous Metals: Manufacturer's standard rust-inhibiting primer, compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified.
- G. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with Military Specification MIL-P-21035 (ships).
- H. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.02 FABRICATION

- A. General: Fabricate handrails and railings to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to support the design loading indicated.
- B. Welded Connections: Fabricate handrails and railings of materials indicated below for interconnections of members by welding. Preassemble railing units in shop to maximum extent practicable and consistent with shipping and handling limitations. Perform welding to comply with applicable AWS specifications, using method appropriate for metal and finish indicated. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
 - 1. Provide welded connections for ferrous pipe handrails and railings.
- C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of handrail and railing components.
- D. For exterior handrails and railings, and those exposed to moisture from condensation or other sources, provide weep holes or other means for evacuation of entrapped water in hollow sections of railing members.
- E. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated. Furnish inserts and other anchorage devices for connecting handrails and railing to concrete or masonry work. Fabricate and space anchorage devices as indicated and as required to provide adequate support. Coordinate anchorage devices with supporting structure.
 - 1. For railing posts set in concrete provide sleeves of galvanized steel, not less than 6 inches long and with inside dimensions not less than 1/2 inch greater than

outside dimensions of post. Provide galvanized steel plat closure welded to bottom of sleeves, make closure 1 inch greater in length and width than outside dimensions of sleeve.

2. Provide slip-fit metal sockets to receive removable railing posts. Include removable socket covers designed and fabricated to fit into socket and resist accidental removal.

2.03 METAL FINISHES

- A. General: Finish shall be an acrylic polyurethane paint system as manufactured by TNEMEC Co., Inc., or other similar system by an approved manufacturer. Color to be selected by Owner's representative.
- B. Surface Preparation: Prepare all surfaces by removing all loose mill scale, loose rust, dirt, grease or other foreign matter by sandblasting to a commercial grade according to SSPC-SP6, by the manufacturer of the paint system.
- C. Shop Applied Prime Coat: Apply a prime coat of TNEMEC Series 66, Color Hi-Build Epoxoline, to a dry thickness of 3 to 4 mils.
- D. Shop Applied Finish Coat: Apply a finish coat of Hi-Build Acrylic Polyurethane Enamel, TNEMEC Series 73 (semi-gloss) or 74 (high-gloss), Endura-Shield III, to a dry film thickness of 2.5 to 3.5 mils.

PART THREE - EXECUTION

3.01 EXAMINATION

- A. Installer must examine the areas and conditions under which handrails and railings are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- b. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for adjustments during installation where taking field measurements before fabrication might delay work.

3.03 INSTALLATION

A. General

1. Fit exposed connections accurately together to form tight, hairline joints.
2. Perform cutting, drilling and fitting required for installation of handrails and railings. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication, and are intended for field connection by mechanical means without further cutting or fitting.
3. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but could not be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat.
4. Adjust handrails and railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated or, if not indicated, as required by design loadings.

B. Anchoring Posts

1. Anchor posts in concrete by means of sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between posts and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
 - a. Leave anchorage joint exposed; wipe off excess grout and leave 1/8 inch build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
2. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
3. Provide removable railing sections as indicated, using slip-fit metal sockets. Accurately locate sockets to match post spacing.

3.04 ADJUST AND CLEAN

- A. Protect finishes of railings and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at project completion or when directed by Owner's representative. Restore finishes damaged during installation and construction period so that no

evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units as required.

- B. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint; and paint exposed areas with same material.

END OF SECTION 05520

SECTION 16010 - ELECTRICAL GENERAL REQUIREMENTS

PROJECT DESCRIPTION: Electrical work associated with Troy Gardens Planned Unit Development.

INDEX

16010	Electrical General Requirements
16530	Exterior Site Lighting and Wiring Devices

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Includes

1. Furnish all labor materials, tools, equipment, and services for all electrical work as indicated, in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically called out on drawing, the contractor shall furnish and install all miscellaneous items, wiring, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Drawings Use and Interpretation

1. Drawings are diagrammatic and indicate general arrangement of systems and equipment, except when specifically dimensioned or detailed.
2. For exact locations of building elements, refer to dimensioned architectural/structural drawings.
3. Field measurements take precedence over dimensioned drawings.
4. Intention is to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
5. Field verify locations and arrangement of all existing systems and equipment.
6. Omissions no later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect/Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.
7. If any errors or omissions appear in Drawings, Specifications, or other documents, bidding Contractor shall notify Engineer no later than ten (10) days prior to submitting bid. Should conflict occur in or between drawings and specifications, bidding contractor is deemed to have estimated more expensive way of doing work, unless he shall have asked for and obtained written decision (addendum) before submission of bid as to which method or materials will be required.

- C. Installation of all systems and equipment is subject to clarification as indicated in reviewed shop drawings and field coordination drawings.
- D. Dimensions indicated are limiting dimensions.
- E. Do not use equipment exceeding dimensions indicated or equipment or arrangements that reduce required clearances or exceed specified maximum dimensions.
- F. Description of systems: Furnish and install all materials to provide functioning systems in compliance with performance requirements specified, and any modifications required by reviewed shop drawings and field coordinated drawings.
- G. Definitions
 - 1. A/E: Architect and/or Engineer
 - 2. Provide: Furnish, install, wire and connect complete by Contractor under Division 16.
 - 3. Contractor: The person or group responsible for project construction under Division 16.

1.02 WEATHERPROOF EQUIPMENT

- A. Where weatherproof (WP) equipment is indicated, use NEMA 3R enclosures.
 - 1. All exterior devices and equipment shall be weather-proof.

1.03 CORROSIVE ENVIRONMENTS

- A. In areas noted with corrosive atmosphere; use NEMA 4X reinforced fiberglass watertight enclosures.

1.04 QUALITY ASSURANCE

- A. Perform all work and install materials and equipment in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following:

State and Federal Laws
International Building Code (IBC)
National Electrical Code (NEC)
Life Safety Code (NFPA-101)
National Electrical Safety Code (NESC)
American National Standards Institute (ANSI)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronic Engineers (IEEE)

Insulated Power Cable Engineers Association (ICEA)
The Occupational Safety and Health Act (OSHA)
American Society for Testing and Materials (ASTM)
Underwriters' Laboratory (UL)
International Building Code (IBC)
Wisconsin Enrolled Commercial Building Code
Wisconsin Electrical Code Volume II
Department of Natural Resources NR-101
Local laws, codes and ordinances

- B. Conflicts, if any, that may exist between the above items, the more restrictive shall govern.

1.05 SUBMITTALS

A. General

1. The A/E's review of shop drawings or samples shall not relieve the Contractor of responsibility for any deviation from the contract documents. The Contractor shall include with the shop drawings an index sheet detailing all deviations from the contract documents, and will be held responsible for all deviations unless he has received written approval from the A/E for the specific deviation, separate from general shop drawing approval. The A/E's review shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings or samples.

B. Shop Drawings

1. As indicated in each Division 16 Section.
2. Provide scale layout of electrical rooms/spaces showing electrical equipment placement and clearances.

C. Product Data

1. Product list
2. Submittals indicated in each Division 16 section.

D. Samples

1. As indicated in each Division 16 Section.

E. Project Information

1. As indicated in each Division 16 Section.

1.06 PROTECTION

- A. Provide covering and shielding for all equipment to protect from damage.
- B. Protect nameplates on motors and similar equipment, to prevent defacing.
- C. Repair, restore or replace damaged, corroded and rejected items.

1.07 JOB CONDITIONS

- A. Cause as little interference or interruption of existing utilities and services as possible.
 - 1. Schedule work which will cause interference or interruption in advance with Owner, Architect, authorities having jurisdiction and all affected trades.
- B. Examine Contract Documents to determine how other work will affect execution of electrical work.
- C. Determine and verify locations of all existing utilities on or near site.
- D. Make arrangements for and pay for necessary permits, licenses, and inspections.
- E. Record drawings
 - 1. Keep a complete set of all electrical drawings in job site office for showing actual installation of electrical systems and equipment.
 - 2. Use this set of drawings for no other purpose.
 - 3. Where any material, equipment, or system components are installed differently from that shown, indicate differences clearly and neatly using ink or indelible pencil.
 - 4. At project completion, submit record set of drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable manufacturers
 - 1. Individual items:
 - a. Base: As noted.
 - b. Optional: As noted.
- B. Use only prime quality, new materials, apparatus and equipment.
- C. Use U/L labeled electrical materials where listing has been established for materials or

devices in question.

1. Manufactured items and fabricated assemblies of electrically operating equipment: U/L approval or U/L reexamination listing.
- D. Structural steel for supports: ASTM A36.
1. Galvanize members installed in areas of high humidity or condensation.
 2. Furnish other members with shop coat of rust inhibiting primer.
 3. Shop fabricate for field assembly using bolts.
 4. Minimize field welding.
 5. Retouch primer and galvanizing after field welding.

PART 3 - EXECUTION

3.01 GENERAL

- A. Use only thorough, highly skilled, and experienced workmen.
1. Division 16 equipment shall be installed in a neat and workmanlike manner.
- B. When changes in location of any work are required, obtain approval of Architect before making change.
1. Make changes at no extra cost.
- C. Do not change indicated sizes without written approval of Architect.
- D. Provide all necessary offsets and crossovers in conduits.
- E. Install exposed conduits parallel to walls and ceilings and vertically plumb, unless otherwise indicated.

3.02 INSTALLATION OF EQUIPMENT

- A. Install all equipment in accord with manufacturer's recommendations.
- B. Provide all necessary anchoring devices and supports.
1. Use structural supports suitable for equipment.
 2. Check loadings and dimensions of equipment with shop drawings.
- C. Verify that equipment will fit support layouts indicated.

1. Where substitute equipment is used, revise indicated supports to fit at no additional cost.
- D. Arrange for necessary openings to allow entry of equipment.
1. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves or other devices to allow later installation.
- E. Install equipment to permit easy access for normal maintenance.
1. Maintain easy access to switches, motors, drives, pull boxes, receptacles, etc.
 2. Relocate items which interfere with access.
- F. Where equipment components are installed prior to final installation (back boxes, panel tubs, fixture frames...), these components shall be properly protected from construction debris (paint, dirt, plaster, etc.)

3.04 FIELD QUALITY CONTROL

- A. Perform indicated tests to demonstrate workmanship, operation, and performance.
1. Conduct tests in presence of Owner's representative and, if required inspectors or agencies having jurisdiction.
 2. Arrange date of tests in advance with Owner's representative, manufacturer and installer.
 3. Give all inspectors minimum of 24 hours notice.
 4. Furnish or arrange for use of electrical energy, steam, water, diesel fuel, or gas required for tests.
 5. Furnish all lubricating materials required for test.
 6. Provide written report on all tests.
- B. Repair or replace equipment and systems found inoperative or defective and retest.
1. If equipment or system fails retest, replace it with products conforming with Contract Documents.
 2. Continue remedial measures and retests until satisfactory results are obtained.
- C. Test equipment and systems as indicated for each item, unless otherwise recommended by manufacturer.

3.05 FINAL PERFORMANCE TEST

- A. At completion of installation, test for operation, panel load balance, short circuits, and ground.
 - 1. Provide written report on final performance test.

3.06 ADJUST AND CLEAN

- A. Inspect all equipment and put in good working order.
- B. Clean all exposed and concealed items.
- C. Where new work occurs in existing areas where no other work has been done, clean area and restore to original condition.

3.07 PUTTING SYSTEMS IN OPERATION - START UP

- A. Prior to final acceptance, at time agreed to by Owner and Architect, put all systems in to satisfactory operation.
- B. Operate all systems in good working order for period of 5 working days.

3.08 TRAINING

- A. Contractor shall be responsible for owner training as specified in other sections of this specification.
- B. All training sessions shall be videotaped on VHS-format tapes, with (2) two copies of the tapes turned over to the owner for future use.

END OF SECTION 16010

SECTION 16530 - EXTERIOR SITE LIGHTING AND WIRING DEVICES**PART 1 - GENERAL**

1.01 DESCRIPTION

A. General

1. See Section 16010 for general electrical requirements.

1.02 SUBMITTALS (See General Conditions)

A. Shop Drawings

1. Names of manufacturers, cuts, and photometric performance curves of all lighting fixtures to be used.
2. Identify fixtures by fixture schedule number, including special notations for finishes, colors, and mountings.

B. Project Data

1. Operating and maintenance data: See Division 1.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acceptable Manufacturers

1. Luminaires and Bollards: As scheduled.
2. Contactors:
 - a. Base: Per MGE or Square D Co.; Siemens; and Cutler Hammer.
3. Selector switches:
 - a. Base: Per MGE or as detailed.
4. Photo cells:
 - a. Base: Per MGE or Tork.

B. Luminaire, Bollard and Pole Assemblies: As scheduled or per MGE.

C. Poles: Steel, designed for 100 MPH constant velocity wind load.

1. Include base template, 4 anchor bolts, cadmium-plated hardware and pole grounding lug, handhole, cast steel anchor base and bolt covers.
2. Finish: Factory primed. Finish with two coats of exterior paint after installation. Color as indicated on drawings or as selected by Architect.

- D. Concrete Base: Provide a concrete base in accordance with details on drawings.
- E. Underground Wiring: Type XLP/USE installed in rigid PVC conduit.
 - 1. Provide all wiring runs with separate green equipment grounding conductor, and ground all pole bases and outlets.
 - 2. Branch circuit homeruns shall be sized as follows:

Generally:	#10 Minimum
Above 100' - 0" in Length:	8 Minimum
Above 200' - 0" in Length:	6 Minimum
- F. Ballasts for Exterior HID: UL approved, high power factor, designed for -20 degF temperature starting.
- G. All hardware and fasteners corrosion resistant finished.
- H. Pole Wiring from Base to Ballast: No. 10 THWN, each phase protected by a 30 A, 600 volt type Tron waterproof fuse-holder, Bussman "Limitron" type, size rating 3-times load current.
- I. Contactors: Electrically held type, 30 ampere lighting load minimum with number of poles required, 120-volt operating coil, designed for tungsten, fluorescent metal halide, high pressure sodium or mercury lamp loads.
 - 1. Provide NEMA 1 sheet metal case.
 - 2. Square D, Class 8903.
- J. Photo-cells: 120 V, 60 cycles, enclosed weatherproof type for outdoor application.
 - 1. 1/2 IN conduit entrance.
 - 2. Fail-safe operation, with pilot light to indicate contacts-closed.
 - 3. Provide time delay device to eliminate nuisance switching.
 - 4. Controls: Temperature compensated, spectrum response permitting cell to face any direction except south.
 - 5. Provide unit with surge protection.
 - 6. Switch: SPST rated for 1,000-watts incandescent lamp load.
 - 7. Operating point field adjustable from 2 to 50 footcandles.
 - 8. Rigid PVC conduit: Per MGE.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all roadway, walkway and parking lighting receptacles, and their wiring as

indicated.

- B. Make conduit bends without injuring conduit or reducing internal diameter.
- C. Project anchor bolts 2 inches (50 mm) minimum above base.
- D. Install poles plumb. Provide shims or double nuts to adjust plumb. Grout around each base.
- E. Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.
- F. Install lamps in each luminaire. Lamps shall be furnished and installed by the Contractor for all fixtures installed, moved or otherwise reworked on this project, whether or not this Contractor installs, moves or otherwise reworks the fixtures.
- G. Bond luminaries, metal accessories and metal poles to branch circuit equipment grounding conductor. See Section 16450 - GROUNDING AND BONDING for requirements.

3.02 FIELD QUALITY CONTROL

- A. Operate each luminaire and receptacle assembly after installation and connection. Inspect for improper connections and operation.

3.03 ADJUSTING

- A. Aim and adjust luminaires to provide illumination levels and distribution indicated on Drawings or as directed.
- B. Relamp luminaires which have failed lamps at Date of Substantial Completion.

3.04 PHOTO CELL

- A. Install photo cells on top of power station with cells facing north.

END OF SECTION 16530