SECTION 01 4000 QUALITY REQUIREMENTS AND INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Mock-ups.
- F. Tolerances.
- G. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
- C. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
- D. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
- E. ASTM E699 Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
- F. ASTM E 548 Standard Guide for General Criteria used for Evaluating Laboratory Competence; 1994.

1.03 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- C. Design Data: Submit for Engineer's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- D. Test Reports: After each test/inspection, promptly submit electronic PDF copies of report to Engineer, Contractor and Building Official.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Engineer, provide interpretation of results.

- E. Certificates: When specified, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Engineer for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- H. Erection Drawings: Submit drawings for Engineer's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified quality control testing, to ensure quality control such that the Contractor shall take responsibility for the end product.
- B. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of shall be pre-approved by the Architect/Engineer., ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and _____.
 - 2. Laboratory: Authorized to operate in State in which Project is located.
 - 3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Engineer.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Engineer.
 - 6. Submit reports of all tests/inspections specified within 7 days. Notify Architect/Engineer within 24 hours of any failed test or non-conformities.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.

- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide direct access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Engineer.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

SECTION 01 5713

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.

1.02 RELATED REQUIREMENTS

A. Section 32 1123 - Aggregate Base Courses: Temporary and permanent roadways.

1.03 REFERENCE STANDARDS

- A. ASTM D4355/D4355M Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- D. ASTM D4632/D4632M Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.
- F. ASTM D4873/D4873M Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of the City of Duluth for erosion and sedimentation control.
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.

- 2. Prevent tracking of mud onto public roads outside site.
- 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
- 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- J. Open Water: Prevent standing water that could become stagnant.
- K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 - 1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 - 2. Obtain the approval of the Plan by authorities having jurisdiction.
 - 3. Obtain the approval of the Plan by Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay.
 - 2. Erosion control matting or netting.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- D. Silt Fence Posts: One of the following, minimum 5 feet long:
- E. Gravel: See Section 32 1123 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences or rock logs.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- B. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 - 5. Install with top of fabric at nominal height and embedment indicated on drawings.
 - 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 - 7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Mulching Over Small and Medium Areas:
 - 1. Dry Straw and Hay: Apply 4 to 6 inches depth.
 - 2. Erosion Control Matting: Comply with manufacturer's instructions.
- D. Temporary Seeding:
 - 1. When hydraulic seeder is used, seedbed preparation is not required.
 - 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
 - 3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
 - 4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
 - 5. Incorporate fertilizer into soil before seeding.
 - 6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
 - 7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
 - 8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 - 2. Remove silt deposits that exceed one-third of the height of the fence.
 - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

SECTION 01 6000 PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sustainable design-related product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Substitution Request Form (attached at the end of this section).

1.02 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.04 QUALITY ASSURANCE

- A. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
 - 1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 - 2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 - 3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
- B. Source Location: Provide products with content that was harvested, extracted or recovered close to the project site.
- C. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by:
 - 1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit http://www.fsccanada.org, for the USA visit http://www.fscus.org.
 - 2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- C. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed after bidding.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named 10 days prior to bidding.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 Substitution Procedures.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals.
- E. Substitution Submittal Procedure (Prior to Bidding):
 - 1. **Complete LHB Substitution Request Form** (attached) whenever a substitution is requested. All questions on the form must be answered. Requests with incomplete forms will not be processed.
 - 2. Submit Email copies of request for substitution to Architect for consideration on the LHB form attached to this section, not less than 5 business days from specified bid date. Limit each request to one proposed substitution.
 - 3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 4. The Engineer will notify by addendum of decision to accept or reject request.
 - 5. All products to be used must have approval prior to bidding.
- F. Requests for substituion not submitted in accordance with the procedures described in this section will not be rewivewed or considered by the Architect.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

SECTION 01 7800 CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Punch List.
- B. Forms Required at Project Closeout

1.02 SUBMITTALS

- A. Upon Substantial Completion, conduct Contractor Punchlist and submit to Engineer for use/review per AIA A201 General Conditions of the Contract.
- B. Project Record Documents: Submit documents to Engineer two-weeks prior to claim for final Application for Payment.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
- D. Forms Required:
 - 1. Prior to final payment, Contractor must submit a complete "Contractor's Affidavit" for Sole Proprietor or Partnership/Corporation on the form attached at the end of this section.
 - 2. Prior to final payment, Contractor must submit a complete "Consent of Surety to Final Payment" on the form attached at the end of this section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Field changes of dimension and detail.
 - 4. Details not on original Contract drawings.

3.02 JOB CLOSEOUT AND DOCUMENT TURNOVER

- A. Construction Documents CD's, As-Builts, Specifications and other documents turned over at the completion of the projects shall be furnished to the Owner in both paper hard copy and digital Adobe PDF.
 - 1. Construction Documents
 - a. PDF Creation: Each roll of drawings shall be scanned or converted to PDF to one single PDF document.
 - 1) Scanning:
 - (a) 200 DPI Grayscale
 - (b) Cropped to original size
 - (c) Color corrected and despeckled
 - 2. Specifications
 - a. PDF Creation: Each book of specifications shall be scanned or converted to PDF to one single PDF document.
 - 1) Scanning:
 - (a) 200 DPI Grayscale
 - b. Bookmarking: Not required.
 - c. Naming: The PDF shall be labeled: "Building Name_Year_Title_Spec_Type"
 - d. Year = Date of Documents
 - e. CD = Construction Document

SECTION 30 1000 BASIC CIVIL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Governing Specification Reference specification for civil work.
- B. Utility Property and Service Identifying and working around existing utilities.
- C. Construction Surveying Surveying necessary to perform the work.

1.02 REGULATORY CODES

A. 29CFR1926. US Code of Federal Regulations-Safety and Health Regulations for Construction.

1.03 GOVERNING SPECIFICATION

- A. The State of Minnesota Department of Transportation, Standard Specifications for Construction (MnDOT), 2018 Edition shall apply on all Division 30 through 35 work, except as modified or altered in the following sections: 30 0000 through 35 9999.
- B. The City of Duluth Public Works & Utilities Department Engineering Division 2019 Edition Standard Construction Specifications book, and any addendum or supplements shall apply on all Division 30 through 35 work, except as modified or altered in the following sections: 30 0000 through 35 9999.
- C. City Engineers Association of Minnesota (CEAM) Standard Specifications 2013 Edition.
- D. All traffic control devices and signing shall conform to the 2014 Minnesota MUTCD, including the most current edition of the field manual. The Contractor is responsible for all traffic control on the Project.
- E. All references to measurement and payment in the Governing Specifications shall not apply.

1.04 UTILITY PROPERTY AND SERVICE

- A. Construction operations in proximity of utility properties shall be performed in accordance with the provisions of MnDOT 1507, except as modified below:
 - 1. Interference of Underground Structures
 - a. When any underground structure interferes with planned placement of the pipeline or appurtenances, to such an extent that alterations in the work are necessary to eliminate conflict or avoid endangering effects on either existing or proposed facilities, Contractor shall immediately notify Engineer of the affected structure. When any existing facilities are endangered by Contractor's operations, Contractor shall cease work associated with the interference and take such precautions as may be necessary to protect in-place structures until a decision is made as to how the conflict will be resolved.
 - b. Without specific authorization from Engineer, no essential utility service shall be disrupted, nor shall any change be made in either the existing structures or the planned installations to overcome the interference. Alterations in existing facilities will be allowed only to the extent that service will not be curtailed unavoidably, and then only when the encroachment or relocation will satisfy all applicable regulations and conditions.
 - c. Whenever alterations are required as a result of unforeseen underground interferences, not due to any fault or negligence of Contractor, Engineer will issue a written order covering any additional or extra work involved and specifying the revised basis of payment, if any. Any alterations made strictly for the convenience of Contractor shall be subject to prior approval and shall be at Contractor's expense.

1.05 CONSTRUCTION SURVEYING

- A. GENERAL SURVEY SPECIFICATIONS
 - 1. This Contract provides for Contractor to accomplish Construction Surveying for this project. Furthermore, Contractor is advised that the Contract may not fully describe every

detail or make specific allowances for all probable exceptions and contingencies related to Construction Surveying requirements for this Project.

- B. SURVEYING TO BE PERFORMED BY OWNER'S ENGINEER
 - 1. The Owner's Engineer has set the initial horizontal and vertical control points in the field for the Project as indicated in the Plans. Upon request by the Contractor, the Engineer will also provide electronic data in the format that was used in the accomplishment of the surveys for the Construction Plan, and in Construction Plan development itself. However, due to the many different processes that the design survey data goes through and the large variety of sources of input in the final production of the Plan itself, no warrantee is made as to the value or adaptability of the electronic data to the Surveyor. No warrantee is made that the data systems used by the Engineer, or any consultants employed by the Owner for Surveying or Construction Plan preparation, will be compatible with the systems used by the Contractor's surveyor. Information shown on the printed "Plan" shall always govern over any electronic "Plan" data.
 - 2. At the discretion of the Owner's Engineer, spot checks may be performed upon the Contractor's surveying calculations, records, field procedures, and actual staking. If the Engineer determines that the work is not being performed in a manner that will assure proper controls and accuracy, the Engineer will order the Contractor to redo such work, to the standards specified in the Contract, at no additional cost to the Owner.
- C. CONSTRUCTION SURVEYING BY THE CONTRACTOR
 - 1. Contractor Construction Surveying Requirements are as follows:
 - a. Construction Surveying is defined as accurately providing all necessary computations, stakes and marks to establish lines, slopes, elevations, points, continuous profile grades and the requirements shown in the Plan for Construction Staking; so that the Contractor's forces are able to construct all the required work for the project in accordance with the Contract requirements; and so that the Owner's Engineers and Inspectors are able to complete all necessary inspection and Contract Administration duties. The staking shall include, but not be limited to clearing, grubbing, removals, grading, culverts, embankments, borrow, aggregate base course, pavements, buildings, utilities, signs, pavement parking, erosion control and turf establishment items to complete the Project as represented in the Plans. The surveying must be done in a way that is timely, and that is reflective of the continuing and ongoing nature of construction and inspection activities which will generally require frequent, separate Project visits by the Contractor's survey crew to the Project to accommodate the various stages of construction and inspection activities that will occur.
 - b. The Surveyor shall be prepared to make all necessary surveying checks for field verification of actual conditions and shall make the necessary minor surveying and staking adjustments to fit the construction to actual field conditions. In addition, some Plan details may be dependent upon actual field conditions at the time of construction. It may be necessary to perform some field surveying or office computations in order to stake these components. All work referred to in this paragraph is considered part of the work of Construction Surveying and no additional payment will be made for this work.
 - c. The Contractor shall:
 - Be responsible for the preservation of all reference points, monuments, government land corners, horizontal and vertical control points, stakes, and marks that are established by the Engineer or others within the Project limits. If the Contractor or its surveyor fails to preserve these items, and if they must be re-established by the Owner, the Engineer will deduct a charge from monies due or becoming due the Contractor according to the Owner's costs.
 - 2) Verify the original site control points provided on the plans by the Owner's surveyor. Any site control points subject to disturbance by the planned construction operations shall be transferred by the Contractor to an undisturbed location on the site or to an offsite location. Contractor shall preserve, protect and maintain a minimum of three site control points at all times throughout the

duration of construction and for a period of one year following substantial completion of the project.

- 3) Start and end all level runs, traverses, or GPS control surveys from known control.
- 4) Perform all Construction Surveying.
- 5) Present the Engineer with the As-built Survey Data. The as-built survey data shall include the following:
 - (a) Changes from the Plan:
 - (1) Manhole and catch basin inverts and top of castings
 - (2) Valve box covers
 - (3) Fence and gate locations
 - (b) Locations of utilities relocated or replaced as part of the Project.
 - (c) Identify any alignment, property, or control monumentation destroyed or placed during the Project.
 - (d) The information shall include the X, Y and if applicable, the Z coordinates in the Project datum. If the original item had no coordinate reference, then show the revised centerline station and offset.
- 6) Furnish survey documentation and as-built survey data to the Engineer within the time limits indicated in the surveying work schedule and prior to application for final payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

SECTION 31 1000 SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2323.

PART 3 EXECUTION

3.01 SITE CLEARING

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Contractor shall call Gopher State One Call in MN, 1-800-252-1166 for locating and marking of all utilities within the work area prior to any excavation on the project site.
- C. Protect existing utilities to remain from damage.
- D. Do not disrupt public utilities without permit from authority having jurisdiction.
- E. Protect existing structures and other elements that are not to be removed.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

3.03 VEGETATION

- A. Do not remove or damage vegetation beyond the limits indicated on drawings. Provide protective fencing around trees to be preserved where indicated on the plans. Fencing shall be 4 feet high, brightly colored plastic material or approved equal.
- B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated. All other vegetation cleared shall be removed from the site.
- C. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 EXISTING BUILT ELEMENTS

- A. Scope:
 - 1. Neat line sawcut and remove paving and curbs as required to accomplish new work.
 - 2. Remove other items indicated for salvage and relocation as indicated on drawings.
 - 3. Fill excavations, open pits, and holes in ground areas generated as result of removals, using General fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Provide, erect, and maintain temporary barriers and security devices.
 - 3. Conduct operations to minimize effects on, and interference with, adjacent structures and occupants.
 - 4. Do not close or obstruct public roadways or sidewalks without permit.

- 5. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Protect existing structures and other elements that are not to be removed.
 1. Prevent movement or settlement of adjacent structures.
- E. Perform demolition in a manner that maximizes salvage and recycling of materials.
- F. Partial Removal of Paving and Curbs: Neatly sawcut at right angle to surface. Begin and end removal of concrete walks and curbs at existing expansion joint locations.
- G. Dispose of demolished bituminous, concrete and other materials off site in compliance with MPCA and local regulations for waste disposal.

3.05 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

SECTION 31 2316 EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for pavement subgrade correction.

PART 2 PRODUCTS - (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.03 EXCAVATING

- A. Excavate to elevations and dimensions required by the drawings and as necessary to complete the work.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Do not interfere with 45 degree bearing splay of foundations.
- E. Hand trim excavations. Remove loose matter.
- F. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
- G. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- H. Remove excavated material that is unsuitable for re-use from site.
- I. Stockpile excavated material to be re-used in area designated on site. Stockpile in designated areas on site. Protect stockpile from erosion.
- J. Remove excess excavated material from site.

3.04 COMMON EXCAVATION

A. Material to be excavated that can be removed by hand shoveling, power shovel, bulldozer or other normal heavy equipment but not requiring the use of drills, and blasting shall be defined as common excavation. The contractor is responsible for all common excavation necessary to complete the work.

3.05 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.
- B. Provide proof-rolling of excavated subgrade in pavement areas with a loaded tandem axle dump truck prior to placement of fill and/or pavement sub-base materials. Subgrade shall be approved by the geotechnical engineer prior to placement of fill and/or sub-base materials.

3.06 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.
- F. Keep excavations free of water. Provide dewatering by approved means. Water pumped or otherwise discharged from the site during construction shall be directed towards sediment containing devices prior to discharge.

3.07 SUBGRADE APPROVAL/PROOF ROLLING

- A. Following excavation to the design subgrade elevations in all pavement areas and prior to placement of any Base Course or other fill materials, the Contractor shall contact the Owner's designated Construction Representative to schedule inspection of the subgrade and observe proof rolling operations. Provide minimum of 24 hrs confirmed notice. All proof rolling shall be completed by the Contractor in the presence of the Owner's designated Construction Representative.
- B. To complete proof rolling, exposed subgrade areas shall be provided with a relatively smooth surface, suitable for observing soil reaction during proof rolling.
- C. Contractor shall schedule and provide a fully loaded tri-axle dump truck for proof rolling. Loaded truck shall have a minimum gross operating weight of 30 tons. Test shall be conducted with "tag" or "pusher" axles retracted from the ground.
- D. Test rolling shall be accomplished in a series of traverses parallel to the centerline of the street, parking area or building area. The truck shall traverse the length of the street or parking / building areas once for each 12 feet of width. Additional passes along the traverse shall be completed as directed by the Owner's Construction Representative, to further define unsatisfactory subgrade.
- E. Soft areas, yielding areas, cracked areas or areas where rolling or wave action is observed shall be considered indicative of an unsatisfactory subgrade. Such areas shall be undercut as outlined in subsequent subsections of this specification.
- F. Once the subgrade has been proof rolled and approved, protect the soils from becoming saturated, frozen, or adversely altered.

SECTION 31 2323 FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 REFERENCE STANDARDS

- A. ASTM C136/C136M Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- B. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).
- C. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017a.

1.03 SUBMITTALS

- A. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- D. Compaction Density Test Reports.

1.04 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Non-organic select compactible salvaged Subsoil excavated on-site and/or imported MnDOT 2105.2B Common Borrow. When on-site soils are exhausted the Contractor shall provide imported MnDOT Common Borrow as necessary to complete the work. General Fill excavated from on-site shall meet the following requirements.
 - 1. Graded.
 - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 3. General Fill salvaged from on-site shall be selected, separated and protected to manage the soils moisture content. The Contractor shall dry or moisture condition the soil as necessary in order to achieve the required compaction densities. If drying the soils is not feasible due to weather or the season, the Contractor shall provide Common Borrow to balance the site at no additional cost to the Owner.
 - 4. If salvaged subsoil from on-site is not compactible due to moisture content, or for other reasons, the Contractor shall remove the uncompactable soils and replace with MnDOT 2105.2B Common Borrow.
- B. Granular Fill (NFS): conforming to MnDOT 3149.2B Select Granular Borrow, modified so that of the portion passing the 1 inch sieve, not more than 7 percent by weight shall pass the No. 200 sieve, and no salvaged bituminous or concrete materials are allowed. Maximum particle size shall not exceed 2 inches and no less than 71 percent shall pass the 3/4 inch sieve.
- C. Topsoil: Friable loam; imported borrow.
 - 1. Select.
 - 2. Graded.
 - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
 - 4. Acidity range (pH) of 5.5 to 7.5.
 - 5. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.

2.02 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work. If source must change then retest at no cost to the Owner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify subdrainage, foundation insulation, dampproofing, and/or waterproofing installation has been inspected.
- D. Verify structural ability of unsupported walls to support imposed loads by the fill, see structural drawings.
- E. Verify subgrade has been approved by the geotechnical engineer. See Section 31 2316.
- F. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- G. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Granular Fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Bench fill into the native soils on all sloped surface 5 horizontal to 1 vertical or steeper. Place fills in uniform thickness horizontal lifts.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Slope grade away from building minimum 4 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- G. Correct areas that are over-excavated.
 - 1. Under, paving slabs-on-grade and similar construction: Use Granular Fill, flush to required elevation, compacted to 100 percent of maximum dry density.
 - 2. Other areas: Use General Fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 100 percent of maximum dry density.
 - 2. At all other locations: 95 percent of maximum dry density.
- I. Reshape and re-compact fills subjected to vehicular traffic.
- J. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed

unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use Granular Fill unless otherwise specified or indicated.
- B. Under Exterior Paving:
 - 1. Use Granular Fill.
 - 2. Compact to 100 percent of maximum dry density.
 - 3. Fill up to subgrade elevation. Refer to the finish surface sections on the drawings for subsequent fill layers.
- C. At Vegetated Areas:
 - 1. Use General Fill.
 - 2. Compact to 95 percent of maximum dry density.
 - 3. Place topsoil to depth as indicated on the plans.

3.05 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. Perform gradation testing on fill materials in accordance with ASTM C136/C136M.
 - 1. If tests indicate material does not meet specified requirements, remove, replace and retest.
 - Frequency of Tests: Provide the minimum number of tests as follows, one test minimum.
 a. Granular Fill: One test at/of fill source and one test for every 500 cu. yds. of fill placed on site.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D6938.
 - 1. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").
 - 2. If tests indicate work does not meet specified requirements, remove work, replace and retest.
 - Frequency of Tests: Provide the minimum number of tests as follows, one test minimum.
 a. Exterior Paving and Similar Construction: One test for every 2500 sq. ft. per 1ft of
 - depth of material placed or fraction thereof.b. Vegetated Areas: One test for every 10,000 sq. ft. per 1ft of depth of material placed or fraction thereof.
- C. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.07 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

SECTION 32 1123 AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.

1.02 REFERENCE STANDARDS

- A. ASTM C136/C136M Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- B. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).
- C. ASTM D1556/D1556M Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- D. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- E. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017a.

1.03 SUBMITTALS

- A. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base: conforming to MnDOT 3138 Aggregate Base, Class 5.

2.02 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Provide materials of each type from same source throughout the Work. If source must change then retest at no cost to the Owner.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, is dry, and gradients and elevations are correct.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Under Bituminous Concrete Paving:
 - 1. Place Aggregate Base to a total compacted thickness indicated on the plans.
 - 2. Compact to 100 percent of maximum dry density.
- B. Under Portland Cement Concrete Paving:

- 1. Place Aggregate Base to a total compacted thickness indicated on the plans.
- 2. Compact to 100 percent of maximum dry density.
- C. Place aggregate in maximum 8 inch lifts and compact to specified density.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform gradation testing on fill materials in accordance with ASTM C136/C136M.
 - 1. If tests indicate material does not meet specified requirements, remove, replace and retest.
 - 2. Frequency of Tests: Provide the minimum number of tests as follows, one test minimum.
 - a. Aggregate Base: One test at/of fill source and one test for every 1000 cu. yds. of fill placed on site.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.
 - 1. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").
 - 2. If tests indicate work does not meet specified requirements, remove work, replace and retest.
 - 3. Frequency of Tests: Provide the minimum number of tests as follows, one test minimum.
 - a. Exterior Paving and Similar Construction: One test for every 2500 sq. ft. per 1ft of depth of material placed or fraction thereof.
- C. Proof roll compacted aggregate at surfaces that will be under paving. Contractor shall obtain the approval of the geotechnical engineer regarding the suitability of the compacted aggregate surfacing layer prior to the placement of bituminous or concrete surfacing.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

SECTION 32 1216 ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Double course bituminous concrete paving.

1.02 SUBMITTALS

A. Provide bituminous mix design data.

1.03 QUALITY ASSURANCE

A. Asphalt Paving shall be in accordance with MnDOT 2360 except as modified below.

1.04 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 32 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tack Coat: Bituminous Tack Coat according to MnDOT 2357.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Base Course: conform to MnDOT Section 2360 mixture type Non-Wearing Course SPNWB330C.
- B. Wearing Course: conform to MnDOT Section 2360 mixture type Wearing Course SPWEA340C.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with MnDOT 2360, all testing shall be performed by the Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted Aggregate Base is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions and MnDOT 2357.
- B. Apply tack coat to contact surfaces of curbs, gutters and existing pavement match points.
- C. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.03 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- A. Install Work in accordance with MnDOT 2360.
- B. Place asphalt binder course within 24 hours of applying primer or tack coat.
- C. Place base course to thickness indicated on drawings.
- D. Place wear course to thickness indicated on drawings.
- E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.04 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. Provide field inspection and testing. Take samples and perform tests in accordance with MnDOT 2360, all testing shall be performed by the Contractor.

3.06 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 1 day or until surface temperature is less than 140 degrees F.

SECTION 32 1313 CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks and gutters.

1.02 REFERENCE STANDARDS

- A. AASHTO M 31M/M 31 Standard Specification for Deformed and Plain Carbon and Low-Alloy Steel Bars for Concrete Reinforcement; 2017.
- B. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2020.
- C. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete; 2020.
- D. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

1.03 SUBMITTALS

- A. Product Data: Provide data on joint filler and curing compound.
- B. Concrete Mix Designs.

1.04 QUALITY ASSURANCE

- A. Concrete Sidewalks shall conform to MnDOT 2521.
- B. Concrete Curb & Gutter shall conform to MnDOT 2531.
- C. Except as modified below.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Epoxy Coated Reinforcement Bars: Conform to MnDOT 3301 and AASHTO M 31M/M 31.
- B. Dowel Bars: Conform to MnDOT 3302.

2.02 CONCRETE MATERIALS

A. Concrete Materials: conforming to MnDOT 2461.

2.03 ACCESSORIES

- A. Curing Compound: White Membrane Curing Compound, conforming to ASTM C309, Type 2.
- B. Preformed Joint Filler: conforming to MnDOT 3702.
- C. Hot-Poured Elastic Joint and Crack Sealer: conforming to MnDOT 3723.

2.04 CONCRETE MIX DESIGN

- A. Concrete Mix:
 - 1. Concrete Sidewalks: conforming to MnDOT 2461, Mix No. 3F52.
 - 2. Concrete Curb & Gutter: conforming to MnDOT 2461, Mix No. 3F52 for manual placement.

2.05 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted Aggregate Base is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete sidewalks in accordance with MnDOT 2521.C1.
- B. Place concrete curb and gutter in accordance with MnDOT 2531.E, F & G.
- C. Do not place concrete when base surface is wet.

3.05 JOINTS

- A. Joint concrete sidewalks in accordance with MnDOT 2521.C2.
- B. Joint concrete curb and gutter in accordance with MnDOT 2531.C.
- C. Align curb, gutter, and sidewalk joints.
- D. Place 3/8 inch wide expansion joints at 50 foot intervals to separate paving from vertical surfaces and other component locations and in pattern indicated on the plans.
 - 1. Form joints with preformed joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
 - 3. Seal joint with hot-poured elastic joint sealer (MnDOT 3723).

3.06 FINISHING

- A. Finish concrete sidewalks in accordance with MnDOT 2521.C1.
- B. Finish concrete curb and gutter in accordance with MnDOT 2531.E.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.07 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

3.08 FIELD QUALITY CONTROL

- A. Contractor's Testing Agency shall perform field quality control tests.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
- C. Perform one slump and air test at the point of discharge for each and every concrete truck delivery to the site.

3.09 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

SECTION 32 1723.13 PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Parking lot markings, including parking bays, crosswalks, and curb markings.
- B. "No Parking" curb painting.

1.02 REFERENCE STANDARDS

- A. FHWA MUTCD Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.
- B. FS TT-P-1952 Paint, Traffic and Airfield Marking, Waterborne; 2015f.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.04 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.1. Parking Lots: Yellow.
- B. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings.
- D. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- E. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- F. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
 - 1. Apply paint in one coat only.
 - 2. Wet Film Thickness: 0.015 inch, minimum.
 - 3. Width Tolerance: Plus or minus 1/8 inch.
- G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
 - 1. Hand application by pneumatic spray is acceptable.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Replace removed markings at no additional cost to Owner.

SECTION 32 9223 SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fertilizing.
- B. Sod installation.
- C. Maintenance.

1.02 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

1.03 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 QUALITY ASSURANCE

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Minnesota.
- B. Installer Qualifications: Company approved by the sod producer.

1.05 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated below; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
 - 1. 2 varieties minimum of Kentucky Blue Grass Type: 80 to 85 percent.
 - 2. Creeping Red Fescue: 15 to 20 percent.
 - 3. Thickness: "Thick" sod, minimum 1 inch and maximum 1-3/8 inch topsoil base.
- B. Topsoil: Type as specified in Section 31 2323.
- C. Fertilizer: 10-10-10; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.

2.02 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

2.03 HARVESTING SOD

- A. Machine cut sod and load on pallets in accordance with TPI Guidelines.
- B. Cut sod in area not exceeding 1 sq yd, with minimum 1/2 inch and maximum 1 inch topsoil base.

2.04 SOURCE QUALITY CONTROL

A. Provide analysis of topsoil fill.

- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- C. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- D. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

A. Place topsoil to thickness indicated on the plans.

3.03 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Lay smooth. Meet edge and grade of mulch and seed areas.
- E. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- F. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 150 lbs.

3.05 MAINTENANCE

- A. Provide maintenance of sodded areas for one month from Date of Substantial Completion or until grass is well established and exhibits a vigorous growing condition.
- B. Water to prevent grass and soil from drying out.
- C. Roll surface to remove irregularities. Repair and re-sod any wash-outs that occur during the maintenance period.
- D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- E. Immediately replace sod to areas that show deterioration or bare spots.
- F. Protect sodded areas with warning signs during maintenance period.