SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Reinforcing bars.
   2. Welded wire fabric.
   3. Reinforcement accessories.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories.
   2. Section 03 30 00 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.
   3. ACI 530.1 - Specifications for Masonry Structures.
   4. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
   1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   3. A185 -07 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
   4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   5. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   6. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   7. ASTM A704 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

C. American Welding Society:
   1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
   1. CRSI - Manual of Standard Practice.
   2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 01300 – Submittals.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice, ACI 301 and ACI 318.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Section 01040 – Coordination.

B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615 60 ksi yield grade, deformed billet bars, uncoated finish.

B. Plain Wire: ASTM A82 unfinished.

C. Welded Plain Wire Fabric: ASTM A185; unfinished in flat sheets. Coiled rolls ARE NOT ACCEPTABLE.

2.2 ACCESSORY MATERIALS

A. Tie Wire: 16 gage annealed type per ASTM A82.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel type; size and shape to meet Project conditions.

D. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.

B. Form reinforcement bends with minimum diameters in accordance with ACI 318.

C. Fabricate column reinforcement with offset bends at reinforcement splices.

D. Form spiral column reinforcement from minimum 3/8 inch diameter continuous deformed bar or wire.

E. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Architect/Engineer.

2.4 SOURCE QUALITY CONTROL

A. Section 01400 – Quality Control.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
   1. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

B. Do not displace or damage vapor retarder.

C. Accommodate placement of formed openings.

D. Space reinforcement bars with minimum clear spacing in accordance with ACI 318 but not less than 1 inch.
   1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.
   2. Maintain concrete cover around reinforcement in accordance with ACI 318

E. Splice reinforcing where indicated on Drawings.

F. Bond and ground reinforcement in accordance with Electric Code requirements.

3.2 ERECTION TOLERANCES

A. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

Reinforcement Depth	Depth Tolerance	Concrete Cover Tolerance
Greater than 8 inches	plus or minus 3/8 inch	minus 3/8 inch
Less than 8 inches	plus or minus 1/2 inch	minus 1/2 inch

B. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

3.3 FIELD QUALITY CONTROL

A. Section 01400 – Quality Control.

B. Reinforcement Inspection:
   1. Placement Acceptance: Specified material requirements and specified placement tolerances.
   2. Welding: Inspect welds in accordance with AWS D1.1.
   3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.

3.4 SCHEDULES

A. Reinforcement For Foundation Wall, Footings, Framing Members and Slab-on-Grade: Deformed bars and wire fabric, unfinished.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Foundations.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories: Formwork and accessories.
   2. Section 03 20 00 - Concrete Reinforcing.
   3. Section 03 39 00 - Concrete Curing.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 305 - Hot Weather Concreting.
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   4. ACI 308.1 - Standard Specification for Curing Concrete.
   5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   2. ASTM C33 - Standard Specification for Concrete Aggregates.
   3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   4. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   5. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
   6. ASTM C150 - Standard Specification for Portland Cement.
   7. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
   8. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
   9. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   10. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   11. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
   12. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
   13. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
   14. ASTM C685 - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
   15. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
   16. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

17. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
18. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
19. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
20. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 SUBMITTALS

A. Section 01300 – Submitals.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures and mix design.

C. Design Data:
1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
   a. Hot and cold weather concrete work.
   b. Air entrained concrete work.
2. Identify mix ingredients and proportions, including admixtures.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 – Contract Close-Out.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 318.

B. Conform to ACI 305 when concreting during hot weather.

C. Conform to ACI 306.1 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.

B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

C. Maintain high early strength concrete temperature after installation at minimum 50 degrees F for minimum 3 days.

1.7 COORDINATION

A. Section 01040 – Coordination.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

Cement: ASTM C150, Type I – Normal, Type IA - Air Entraining, Type III - High Early Strength

A. Normal Weight Aggregates: ASTM C33.

B. Water: ACI 318; potable, without deleterious amounts of chloride ions.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494.
1. Type A - Water Reducing.
2. Type B - Retarding.
3. Type C - Accelerating.
4. Type D - Water Reducing and Retarding

C. Fly Ash: ASTM C618.

D. Plasticizing: ASTM C1017 Type I, plasticizing.

2.3 ACCESSORIES

A. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Sealant: ASTM D6690, Type I.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94.

B. Provide concrete for piers, footings, walls, foundation walls to the following design:

Compressive Strength (7 day)	2,800 psi / 2,400 psi
Compressive Strength (28 day)	3,500 psi (5.5 sack)
Cement	329 pounds
Coarse Aggregate	1,700-1,900 pounds
Fine Aggregate	1,400-1,600 pounds

Water/Cement Ratio	0.4-0.48
Course Aggregate Size	MDOT 6A
Fine Aggregate Size	MDOT 2NS
Air Entrained	2% +/- footings / 5-6% all other
Fly Ash	Approved Type F or C
Slump	Less than 4"

C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.

D. The use of calcium chloride will not be permitted.

E. Use set retarding admixtures during hot weather only when approved by Architect/Engineer.

F. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01040 – Coordination.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout or epoxy anchor per Architect/Engineer recommendation.

C. Remove debris and ice from formwork, reinforcement, and concrete substrates.

D. Remove water from areas receiving concrete before concrete is placed.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and ACI 318.

B. Notify testing laboratory minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.

D. Deposit concrete at final position. Prevent segregation of mix.

E. Place concrete in continuous operation for each panel or section determined by predetermined joints.

F. Consolidate concrete.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Place concrete continuously between predetermined expansion, control, and construction joints.

I. Do not interrupt successive placement; do not permit cold joints to occur.

3.4 CONCRETE FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 318.

B. Wood float surfaces receiving quarry tile, ceramic tile and terrazzo with full bed setting system.

C. Steel trowel surfaces which are indicated to be exposed.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for minimum 5 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete. Cure concrete in accordance with ACI 308.1.

C. Cure surfaces in accordance with ACI 301 and ACI 318 and Section 03 39 00.

3.6 FIELD QUALITY CONTROL

A. Contractor shall hire a qualified testing agency to perform field inspection and testing in accordance with ACI 318.

B. Provide free access to Work and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to Engineer/Architect for review prior to commencement of Work.

D. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.
   2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

E. Strength Test Samples:
   1. Sampling Procedures: ASTM C172.
   2. Cylinder Molding and Curing Procedures: ASTM C31, cylinder specimens, standard cured.

3. Sample concrete and make one set of three cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 2,500 sf of surface area for slabs on grade.
4. As a minimum, Contractors tester shall make one set of cylinders for each pour.
5. Make one additional cylinder during cold weather concreting, and field cure.

F. Field Testing:
1. Slump Test Method: ASTM C143.
2. Air Content Test Method: ASTM C173 and ASTM C231.
3. Temperature Test Method: ASTM C1064.
4. Measure slump and temperature for each compressive strength concrete sample.
5. Measure air content in air entrained concrete for each compressive strength concrete sample.

G. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
2. Test Acceptance: In accordance with ACI 318.
3. Test one cylinder at 7 days.
4. Test two cylinders at 28 days.
5. Dispose remaining cylinders when testing is not required.

H. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections as directed by Architect/Engineer.

3.8 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Architect/Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect/Engineer for each individual area.

3.9 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Foundation Walls: 3,500 psi 28 day concrete form finish, air entrained.

B. Footings: 3,500 psi 28 day concrete.

END OF SECTION

SECTION 03 39 00

CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes initial and final curing of horizontal and vertical concrete surfaces.

B. Related Sections:
1. Section 03 30 00 - Cast-In-Place Concrete.
2. Section 03 35 00 - Concrete Finishing.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
3. ACI 308.1 - Standard Specification for Curing Concrete.
4. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
1. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
4. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

1.3 SUBMITTALS

A. Section 01300 – Submittals.

B. Product Data: Submit data on curing compounds, compatibilities, and limitations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI 302.1 and ACI 318.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Deliver curing materials in manufacturer's packaging including application instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound: ASTM C309 or ASTM C1315.

B. Polyethylene Film: ASTM C171, 6 mil thick, clear.

C. Water: Potable, not detrimental to concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01040 – Coordination.

B. Verify substrate surfaces are ready to be cured.

3.2 INSTALLATION - HORIZONTAL SURFACES

A. Cure concrete in accordance with ACI 308.1.

B. Spraying: Spray water over areas and maintain wet for 7 days.

C. Membrane Curing Compound: Apply curing compound in one coat.

3.3 INSTALLATION - VERTICAL SURFACES

A. Cure concrete in accordance with ACI 308.1.

B. Spraying: Spray water over surfaces and maintain wet for 7 days.

C. Membrane Curing Compound: Apply compound in one coat.

3.4 PROTECTION OF FINISHED WORK

A. Section 01700 – Contract Close-Out.

B. Do not permit traffic over unprotected concrete.

3.5 SCHEDULES

A. Foundations and Foundation Walls: curing compound.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes shop fabricated metal items.
   1. Structural supports, framing, and miscellaneous attachments.
   2. Anchor bolts, eye bolts, and plates.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for embedded anchors and attachments for metal fabrications specified by this section in concrete.
   2. Section 06 10 00 – Rough Carpentry.

1.2 REFERENCES

A. Aluminum Association:
   1. AA DAF-45 - Designation System for Aluminum Finishes.

B. ASTM International:
   1. ASTM A36 - Standard Specification for Carbon Structural Steel.
   2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   6. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   7. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
   8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   9. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
   10. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
   11. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
   12. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
   13. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   14. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

15. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
16. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
17. ASTM F436 - Standard Specification for Hardened Steel Washers.
18. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.6 - Structural Welding Code - Stainless Steel.

D. National Ornamental & Miscellaneous Metals Association:
1. NOMMA Guideline 1 - Joint Finishes.

E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
2. SSPC SP 1 - Solvent Cleaning.
3. SSPC SP 10 - Near-White Blast Cleaning.
4. SSPC Paint 15 - Steel Joist Shop Paint.
5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.3 SUBMITTALS

A. Section 01300 – Submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

D. Provide manufacturer’s certificate that materials are processed in the United States.

1.4 QUALITY ASSURANCE

A. Finish joints in accordance with NOMMA Guideline 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 – Material and Equipment.

B. Accept metal fabrications on site in labeled shipments. Inspect for damage.

C. Protect metal fabrications from damage by exposure to weather.

1.6 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36. (Grade 50 Structural Steel also acceptable)

B. Steel Plate: ASTM A240, Stainless steel.

C. Stainless Steel Hardware: ASTM F593

D. Bolts: ASTM A307; Grade A or B.
1. Finish: Hot dipped galvanized for exterior applications.

E. Nuts: ASTM A563 heavy hex type.
1. Finish: Hot dipped galvanized for exterior applications.

F. Washers: ASTM F436; Type 1.
1. Finish: Hot dipped galvanized for exterior applications.
2. Welding Materials: AWS D1.1; type required for materials being welded.

G. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

H. Shop Primer: SSPC Paint 8 Gray Oxide. (For Alternate No. B Bid Price)

I. Finish Coat: SSPC Paint 21 Type I, high gloss black (2) coats. (For Alternate No. B Bid Price)

J. Eyes Bolts: Shoulder eye bolts, stainless steel type 316, working load limit= 4,700 lbs

K. Chain Link Fence: Chain link fence shall be 9 gauge wire, 2” mesh, ASTM A392, hot dipped galvanized before weaving, Class 2, vinyl coated.

2.2 ANCHOR BOLTS

A. Anchor Rods: ASTM F1554; Grade 36.
1. Shape: straight with heavy hex nut tack welded.
2. Furnish with nut and washer; hot dipped galvanized.

2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FACTORY APPLIED FINISHES - STEEL

A. Prepare surfaces to be primed in accordance with SSPC SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Galvanizing: ASTM A123; hot dip galvanize after fabrication.

D. Galvanizing for Fasteners, Connectors, and Anchors:
1. Hot-Dipped Galvanizing: ASTM A153.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01040 – Coordination.

B. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval of Architect/Engineer prior to site cutting or making adjustments not scheduled.

F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 ERECTION TOLERANCES

A. Maximum Offset From Alignment: 1/4 inch.

B. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 73 00 – STAINLESS STEEL CABLE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Suspension Cables.
2. Vertical cables.
3. Horizontal railing cables.
4. Fittings and Hardware

B. Related Requirements:
1. Section 03 30 00 - Cast-in-Place Concrete.
2. Section 05 50 00 - Metal Fabrications.
3. Section 06 10 00 - Rough Carpentry.

1.2 REFERENCE STANDARDS

A. ASTM International:
1. American Iron and Steel Institute (AISI) - Steel Product Manual; Stainless and Heat Resisting Steel.
2. ASTM A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.
3. ASTM A 380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.
4. ASTM A 492 - Specification for Stainless Steel Rope Wire.
5. ASTM A 555 - Stainless Steel Wire.
6. ASTM A 582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.
7. ASTM E 935 - Permanent Metal Railing Systems and Rails for Buildings.
8. ASTM E 985 - Anchorage of Permanent Metal Railing Systems and Rails for buildings.
9. ASTM F 1145 - Specification for Turnbuckles, Swaged, Welded, Forged.
10. MIL-C-5688 - Pre-Stretching and Proof-Testing of Wire Rope Assemblies.

1.3 DESIGN / PERFORMANCE REQUIREMENTS

A. Structural Requirements: Provide cable for railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated on the Drawings:
1. Handrails:
   a. Uniform load of 50 lbs/ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbs/ft (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Top Rails of Guards:
   a. 50 lbs/ft. applied horizontally and concurrently with 100 lbs/ft. applied vertically downward.
   b. Concentrated load of 200 lbs/ft applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill of Guards:

a. Concentrated load of 200 lbs/ft applied horizontally on an area of 1 SF.

4. Railing shall comply with all requirements of the ADA and OSHA regulations.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300 – Submittals.

B. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards. Provide list of all fittings being provided with descriptions, load capabilities, dimensions, and either photographs or drawings for each type.

C. Shop Drawings: Submit Shop Drawings for fabrication and installation. Include the following:
1. Plans, elevations, and detail sections.
2. Indicate materials, methods, finishes, fittings, fasteners, anchorages, and accessory items.
3. Provide setting diagrams and templates for anchorages, sleeves, and bolts to be installed by others.
4. Where materials or fabrications are indicated to comply with design loadings, include material and safety factor properties, and other information needed for structural analysis.

D. Installation Instructions: Manufacturer's printed installation instructions.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturer of stainless steel cable assemblies with 5 years minimum experience.

B. Installer Qualifications: Experienced in performing work of this section that has specialized in installation of work similar to that required for this project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle and store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

C. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.

1.7 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

A. Verify actual openings by field measurements before fabrication; show recorded measurements on shop drawings.

B. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide all cable, materials, fittings, and components from a single manufacturer if possible.

2.2 MATERIALS

A. Cables: ASTM A 492, stainless steel, polished finish, dry grade.
   1. Main suspension cable: 1” diameter, type 302/304, 6x19 IWRC, breaking strength= 85,400 lbs.
   2. Hanger cables: 5/16” diameter, 1x7, Type 316 stainless steel strand, breaking strength= 11,900 lbs.
   3. Horizontal railing cables: 5/16” or 7/16” diameter, 1x7, Type 316 stainless steel strand.

B. Fittings: Type 316 stainless steel, vibratory/ tumbled finish. Provide fittings required for attachment and connection of stainless steel cable and infill to support framework and substrates.
   1. Cable Attachment Method:

      a. Machine Swaging: Machine swaged by cold-forming press, with smooth surface and can achieve full cable strength in fitting connection.
      b. Hand Crimping: Hand crimped for in-field installations.
      c. Mechanical Terminals: Mechanical terminal with full cable strength in fitting connection.
      d. As recommended by the fabricator and approved by the Architect.

   2. Turnbuckles:

      a. Terminal Tuner Turnbuckle Series available in "Button", "Ball" and "Bevel" end attachments.
      b. Classic Turnbuckle Series available in Jaw, Deck Toggle, Button, Ball and Swage to Swage end attachments.
      c. Shortie Turnbuckle Series available in Jaw, Deck Toggle, Button, Ball and Swage to Swage end attachments.
      d. Decko Turnbuckle Series available in Jaw, Deck Toggle, Button, Ball and Swage to Swage end attachments.
      e. Smooth Line Turnbuckle Series available in Jaw, Deck Toggle, Button, Ball and Threaded Terminal end attachments.
      f. Threaded Terminal Series available in 1/8 inch to 3/8 inch cable sizes.
      g. Terminator Turnbuckle Series available in threaded and blind thread versions.

h. As recommended by the fabricator and approved by the Architect.

3. End Fittings:

a. Jaw End Fitting.
b. Smooth Line Jaw End Fitting.
c. Button End Fitting.
d. Smooth Line Button End Fitting.
e. Deck End Fitting.
f. Smooth Line Deck End Fitting.
g. Ball End Fitting.
h. Smooth Line Ball End Fitting.
i. Button end w/ 30 degree angled washer.
j. As recommended by the fabricator and approved by the Architect.

4. Threadlocker

a. Loctite Blue 242 or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify that conditions installed under other sections are acceptable for installation of cable railing systems in accordance with manufacturer's installation instructions.

B. Verify supporting posts and framework for cable are prepared for attachment of anchors, fittings and cable, and transfer of calculated loads.

C. If conditions are the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Verify alignment, support dimensions, and tolerances are correct.

C. Inventory components to ensure all required items are available for installation. Inspect components for damage. Remove damaged components from site and replace.

3.3 INSTALLATION

A. Install cable infill system in accordance with manufacturer's instructions and the approved shop drawings.

B. Provide anchorage devices and fittings to secure to in-place construction; including threaded fittings for concrete inserts, toggle bolts and through-bolts.

C. Install cable infill system plumb, level, square, and rigid without kinks or sags.

D. Anchor cable railing system to mounting surfaces as indicated on the drawings.

E. Dissimilar metals shall not come in contact. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

F. Use manufacturer's supplied cable hardware.

G. Ensure cables are clean, parallel to each other, and without kinks or sags.

H. Tension cable to 350 lbs.

I. After final adjustment provide tamper resistant loc-tite threadlocker on all fittings. Verify that materials are a non-permanent-locking type that permits the fittings to be re-adjusted without destroying the fittings

3.4 ADJUSTING AND CLEANING

A. Adjust cable tension and connecting hardware.

B. Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.

C. Do not use abrasive cleaners.

D. Remove from project site and legally dispose of construction debris associated with this work.

3.5 PROTECTION

A. PROTECTION

B. Protect installed products until completion of project.

C. Protect installed products and finished surfaces from damage during construction.

D. Repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rough sawn structural floor framing.
   2. Full Log Beams.
   3. Preservative treatment of wood.
   4. Miscellaneous framing.

1.2 REFERENCE STANDARDS

A. American Wood Protection Association:
   1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
   2. AWPA U1 - Use Category System: User Specification for Treated Wood.

B. ASTM International:
   1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
   3. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
   4. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
   5. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products.
   6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
   8. ASTM D25 - Standard Specification for Round Timber Piles

C. California Department of Health Services:
   1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

D. Forest Stewardship Council:
   1. FSC Guidelines - Forest Stewardship Council Guidelines.

E. Green Seal:
   1. GS-36 - Aerosol Adhesives.

F. National Lumber Grades Authority:
   1. NLGA - Standard Grading Rules for Canadian Lumber.

G. Northeastern Lumber Manufacturers Association:
   1. NELMA - Standard Grading Rules for Northeastern Lumber.

H. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

I. Southern Pine Inspection Bureau:
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

J. U.S. Department of Commerce National Institute of Standards and Technology:
   1. DOC PS 20 - American Softwood Lumber Standard.

K. West Coast Lumber Inspection Bureau:
   1. WCLIB - Standard Grading Rules for West Coast Lumber.

L. Western Red Cedar Association:
   1. WRCA - Lumber Grades and Standards.

M. Western Wood Products Association:
   1. WWPA - 2011 Western Lumber Grade Rules, including supplements.

1.3 SUBMITTALS

A. Section 01300 - Submittals.

B. Product Data: Submit technical data on wood preservative materials and application instructions.

1.4 QUALITY ASSURANCE

A. Perform Work according to the following:
   1. Lumber Grading Agency: Certified by NIST PS 20.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 – Material and Equipment.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store materials according to manufacturer instructions.

D. Protection:
   1. Protect framing members from warping or other distortion by stacking in vertical position and bracing to resist movement.
   2. Provide additional protection according to manufacturer instructions.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: RIS SPIB WCLIB WRCA WWPA NFPA.

B. Rough sawn materials shall be to the actual dimensions as called out on the plans.

C. Log Beam Framing: Stress Group A, Red pine species, Full log, No. 1 grade, 19 percent maximum moisture content.

D. Deck Framing: Stress Group A, Southern Pine (S.P.) species, Rough sawn, No. 1 grade, 19 percent maximum moisture content.

E. Miscellaneous Framing: Stress Group D, Spruce, Pine, Fir (S.P.F) species, Rough sawn, 19 percent maximum moisture content.

2.2 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specifications A-Sawn Products or F-Wood Composites, using waterborne ACQ, SBX, or 0.075 CuN preservative.

B. Wood Preservative (Surface Application):
   1. Type: Colored.

C. Moisture Content after Treatment: Kiln dried (KDAT).

D. Lumber: Maximum 19 percent.

2.3 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: ASTM A153, hot-dip galvanized steel for high-humidity and treated wood locations.
   2. Fasteners: Stainless steel, 304 or 316 per ASTM F593.
   3. Fasteners, Coated: Coated structural and deck screws by any of the following manufacturers.
      a. GRK Fasteners
      b. Big Timber
      c. Or equal – submit for approval.

B. Die-Stamped Connectors:
   1. Material: Hot-dipped galvanized steel.

PART 3 EXECUTION

3.1 APPLICATION

A. Framing:
   1. Carefully select all members. Select individual pieces so that knots and defects will not interfere with placement of bolts, when nailing or making connections.
   2. Discard defective pieces.
   3. Set structural members level and plumb, in correct position.
   4. Fasten framing according to applicable code.
   5. Make provisions for erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
   6. Place horizontal members, crown side up.
   7. Construct load-bearing framing members full length without splices.
   8. Bridge joists framing in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.
   9. Place full-width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 4 inches.

B. Site-Applied Wood Treatment:
   1. Apply preservative treatment.
   2. Treat Site-sawn cuts by applying preservative according to AWPA M4.
   3. Allow preservative to dry prior to erecting members.

3.2 TOLERANCES

A. Other Framing Members: 1/4 inch from indicated position, maximum.

B. Surface Flatness of Floor Decking: 1/4 inch in 10 feet minimum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated trees, shrubs, and other plant life.
   3. Excavating topsoil.

B. Related Sections:
   1. Section 31 22 13 - Rough Grading.

1.2 QUALITY ASSURANCE

A. Conform to applicable Federal, State, and local code for environmental requirements, and disposal of debris. No burning of debris permitted on site.

B. Perform Work in accordance with 2012 MDOT Standard Specifications for Construction.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 – Submittals.

B. Verify existing plant life designated to remain is tagged or identified.

C. Identify waste area for placing removed materials.

3.2 PREPARATION

A. Call Local Utility Line Information service not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 01500 – Construction Facilities. Repair/replace any damage at no expense to Owner.

C. Protect bench marks, survey control points, and existing structures from damage or displacement. Repair/replace any damage at no expense to Owner.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work to minimum depth of 12 inches within the limits shown on the plan.

B. Remove trees and shrubs within marked areas. Remove stumps, main root ball, root system to depth of 12 inches, and surface rock.

C. Clear undergrowth and deadwood, without disturbing subsoil.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

C. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

D. Do not burn or bury materials on site. Leave site in clean condition.

3.6 DISPOSAL

A. The CONTRACTOR shall make his own arrangements for disposal of materials resulting from clearing and grubbing. Disposal shall be off the facility site and/or right-of-way and written permits for such disposal shall be obtained by the CONTRACTOR from the Owner of the property on which the material is placed. Contractor shall supply Owner/Engineer a copy of all written permit(s).

B. All waste material generated by the clearing and grubbing operation must be disposed of in a safe and environmentally sound manner which meets the requirements of all of the applicable State of Michigan Rules and Regulations; such as, the Clean Air Act, the Solid Waste Act, the Wetlands Protection Act, Etc.

3.7 ENVIRONMENTAL REQUIREMENTS

A. The CONTRACTOR shall comply with all requirements of the Department of Natural Resources which permit the open burning of weeds, brush, logs, limbs, stumps, roots and other debris which results from clearing and grubbing.

B. The CONTRACTOR shall also comply with all applicable local laws and ordinances regarding the disposal of trees (especially elm and ash) after removal, including their

logs, stumps, branches and bark.

C. All waste generated from the burning of the clearing and/or grubbing material shall be disposed of in a safe and environmentally acceptable manner which meets the requirements of all the applicable State of Michigan Rules and Regulations, such as the Clean Air Act, the Solid Waste Act, the Inland Lakes and Streams Act, the Wetlands Protection Act, Soil Erosion and Sedimentation Act, Notice to Public Utilities Act, and the National Historic Preservation Act.

3.8 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.9 SCHEDULES

A. None.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating topsoil.
   2. Excavating subsoil.
   3. Cutting, grading, filling, rough contouring, and compacting, site for site structures, concrete pads, and parking areas.

B. Related Sections:
   1. Section 31 05 16 - Aggregates for Earthwork.
   2. Section 31 10 00 – Site Clearing.
   3. Section 31 23 16 - Excavation.
   4. Section 31 23 23 - Fill.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
   7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
   8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01300 - Submittals.

B. Submit test results for proposed aggregates and fill materials to be used as specified in individual specification sections.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 – Contract Close-Out.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

B. Perform Work in accordance with 2012 MDOT Standard Specifications for Construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Site soils or MDOT Class III material as specified in Section 31 05 16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 – Submittals.

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Local Utility Line Information service at not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Comply with utility company requirements.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove or relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, and paving from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from designated areas, without mixing with foreign materials for use in finish grading, prior to any site excavation.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

F. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.

G. Stability: Replace damaged or displaced subsoil as specified for fill.

H. Any over excavation for the proposed construction shall be at the Contractor’s expense, unless approved by Engineer/Architect. Contractor shall notify Engineer of differing site conditions prior to over-excavating.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 12 inches compacted depth.
   2. Granular Fill: Maximum 8 inches compacted depth.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating for foundations and footings.
   2. Excavating for landscaping.

B. Related Sections:
   1. Section 31 05 16 - Aggregates for Earthwork: Stockpiling excavated materials.
   2. Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.
   3. Section 31 23 23 - Fill.

1.2 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

1.3 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Section 205 of the 2012 MDOT Standard Specifications for Construction.

1.5 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Michigan.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work, and comply with all requirements. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, and paving from excavating equipment and vehicular traffic.

F. Install silt fence and other soil erosion control requirements as required by the specifications and as called out in the plans.

3.2 EXCAVATION

A. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures, and construction operations.

B. Unless so directed by the Engineer, excavation shall not be carried below the elevations indicated on the drawings. Where the excavation is made below the elevations indicated on the drawings or directed by the Engineer due to fault of the Contractor, the excavations, if under slabs, shall be restored to the proper elevations; if under footings, the heights of the walls or footings shall be increased and the cost of such additional work shall be borne by the Contractor.

C. Slope banks with machine to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Notify Engineer of unexpected subsurface conditions.

H. Remove excess and unsuitable material from site.

I. Stockpile subsoil in area designated on site to depth not exceeding 8 feet and protect from erosion.

J. Repair or replace items indicated to remain damaged by excavation at no cost to Owner.

K. Contractor shall coordinate with Owner for disposal of excavated material. If owner provided site is used, all material shall be graded, protected from soil erosion and restored to the Owner's approval. All other materials shall become property of the Contractor and disposed of according to State and local requirements.

3.3 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall provide and maintain ample means and devices with which to promptly remove all water entering excavations, trenches, and other parts of the work and shall keep said excavations dry until the piping and/or structures to be built therein are completed. Under no circumstances shall any proposed water system components be subjected to water within the trench or excavation during construction. In no event shall water be allowed to rise over masonry or concrete until the concrete has set at least 24 hours. The Contractor must also guard against flotation of formwork. When the water cannot be removed by the commonly used methods, such as in water bearing sand, the Contractor shall furnish and install a well point system with vacuum pump and self-jetting points and all other appurtenances of amply capacity to keep the excavation and/or trenches dry.

B. The Contractor shall dispose of water from the work in a suitable manner without damage to adjacent property, utilities, or sewers. All removal of water and handling of water necessary to keep excavation, trenches and the work dry shall be at the expense of the Contractor.

C. The Contractor shall be responsible for keeping all system components dry until the work is accepted by the Owner. If at any time previous to acceptance the equipment or components become submerged, the Contractor shall correct any problems associated with the submergence. All expenses of any kind necessary to put the equipment or components mentioned in first class working order shall be paid for by the Contractor at no extra cost to the Owner.

D. Sedimentation Control shall be used with all discharges and any contaminants will be treated, if necessary, at no cost to the Owner.

E. Dewatering is considered incidental to the work.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Backfilling site structures to subgrade elevations.
   2. Fill for over-excavation.

B. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete.
   2. Section 31 05 13 - Soils for Earthwork.
   3. Section 31 05 16 - Aggregates for Earthwork.
   4. Section 31 22 13 - Rough Grading.
   5. Section 31 23 16 - Excavation.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Materials Source: Submit name of imported fill materials suppliers. Aggregate supplier shall provide current test results of materials supplied verifying that supplied products meet product requirements.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Per the 2012 MDOT Standard Specifications for Construction or as listed on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 – Submittals.

B. Verify that forms are removed and excavation is free of trash and debris.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place material in continuous layers as follows:
1. Subsoil Fill: Maximum 12 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.
3. Granular Fill: Maximum 8 inches compacted depth.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

I. Make gradual grade changes. Blend slope into level areas.

J. Remove surplus backfill materials from site.

K. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Section 01400 – Quality Control.

B. Perform laboratory material tests in accordance with ASTM D1557, ASTM D698 and AASHTO T180.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556 and ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest, at no cost to Owner.

E. Frequency of Tests:
   1. Owner's tester shall perform density testing of backfill materials prior to subsequent layer at a frequency of 1 test 250 feet of trench.

F. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 – Contract Close-Out.

B. Re-shape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

A. Fill Under Rip-Rap:
   1. Existing site soils, compacted to 95 percent.

B. Fill Under Aggregate:
   1. MDOT Class III or better material or suitable existing site soils, compact uniformly to 90 percent of maximum density.
      a. Unacceptable soils include peat and organic coils and clay or silt with excessive moisture content.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silt Fence.
   2. Diversion Channels.
   3.

B. Related Sections:
   1. Section 31 05 16 - Aggregates for Earthwork.
   2. Section 31 10 00 - Site Clearing.
   3. Section 31 22 13 – Rough Grading.
   4. Section 31 23 16 - Excavation.
   5. Section 31 23 23 - Fill.
   6. Section 32 92 19 – Seeding.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
   1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01300 – Submittals.

B. Product Data: Product Data: Submit data on geotextile.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

D. Follow all DTMB requirements for soil erosion control as listed on the plans.

1.4 CLOSEOUT SUBMITTALS

A. Section 01700 – Contract Close-Out.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with 2012 MDOT Standard Specifications for Construction.

1.6 PRE-INSTALLATION MEETINGS

A. Section 01200 – Project Meeting.

B. Convene one week prior to commencing work of this section.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 – Material and Equipment.

PART 2 PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish in accordance with 2012 MDOT Standard Specifications for construction.

2.2 PLANTING MATERIALS

A. Seeding and Soil Supplements: As specified in Section 32 92 19.

B. Mulch: As specified in Section 32 92 19.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 – Submittals.

B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

D. Install Work in accordance with 2012 MDOT Standard Specifications for Construction.

3.2 GEOTEXTILE SEDIMENTATION FENCING

A. Install geotextile silt fence to extent of disturbance of existing soil, in accordance with 2012 MDOT Standard Specifications for Construction.

B. Install geotextile silt fence around all stockpiled, excavated and filled areas.

C. Mulch seeded areas as specified in Section 32 92 19.

3.3 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 8 feet. Slope stockpile sides at 1:3 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 at 50 percent of permanent application rate with no topsoil
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.4 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest, at no cost to Owner.

3.5 CLEANING

A. Section 01700 – Contract Close-Out.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately 1/3 channel depth.

F. Repair/Replace damaged areas of sediment device immediately upon inspection.

3.6 PROTECTION

A. Protect sedimentation control devices throughout duration of work, or until seeding is established.

END OF SECTION

SECTION 32 92 19 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Rough grading of site.

1.2 REFERENCES

A. ASTM International:

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SUBMITTALS

A. Section 01300 – Submittals.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 – Contract Close-Out.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work in accordance with the 2012 MDOT Standard Specifications for Construction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 – Material and Equipment.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials according to MDOT 2012 Standard Specifications for Construction standards.

B. Description:
1. Creeping Red Fescue Grass: 40 percent.
2. Perennial Rye Grass: 30 percent.
3. Cereal Rye: 30 percent.

2.2 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are acceptable.

B. Fertilizer: in accordance with the 2012 MDOT Standard Specifications for Construction.

C. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01300 – Submittals.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 FERTILIZING

A. Apply fertilizer in accordance with the 2012 MDOT Standard Specifications for Construction**.**

B. Apply after smooth raking of topsoil.

C. Do not apply fertilizer at same time or with same machine used to apply seed.

D. Mix fertilizer thoroughly into upper 2 inches of topsoil.

E. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed in accordance with the 2012 MDOT Standard Specifications for Construction. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: follow the 2012 MDOT Standard Specifications for Construction.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Immediately following seeding, apply mulch in accordance with the 2012 MDOT Standard Specifications for Construction.

F. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder in accordance with the 2012 MDOT Standard Specifications for Construction.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A. Apply mulch and mulch blankets in accordance with the 2012 MDOT Standard Specifications for Construction and as called out on the plans.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Water to prevent grass and soil from drying out.

B. Roll surface to remove minor depressions or irregularities.

C. Immediately reseed areas showing bare spots.

D. Repair washouts or gullies.

E. Protect seeded areas with warning signs during maintenance period.

F. Maintenance of seeding is only required up to the date of final completion.

3.7 SCHEDULE

A. Seeded Areas: Grass seed mixture specified, 3 inch of top soil.

END OF SECTION 32 92 19