CAMP DODGE SOFTBALL FIELD
JOHNSTON, IOWA
AUGUST 2, 2024
100% SUBMITAL

TECHNICAL SPECIFICATIONS
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SECTION 02 41 23
SITE SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 Drawings and general provisions of contract including general and supplementary conditions apply to this section.

1.02 This part of the specifications includes the demolition and removal of existing pavement, utilities, granular areas, poles, footings, plant material and other miscellaneous items or structures as shown on the drawings.

1.03 The Contractor is responsible for the hauling and disposal of all removal items off of the site. Any items to be removed and salvaged shall be stored at a location chosen by the Owner.

1.04 The Contractor shall be responsible for any permits and notices necessary for authorizing the demolition, or for the transport and disposal of debris, if required by local authorities.

1.05 PROTECTION

A. The Contractor is expected not to interfere with the use of adjacent public streets and is required to maintain safe passage to and from the site.

B. The Contractor shall prevent the movement, settlement, or collapse of adjacent utility services, sidewalks, roadways, driveways and buildings. Any damage shall be repaired by the contractor to the owner's specifications and at the contractor's expense.

C. The Contractor shall install and maintain safety fence and traffic control as required to protect the general public, workers and adjoining property owners.

D. The Contractor is responsible for locating and protecting existing utility lines during construction. Any damage shall be repaired by the Contractor to the Owner's specifications at the Contractor's expense.

1.06 EXISTING SERVICES

A. The Contractor shall arrange with the affected utility companies and Owner in advance to obtain approval for disconnecting, removing, capping and for plugging utility services.

B. Manholes, utility stop boxes, fire hydrants, utility vents, and power and light poles, occurring in walks, alleys, or pavement that are required to remain in service, shall be left intact in the sidewalk or pavement removed from around them. The Contractor shall exercise extreme care and caution and will become liable for any damages to the existing utilities regardless of their location.

C. The Contractor shall install markers to indicate the location of disconnected services.

1.07 TRAFFIC CONTROL

A. The Contractor shall notify the Engineer, Owner, residents, businesses, police and fire departments at least two days in advance of closing any street for the demolition of existing utilities or pavement. Contractor shall be responsible for all required traffic control measures and for maintaining the flow of traffic in the street.

PART 2 - MATERIALS – NONE

PART 3 – EXECUTION

3.01 DEMOLITION

A. Work with pneumatic or vibratory tools will generally be permitted. Use of explosives will not be permitted.

B. Provide protection to the public, workers, and adjacent properties from falling debris and operating equipment adjacent to structures under demolition by the use of barricades or other adequate means. Warning signs and lights shall be placed at night at locations where the public is exposed to damage. The Contractor is responsible for maintaining during the period that danger to the public exists.

C. Remove existing utilities as indicated on the drawings.

D. Repair demolition performed in excess of that required at no cost to the Owner.

E. Keep work sprinkled to prevent dust. Provide hoses and water main or hydrant connections for this purpose.

F. Burning of materials on site is not permitted.

G. Remove from site contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger the health of workers and the public.

H. Remove demolished materials, tools, and equipment upon completion of work.

I. Contractor to mark demolition limits in field for Engineer’s and Owner’s approval prior to demolition activities.

J. All holes resulting from removals shall be filled and consolidated to finished grade as approved by the Engineer to prevent future settlement.

3.02 REPAIR

A. The Contractor shall repair any damage done to adjacent site improvements caused as a result of this work. The repairs will be made to the Owner's specifications at the Contractor's expense.

3.03 CLEANING

A. All roadways shall be kept free of debris on a daily basis on a daily basis and washed down as required to remove mud, soil, and dust on streets that result from trucking at points of site access.

B. Wet down dry materials and rubbish to lay dust.

C. Leave the site free of any vertical objects projecting above grade inside the staging area enclosed by any required safety fencing.

END OF SECTION 02 41 23

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SECTION 31 23 00
EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

B. This section includes excavation and earthwork for all site work including pavement earth subgrade.

1.02 DESCRIPTION OF WORK

A. Work includes stockpiling topsoil, excavating, loading, hauling, depositing, compacting, grading, pavement subgrade preparation, topsoil respreading, finish grading, and restoring surfaces as necessary to conform to lines, grades, and slopes as shown on plans.

B. Related work covered by other sections:

1. Section 31 23 43: Excavation and Fill for Pipes and Structures

2. Section 31 10 00: Site Clearing

3. Section 31 23 13: Building Pad Preparation

1.03 DEFINITIONS

A. Reference to percent maximum density shall mean a soil density not less than the stated percentage of maximum density for soil as determined by ASTM D698, "Moisture Density Relations of Soils", using 5.5-lb. rammer and 12 inch drop. (Standard Proctor Method).

1.04 TESTING

A. Contractor shall employ and pay for services of an independent testing laboratory for tests required to show compliance with specifications.

B. Contractor to provide equipment and materials as required for de-watering site areas for excavation operations.

C. Contractor to plan work and provide temporary means for routing storm water drainage as necessary during construction.

1.05 CONSTRUCTION LAYOUT STAKING

A. The Contractor shall supply all construction layout staking for this project, including for exterior improvements and utilities. Engineer will supply geometric information for purposes of staking upon request. Contractor shall give Engineer 48-hour notice per request for said information.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Earth: All materials not classified as rock or rubble including loam, silt, gumbo, peat, clay, soft shale, sand, gravel, and fragmentary rock or boulders which can be handled by normal earth moving equipment.

B. Rock: Boulders so large that they cannot be handled by normal earth moving equipment or solid deposits so firmly cemented together that they cannot be removed without continuous use of pneumatic tools or blasting.

C. Rubble: Buried concrete foundations, beams, walls, and other materials which cannot be removed without continuous use of pneumatic tools or blasting.

D. Topsoil: Organic well draining soil free from clay lumps, rocks, stones, concrete, toxic minerals, roots over 1/4" in diameter or other material which will not provide good turf growth. Secure from stripping operations as required or provide as necessary for finish grading.

E. Contractor shall notify the Owner if unsuitable soils are encountered during construction. Acceptable materials for construction shall include:

1. Fill used for site construction shall be free of organic matter and debris. The soils shall have a liquid limit less than 45 and a plasticity index less than 23.

2. All backfill and subgrade for pavements shall be compacted to 95% of standard proctor and shall be within a range of -1% to 4% of the materials optimum moisture content.

PART 3 - EXECUTION

3.01 EROSION PROTECTION

A. Code Compliance: The Contractor shall comply with soil erosion control requirements of the Iowa Code, the construction drawings and local ordinances. The Contractor shall take all necessary measurements to protect against erosion and dust pollution on

this project site and all off-site borrow or deposit areas, during performance or as a result of performance.

B. Damage claims: The Contractor will hold the Owner harmless from any and all claims of any type whatsoever resulting from damages to adjoining public or private property, including reasonable attorney's fees incurred to Owner. Further, if the Contractor fails to take necessary steps to promptly remove earth sedimentation or debris which comes onto adjoining public or private property, the Owner may, but need not, remove such items and deduct the cost thereof from amounts due the Contractor.

C. The Contractor shall be responsible for erosion control measures in accordance with the contract documents.

3.02 Protection of existing utilities: The contractor shall protect existing gas, electric, water, fiber optic, subdrain lines, storm and sanitary service lines encountered during construction. Any damage shall be repaired by the Contractor to the Owners specifications at the Contractor's expense.

3.03 EXCAVATION

A. Excavate, load, transport and place excavated materials as necessary to conform to lines, grades and slopes as shown on plans.

B. Roll and compact cut areas to density not less than specified for fill area.

C. If soft or yielding materials are encountered near finished grade in cut areas, remove unstable materials at a depth specified by Owner and replace with suitable materials and compact.

D. Excavate in manner to avoid construction of lenses, pockets, streaks or layers of material differing from surrounding materials in fill areas.

E. Cooperate with Owner in selection of locations for placement of excavated materials which differ appreciably from surrounding materials.

F. Maintain excavation in free draining condition; provide drainage for any water or springs which may be encountered.

G. The Contractor shall notify the Owner should existing drain tile be encountered during excavation and earthwork activities. Contractor is to connect all existing tiles encountered during construction to the storm sewer system.

H. Provide temporary drainage facilities to prevent damage when necessary to interrupt natural drainage or flow of storm sewers, culverts or subdrains.

I. Maximum height of vertical cut shall be three (3) feet.

3.04 FILL

A. Prepare areas for fill by discing, plowing and scarifying to depth of 4 to 6 inches following topsoil removal under building pad or proposed paved areas.

B. If soft or yielding materials at existing grade are encountered, remove unstable materials and replace with suitable materials and compact prior to fill operations.

C. When fill meets natural grade of slope, cut bench in existing slope to connect existing grade with new fill.

D. Step or bench all existing slopes greater than 5 horizontal to 1 vertical to connect existing grade with new fill.

E. Place no roots, brush, grass or other organic material in fill under buildings, pavement, and pond areas. Place no material on fill when material or foundation is frozen.

F. Select material for each portion of fill with approval of the Engineer; select materials to avoid sharp change in texture.

G. Use fill material free of lenses, pockets, streaks or layers of materials differing from surrounding materials.

H. Construct fill in horizontal layers not more than 9 inches in loose thickness.

I. Deposit each layer over full width of fill as separate and distinct operation.

J. After layer is deposited, smooth to uniform depth by means of suitable motor patrol or bulldozer.

K. Maintain fill in free draining condition, provide drainage for any water or springs which may be encountered, except in the pond areas.

L. If soft or yielding materials are encountered within fill areas due to trapped water, remove unstable materials and replace with suitable materials and compact.

3.05 COMPACTION

A. Contractor is responsible for all required compaction tests. Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.

1. Allow testing agency to inspect and test subgrades and fill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

2. Perform soil density and moisture tests on earthwork at locations selected by Owner to show compliance of compaction with specifications. Provide one test every 1,000 square yards of subgrade preparation, 1,800 square yards of fill

placement, or as may be required by geotechnical engineer. Intent is to provide sufficient test to adequately control and represent the compaction procedures.

3. If compaction fails density and moisture tests, rework fill by mechanical means until specified density and moisture is obtained; Contractor shall pay all costs for testing and retesting.

B. Compact all materials placed in fill.

C. Compact selected materials in horizontal layers with tamping or sheepsfoot roller; use roller designed to provide at least 200 psi distributed on one row of knobs; tamping feet must project not less than 6½ inches from face of drum.

D. Compact layer by rolling with tamping type roller until full weight of roller is supported by tamping feet.

E. Roller will be considered to be supported entirely on its tamping feet when feet do not penetrate more than 3 inches into material being compacted.

F. If soil is wet so that it will not sufficiently compact by one passage of roller per inch of loose thickness, provide one discing per 2 inches of loose thickness.

1. Cut and stir full depth of layer.

2. Allow interval of not longer than 2 hours between successive discings, or as directed by Geotechnical Engineer.

3. After discing is completed, compact layer by specified rolling.

G. If soil is dry so that it will not satisfactorily compact by rolling, moisten material before compaction; manipulate material to secure proper distribution of moisture before compaction.

H. Compact fill slopes progressively until slopes are stable.

I. Place fill and compact on all sides of structures to same level as fill operation progresses to protect structures against displacement or other damage.

J. Areas adjacent to structures which cannot be tamped with rollers: hand tamp with mechanical tamper to same degree of compaction as specified for other parts of fill.

K. Place fill material in maximum of 8 inch lifts.

L. Whenever operations are suspended during period, when rain is likely to occur, smooth and compact surface to shed water readily.

M. Compact all fill material in non-paved areas to not less than 85% maximum density as determined by ASTM D698 (Standard Proctor Method) with moisture content within -1% to plus 4% points optimum moisture.

N. Compact all fill material in the upper 12 inches below paved areas, proposed building area, and below footing elevations to not less than 95% maximum density as determined by ASTM D 698 (Standard Proctor Method) with moisture content within -1% to plus 4% points of optimum.

3.06 SUBGRADE PREPARATION

A. Shape and consolidate subgrade for placement of pavements.

B. Prepare subgrade as separate and distinct construction operation just prior to pavement placement.

C. Provide a uniform composition below top of subgrade of at least 12 inch depth under new paving plus 2 feet outside pavement limits.

D. Compact upper 12 inches with moisture and density control (95% MD). Moisture content to be -1% to 4% points of optimum.

E. Excavate top 6 inches of subgrade, scarify, pulverize, mix and recompact with moisture and density control. Pulverize, mix and replace top 6 inches of subgrade and compact with moisture and density control (95% MD).

F. Other methods for construction of subgrade preparation may be considered for use if uniform composition of finished subgrade is obtained and moisture and density tests taken at top of final subgrade and at 6 inches below top of final subgrade meet specified requirements as approved by Owner.

G. Remove stones over 3 inches in size from subgrade and stockpile as directed by Owner.

H. If ruts or other objectionable irregularities form in subgrade during construction, reshape and reroll subgrade before placing pavement; fill ruts or other depressions with material similar to other subgrade material and compact. No extra payment will be made for subsequent subgrade re-compaction.

I. Construct to elevation and cross section such that, after rolling, surface will be above required subgrade elevation.

J. Proof roll subgrade with loaded tandem axle truck to determine uniformity and stability of subgrade.

K. If soft or yielding areas are located, remove unstable materials and replace with suitable materials and compact as specified.

L. Complete final subgrade within drive areas by excavation to grade by use of steel-shod template supported on side forms or support rollers or by use of automatically controlled subgrade excavating machine.

M. Check subgrade elevation and grade within drives and parking areas by method approved by Owner prior to paving. No additional payment will be made for rework of subgrade after rain or snow events. The Contractor is responsible for scheduling subgrade operations with pavement installations to ensure proper timing of construction.

N. Maintain subgrade prior to and during paving operations; repair any damaged or disturbed areas prior to paving. No additional payment will be allowed for the re-compaction of subgrade area if work is not protected.

3.07 FINISH GRADING

A. Finish excavating and fill areas to conform to lines, grades and slopes as shown on plans or as directed by Owner.

B. Maximum allowable variation in finished earth grade from design grade outside of paved areas is 0.2 feet. Grade and slope all earth surfaces to drain.

C. Smooth and finish all earth surfaces disturbed by construction operations.

D. Provide continuous use of blade grader, dozer or similar equipment of adequate size and power to handle materials encountered during finishing of excavation and fill.

E. Respread stockpiled topsoil as required for finish grading to a minimum 6 inch depth.

F. Disc earth surfaces to depth of 3 inches and place topsoil 6 inches deep on finished earth surfaces; smooth and grade ready for turf bed preparation.

G. Schedule and coordinate topsoil respreading with seeding, sodding, and planting operations.

END OF SECTION 31 23 00

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SECTION 31 25 00
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Erosion Control Measures

B. Velocity and Flow Control Measures

C. Sediment Control Measures

D. Application/Installation of Measures

E. Removal/Replacement of Measures

1.02 DESCRIPTION OF WORK

A. Furnish all materials; install, construct, maintain, and remove specified erosion control devices; at locations shown on the plans, or where specified by the Engineer, in accordance with the contract documents.

B. Complete the required construction work on this project, while minimizing soil erosion and controlling water pollution. Maintain these features as specified, from initial construction stages to final completion of the project.

C. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term “Iowa DOT Specifications” and/or “Iowa DOT I.M.”

1.03 SUBSTITUTIONS

Follow the General Provisions.

1.04 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions.

1.05 SCHEDULING AND CONFLICTS

Follow the General Provisions, as well as the following:

A. Implement erosion and sediment control measures at the appropriate time(s).

B. Coordinate construction to minimize damage to erosion and sediment control devices.

1.06 SPECIAL REQUIREMENTS

A. Protection of Property: Prevent accumulation of earth, sediment, or debris from project site onto adjoining public or private property. Remove any accumulation of earth or debris immediately, and take remedial actions for prevention.

PART 2 - PRODUCTS

2.01 FILTER MATERIAL

A. Material for use in filter socks, filter berms, and other areas, as specified.

B. Use material derived from wood, bark, or other, non-toxic vegetative feedstocks.

C. Use material with no visible admixture of refuse or other physical contaminants, nor any material toxic to plant growth.

D. Use material meeting the following particle sizes:

Sieve Size	Percent Passing[1]
2”	100
1”	90-100
3/8”	0-30
[1]The target flow rate of in-place material is 10 gal/min/lf. The Engineer may approve use of alternate materials meeting the target flow rate.	

2.02 FILTER SOCK

A. For slope and sediment control applications, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 5-mil thickness, photodegradable HDPE.

B. For inlet protection, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 500-denier polypropylene.

C. Use 1 inch by 2 inch (minimum) hardwood stakes or stakes of equivalent strength.

2.03 SILT FENCE

Use silt fence that meets the following requirements:

A. Fabric: Conform to Iowa DOT Article 4196.01.

B. Posts: 4 foot minimum steel (T-section) weighing at least 1.25 pounds per foot, exclusive of anchor plate. Painted posts are not required.

C. Fastener: Wire or plastic ties with a minimum tensile strength of 50 pounds.

2.04 DUST CONTROL

A. Water: Use potable water or water from a source approved by the engineer.

B. Calcium Chloride: Conform to Iowa DOT Article 4194.01.

C. Lignosulfonate (Tree Sap): Use a commercially-available product with known lignin content.

D. Soapstock (Soybean Oil):

1. Use a commercially-available, undiluted, soybean oil soapstock emulsion.

2. Conform to specific storage, transportation, temperature, and application equipment requirements, as recommended by the manufacturer.

2.05 EROSION CONTROL MULCH

A. Conventional Mulch:

1. Use dry straw (oats, wheat barley, or rye) or hay (bromegrass, timothy, orchard grass, alfalfa, or clover).

2. Use material that is free of noxious weed, seed-bearing stalks, or roots and will be inspected and approved by the Engineer prior to use.

3. Other materials, subject to the approval of the Engineer may be used.

B. Hydromulch:

1. Wood Cellulose:

a. Use material that is a natural or cooked cellulose fiber processed from whole wood chips, or a combination of up to 50% of cellulose fiber produced from whole wood chips, recycled fiber from sawdust, or recycled paper (by volume).

b. Product contains a colloidal polysaccharide tackifier adhered to the fiber to prevent separation during shipment and avoid chemical co-agglomeration during mixing.

c. Form a homogeneous slurry of material, tackifier, and water.

d. Use a slurry that can be applied with standard hydraulic mulching equipment.

e. Dye the slurry green to facilitate visual metering during application.

f. Do not use materials that have growth or germination-inhibiting factors or any toxic effect on plant or animal life when combined with seed or fertilizer.

2. Bonded Fiber Matrix (BFM):

a. Produced from long-strand wood fibers, held together by organic tackifiers and bonding agents that, when dry, become insoluble and non-dispersible.

b. Upon curing 24 to 48 hours, form a continuous, 100% coverage, flexible, absorbent, erosion-resistant blanket that encourages seed germination.

c. Manufactured to be applied hydraulically.

d. Physical Properties:

1) Fibers: Virgin wood, greater than 88% of total volume.

2) Organic Material: Greater than 96% of total volume.

3) Tackifier: 8-10%.

4) pH: 4.8 minimum.

5) Moisture Content: 12% +/- 3%.

6) Water-holding Capacity: 1.2 gal/lb.

e. Dyed green to facilitate visual metering.

3. Mechanically-Bonded Fiber Matrix (MBFM):

a. Produced from long-strand wood fibers and crimped, interlocking synthetic fibers.

b. Within two hours of application, form a continuous, 100% coverage, flexible, absorbent, porous, erosion-resistant blanket that encourages seed germination.

c. Manufactured to be applied hydraulically.

d. Physical Properties:

1) Wood Fibers: 73% minimum.

2) Tackifier: 10% +/- 1%.

3) Crimped, Interlocking Synthetic Fibers: 5% +/- 1%.

4) Moisture Content: 12% +/- 3%.

5) Water holding capacity: 1.2 gal/lb.

6) Minimum pH: 4.8.

e. Dyed green to facilitate visual metering.

2.06 TEMPORARY ROLLED EROSION CONTROL PRODUCTS (RECP)

Use temporary rolled erosion control products that are classified and have material properties according to the Erosion Control Technology Council's (ECTC) guidelines as follows:

A. Material Classification:

1. RECP Type 1 (Ultra Short-Term): Functional longevity of three months or less and classified as follows:

a. RECP Type 1.A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.

b. RECP Type 1.B: Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.

c. RECP Type 1.C: Single-net erosion control blankets and open weave textiles, consisting of processed degradable natural and/or polymer fibers, mechanically bound together by a single rapidly-degrading, synthetic or natural fiber netting, or an open weave textile of processed rapidly-degrading natural or polymer yarns or twines woven into a continuous matrix.

d. RECP Type 1.D: Double-net erosion control blankets, consisting of

processed degradable natural and/or polymer fibers, mechanically bound together between two rapidly-degrading, synthetic or natural fiber nettings.

2. RECP Type 2 (Short-Term): Functional longevity between 3 and 12 months and classified as follows:

   a. RECP Type 2.A: Mulch control net, consisting of a photodegradable synthetic mesh or woven biodegradable natural fiber netting.

   b. RECP Type 2.B: Netless rolled erosion control blankets, consisting of natural and/or polymer fibers, mechanically interlocked and/or chemically adhered together to form a RECP.

   c. RECP Type 2.C: Single-net erosion control blankets and open weave textiles, consisting of an erosion control blanket composed of processed degradable natural or polymer fibers, mechanically bound together by a single degradable synthetic or natural fiber netting to form a continuous matrix, or an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix.

   d. RECP Type 2.D: Double-net erosion control blanket, consisting of processed degradable natural and/or polymer fibers, mechanically bound together between two degradable synthetic or natural fiber nettings.

3. RECP Type 3 (Extended Term): Functional longevity between 12 and 24 months and classified as follows:

   a. RECP Type 3.A: Mulch control nets, consisting of a slow-degrading synthetic mesh or woven natural fiber netting.

   b. RECP Type 3.B: Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow-degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

4. RECP Type 4 (Long Term): Functional longevity of 36 months and classified as follows: Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

B. Properties and Performance:

1. Testing performed according to the ECTC's Testing Procedures for Rolled Erosion Control Products. Verify manufacturer's test results by independent testing.

2. Material properties meeting the Erosion Control Technology Council's (ECTC) Standard Specifications for Rolled Erosion Control Products as follows:

Classification	Slope Application	Channel Application	Min. Tensile Strength
	Max. Grade*	Permissible Shear Stress	
RECP Type 1.A	5:1 (H:V)	0.25 lb/ft^2	5 lb/ft
RECP Type 1.B	4:1 (H:V)	0.50 lb/ft^2	5 lb/ft
RECP Type 1.C	3:1 (H:V)	1.50 lb/ft^2	50 lb/ft
RECP Type 1.D	2:1 (H:V)	1.75 lb/ft^2	75 lb/ft
RECP Type 2.A	5:1 (H:V)	0.25 lb/ft^2	5 lb/ft
RECP Type 2.B	4:1 (H:V)	0.50 lb/ft^2	5 lb/ft
RECP Type 2.C	3:1 (H:V)	1.50 lb/ft^2	50 lb/ft
RECP Type 2.D	2:1 (H:V)	1.75 lb/ft^2	75 lb/ft
RECP Type 3.A	5:1 (H:V)	0.25 lb/ft^2	25 lb/ft
RECP Type 3.B	1.5:1 (H:V)	2.00 lb/ft^2	100 lb/ft
RECP Type 4	1:1 (H:V)	2.25 lb/ft^2	125 lb/ft
*Product tested according to ECTC Test Method No. 2 and meeting the ECTC Standard Specifications for "C" factor.			

C. RECP Anchors: Stakes or staples as recommended by manufacturer, with a minimum length of 6 inches.

2.07 TURF REINFORCEMENT MATS (TRM)

A. Material Classification:

1. TRM Type 1: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, or monofilaments fibers that are entangled to form a strong and dimensionally stable mat. Bonding methods include polymer welding, thermal or polymer fusion, or the placement of synthetic fibers between two high-strength, biaxially-oriented nets, mechanically bound by parallel stitching with polyolefin thread. Products may contain a degradable component.

2. TRM Type 2: Use a TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled or woven to form a strong and dimensionally stable mat. Non-woven bonding methods include polymer welding, thermal or polymer fusion, or the placement of fibers between two high-strength, biaxially oriented nets, mechanically bound by parallel stitching with polyolefin thread. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation.

3. TRM Type 3: Use a high performance/survivability TRM that is composed of monofilament yarns woven into a resilient uniform configuration. Use a mat that has a matrix that exhibits very high interlock and reinforcement capacities with

both soil and root systems and demonstrate a high tensile modulus. TRMs manufactured from discontinuous or loosely held together by stitched or glued, netting, or composites are not allowed in this category. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation. Use this category when field conditions exist with high loading and/or high survivability requirements. These requirements consist of maintenance, structural backfills protecting critical structures, potential traffic areas, abrasion, higher factors of safety, and/or general durability concerns.

B. Properties and Performance: Meet the minimum material and performance requirements contained in the following table:

	Property[1]	Test Method	Type 1	Type 2	Type 3	Type 4
Material	Thickness	ASTM D 6525	0.25 in	0.25 in	0.25 in	0.25 in
Material	Tensile Strength[2]	ASTM D 6818	125 lb/ft	240 lb/ft	750 lb/ft	3,000 lb/ft
Material	UV Resistance[3]	ASTM D 4355	80% @ 500 hrs	80% @ 1,000 hrs	80% @ 1,000 hrs	90% @ 3,000 hrs
Performance	Maximum Shear Stress[4] (Channel Applications)	ASTM D 4640	7 lb/ft^2	10 lb/ft^2	12 lb/ft^2	15 lb/ft^2
Performance	Maximum Slope Gradient (Slope Applications)	N/A	1:1 (H:V) or flatter	1:1 (H:V) or flatter	1:1 (H:V) or greater	1:1 (H:V) or greater

1 For TRMs containing degradable components, all values must be obtained on the non-degradable portion of the matting.
2 Minimum Average Roll Values, machine direction only. Tensile strength from ASTM D5035 may be substituted upon approval.
3 Tensile strength of structural components retained after exposure.
4 Minimum shear stress that fully-vegetated TRM can sustain without physical damage or excess erosion (0.5 in soil loss) during a 30-minute flow event in large scale testing. Acceptable large scale testing protocol includes ASTM D6460 or independent testing conducted by the Texas Transportation Institute, Colorado State University, Utah State University, or other approved testing facility.

2.08 FLOW TRANSITION MATS

Use flow transition mats that meet the following requirements:

A. UV-stabilized HDPE plastic sheet with openings for vegetation growth and energy dissipation.

B. Use a nominal sheet size of 4 feet by 4 feet by 1/2 inch.

C. Use duckbill style anchors, as specified by the mat manufacturer.

2.09 INLET PROTECTION

A. Drop-In Intake Protection:

1. Use a manufactured device that is inserted into the intake, and is capable of trapping or filtering sediment from runoff prior to entering the storm sewer.

2. All components must be contained entirely below the surface of the intake grate.

3. Incorporate means of emergency outflow to prevent flooding if plugged with sediment.

B. Surface-Applied Intake Protection:

1. Use devices or filter socks, placed around or over the intake, that are capable of trapping or filtering sediment from runoff prior to entering the storm sewer.

2. Do not allow the device to completely block or plug the intake, preventing inflow.

2.10 ENGINEERING FABRIC

Comply with Iowa DOT Article 4196.01, C (Embankment Erosion Control).

2.11 REVETMENT AND EROSION STONE

A. Class A Revetment: Conform to Iowa DOT Section 4130.

B. Class B Revetment: Conform to Iowa DOT Section 4130.

C. Class D and E Revetment: Conform to Iowa DOT Section 4130.

D. Erosion Stone: Conform to Iowa DOT Section 4130.

2.12 REVETMENT AND EROSION STONE

A. Class A Revetment: Conform to Iowa DOT Section 4130.

B. Class B Revetment: Conform to Iowa DOT Section 4130.

C. Class D and E Revetment: Conform to Iowa DOT Section 4130.

D. Erosion Stone: Conform to Iowa DOT Section 4130.

2.13 STABILIZED CONSTRUCTION ENTRANCE

A. Entrance Stone: Use Iowa DOT Section 4122, Gradation 13, Macadam crushed stone.

B. Subgrade Stabilization Material:

1. Use woven, UV-stabilized geotextile.

2. Minimum tensile strength of 135 lb/ft.

PART 3 - EXECUTION

3.01 EROSION AND SEDIMENT CONTROL INSPECTION

A. Schedule necessary maintenance or improvements for items that are included in the contract documents.

B. Notify the Engineer immediately of situations requiring attention beyond that provided for in the contract documents.

3.02 FILTER BERMS

A. Construct berm with filter material, unless otherwise specified.

B. Install filter berm along the contour as specified in the contract documents, or as directed by the Engineer.

C. Turn the ends of the filter berm uphill to prevent runoff from flowing around the end of the berm.

D. When a vegetated berm is specified, apply seed to the surface of the berm.

E. Replace the berm when sediment accumulation reaches one-half of the height of the berm.

3.03 FILTER SOCKS

A. Installation:

1. Pneumatically fill mesh filter sock of size and length indicated in the contract documents, or as directed by the Engineer. Alternative methods of filling the sock may be allowed upon approval of the Engineer.

2. Fill socks with filter material.

3. Place the filter sock along the contour as specified in the contract documents, or

as directed by the Engineer.

4. Place additional filter material or soil from the site, on the upstream side of the sock, in the seam between the tube and the ground.

5. Construct a “J-hook” at each end of a continuous run of filter sock, by turning the end of the sock uphill, as necessary to prevent runoff from flowing around the ends when water behind the sock ponds up to a level even with the top of the sock.

6. Drive stakes into the ground at a maximum spacing of 10 feet, and as required to secure the sock and prevent movement.

B. Maintenance: Perform the following incidental work.

1. Repair or replace non-functioning filter socks that allow water to flow under the sock, are torn, or are otherwise damaged, due to inadequate installation.

2. Remove filter material from damaged socks that are located along streambanks, around intakes, in ditches, or in other locations where the material may be carried to surface waters.

3.04 SILT FENCES

A. Installation:

1. Install material along the contour of the ground, as specified in the contract documents, or as directed by the Engineer.

2. Install silt fence with a mechanical soil slicing machine that creates a slit in the ground while simultaneously installing the fabric. The trenching method may be used when situations will not allow soil slicing, as determined by the Engineer.

3. Construct a “J-hook” at each end of a continuous run of silt fence, by turning the end of the silt fence uphill, as necessary to prevent runoff from flowing around ends when water behind the fence ponds to a level even with the top of the fence.

4. Insert 12 inches of fabric to a minimum depth of 6 inches (fabric may be folded below the ground line).

5. Compact installation by driving along each side of the silt fence, or by other means, as necessary to adequately anchor the material in the ground, to prevent pullout and water flow under the fence.

6. Drive steel posts into the ground alongside the silt fence, to a minimum depth of 20 inches, unless otherwise specified by the Engineer. Space posts, or as required to adequately support silt fence.

B. Maintenance: At the Contractor’s expense, repair or replace non-functioning silt fence

that allows water to flow under the fence, is torn, or is otherwise damaged, due to inadequate installation.

C. Removal:

1. Remove sediment or spread to match finished grade; ensure proper drainage.

2. Stabilize the area disturbed by removal operations.

D. Replacement:

1. When accumulated sediment reaches a level one-half the height of the fence, remove the silt fence as described above, and replace according to the installation instructions above.

2. At the Engineer's option, the existing silt fence and accumulated sediment may be left in place, and a new silt fence installed up-slope from the existing silt fence.

3. When permitted by the Engineer, the existing silt fence may be left in place and the accumulated sediment removed. Carefully inspect the existing silt fence for structural integrity and signs of undermining. Make any necessary repairs.

3.05 DUST CONTROL

A. Water: Apply frequent light watering to ground surface, as required to control dust.

B. Calcium Chloride: Apply according to Iowa DOT Section 2314.

C. Lignosulfonate (Tree Sap):

1. Loosen the top 1 to 2 inches of the roadway surface.

2. Apply solution with a 50% residual concentration, at a rate of 0.50 gal/yd^2, to deliver a 25% residual. For diluted solutions, increase the application rate, as required, to deliver an equivalent 25% residual.

3. Allow product to penetrate through the loosened material.

4. Tight-blade road surface.

D. Soapstock (Soybean Oil):

1. Loosen the top 1 to 2 inches of the roadway surface.

2. Apply undiluted soapstock at a rate of 0.70 gal/yd^2.

3. Allow product to penetrate through the loosened material.

4. Tight-blade road surface.

3.06 TEMPORARY EROSION CONTROL SEEDING

A. Temporary Erosion Control Seedmix

Common Name	Application Rate lb/acre
SPRING - March 1 - May 20	
Oats	65
Annual ryegrass	40
SUMMER - May 21 - August 14	
Oats	95
Annual ryegrass	50
FALL - August 15 - September 30	
Oats	65
Annual Ryegrass	40

3.07 EROSION CONTROL MULCHING

A. Conventional Mulching:

1. Use conventional mulching when the surface cannot be stabilized by seeding, due to season or ground conditions.

2. Uniformly distribute mulch over the required areas, at a rate of 2 tons/acre for dry cereal straw, or 2.5 tons/acre for prairie hay.

3. Work the mulch into the soil with a mulch tucker, designed to anchor the mulch into the soil, by means of dull blades or disks.

B. Hydromulching:

1. Place mulch and tackifier (if applicable) in equipment specifically manufactured for hydraulic mulching.

2. Mix materials with fresh, potable water; using a combination of re-circulation through the equipment's pump, and mechanical agitation to form a homogeneous slurry.

3. If necessary, dampen any dry, dusty soil, as required to prevent balling of the material during application.

4. Apply hydromulch in multiple layers from opposing directions, where possible.

5. Apply the slurry evenly over all specified areas, at the minimum component material rates specified:

    a. Wood Cellulose Mulch:
        1) Mulch: 2600 lb/acre dry weight.
        2) Tackifier: 50 lb/acre.
    b. Bonded Fiber Matrix: 3600 lb/acre dry weight.
    c. Mechanically Bonded Fiber Matrix: 3600 lb/acre dry weight.

6. Retain and count empty bags of mulch to ensure final application rate.

3.10 SURFACE ROUGHENING

A. Directional Tracking:

1. Do not use on slopes steeper than 3:1.

2. Operate tracked equipment up and down exposed slope, to create ridges perpendicular to the slope.

3. Continue operation until the entire surface has been tracked.

B. Grooving/Furrowing:

1. May be used on all slopes.

2. Use rippers, disks, harrows, chisel plows, or other equipment, capable of operating on the slope and creating grooves a maximum of 15 inches apart and 3 inches deep.

3. Operate equipment along the contour of the slope, to create grooves that are perpendicular to the slope.

4. Perform over all exposed slopes as specified.

3.11 TEMPORARY ROLLED EROSION CONTROL PRODUCTS

Install temporary RECPs according to the manufacturer's published installation recommendations, subject to the following minimum requirements:

A. Slope Application:

1. Grade and smooth surface. Remove all rocks, clods, vegetation, or other obstructions that will prevent direct contact between the RECP and the soil surface.

2. When specified, prepare seedbed and place seed and fertilizer according to Section 32 92 00 prior to placing RECP.

3. Installation:

a. Install anchor trench at top of slope. Seed and fertilize trench after backfill and compaction, if seeding is specified.

b. Unroll the RECP down or horizontally across the slope.

c. Place consecutive blankets down the slope end-over-end, shingle style.

d. Overlap ends of consecutive rolls a minimum of 3 inches, and install anchors at a maximum spacing of 18 inches along all overlaps.

e. Overlap edges of adjacent rolls a minimum of 2 inches.

f. Install anchors at edge seams between rows.

B. Channel/Ditch Application:

1. When specified, prepare seedbed and place seed and fertilizer according to Section 32 92 00, prior to placing RECP.

3.12 TURF REINFORCEMENT MATS

Install according to the manufacturer's published installation literature, for the product specified and application (slope or channel).

3.13 TEMPORARY EARTH DIVERSION STRUCTURES

A. Construct at the location shown in the contract documents.

B. Construct to the dimensions specified in the contract documents.

C. Ensure positive drainage along the diversion toward the outlet area.

D. Adequately compact fill to prevent failures or seepage.

E. Outlet the diversion to undisturbed and/or stabilized areas only.

F. Stabilize the surface of the earth diversion with temporary erosion control seeding.

3.14 FLOW TRANSITION MATS

Install according to the manufacturer's published recommendations.

3.15 SEDIMENT TRAPS

A. Construct the storage area to the size and elevations indicated in the contract documents.

B. Construct the rock outlet to the dimensions indicated in the contract documents.

3.16 INLET PROTECTION

A. Install inlet protection devices according to the manufacturer's recommendations.

B. Remove the accumulated sediment, as required to maintain the inlet protection device in working order. Remove any accumulated sediment from streets open to traffic if it encroaches into the traveled roadway.

3.17 ROCK OUTLET PROTECTION

A. Install the quantity of revetment stone or erosion stone, as specified in the contract documents.

3.18 STABILIZED CONSTRUCTION ENTRANCE

A. Install a stabilized construction entrance at all locations where construction traffic leaving the site presents the potential for sediment track-out.

B. Remove the accumulated sediment and install new stone, as required to prevent track-out.

C. Remove construction entrance near completion of project, coordinate with construction schedule.

3.19 MAINTENANCE

A. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer; perform such work at the Contractor's expense.

B. Prevent the accumulation of soil sediment or debris onto streets adjacent to project site. Remove any accumulation of earth or soil immediately, and take remedial actions for prevention.

C. In case of repeated failures on the part of the Contractor to control erosion, pollution, and/or siltation, the Engineer reserves the right to employ outside assistance, or to use

the Jurisdiction's own forces to provide the necessary corrective measures. Such incurred direct costs, plus project engineering costs, will be at the Contractor's expense, and appropriate deductions will be made from the Contractor's monthly progress estimate and final payment.

END OF SECTION 31 25 00

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SECTION 32 13 13
CONCRETE PAVING

PART 1- GENERAL

1.01 SECTION INCLUDES

A. Includes construction of concrete drives, parking lots, curbs, slabs and sidewalks.

1.02 DESCRIPTION OF WORK

A. Furnish all materials and labor to construct portland cement pavements, curbs, and sidewalks on prepared subgrade.

B. See Section 31 23 00 Excavation and Fill.

C. Reference is made to the Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2001, and all current General Supplemental Specifications and Materials Instructional Memorandum by the term “Iowa DOT Specifications” and/or “Iowa DOT I.M.”

1.03 SUBMITTALS

A. Submit under provisions of Division 1.

B. Concrete mix including material components and origins.

C. Jointing plan for Engineer’s review and approval prior to construction, if anticipated jointing varies significantly from jointing plan provided as part of the plans.

1.04 STORAGE AND PROTECTION OF MATERIALS

A. Aggregates: store and handle aggregates to avoid contamination and frequent variations in specific gravity, gradation or moisture content of materials used.

1. Store fine and coarse aggregates in separate piles or bins.

2. Minimize changes in aggregates with different specific gravities or gradations in working day.

3. Handle aggregates to prevent variations of more than 0.5 percent in moisture content of successive batches.

4. Thoroughly wet and allow to drain for at least one hour coarse aggregate having an absorption greater than 0.5 percent.

5. Drain fine aggregate at least 24 hours after washing and before batching.

B. Cement: store in suitable weathertight enclosures and handle to prevent loss.

1. If lumps develop in cement, it must be reprocessed, re-tested and re-approved prior to use.

2. Cement in storage at site or local warehouses for more than 60 days must be re-tested prior to use.

C. Admixtures: store in suitable weathertight enclosures that will preserve quality.

D. Reinforcing steel: store off ground on timbers or other supports.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT: ASTM C150, Type I.

2.02 ADMIXTURES

A. Air entraining: ASTM C260; no admixtures containing chlorides will be permitted.

B. Retarding: a suitable retarding admixture may be used during hot weather, with approval of Owner.

C. Calcium chloride shall not be used except as directed by the Owner.

D. Fly ash: Iowa DOT Section 4108. Use only as approved by Owner.

E. Other admixtures may be used subject to approval of Owner.

2.03 FINE AGGREGATE

A. Clean, hard, durable particles of natural sand, free from injurious amounts of silt, shale, coat, organic matter or other deleterious substances.

B. Deleterious substances: not more than 2.0% shale and coal by weight retained on No. 16 sieve.

C. Organic matter: other than coal, not more than standard reference color; ASTM C40.

D. Conform to the following sieve analysis:

Sieve Size	% Passing
3/8"	100
No. 4	90-100
No. 8	70-100
No. 200	0.-1.5

E. Percent passing one sieve and retained on next higher number sieve not more than 40% when sieved through 4, 8, 16, 30, 50 and 100 numbered sieves.

F. Mortar strength at 7 days not less than 1.5 times standard sand strength when tested in accordance with Iowa DOT Laboratory Test Method 212.

2.04 COARSE AGGREGATE

A. Clean, hard, durable particles of crushed limestone free from injurious amounts of objectionable materials; Class 2 durability limestone; Iowa DOT 4115.04.

B. Objectionable materials not more than:

	Percent
Clay lumps	0.5
Coal and carbonaceous shale	0.5
Sticks (wet weight)	0.1
Total of all shale and coat combined	1.0
Organic material other than coal and sticks	0.0
Unsound chert particles* retained on 3/8" sieve	3.0

*Chert particles breaking into three or more pieces in freezing and thawing test, Iowa DOT Laboratory Test Method 211, Method A, are considered unsound.

C. Conform to the following sieve analysis:

Sieve Size	% Passing
1 1/2"	100
1"	50-100
3/4"	30-100
1/2"	20-75
3/8"	5-55
No. 4	0-10
No. 8	0-5
No. 200	0-1.5

D. Percent of wear, AASHTO T96, Grading A or B, shall not exceed 35% for gravel, 50% for crushed stone.

E. Particle durability: aggregate considered durable when it has no adverse affect upon durability of concrete in which used; minimum percent of durable particles in aggregate: 95; durability based on the following:

1. That loss in freezing and thawing test, Iowa DOT Laboratory Test Method 211, Method A, does not exceed 6%.

2. Behavior of existing air-entrained concrete pavement over 10 years of age containing aggregate of similar geological origin or chemical and mineral composition.

F. Water: clean and clear, free from salt, oil, acid, strong alkalis, vegetable matter, or other substances injurious to concrete.

G. Water may be heated for cold weather paving operations; anti-freezing agents not permitted.

2.05 REINFORCING STEEL

A. Deformed bars: ASTM A615, Grade 40, epoxy coated.

B. Plain and smooth dowel bars: ASTM A615; Grade 40, epoxy coated.

C. Epoxy coated reinforcement: AASHTO M284 and Iowa DOT 4151.03C.

D. Metal expansion tubes: fabricated steel tubes; provide tubes with internal diameter 1/16" larger than dowel bar; bar stop capable of withstanding 20 lbs. push, minimum.

E. Metal keyways: fabricated 24 gauge sheet steel; conform to details shown on plans; provide lengths in multiples of tie bar spacing; punch to receive tie bars.

2.06 SUPPORTS FOR REINFORCING STEEL

A. Support tie bars as required to place and maintain correct location during construction.

B. Support dowel bars at expansion and contraction joints as shown on plans.

C. Epoxy coated reinforcement: support with metal chairs and supports coated with epoxy or other inert material reviewed by Engineer; tie with plastic coated tie wires.

2.07 PAVEMENT JOINTS

A. Joint Sealers: Comply with Iowa DOT Section 4136.02, see specification.

B. Preformed Expansion Joint Fillers and Sealers:

1. Use the following types of preformed materials for filling expansion joints that comply with Iowa DOT Article 4136.03. Use resilient filler.

2. Expansion joint filler material with "tear-off" strips where joint is intended to be filled with sealant. These strips help ensure a consistent, correct joint depth. Joints must be primed as required by the sealant manufacturer. Acceptable products:

   a. Expansion Strips by "Reflectix" http://www.reflectixinc.com/
   b. Cellu-Cushion EXP 200 by "Sealed Air" https://sealedair.com/
   c. 1000 Series Expansion Board Caps by "BoMetals, Inc." http://bometals.com/

C. Joint Caps: Provide preformed, removable joint caps to assure that the top of the joint filler is at the proper depth for installation of sealant.

D. Liquid curing compound: white pigmented curing compound: Iowa DOT 4105.

E. Adjacent to proposed building: Use expansion joint filler with "tear-off" strips.

2.08 PROPORTIONS FOR MIX

A. Mix No. C-4 in accordance with Iowa DOT 2301.04; proportions as follows:

1. Basic absolute volumes of materials per unit volume of concrete:

Cement Minimum	0.118
Water	0.159
Entrained Air	0.060
Fine Aggregate	0.331
Coarse Aggregate	0.332

2. Approximate quantity of dry materials per cubic yard of concrete: cement: 624 lbs.; fine aggregate: 0.739 tons; coarse aggregate: 0.741 tons.

3. Above quantities based on specific gravity of cement: 3.14; specific gravity of aggregates: 2.65; water-cement ratio: 0.430 pound of water per pound of cement; air voids: 6.0%.

4. Maximum water-cement ratio: 0.488 pound of water per pound of cement including free water in aggregate.

5. Air entraining admixture: produce 7% ± 1.5% air voids in fresh concrete measured by pressure method.

B. Adjustments:

1. Basis: when actual quantity of concrete is more than 101% or less than 99% of calculated quantity or if combination of materials does not produce quality of concrete specified.

    a. Fine aggregate shall not exceed 50% of total aggregate in any adjustment.

    b. Do not exceed maximum water-cement ratio specified.

2.09 WATER QUANTITY AND CONCRETE CONSISTENCY

A. Use proper amount of mixing water to produce concrete of uniform consistency; adapt to mix, characteristics of materials used, methods of consolidation, weather conditions and slope of finished surface.

B. Modify proportions if maximum water-cement ratio does not produce workability; increase cement to aggregate proportion to produce specified degree of workability without exceeding maximum water-cement ratio.

2.10 CONCRETE PROPORTIONING AND MIXING EQUIPMENT

A. Plant batching and mixing equipment shall be Iowa DOT calibrated and approved. Provide copy of current certification.

B. Equipment may be either stationary central plant mixer or central plant-proportioned, truck mounted transit mixer.

C. If concrete is centrally mixed; it may be transported in agitating or non-agitating units.

1. Concrete must be placed on grade within 30 minutes after mixing if transported in non-agitating units.

2. Concrete must be placed on grade within 90 minutes after mixing if transported in agitating units.

D. When concrete is mixed on truck mounted transit mixers and agitated thereafter, it must be placed on grade within 90 minutes after materials added to mixer.

E. Truck Mounted Transit Mixers: capacities and mixing capability as defined in ASTM C94 with attached plate containing required information.

1. Equipment shall include reliable reset-revolution counter that will register the number of revolutions at mixing speed.

2. Unit must have signed certification that concrete producer or authorized representative has inspected unit within previous 30 day period and that interior of mixing drum is clean and reasonably free of hardened concrete, that fins or paddles are not broken or worn excessively and that other parts are in proper working order.

F. Plant or transit mixers must produce concrete with consistent quality; if uniformity entrained air or slump varies, concrete producer must take corrective action.

G. Each truck load of concrete must be identified by an acceptable plant charge ticket showing plant name, contractor, project name, date, quantity, class and time batched.

2.11 PLACEMENT EQUIPMENT

A. Subgrade finishing equipment: use mechanical excavating equipment designed for purpose and approved by Owner.

1. Form line or path area for slip-form paving machine constructed to final grade by form-line excavating equipment with automatic grade controls.

2. Subgrade between forms or between path areas for slip-form machines constructed to final grade with steel shod template or automatically controlled subgrade excavating machine.

B. Side forms: steel, minimum thickness: 5 gage, height at least equal to design thickness of pavement, base width at least 6".

1. Minimum section length: 10’, joint connections designed to permit horizontal and vertical adjustment with locking device to hold abutting sections firmly in alignment when set.

2. Bracing, support and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

C. Flexible forms: use steel or wood flexible forms for curves with radius less than 100'.

1. Bracing, support, and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

2. Forms used to form back of curbs at returns shall have height at least equal to design thickness of pavement and curb height.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

D. Consolidating and finishing equipment: fixed form or slip form paving machines specifically designed for placing, striking off, consolidating and finishing in single passage to required cross section.

1. Consolidation of concrete by single pass of approved surface, tube or internal vibrator operated in accordance with manufacturer's recommendations.

2. Slip form equipment: automatic horizontal and vertical controls required; equipment must spread concrete to uniform depth prior to striking off.

3. Air screeds and vibrating screeds are not approved consolidating and finishing equipment.

4. Equipment subject to approval of Owner.

E. Hand finishing equipment: Contractor shall provide tools including wood or magnesium floats, wood hand floats, pointing trowels, edgers or other equipment necessary for proper finishing of concrete.

1. Provide two light straightedges, 10' long, with handles not less than 12' long for use in detecting irregularities in surface; provide two heavy straightedges of similar size for use in correcting surface; provide two light straightedges 6' long for checking curb and gutter line.

2. Provide approved vibrators for consolidating concrete.

3. Provide metal or wood screed true to crown.

F. Curing equipment: use pressure sprayer capable of applying a continuous uniform film of curing compound.

G. Concrete saws: power operated concrete saws capable of cutting hardened concrete neatly to dimensions shown on plans.

H. Joint sealing equipment: equipment capable of heating and installing sealant in joints in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.01 GENERAL

A. Place, strike off, consolidate and finish concrete with fixed form or slip form mechanical paving equipment to cross section shown on plans.

B. Use paving machine for all uniform width slabs 8 1/2' or more in width and 200' or more in length. Use of paving machine or hand methods with screeds and laser guided screeds are allowed as an alternative method.

C. Use hand placing, consolidating, and finishing in areas of irregular dimensions or narrow widths.

3.02 SETTING AND REMOVING FORMS

A. Use form line excavating machine to establish subgrade for forms used to support mechanical subgrader, mechanical spreader or finisher or other similar equipment.

B. Set base of forms at or below subgrade elevation with top of forms at pavement surface elevation at edge of slab.

C. Extra height forms may be used to back up integral curb; set base at or below subgrade elevation with top of form at top of curb elevation.

D. Set forms accurately to required grade and alignment and secure in place to maintain grade and alignment during concrete placement and finishing.

E. If voids occur under forms, remove forms and rework subgrade to proper elevation and density.

F. If soil supporting form is softened by rain or standing water so that form is inadequately supported, remove forms and rework subgrade to proper elevation and density.

G. Check forms joints with 10 foot straightedge prior to paving; adjust as necessary to proper grade and alignment; maximum deviation of top surface is 1/4" in 10'

H. Coat forms with form oil before concrete is placed to prevent adherence of concrete.

I. Leave side forms in place not less than 6 hours after concrete is placed; if form removal damages concrete, Owner may require remaining forms to remain in place more than 6 hours.

J. Remove forms with care to prevent cracking, spalling or overstressing concrete; remove form stakes prior to raising forms.

K. Clean forms before resetting.

3.03 CONCRETE AND STEEL PLACEMENT

A. Place plastic film on prepared subgrade, lap joints 12" or uniformly moisten subgrade just prior to concrete placement.

B. Adjust manhole castings, valve boxes or other fixtures within pavement to finished surface grade; clean outside of castings.

C. Place dowel and tie bars as shown on plans or specified; support and secure bars by approved chairs and wire assemblies.

D. Place concrete to full depth in single operation; do not pile concrete more than 8" above design elevation of surface.

E. Carefully place concrete on subgrade to prevent segregation of materials and at locations which require minimum rehandling; do not displace reinforcing.

F. All concrete to be consolidated with mechanical vibration equipment. Vibrate and consolidate to prevent formation of voids; do not displace reinforcing.

3.04 FINISHING

A. Begin finishing operations promptly after concrete has been placed and consolidated.

B. Screed surface to grade and crown as shown on plans.

C. Finish surface with wood or magnesium floats, finish from both sides simultaneously if pavement is placed to full width with one pass of paving machine.

D. Check surface longitudinally with 10' long straightedge while concrete is still plastic; correct any surface deviations greater than 1/8" in 10'.

E. Provide finish as designated.

1. Uniformly gritty surface with astroturf drag; round edges of pavement to 1/8" radius.

F. Check pavement surface longitudinally after concrete has hardened with 10' long straightedge; grind high spots over 1/8" with approved grinding device or device consisting of multiple saw blades.

3.05 CURBS

A. Construct integral curb or rolled curb, as shown on plans, along with pavement or immediately following finishing of pavement.

B. Use paving machine with integral slip-form for curb, curb mule or similar mechanical where possible.

C. Construct depressed curb where sidewalks intersect street; use templates to form faces of such curbs.

D. Form and construct curb by hand only where barrier or depressed curb is required and where small radii or other special sections preclude use of mechanical equipment.

E. Construct curb as rapidly as finishing operations on pavement permit; maximum distance behind paving machine: 100’.

F. Remove free water, laitance, dust, leaves or other foreign matter prior to placing concrete for curb.

G. Use freshly mixed concrete; do not store concrete in receptacles at side of pavement for use in curb at a later time; do not use concrete require retempering.

H. Vibrate or puddle concrete to secure bond with paving slab and eliminate rock pockets.

I. Secure final finish on curbs by hand method, including 6' straightedge or 6' slipform.

J. Edge, protect and cure curb in same manner as pavement.

K. Check surfaces of curb and gutter with 10' straightedge; correct variations greater than 1/8"; remove and replace curbs having varying cross section.

3.06 CURING AND PROTECTION

A. Apply liquid curing compound in fine spray to form continuous, uniform film on surface and vertical edges of pavement and curbs.

B. Apply compound with power sprayer; rate of application not less than 0.067 gal. per square yard (15 square yards per gallon); do not dilute compound.

C. Apply to pavement surface after finishing and after surface moisture has disappeared; apply to pavement edges within 30 minutes after forms are removed.

D. Protect concrete pavement during cold weather for at least 36 hours after placement as follows:

Forecast or Actual Temperature	Protection
35 to 32 F.	One layer of burlap for concrete. Plastic top layer is required if burlap is exposed to rain or heavy winds.
31 to 25 F.	Two layers burlap or one layer plastic film on one layer burlap
Below 25 F.	Four layers of burlap between layers of four mil plastic or equivalent commercial insulating material.

1. Burlap: AASHTO M182, Class 3.

2. Use of straw shall not be allowed for temperature protection

3. Protect insulation from disturbance by wind; leave in place for 5 days, minimum, or until pavement is opened to traffic.

4. Lap plastic film 18" at junctions.

E. Provide cold weather protection as specified for temperature below 25 degrees F. for all concrete placed after November 15.

F. Provide burlap, paper, or plastic film and planks and stakes at or near job site to cover and protect fresh concrete and to construct temporary forms for protection against rain.

G. Contractor responsible for pavement protection against effects of rain; failure to properly protect may result in removal and replacement of defective pavement.

H. Curing of concrete containing calcium chloride shall be in accordance with IDOT Supplemental Specifications SS-1091, Section 1091.09A.

3.07 CONSTRUCTION OF JOINTS

A. General:

1. Longitudinal and transverse joints shall be constructed of the type, dimensions, and at the locations required, as described by these specifications, or as detailed by the plans or special provisions.

2. Longitudinal joints shall be coincident with or parallel to the pavement center line unless shown otherwise on the plans.

3. All transverse joints shall be at right angles to the center line and shall extend the full width of the pavement unless otherwise specified.

4. All joints shall be perpendicular to the finished grade of the pavement and the alignment across the joint shall not vary from a straight line by more than 1 inch.

5. All joint fillers shall be installed as shown in the contract documents.

6. The Contractor shall exercise care in placing, consolidating, and finishing the concrete at and about all joints.

7. The edges of the pavement at tooled joints shall be rounded, where required, as specified on the standard detailed plates.

8. Wet sawing shall be used when required by the contract documents for dust control.

B. Expansion Joint:

1. Install expansion joints where pavement meets building slabs, footings or other frost-protected items.

2. Prevent movement of or damage to joint assembly when placing concrete; set joint material low enough to clear the finish machine.

3. Construct double width expansion joint in curb over expansion joint in pavement. The backside of the joint must be clear of concrete.

4. The expansion joint shall be aligned straight and true.

5. If joint fillers are assembled in sections, or if joints as a whole are constructed in sections, then no offsets shall be between adjacent units.

6. Where more than one section is used in a joint, the sections shall be securely laced or clipped together. Damaged basket assemblies shall not be used.

C. Saw Joints:

1. Joint locations shall be chalked with a string line before sawing.

2. Joint dimensions:

a. All transverse contraction joints shall be sawed at a maximum spacing of 21T, where T is the thickness of the pavement in feet.

b. All joints shall be sawed to a depth shown below and on the detail plate.

	Minimum Sawcut Depth	
	Conventional Saw	Early "Green" Saw
Transverse "C" Joint	T/3	1 1/4"
All other Transverse	T/3	1 1/4"
Contraction joints	T/3	1 1/2"
Longitudinal Joint	T/3	Not Allowed

c. The Contractor shall closely monitor joint sawing for both longitudinal and transverse joints for depth and spacing and immediately report any deviations from the specifications. The Contractor shall take immediate steps to correct any deviations.

3. In order to prevent shrinkage cracks, sawing shall be commenced promptly after the pavement has obtained sufficient strength to resist tearing of the concrete adjacent to the joint during the process of sawing.

4. Pavement pours shall be scheduled to allow transverse joints to be sawn within 24 hours of the concrete being placed.

5. Longitudinal joints shall be sawn within 24 hours of the concrete being placed.

6. If necessary, the sawing operations shall be carried on both day and night.

7. Joints sawed with an early "green" concrete saw shall be washed out prior to sealing. The concrete must be capable of supporting the sawing operations to allow the use of an early green concrete saw.

D. Construction Joints:

1. Longitudinal or transverse construction joints shall be placed between adjacent lanes of concrete and at end-of-day header runs.

2. Manhole boxouts shall be located and placed on grade prior to paving. Manhole boxouts are required for two piece castings for sanitary/storm manholes.

3. The longitudinal construction joints shall be an approved key type joint with legs unless machine placed.

4. Transverse construction joints shall employ load transfer devices (Header) and shall be placed whenever concrete placement is delayed for more than 30 minutes.

3.08 RESTRICTIONS ON OPERATIONS

A. Weather

1. Do not place concrete when stormy or inclement weather prevents good workmanship.

2. Use no aggregates containing frozen lumps and do not place concrete on frozen subgrade.

3. With favorable weather conditions, begin concrete mixing and placement when temperature is at least 34 degrees F. and rising.

4. Concrete delivered to subgrade must have temperature of at least 40 degrees F.

5. Stop concrete mixing and placement when air temperature is 38 degrees F. and falling.

6. Stop concrete mixing and placement when air temperature exceeds 95°F.

B. Night operation:

1. Place no concrete when darkness prevents good workmanship in placing and finishing.

2. Do not place or finish concrete under artificial light.

C. Use of pavement:

1. Time for opening pavement for use will be determined by results of tests on cylinders taken during concrete placement.

2. Pavement may be opened to Contractor's forces after 7 days for purpose of removing coverings and building shoulders if tests of cylinders from section show compressive strength of 3,000 psi or higher.

3. Open pavement to general traffic when authorized by Owner.

4. Concrete placed in cold weather may require additional curing time, as directed by Owner; keep all vehicles off pavement until such curing time has been completed.

3.09 TESTS ON TRIAL BATCHES AND CONCRETE PLACED AT PROJECT SITE

A. Provide slump test: ASTM C143; 1-1/2" to 3" for machine finished concrete; 4", maximum, for hand finished concrete.

B. Air voids of fresh concrete, by pressure method: ASTM C231; 6.5% ± 1.5% without CaCl and 5.0% ± 2% with CaCl.

C. Minimum compressive strength: ASTM C39; 3,000 psi when tested at 7 days and 4,000 psi when tested at 28 days.

D. Provide a minimum of two 28 day compressive strength test cylinders for every 100 cubic yards of concrete placed for purpose of demonstrating compressive strength. Minimum of 1 test each day substantial pavement is placed, (25 CY).

3.10 DEFECTS OR DEFICIENCIES

A. Pavement containing excessive cracks, fractures, spalls or other defects shall be removed and replaced at no cost to Owner.

B. Pavement thickness: determined by random cores; one 4" diameter core taken for each section of approximately 2,000 square yards.

C. Restore core holes by tamping non shrink cement grout into hole, finishing and texturing surface.

D. If the concrete cores taken are less than the specified thickness, the following adjustments in payment will be made:

Pavement Deficiency	Payment
0 - 0.25"	100% of Lump Sum for PCC Paving
0.25" 0 - 0.50"	90% of Lump Sum for PCC Paving
0.50" - 0.75"	83% of Lump Sum for PCC Paving
0.75" - 1.00"	77% of Lump Sum for PCC Paving

E. Pavement with thickness deficient by more than 1":

1. Remove and replace at Contractor's expense.

2. Leave in place and paid for at 10% of Lump Sum for PCC Paving.

F. Area represented by each core is one-half of distance to next core or to end of pavement.

G. Additional core samples may be made and measured at Contractor's expense to determine the extent and severity of pavement deficiency; minimum distance between core samples: 100'. A maximum of 1 additional core may be taken for each deficient core.

3.11 DRIVES, PARKING LOTS, CURBS, SLABS AND SIDEWALKS

A. Construct drives, parking lots, curbs, slabs and sidewalks as shown on plans.

B. Use concrete with air entrainment and other materials as specified in Section 2.15 Proportions for Mix.

C. Forms: use wood or steel forms adequately staked and braced to maintain grade and alignment while concrete is placed and finished.

1. Set base of forms at or below subgrade elevation with top of forms at surface elevation at edge of slab.

2. Coat forms with form oil before concrete is placed to prevent adherence of concrete.

3. Leave forms in place not less than 24 hours after concrete is placed.

4. Remove forms with care to prevent cracking, spalling or overstressing concrete.

D. Concrete placement: place plastic film on prepared subgrade or uniformly moisten subgrade just prior to concrete placement.

E. Vibrate and consolidate to prevent formation of voids.

F. Screed concrete flush with forms; finish surface with wood or cork float.

G. Saw cut and seal joints in driveways and curb and gutter as shown on plans or as directed by Owner.

H. Cure and protect drives, curbs, slabs and sidewalks as specified for concrete pavement.

I. Restrictions on operations for drives, curbs, slabs and sidewalks as specified for concrete pavement.

END OF SECTION 32 13 13

SECTION 32 18 23
INFIELD CONSTRUCTION

PART 1 GENERAL

1.01 This part of the Specifications includes providing labor, materials, equipment, and supervision required for the following:

A. Extent of work is indicated on the Drawings.

B. Work includes:

1. Providing and placing sand and limestone at infield areas.

2. Grading and shaping sub-grade.

3. Finish grading.

1.02 QUALITY ASSURANCE

A. Codes and Standards:

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

2. Obtain any necessary permits to do work and pay any fees required for permits.

3. Testing and Inspection Service:

a. Cost of field and laboratory testing will be borne by the Contractor. Lab reports shall be simultaneously forwarded to the Owner, Contractor, and Landscape Architect.

1.03 SUBMITTALS

A. Testing Reports: Submit the following reports directly to the Owner from the testing services, with copies to the Engineer.

1. Lab test for sand and limestone.

1.04 JOB CONDITIONS

A. Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

2. Underground utilities shown on the drawings have been taken from existing public records, Owner's records, and available as-built drawings and are correct to the best of our knowledge and provided for information only.

3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for

directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities caused by Contractor's negligence to the satisfaction of utility owner at not cost to the Owner.

4. Provide minimum of 48-hour notice to Owner and receive written notice to proceed before interrupting any utility.

5. Protection of Persons and Property:

a. Barricade open excavations occurring as part of this work and post with warning lights.

b. Operate warning lights as recommended by authorities having jurisdiction.

c. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

1.05 PRODUCTS

A. Sand:

1. Washed, fine masons sand.

2. Possessing a fineness modulus between 1.7 and 2.1.

3. Obtain locally.

4. Furnish Engineer with gradation analysis and fineness modulus computation for approval prior to delivery of materials to site.

B. Crushed Limestone: (for infield)

1. Provide crushed Shakopee Red Ball Diamond limestone material to meet gradation requirements. Submit sample to the Engineer. Sources must be approved by the Engineer and Owner prior to delivery and construction.

a. Gradation:

100% Passing 3/8 Mesh
95 - 100% Passing #4 Mesh
35 - 50% Passing #40 Mesh
25 - 35% Passing #80 Mesh
15 - 25% Passing #200 Mesh

b. Furnish Engineer with gradation analysis for approval prior to delivery of materials to site.

c. Contractor to provide half a gallon can sample of materials to Engineer.

C. Red Crushed Brick (batters walkup)

1. Furnish Engineer with gradation analysis for approval prior to delivery of material to site.

2. Contractor to provide half a gallon can sample of materials to Engineer.

1.06 EXECUTION

A. Dewatering:

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

2. Do not allow water to accumulate in excavations.

3. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.

4. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

5. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas.

6. Do not use trench excavations as temporary drainage ditches.

B. Material Storage:

1. Stockpile satisfactory excavated materials where directed, until required for backfill or fill.

2. Place, grade, and shape stockpiles for proper drainage.

3. Locate and retain soil materials away from edge of excavations.

4. Do not store within drip line of trees indicated to remain.

5. Dispose of excess soil material and waste materials as herein specified.

C. Finish Subgrade:

1. Finish subgrade to be parallel with finish “DESIGN” grades as shown by contours and spot elevations. Finish areas to within not more than 0.10’ above or below subgrade elevations.

2. Remove earth or bring grade to elevations shown on Drawings minus depth for limestone or sod/seeding as follows:

3. Seeded/Sodded areas: See sections 02924 and 02925.

4. Limestone infield: 10” settled depth (for sand and limestone).

5. Smooth subgrade to drain, without ruts and depressions. Blend to adjoining existing grades.

6. Round surfaces at abrupt changes in slope.

7. Should spot elevations for finished grades conflict with finished contours, the spot elevations shall govern.

8. Finish grades to uniform levels or slopes between points where levels are given or between such points and existing grades.

9. Protect paving, sidewalks, utilities, and plants during finish grading; repair or replace any items damaged by construction operations at no cost to Owner.

D. Installation of Infield Sand and Limestone:

1. Subbase to drain towards installed sub-drain lines.

2. Top of subgrade is parallel to finish grade.

3. Cut a clean sharp edge adjacent to grassed areas.

4. Place a temporary MDF flexible form board at edges of skinned areas to insure true line and dimension between skinned areas and turf areas. Top of MDF board to be minus 1” below top of skinned infield surface.

5. Fill excavated area with washed sand to a level 5” below the proposed finish grade.

6. Settle sand with the equivalent of 4” of water. Level smooth and roll surface as necessary to provide a settled true and smooth surface. Equipment ruts in sub-grade or sand are not acceptable and must be smoothed out.

7. Bond 1” of the limestone material with the sand surface by mixing with the top 1” of sand.

8. Add limestone material (enough to achieve final 5” settled and compacted thickness of limestone). Smooth surface, and settle with water.

9. Blade and roll infield mix smooth, settle with water, and roll to compacted thickness of 5”.

10. Variations from a plane shall not exceed .5” per 10’ on the finished surface.

11. Subgrades shall be inspected and approved by the Engineer prior to installation of the sand and the limestone. Sub-grade ruts are not acceptable and must be smoothed out.

E. Maintenance:

1. Protection of Infield:

F. Protect newly installed areas from traffic and erosion. Keep free of trash and debris.

G. Repair and re-establish grades in settled, eroded, and rutted areas to specified

tolerances.

H. Keep public streets and parking lots clean from soil, soil tracking, and debris at all times.

1. Reconditioning Grade Areas: Where completed areas are disturbed by subsequent construction operations, erosion or adverse weather, scarify surface and re-shape, prior to further construction.

2. Settling: Where settling is measurable or observable at trenches and excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill materials, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration.

END OF SECTION 32 18 23

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SECTION 32 31 00
CHAIN LINK FENCE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Chain Link Fence

B. Removal and Reinstallation of Existing Fence

C. Temporary Fence

1.02 DESCRIPTION OF WORK

A. Installation of chain link fence.

B. Removal and reinstallation of existing fences.

C. Installation and removal of temporary fence.

1.03 SUBMITTALS

Comply with General Provisions, as well as the following:

A. Materials and color samples for vinyl-coated fence fabric.

B. Upon request, submit certification that products supplied comply with identified specifications.

1.04 SUBSTITUTIONS

Comply with General Provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with General Provisions.

1.06 SCHEDULING AND CONFLICTS

Comply with General Provisions.

1.07 SPECIAL REQUIREMENTS

Provide chain link fencing and gates as completed units, constructed by a single source, including necessary erection accessories, fittings, and fastenings.

PART 2 - PRODUCTS

2.01 FABRIC

A. General: Provide fence fabric manufactured from wire meeting the requirements of ASTM A 817. Use No. 9 gauge wire woven in a 2 inch mesh. Construct knuckled selvedge at the top and bottom of the fabric.

B. Zinc-coated Fabric: Comply with ASTM A 392.

1. Wire Coated Prior to Weaving: Use Type II, Class 5 zinc coating per ASTM A 817.

2. Fabric Coated After Weaving: Use Class 2 coating per ASTM A 392.

C Aluminum-coated Fabric: Meet the requirements of ASTM A 491. Coat wire prior to weaving fabric per ASTM A 817, Type I coating.

D. PVC-coated Fabric: Comply with ASTM F 668, Class 2b.

1. Apply PVC coating to zinc or aluminum-coated wire prior to weaving fabric.

2. PVC coating color as specified in the contract documents, complying with ASTM F 934.

2.02 POSTS, RAILS, AND BRACES

A. Standard weight (Schedule 40) pipe complying with ASTM F 1083.

1. Galvanize pipe inside and out.

2. Unless otherwise specified in the contract documents, provide the following nominal sizes for the respective uses:

Post Use	Fence Height		
	48” and under (nominal diameter)	48” to 96” (nominal diameter)	Greater than 96” (nominal diameter)
Line Post	2”	2 1/2"	3”
Terminal Post*	2 1/2"	3”	4”
Top/intermediate Rail Braces	1 1/4"	1 1/4"	1 1/4"
Gate Post	Refer to contract documents and ASTM F 900		
*Includes corner, angle, end, and pull posts.			

B. Pipe meeting the requirements of ASTM F 1043, Group 1A (Type A coating) or Group 1C (Type B coating). Use nominal sizes specified in ASTM F 1043.

C. When PVC-coated fence is specified in the contract documents, coat all posts, rails, and braces with a PVC-coated finish according to ASTM F 1043.

1. Zinc-coated post per ASTM F 1083 prior to application of PVC coating.

2. Color as specified in the contract documents, complying with ASTM F 934.

D. Ensure all posts, rails, and braces provided for a given section of fence have similar coatings and shapes.

E. Provide caps for all posts. Comply with ASTM F 626.

2.03 FITTINGS

A. Comply with ASTM F 626.

B. Provide attachments to connect braces to posts by fittings that will hold both post and brace rigidly.

C. Provide 3/8 inch diameter round steel diagonal tension rods with an appropriate

commercial means for tightening. Provide a locknut or other device to hold the tightening device in place.

D. Provide a suitable sleeve or coupling device, recommended by the manufacturer, to connect sections of top rail and provide for expansion and contraction.

E. Use stretcher (tension) bars of the size specified in ASTM F 626 with suitable bands for attaching fabric to corner, end, or gate posts.

2.04 TIE WIRE AND TENSION WIRE

A. Tie Wire: Provide tie wires for chain link fence that are the size and type the manufacturer recommends, but no smaller than No. 9 diameter for post ties or No. 12 diameter for rail and brace ties. Comply with ASTM F 626.

B. Tension Wire: Comply with ASTM A 824, with Type I or Type II (Class 3) coating per ASTM A 817.

2.05 BARBED WIRE SUPPORTING ARMS

A. Comply with ASTM F 626 for type of arm configuration specified in the contract documents, as listed below:
   1. Type I: Single slanted arm for three barbed wire strands.
   2. Type II: Single vertical arm for three barbed wire strands.
   3. Type III: V-shaped arm for six barbed wire strands.
   4. Type IV: A-shaped arm for five barbed wire strands.

B. Anchor arms to line, end, corner, and pull posts

2.06 BARBED WIRE

Comply with ASTM A 121, design number 12-4-5-14R, Type A or Type Z (Class 3) coating.

2.07 GATES

A. Provide the type, height, and width of gates as specified in the contract documents.

B. Comply with ASTM F 900.

C. Provide coating on gate, gate posts, and fabric as required for adjacent fence.

2.08 CONCRETE

Provide concrete materials complying with Section 33 42 31.

2.09 ELECTRICAL GROUND

A. Ground Rod: 5/8 inch diameter, 8 foot long copper-clad rod.

B. Ground Wire: No. 6 AWG bare copper wire.

PART 3 - EXECUTION

3.01 CHAIN LINK FENCE INSTALLATION

A. General: Comply with ASTM F 567. Construct fence at the location and height specified in the contract documents.

B. Posts:

1. Post Location:
   a. Place posts in the line of the fence with equal spacing not to exceed 10 feet on center.
   b. Set terminal (end, corner, and gate) posts at the beginning and end of each continuous length of fence and at abrupt changes in vertical and horizontal alignments. Place pull posts so that no more than 300 linear feet of fence is constructed with only line posts.

2. Post Setting:
   a. Dig or drill post holes to the dimensions specified in the contract documents.
   b. Set posts in concrete. Ensure all posts are set plumb in a vertical position.
   c. Form top of concrete footing so it extends 1 inch above grade and is sloped to direct water away from the post. To prevent frost heave, ensure footing is a uniform size to full depth without flare at the top of grade.
   d. Install posts no less than 24 hours prior to installation of fabric.
   e. Set terminal, corner, angle, pull, and gate posts with the required brace-post assembly as specified in the contract documents.

C. Rails:

1. Top Rail: Pass the top rail through the base of the line post caps to form a continuous brace from end to end of each stretch of fence. Join rail sections with sleeve or coupling device to allow for expansion and contraction. Securely fasten the top rail to the terminal posts with pressed steel connectors.

2. Intermediate Rail: Securely fasten the intermediate rail between all line posts and terminal posts with pressed steel fasteners. Intermediate rail is required only on fences 8 feet tall and taller.

D. Braces:

1. Securely fasten braces to the post by means of malleable iron or pressed steel connections; then truss from the line post back to the end, gate, or corner post.

2. Tighten the diagonal tension rod (truss rod) to produce proper tension.

E. Fabric:

1. Install fabric on the outside of the posts from the area being fenced or on the roadway side of the posts.

2. Secure one end of the fabric by a stretcher bar inserted in the final link of the fabric. Pull fabric taut with bottom selvedge, 2 inches above grade, before making attachment elsewhere.

3. Tighten and secure each end of each run of chain link fabric by a stretcher bar inserted in the final link of the fabric. Secure stretcher bar to the end post by tension bands equally spaced no more than 15 inches apart.

4. Attach fence fabric securely to the braces, top rail, tension wire, and all intermediate posts with wire ties or bands at intervals of no more than 12 inches.

F. Bottom Tension Wire:

1. Install bottom tension wire on fence 5 feet high and taller.

2. Stretch bottom tension wire taut from terminal post to terminal post and securely fasten to each intermediate post within the bottom 6 inches of fabric.

G. Barbed Wire (When Specified):

1. Install 3 parallel wires on each barbed wire supporting arm on the outside of the area being secured, unless otherwise specified in the contract documents.

2. Pull wires taut, without kinks or twists, for tension.

H. Gates: Install gates as specified in the contract documents.

I. Electrical Grounds:

1. Install electrical grounds as specified in the contract documents at the following locations:
   a) Where a primary electrical transmission line (not a secondary feeder line for individual service) passes over the fence. Also install the ground on the fence at a distance of 25 to 50 feet in each direction from the crossing.
   b) Where the fence is adjacent to and within 50 feet of a primary electrical transmission line, install the ground at 500 foot maximum intervals.
   c) In at least one location on each applicable straight section of fence.

2. Drive ground rod vertically until the top is 6 inches below the ground surface.

3. Clamp ground wire to the rod and to the fence in such a manner that each element of the fence is grounded.

3.02 REMOVAL OF EXISTING FENCE

Remove all fences, including posts and footings, within work areas unless otherwise specified in the contract documents. Remove fence to first line post beyond construction limits. Replace items damaged from Contractor's operations with new materials, at no additional cost to the Contracting Authority.

3.03 TEMPORARY FENCE

A. Furnish and install chain link fence fabric, posts, ties, and other materials for the height specified in the contract documents.

B. Install according to permanent fence installation specifications, with the following exceptions:

1. Drive posts into the ground. Do not set posts in concrete except at corner or temporary gate posts.

2. Top rail, tension wire, and bracing will not be required.

C. Remove temporary fence and materials when no longer necessary. Place suitable backfill material in post holes. Fence materials will remain the property of the

Contractor and removed from the site.

END OF SECTION 32 31 00

SECTION 32 92 00
SEEDING AND SOIL SUPPLEMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Description of Work

B. Warranty

C. Seeding Dates

D. Seedbed Preparation

E. Seed Preparation

F. Application of Seed

G. Watering

H. Reseeding

I. Cleanup

J. Acceptance

1.02 DESCRIPTION OF WORK

A. Drawings and general provisions of contract, including general and supplementary conditions apply to this section.

B. This section shall include materials, equipment, and labor for the preparation of the seedbed, furnishing and installing seed, fertilizer and mulch, maintenance, and guarantee for completed seeded areas, as shown on plans. Seed all areas disturbed by construction, unless otherwise noted.

C. The Contractor has the option of using either hydraulic or conventional seeding methods; unless specified otherwise in the contract documents.

D. Provide permanent seed at the earliest possible date following grading and topsoil re-spreading and/or irrigation installation operations, as approved by Engineer.

1.03 PROTECTION OF PROPERTY

A. Protect existing conditions at the site against damage including the following:

1. Take precautions to insure that equipment, vehicles, and seeding operations do not disturb or damage existing grades, walls, drives, pavement, utilities, plants, lawns, irrigation systems, and other facilities.

2. Verify locations and depths of all underground utilities prior to excavation and report conflicts with new seeding operations.

3. Any damage to existing trees or shrubs, including branches and root systems shall be repaired and/or pruned by an experienced tree surgeon or arborist.

4. Contractor shall replace plantings damaged due to watering of newly seeded areas with same species, size, 1-year warranty, and planted as approved by Engineer without additional compensation.

5. All existing lawn areas undisturbed by construction within the construction limits shall be mown by the Contractor until the project is accepted.

6. New seeding installed adjacent to existing lawns shall be installed to provide a smooth matching grade transition in a straight, neat alignment as approved by the Engineer.

7. Repair, replace, and/or return to original condition any damaged item, without additional compensation.

1.04 SUBMITTALS

A. Submit a laboratory analysis showing the seed provided meets or exceeds the minimum requirements of purity and germination stated on an independent certificate of seed analysis document in accordance with the AOSA (Association of Official Seed Analysts) rules. The seed certification tag and seed analysis document provided must be from the same lot number as shown on the seed tag. The date of test results shall be no greater than 9 months from seed application date. The following information shall be included on the seed laboratory analysis:

1. Name of company responsible for analysis,

2. Lot number of seed being provided and tested,

3. Kind - Species or common name of seed. Include cultivar or variety name if applicable,

4. Seed origin,

5. Percentage of purity and germination,

6. Percentage of dormant seed,

7. Percentage of inert matter, other crop seed and weed seeds,

8. Restricted and prohibited noxious seed. Provide name of and number per pound of seed.

B. Submit from an established seed dealer or certified seed grower the applicable Association of Official Seed Certifying Agencies (AOSCA) certified Blue, Gold or Yellow Tag, from each container seed mixture dated within 9 months of delivery, indicating bulk weight of bag or container, percentage by weight and percentage of purity, germination and weed seed for each grass, forb, legume, and cereal crop stating botanical and common name of each species as specified in contract documents.

C. Submit certificates of inspection as required by governmental authorities and manufacturer's or vendor's certified analysis for soil amendments.

1. Certification of the fertilizer analysis with scale weight and statement of guaranteed analysis.

2. Certification of the tackifier ingredients, recommended rates of application, and expiration date.

3. Certification of the inoculant ingredient for legumes and the specific seed to be inoculated with the application rate and expiration date.

4. Certification of the fungicide ingredients and applicable fungus disease control and recommended application rate of manufacturer.

5. Certification on the sticking agent ingredients with applicable use and rate by manufacturer.

6. Certification in the degradable wood cellulose fiber mulch ingredients with applicable use and rate, and the water retention capacity by manufacturer or supplier.

D. Submit written maintenance instructions recommending procedures for maintenance of seeded areas for one year, prior to final acceptance of the seeded areas.

E. Upon request the Contractor will provide additional Material Certifications to the Owner.

1.05 QUALITY ASSURANCE

A. All seed shall be certified and provided by an established seed dealer or certified seed grower.

B. All materials to be in accordance with Iowa Seed Law and Iowa Department of Agricultural Regulations and shall be labeled accordingly.

C. All materials and method of operation shall be subject to inspection and approval by Engineer.

D. Material not meeting requirements specified will be rejected.

1.06 DELIVERY, HANDLING, AND STORAGE

A. Packaged materials shall be delivered in original, unopened, and undamaged containers.

B. Deliver, handle and store all materials according to product recommendations and protect them from loss, damage and deterioration.

C. Deliver all seed in original containers. Seed shall not be mixed or blended except in the presence of the Engineer.

1.07 SCHEDULING

A. Coordinate the seeding schedule with all other work on the project. Notify the Engineer at least three working days prior to the start of seeding operations.

B. After all land-disturbing activities are complete and the seedbed has been approved by the Engineer, perform seeding operations.

1.08 WARRANTY

The seeding shall be installed as specified to germinate and provide a uniformly dense stand of the seed mix specified, free of weeds and undesirable species, debris, and free of eroded areas and bare spots. Re-rake areas failing to show a good dense stand within 60 days and reseed as originally specified.

A. A warranty is to be provided for completed seeded areas, starting upon the date of initial acceptance. The warranty is to guarantee completed seeded areas to provide a uniformly dense, live, and healthy stand of seed mix specified, free of weeds and undesirable species, debris, and free of eroded areas, bare spots, diseases, and insects at the end of the warranty period of 60 days for domestic/lawn grasses and a 12-month period for native prairie and wetlands species from date of project acceptance.

B. During warranty period, any defects in the seeded area and grass stand such as weedy areas, eroded areas and bare spots shall be corrected and reseeded as originally specified until all affected areas are accepted by the Engineer, without additional compensation.

C. Repair and replace to original condition all damages to property resultant from the seeding operation and all damages as a resultant from the remedying of these defects, without additional compensation.

PART 2 - PRODUCTS

2.01 SEED

A. Provide fresh, clean, new crop, certified seed complying with tolerance for germination and purity and free of poa annua, bent grass, and noxious weed seed. Furnish all seeds, including grass, legume, forbs, and cereal crop seeds, from an established seed dealer or certified seed grower. All materials and suppliers are to follow Iowa Seed Law and Iowa Department of Agriculture and Land Stewardship regulations, and be labeled accordingly.

B. Type 1 –Permanent Lawn Seed Mix: choose equal portions of three different cultivars of Kentucky Bluegrass and two different culitvars of Turf-Type Perennial Ryegrass at 20 pounds/acre each. Selected seed to be Blue or Gold Tag certified. Seed Rate: See table below.

Variety & Kind	Purity	Germination	Application Rate lb/acre
Turf-Type Perennial Ryegrass cultivar blend	95%	90%	40
Creeping Red Fescue	98%	85%	25
Kentucky Bluegrass cultivar blend	95%	85%	195

2.02 FERTILIZER

A. Fertilizer shall comply with the rules of the Iowa Department of Agriculture and Land Stewardship as follows:

1. The grade of fertilizer will be identified according to the percent nitrogen (N), percent of available phosphoric acid (P_2O_5), and percent water soluble potassium (K_2O), in that order, and approval will be based on that identification.

2. All fertilizer shall be furnished from an established fertilizer dealer and guaranteed percentage analysis shall be provided by the fertilizer supplier on each container with the proper scale weight records.

3. Fertilizer shall be of a type that can be uniformly distributed by the application equipment. Fertilizer may be furnished in a dry or liquid form.

4. When applied dry, the fertilizer shall be a granular, non-burning chemically combined product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer. Granular or pellet form shall be

uniform in composition, dry, and free flowing without caking or other damage not suitable for use.

5. When applied in a liquid form, fertilizer may be chemically combined or may be furnished as separate ingredients.

6. Upon request of the Engineer, the Contractor shall provide a test of the fertilizer for conformance with the required analysis at no additional compensation; a tolerance of 1.0 percentage point plus or minus of that specified will be considered to be in substantial compliance.

2.03 WATER

A. Water shall be free of any substance harmful to seed growth.

B. The Contractor shall provide water, equipment, methods of transportation, water tanker, hoses, sprinklers, and labor necessary for the application of water.

2.04 MULCH

A. Hydraulic Seeding:

1. The material shall be a natural or cooked cellulose fiber processed from whole wood chips (no recycled material) which will disperse readily in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit. Material shall be completely photo-degradable or biodegradable.

2. The homogeneous slurry of material and water shall be capable of being applied with standard hydraulic mulching equipment.

3. The slurry shall be dyed green to facilitate visual metering during application with said material or homogeneous slurry having no growth or germination-inhibiting factors, being completely non-injurious to plant or animal life and having no toxic effect when combined with seed, fertilizer, and water.

4. When applied, the wood cellulose fiber slurry shall be free from weeds or other foreign matter toxic to seed, consisting of a classification of fibers with a minimum of 30 percent having an average length of 0.15 inches or passing a Clarke Classifier 24 mesh screen, will form an absorptive mat, but not a plant-inhibiting membrane, which will allow moisture to percolate into the underlying soil.

5. Mulch shall have a water-holding capacity of not less than 9 pounds of water per pound of fiber.

6. The wood cellulose fiber shall have an equilibrium air dry moisture content of 12 percent or less a time of manufacture, as defined by the pulp and paper industry standards, and shall have a ph range of 4.0 – 5.5.

7. It shall be packaged in new labeled containers and be applied at a rate of 1,800 pounds per acre (41.3 lb/1,000 sf).

8. The mulch shall include a colloidal polysaccharide tackifier which shall be adhered to the fiber to prevent separation during shipment and avoid chemical co-agglomeration during mixing within the hydraulic mulching equipment.

9. The material shall be homogeneous within the slurry and shall have no growth or germination-inhibiting factors nor any toxic effect on plant or animal life when combined with seed or fertilizer. The material shall not form a water-resistant crust that can inhibit plant growth.

10. The tackifier shall be applied at a minimum rate of 50 pounds per acre (0.11lb/sq) and shall be packaged in new labeled containers.

11. All components pre-packaged by manufacturer to ensure material performance and compliance. Field mixing of additives or any components will not be allowed.

B. Conventional Seeding:

1. Material used as mulch may consist of straw (oats, wheat, barley, or rye).

2. Hay (bromegrass, timothy, orchard grass, alfalfa, or clover) shall not be used to mulch areas where lawn mixtures are seeded but may be used to mulch areas where erosion control and perennial ground covers are seeded.

3. All material used as mulch will be free from all noxious weed, seed-bearing stalks, or roots and shall be inspected and approved by the Engineer prior to its use.

4. Other materials, subject to the approval of the Engineer, may be used.

2.05 INOCULANT FOR LEGUMES

A. An inoculant is a culture of bacteria specifically formulated for legume seeds (alfalfa, clovers, lespedesa, birdsfoot trefoil, hairy vetch, and crown vetch).

B. The manufacturer’s container shall indicate the specific legume seed to be inoculated, rate of application, and the expiration date.

C. All inoculant shall meet requirements of the Iowa Seed Law. Follow the safety precautions specified on the product label.

2.06 FUNGICIDE

A. A fungicide shall be a noncommercial protectant formulation to provide protection from soil-born fungus diseases of seeds.

B. The application shall be made at the rate of 5 1/2 ounces of a 75 percent concentrate or equivalent per 100 pounds of seed.

2.07 STICKING AGENT

A. A sticking agent shall be a commercial material recommended by the manufacturer to improve adhesion of inoculant and fungicide to the seed.

B. For small quantities, less than 50 pounds, the sticking agent need not be a commercial agent, but it must be approved by the Engineer and must be applied separately prior to application of inoculant and fungicide.

PART 3 - PART 3 EXECUTION

3.01 AREA OF SEEDING

A. Areas to be seeded include all areas disturbed by construction unless otherwise noted.

B. Temporary Erosion Control: Contractor to provide and seed temporary seeding as may be required to fulfill NPDES Permit requirements.

3.02 SEEDING DATES

A. Seeding dates Turf Type 1 seed shall be between March 1 to May 31 and between August 10 and September 30. Commence only when ground temperatures are 55 degrees Fahrenheit or greater.

B. Dormant seeding for domestic lawn seed, if approved by Owner, shall be completed when air temperatures are consistently below 40°F and prior to December 25 of a given year, unless otherwise approved. Dormant seeding is not allowed on snow. Prepare the seedbed before the ground freezes. To ensure protection of the seed, apply on a frosty morning or before a predicted snow.

C. At the option and at the full responsibility of the Contractor, seeding operations may be conducted under unseasonable conditions. The final results shall be as specified and guaranteed without additional compensation should the seeded areas require reseeding.

3.03 SEEDBED PREPARATION

A. Limit preparation of seedbed to areas which will be seeded immediately upon completion.

B. Remove all straw-mulch, weeds and weed debris where weed growth has developed, in the opinion of the Engineer. Straw-mulch, weed growth and weed debris removal

process shall be approved by the Engineer and shall be done without additional compensation.

C. Use crawler type or dual-wheeled tractors for seedbed preparation. Operate equipment in a manner to minimize displacement of soil and disturbance of the design cross-section. Harrow ridging in excess of 4 inches due to operation of tillage equipment prior to rolling with the cultipacker. Roll the area with no less than one pass of the cultipacker prior to permanent seeding.

D. The Contractor shall shape and fine grade to remove washes or gullies, water pockets, and irregularities to provide a smooth, firm, and even surface true to grade and cross-section.

E. Disk or rototill and cultivate seedbed to a minimum 3 inch depth to a fine texture and without soil lumps. Where the area is inaccessible to machinery, it shall be prepared by hand to a minimum depth of 2 inches after the fertilizer has been applied. For lawn seeding areas, prepare to a fine texture and without soil lumps. Coordinate preparation of all ditches designated for special ditch control with the seedbed preparation. Till parallel to the contours.

F. Smooth the seedbed with a cultivator-type tillage tool having a rake bar or a rock rake. Pick up and remove all debris, such as rocks, stones, concrete larger than 2 inches (1/2 inch maximum for lawn seeding areas), or roots and other objectionable material that will interfere with the seeding operation. A spring tooth cultivator may be used in lieu of a rock picker. Remove the rock by hand after each use of the cultivator; repeat the process until the soil is relatively free of rock as determined by the Engineer.

G. Choose equipment to minimize soil compaction. Operate equipment in a manner to minimize displacement of soil and disturbance of the design cross-section. Roll the area with at least one pass of the cultipacker. Remove ruts that develop during the sequence of operations before subsequent operations are performed. This must be completed just prior to seeding and the work approved by the Engineer before the seeding application.

H. Application of Fertilizer:

1. Do not apply fertilizer with native grass and forb mixes.

2. Apply fertilizer after shaping and fine grading and prior to the combined tillage and rock-removal operations. On areas inaccessible to machinery, the fertilizer may be spread prior to tillage and cultivated seedbed preparation and uniformly mixed into the top 1 1/2 inches of soil.

3. Fertilizer shall be spread with a mechanical spreader or sprayer uniformly to all areas to be seeded at the minimum rate specified herein. The fertilizer shall be tilled into the soil to a minimum depth of 3 inches.

4. The Contractor shall be permitted to substitute other fertilizer containing analysis percentages different from those specified, provided that the minimum amounts of actual nitrogen (N), phosphate (P), and potash (K) per acre are supplied and

that in no case shall the total amount per acre of the three fertilizer elements (N), (P), or (K) be exceeded by 30 percent of the following minimum amounts.

5. Conventional Seeding (Lawn Seed Mixes Only):

   a. Apply 6-24-12 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 200 pounds per acre. A minimum of 40 percent of the total nitrogen (N) shall be water insoluble nitrogen.

6. Hydraulic Seeding (Lawn Seed Mixes Only):

   a. Apply 6-24-12 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 200 pounds per acre prior to seeding.

   b. In addition to the above, a minimum of 100 pounds per acre of a 20-26-6 fertilizer in which a minimum of 50 percent of the total nitrogen is water insoluble nitrogen shall be applied as part of the seed, fertilizer, mulch, and water slurry.

7. Tilling:

   a. After fertilizer has been applied, a mechanical rock picker shall be used on areas accessible to machinery to mix fertilizer in the soil to a depth of 3 inches and to remove all rocks, debris, and solid non-soil material larger than 1 inche in diameter from the upper 3 inches of the soil. A spring tooth cultivator may be used in lieu of a rock picker. The rock shall then be removed by hand after each use of the cultivator--the process to be repeated until the soil is relatively free of rock as determined by the Engineer.

   b. Remove all rock remnants from rock piles used on project smaller than 1 inch.

   c. The seedbed shall then be smoothed with a cultivator-type tillage tool having a rake bar-such as the Roseman rake-or a rock rake-such as the York-gauged by rear gauge wheels or by a blade gauged by a landscape roller-such as the Viking roller blade.

   d. Tilling shall be parallel to the contours.

   e. Ruts and wheel tracks in the seedbed from seedbed preparation are to be removed prior to seeding. This must be completed just prior to seeding and the work approved by the Engineer before the seeding application.

3.04 SEED PREPARATION

A. Treat all legume seed with a commercial sticking agent to be applied prior to application of inoculant, or as a mixture when the sticking agent is compatible with other materials. A sticking agent is not required if a liquid formulation of inoculant is used. Use mechanical mixing equipment to apply sticking agent and inoculant on seed quantities over 50 pounds.

B. Inoculate all legumes with a standard product humus culture before being mixed with other seeds for sowing.

C. Inoculate all legumes with a standard culture at the rate specified by the manufacturer of the inoculant according to Iowa DOT Article 4169.04. Do not expose inoculated seed to direct sunlight for more than 30 minutes. Re-inoculate seed that is not sown within 8 hours after inoculation prior to use. Pre-inoculated seed with manufacturer's recommended protective coating may be used in lieu of seed with Contractor-applied inoculant.

D. When the gravity or cyclone seeder is used for application of seed, inoculate legume seed according to the manufacturer's recommended procedures, before mixing with other grass seeds for sowing. Furnish and apply inoculant.

3.05 APPLICATION OF SEED

A. Prior to seeding, the seedbed shall be inspected and approved by the Engineer and Owner.

B. Conventional Seeding:

1. Sowing:

a. Domestic Grasses - On all areas accessible to machinery, all grasses shall be sown with a drop-type seeder attached to a landscape roller in such a manner that the seed is applied and then covered by rolling which firms the soil. Seeding to be completed with a minimum of two passes in different directions.

b. On areas inaccessible to field machinery, the use of cyclone seeders will be permitted, but no other hand-seeding methods will be accepted.

2. Mulching:

a. All seeded areas shall be mulched within 24 hours after the seed is sown. The mulch shall be uniformly distributed over the required areas at a rate of 2 tons of dry mulch per acre.

b. The mulch shall then be worked into the soil with a mulch tucker which shall be designed to anchor the mulch into the soil. The tucker shall be designed to anchor mulch into soil by means of dull blades or disks with a

minimum of two passes. Operate equipment in a manner to minimize displacement of the soil and disturbance of the design cross-section.

c. Do not tuck mulch over native prairie, wetland, and forbes mixtures.

C. Hydraulic Seeding:

1. If approved by Engineer, hydraulic seeding shall be applied as specified.

2. All material, seed, fertilizer, mulch, tackifier, and fungicide shall be placed in hydraulic-mulching equipment specifically manufactured for hydraulic seeding and mulching.

3. Ensure the hydraulic equipment, pump, and application process do not damage or crack seeds.

4. Materials shall be mixed with fresh potable water using a combination of both recirculation through the equipment's pump and mechanical agitation to form a homogeneous slurry.

5. It shall be applied evenly over all specified areas in a workmanlike manner at component material rates specified.

6. Apply mixture within one hour after seed and fertilizer are placed in the hydraulic seeder.

7. If necessary, dampen dry, dusty soil, to prevent balling of the material during application.

8. Site cleanup shall be considered part of application and shall include the removal of hydraulic mulch slurry from buildings, landscaping, sidewalks, and any other areas not specified for application. All debris resulting from this application shall be removed from the site.

3.06 WATERING

A. All seeded areas shall be kept moist at all times. The areas shall be artificially watered a minimum of twice a day (early morning and evening) every day for the first week after seeding is completed.

B. For the second and third weeks after seeding, the seeded areas shall be artificially watered once a day (early morning or evening).

C. The quantity of water used shall be adequate to keep the soil and mulch moist to a depth of 1 inch and ensure growth of the seed. If natural rainfall is adequate to keep the soil and mulch moist as stated above, artificial watering may be deleted.

D. Any area seeded in the month of May shall be maintained for an additional 3 weeks. The seeded areas shall receive a minimum of 1 inch of water each week (either natural, artificial, or combination) for the fourth, fifth, and sixth week after seeding.

3.07 MAINTENANCE

A. Domestic Grasses - Maintenance shall begin immediately following the installation of seed and mulch and continue for a minimum 60 day period or until seed has been accepted.

B. Maintenance of seeded areas shall include protection against traffic, repairing of areas damaged, watering, rolling, and mowing when grasses are at an approximate 3-inch height.

1. If areas are seeded in the fall and not given a full maintenance period, or if seeding establishment is not acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

3.08 RE-SEEDING

A. When all work related to seeding on an area has been completed but is washed out or damaged prior to final acceptance of the seeding area and that area involves seeding in combination with mulching or fertilizing or both, the area shall be reseeded, refertilized, and remulched at the contract unit price or prices when so ordered by the Owner.

B. Fertilized or seeded areas damaged by rain prior to required mulching or areas where the mulch is not tucked shall be refertilized or reseeded or both at a rate not to exceed the specified rate, as designated by the Engineer, without additional compensation.

3.09 CLEANUP

A. Perform cleanup operations during installation of work and upon completion.

B. Remove from site all excess materials, debris, and equipment.

C. Hose down and/or broom clean all paved surfaces.

D. Repair any damage resulting from seeding operations.

E. Remove hydraulic slurry from buildings landscaping and plantings, mulch, sidewalks, pavement, and any other areas not specified for application.

3.10 FINAL ACCEPTANCE

A. The areas seeded shall be given acceptance based upon the following criteria:

1. All requirements for the completed installation and a minimum of 60 days maintenance have been provided for domestic grasses.

2. Seeded areas shall be in a live, healthy, growing, and well-established condition without eroded areas, bare spots, free of weeds, undesirable grasses, disease, or insects.

3. Re-seeding operations are completed, as per original specifications.

B. Final acceptance may be given by the Owner upon fulfillment of all items completed as required.

END OF SECTION 32 92 00

SECTION 33 05 00

MISCELLANEOUS ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire and Cable

1.2 DESCRIPTION OF WORK

This part of the specifications includes the furnishing of all materials and equipment necessary to complete, in place and operational, electrical circuit as described in the project plans.

1.3 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants as well as the additional requirements listed below. All of the following must be submitted within 30 days after awarding of the contract for the project. Submit catalog cuts for review. Verify the method of submittal with the Owner.

PART 2 PRODUCTS

2.1. WIRE AND CABLE

Wire and cable construction types, conductor sizes, and working voltage ratings will be specified in the contract documents.

A. Single Conductor Wire and Cable.
Furnish wire and cable meeting the following requirements:

1. Insulation.
   a. Rated for 600 volts.
   b. Thermosetting, cross linked polyethylene meeting the requirements of ICEA S-66-524 (NEMA WC-7).
   c. Thickness meeting the requirements of Table No. 3-1 Column "A".
   d. Unless specified otherwise in the contract documents, comply with applicable requirements of UL Standard No. 44.
   e. UL listed for use at conductor temperatures of 167°F (75°C) or higher in wet or dry locations.

2. Wire and Cable.
   a. Bear required UL labeling repeated throughout their length.
   b. UL Listed Type USE-2 per UL Standard 854, Type RHH or RHW-2 per UL Standard 44, and UL Listed Type THHN per UL Standard 83.

3. Conductors.
   a. Annealed copper meeting the requirements of ASTM B 3.
   b. Sizes smaller than No. 8 AWG, may be solid or stranded.
   c. Sizes No. 8 AWG and larger are to be stranded and are to meet the requirements of ASTM B 8, Class B.

B. Bare Copper Ground Wire.

1. Use soft drawn wire meeting the requirements of ASTM B 3, or medium hard drawn wire meeting requirements of ASTM B 2.

2. For direct burial installation, use solid wire for sizes smaller than No. 4 AWG and stranded wire for sizes of No. 4 AWG and larger. For installation in raceways or ducts, use solid wire for sizes smaller than No. 8 AWG and stranded wire for sizes of No. 8 AWG and larger. Ensure stranding meets the requirements of ASTM B 8, Class B.

2.2. CONTROL CABINET

Utilize the existing control cabinet as indicated in the contract documents. Furnish and install meter sockets as necessary.

A. General.
Meet the following requirements:

1. Internal wiring for line and control circuits shall meet the requirements for single conductor cable. Thermoplastic cable may be used with the Engineer's approval.

2. Minimum interrupting ratings for branch circuit breakers identical to line circuit breakers. Provide one branch breaker for each active circuit and specified spare.

3. Unless shown otherwise, load current ratings of
   - 30 amperes for branch circuit breakers.
   - 100 amperes for main circuit breakers.

4. Interrupting ratings for the contactor not less than the load current rating for the line circuit breaker.

5. Minimum working voltage rating of 240 volts for the control fuse. Use cartridge type fuse with dimensions 13/32 inch by 1 1/2 inch. Current ratings as recommended by the manufacturer.

6. Double-break contact block test switch.

PART 3 EXECUTION

3.1. SECONDARY SERVICE LOCATIONS.

1. Coordinate new secondary service locations with staff. Consult and cooperate with the staff in locating the service locations so lines will be as short and direct as possible.

3.2. CIRCUITS.

1. Ensure circuits are complete with all necessary accessories for proper operation. Thoroughly coordinate disconnecting devices, protective devices, and all other equipment to secure a safe operating system. If any changes in arrangement of the circuit system are considered necessary by the Contractor, submit details of changes and reasons to the Engineer for approval. Obtain the Engineer's approval prior to making changes.

3.3. GROUNDING.

1. General Requirements.
   a. Use copper clad, steel rods for ground rods, pressure type clamps, and bare solid conductor copper wire (No. 6 AWG) bonding jumpers to ground major components of the lighting system, such as light poles. Ground rods shall be a minimum nominal 5/8 inch diameter and 8 feet minimum length.

2. Grounding Installations.
   a. Permissible grounding installations are as follows:
      1) Ensure that in no case is any portion of the ground rod closer than 18 inches (0.5 m) to the finished earth surface. Drive all rods as nearly vertical as possible. Whenever possible, drive a full length ground rod.
      2) When rock or other obstructions prevent driving the rod to full depth, two half-length sections may be driven, with the Engineer's approval. The two half-length sections are considered as a minimum length rod when additional rods are required to obtain the specified resistance to ground.
      3) Where two half-length rods cannot be driven to the required depth, place full length rods horizontally at a depth of no less than the adjacent trench depth.
      4) The minimum horizontal clearance between all rods in a multiple ground installation is to be 6 feet (2 m).

3.4. WIRE OR CABLE.

1. Furnish and install wire or cable of the size and type specified. When installing wire or cable in a conduit system, provide equipment to demonstrate to the Engineer that at no time will a pulling tension of 0.008 pound per circular mil (70 N/mm^2) of conductor be exceeded.

2. Ensure unreeled wire or cable is not left on the ground surface or exposed to mechanical abrasion. Replace all wire or cable that is stressed or damaged in any way at no additional cost to the Owner. Do not install wire or cable with dirt or any other abrasive material adhering to it.

3. Use a lubricant when pulling wire or cable. Use a UL listed lubricant designed for use with the specified cable and conduit. The use of graphite or petroleum lubricants will not be permitted. Ensure the pulling device is attached to each conductor and all wire or cable within a single duct is pulled simultaneously.

3.5. SPLICES.

Use approved connector assemblies to make splices. Splices in the system will only be allowed in pole shafts, handholes, pull boxes, breakaway bases, and other specified locations.

3.6. CLEANUP

A. Perform cleanup operations during installation of work and upon completion.

END OF SECTION 33 05 00

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SECTION 33 14 23
WATER UTILITY DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Butterfly Valves

B. Gate Valves

C. Tapping Valve Assemblies

D. Fire Hydrant Assemblies

E. Flushing Devices (Blowoffs)

F. Valve Boxes

1.02 DESCRIPTION OF WORK

Install valves, fire hydrants, and appurtenances for water mains.

1.03 SUBMITTALS

Comply with General Provisions and Covenants.

1.04 SUBSTITUTIONS

Comply with General Provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with General Provisions, as well as the following:

Remove valves, fire hydrants, and appurtenances contaminated with mud and surface water from the site. Do not use in construction unless thoroughly cleaned, inspected, and approved by the owner.

1.06 SCHEDULING AND CONFLICTS

Comply with General Provisions.

1.07 SPECIAL REQUIREMENTS

None.

PART 2 - PRODUCTS

2.01 VALVES

A. General:

1. Valve Body: Manufacturer□s name and pressure rating cast on valve body.

2. Direction of Opening: The opening direction is counterclockwise as viewed from the top, unless otherwise specified in the contract documents or as directed by the Jurisdiction.

3. Joints:
   a. For buried installations, use mechanical joints per AWWA C111. Comply with Section 5010 for joint nuts and bolts.
   b. For installation within structures, flanged with dimensions and drillings according to AWWA C110 or ANSI B16.1 class 125.

B. Gate Valves:

1. Standards: Comply with AWWA C509 (gray iron or ductile iron) or AWWA C515 (ductile iron) and NSF 61.

2. Stem Seals: Double O-rings permanently lubricated between seals. Lubricant certified for use in potable water.

3. External Bolts and Hex Nuts: Stainless steel according to ASTM A 240, Type 304.

C. Butterfly Valves:

1. Standards: Comply with AWWA C504 class 150B (gray iron or ductile iron) and NSF 61.

2. Stem: Stainless steel according to ASTM A 240, Type 304, turned, ground, and polished.

3. For Seat on Body Valves:
   a. Disc: Ductile iron or gray iron with plasma applied nickel-chromium edge or stainless steel edge according to ASTM A 240, Type 316, and mechanically fixed stainless steel pins.
   b. Seat: Synthetic rubber compound mechanically retained to the body.

4. For Seat on Disc Valves:
   a. Disc: Ductile iron according to ASTM A 536 with synthetic rubber compound seat mechanically retained to the disc.
   b. Seat: Continuous Type 316 stainless steel seat.

5. External Bolts and Hex Nuts: Stainless steel according to ASTM A 240, Type 304.

D. Tapping Valve Assemblies:

1. Tapping Valve: Gate valve complying with AWWA C509 or AWWA C515.

2. Sleeve:
   a. Minimum 14 gauge.
   b. Stainless steel according to ASTM A 240, Type 304.
   c. Working pressure 150 psi.
   d. Must fully surround pipe.
   e. Flanged with dimensions and drillings according to AWWA C110 or ANSI B16.1 class 125.

3. Minimum Sleeve Length: Comply with the following table.

Table 5020.01: Minimum Sleeve Length

Outlet Flange Size	Minimum Sleeve Length
4”	15”
6”	15”
8”	20”
10”	25”
12”	25”
Over 12”	As approved by the Engineer

4. Gasket:
   a. To completely surround pipe.
   b. Minimum thickness 0.125 inch.
   c. Use nitrile rubber.

5. Outlet Flange:
   a. Stainless steel complying with ASTM A 240, Type 304.
   b. ANSI B16.1, 125 pound pattern.

6. Hex Nuts and Bolts: Stainless steel complying with ASTM A 240, Type 304.

7. Tapping Valve Assemblies: Use only where specified in the contract documents.

2.02 FIRE HYDRANT ASSEMBLY

A. Material: Comply with AWWA C502.

B. Manufacturers: As allowed by the Jurisdiction or as specified in the contract documents.

C. Features:

1. Breakaway Items: Stem coupling and flange.
2. Inlet Nominal Size: 6 inch diameter.
3. Inlet Connection Type: Mechanical joint.
4. Hose Nozzles: Two, each 2 1/2 inches in diameter.
5. Direction of Opening: Counterclockwise, unless otherwise specified.
6. Items to be Specified: The following items will be specified by the Jurisdiction

or in the contract documents.
a. Operating nut.
b. Pumper nozzle.
c. Nozzle threads.
d. Main valve nominal opening size.

D. Painting:

1. Shop coating according to AWWA C502.

2. Above grade exterior coating type and color will be selected by the Engineer.

E. External Bolts and Hex Nuts: Stainless steel according to ASTM A 193, Grade B 8.

F. Gate Valve: Comply with Section 33 14 23, 2.01.

G. Pipe and Fittings: Comply with Section 33 14 16.

2.03 APPURTENANCES

A. Flushing Device (Blowoff): As specified in the contract documents.

B. Valve Box:

1. Applicability: For all buried valves.

2. Manufacturer: As allowed by the Jurisdiction or specified in the contract documents.

3. Type:
a. In paved areas, use a slide type.
b. In all other areas, use a screw extension type.

4. Material: Gray iron.

5. Cover: Gray iron, labeled "WATER"

6. Wall Thickness: 3/16 inch, minimum.

7. Inside Diameter: 5 inches, minimum.

8. Length: Adequate to bring top to finished grade, including valve box extensions, if necessary.

9. Factory Finish: Asphalt coating.

10. Valve Box Centering Ring: Include in installation.

C. Valve Stem Extension: For all buried valves, provide as necessary to raise 2 inch operating nut to within 3 feet of the finished grade. Stem diameter according to valve manufacturer's recommendations, but not less than 1 inch.

PART 3 - EXECUTION

3.01 GENERAL

A. Install according to the contract documents.

B. Apply polyethylene wrap to all iron pipe, valves, fire hydrants, and fittings.

C. Set tops of valve boxes to finished grade, unless otherwise directed by the Engineer.

D. Check the working order of all valves by opening and closing through entire range. Before opening the valves, check with the Jurisdiction on operating requirements.

E. Test and disinfect all valves, fire hydrants, and appurtenances as components of the completed water main according to Section 33 01 12.

3.02 FLUSHING DEVICE (BLOWOFF)

Install and construct as specified in the contract documents.

3.03 FIRE HYDRANT

A. Install according to SUDAS Figure 5020.201. Ensure a 3 foot clear space around the circumference of the fire hydrant. Place anchor tee and hydrant in the locations specified in the contract documents.

B. If the fire hydrant valve is positioned adjacent to the water main, attach it to an anchor tee.

C. If the fire hydrant valve is positioned away from the water main, restrain all joints between the valve and water main.

D. Fire Hydrant Depth Setting:

1. Use adjacent finished grade to determine setting depth.

2. Set bottom of breakaway flange between 2 and 5 inches above finished grade.

3. If finished grade is not to be completed during the current project, consult with the Engineer for proper setting depth.

E. Coordinate installation with tracer wire installation.

F. Orient fire hydrant nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb. Set hydrants having two hose nozzles 90 degrees apart with each nozzle facing the curb at an angle of 45 degrees or as directed by the Engineer.

3.04 ADJUSTMENT OF EXISTING VALVE BOX OR FIRE HYDRANT

A. Minor Valve Box Adjustment: For existing adjustable boxes that have sufficient adjustment range to bring to finished grade, raise or lower valve box to finished grade.

B. Valve Box Extension: For existing valve boxes that cannot be adjusted to finished grade, install valve box extensions as required.

C. Valve Box Replacement: For existing valve boxes that cannot be adjusted to finished grade, remove and replace the valve box.

D. Fire Hydrant Adjustment:

1. Add extension barrel sections and stems as necessary to set existing fire hydrant at finished grade.

2. Paint exterior of new barrel section to match existing fire hydrant unless otherwise specified.

END OF SECTION 33 14 23

SECTION 33 41 00
SUB-SURFACE DRAINAGE SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and supervision required to construct the sub-surface drainage system including:

1. Trenching and disposal of trench excavation.

2. Provide and install drainage piping.

3. Provide sand.

4. Sand and earth backfill.

1.02 DELIVERY, HANDLING, AND STORAGE

A. Materials shall be delivered to the site in accordance with manufacturer's recommendations for shipment and protection of materials.

B. Handling of materials as recommended by manufacturer.

C. Storage of all materials in locations designated and approved by Owner.

1.03 CODES, INSPECTIONS AND PERMITS

A. Obtain any necessary permits for this Section of Work and pay any fees required for permits.

B. The entire installation shall fully comply with all local and State laws and ordinances, and with all established codes applicable thereto.

1.04 SITE CONDITIONS

A. Take precautions to insure that equipment and vehicles do not disturb or damage existing site grading, walks, drives, utilities, plants, etc.

B. Verify locations and depths of all underground utilities prior to excavation.

C. Repair and/or return to original condition any damage caused by Contractor's negligence at no cost to Owner.

D. Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during this work.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate

with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.

4. Provided minimum of 48-hour notice to Owner and Engineer and receive written notice to proceed before interrupting any utility.

5. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

E. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by this work.

PART 2 PRODUCTS

2.01 Perforated Corrugated Plastic Tubing:

A. Similar or equal to as manufactured by Advanced Drainage Systems, Inc., or Han-Cor.

B. With a drain guard similar or equal to Drain*Guard as manufactured by Advanced Drainage Systems, Inc.

C. Comply with all performance requirements of S.C.S. Code 606.

D. Comply with requirements of ASTM-F-405.

E. Sizes as shown on Drawings.

2.02 Non-Perforated Corrugated Plastic Tubing:

A. Similar or equal to as manufactured by Advanced Drainage System, Inc., or Han-Cor.

B. Comply with all performance requirements of S.C.S. Code 606.

C. Comply with requirements of ASTM-F-405.

D. Sizes as shown on Drawings.

2.03 Plastic Fittings:

A. Similar or equal to as manufactured by Advanced Drainage Systems, Inc., or Han-Cor.

B. Comply with all performance requirements of S.C.S. Code 606.

C. Comply with requirements of ASTM-F-405.

2.04 Sand Backfill:

A. Locally obtained, concrete sand.
B. Washed concrete sand having a fineness modulus of approximately 2.8.

C. Furnish test data and analysis for approval.

PART 3 EXECUTION

3.01 Layout: As shown on Drawings.

3.02 Trenching:

A. Trench width for specified tubing sizes as shown on Drawings.

B. Remove from site and dispose of all excavated material.

3.03 Installation of Tubing:

A. Slopes and grades as shown on Drawings.

B. Lay tubing on bottom of trench and centered in trench.

C. All tubing connections to be made as required and as recommended by manufacturer.

3.04 Backfilling:

A. Backfill all trenches having perforated corrugated plastic tubing with sand as specified in this Section. Settle sand by flooding.

B. Backfill all trenches having non-perforated corrugated plastic tubing with material excavated from trench.

C. Compact backfill to insure settlement does not occur. Place backfill in 4” layers mechanically compacted into place a minimum of 1' above the top of the pipe to 95% Standard Proctor density.

D. Top of backfill, after compaction, to be flush with finish surface grade.

3.05 Repair: If settlement occurs, add backfill, compact, and restore finish grade.

3.06 Clean-Up:

A. Contractor shall at all times keep premises on which work is being done, and adjoining premises within the Contract Limits, clean of rubbish caused by his work.

B. Upon completion of job, Contractor shall clean-up all debris caused by his work and leave area in a neat and clean condition.

C. Remove from the site and dispose of all debris and excess materials.

END OF SECTION